Popular Electricity Magazine

EDISONS IMPRESSIONS OF EUROPE IN THIS ISSUE

December

10 Cents

Five Features to Demand in a Vacuum Cleaner

You can get an immense amount of satisfaction out of an efficient vacuum cleaner — just as you can get only disappointment out of an inefficient machine. It is easy to tell the difference. There are five essential features to look for.

You Can Find Them All in

The Silent Running

Federal Vacuum Cleaner

First. Choose the machine with **the most powerful suction,** so you can take up **all** the dust and dirt—not merely from the floor, but from deep within upholstery, mattresses, etc. The FEDERAL has a **Rotary Vacuum Pump** that revolves steadily in one direction, like a powerful turbine engine. It creates a suction impossible with a fan or bellows type of cleaner.

Second. Choose a machine with **simple mechanism.** Just look at the extreme simplicity of the FEDERAL working parts. **Few** parts—**nothing** complicated—**everything** easy of access.

Third. Choose a **durable machine**—the FEDERAL has no valves to work loose—no bellows to wear out. Just a powerful, substantial pump and a motor—both revolving in one direction—steadily—noiselessly with the minimum of wear.

Fourth. Choose a **vibrationless machine.** The Rotary Pump in the FEDERAL operates so smoothly, steadily—without jarring or jerking—that it transmits no vibration to the floor.

Fifth. Choose a **noiseless** machine. The FEDERAL alone operates noiselessly. No gears to rattle, no piston to pound up and down. The FEDERAL is the Silent Running Cleaner.

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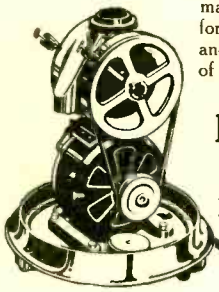
It is the Rotary Pump that makes the FEDERAL excel other Vacuum Cleaners. It is the Rotary Pump that gives it the powerful suction—that takes up all the dirt and dust, no matter how deeply imbedded in heavy rugs, carpets, upholstery, hangings and clothing. It is the Rotary Pump that makes the FEDERAL a simple machine, a durable one, a vibrationless and silent-running Vacuum Cleaner.



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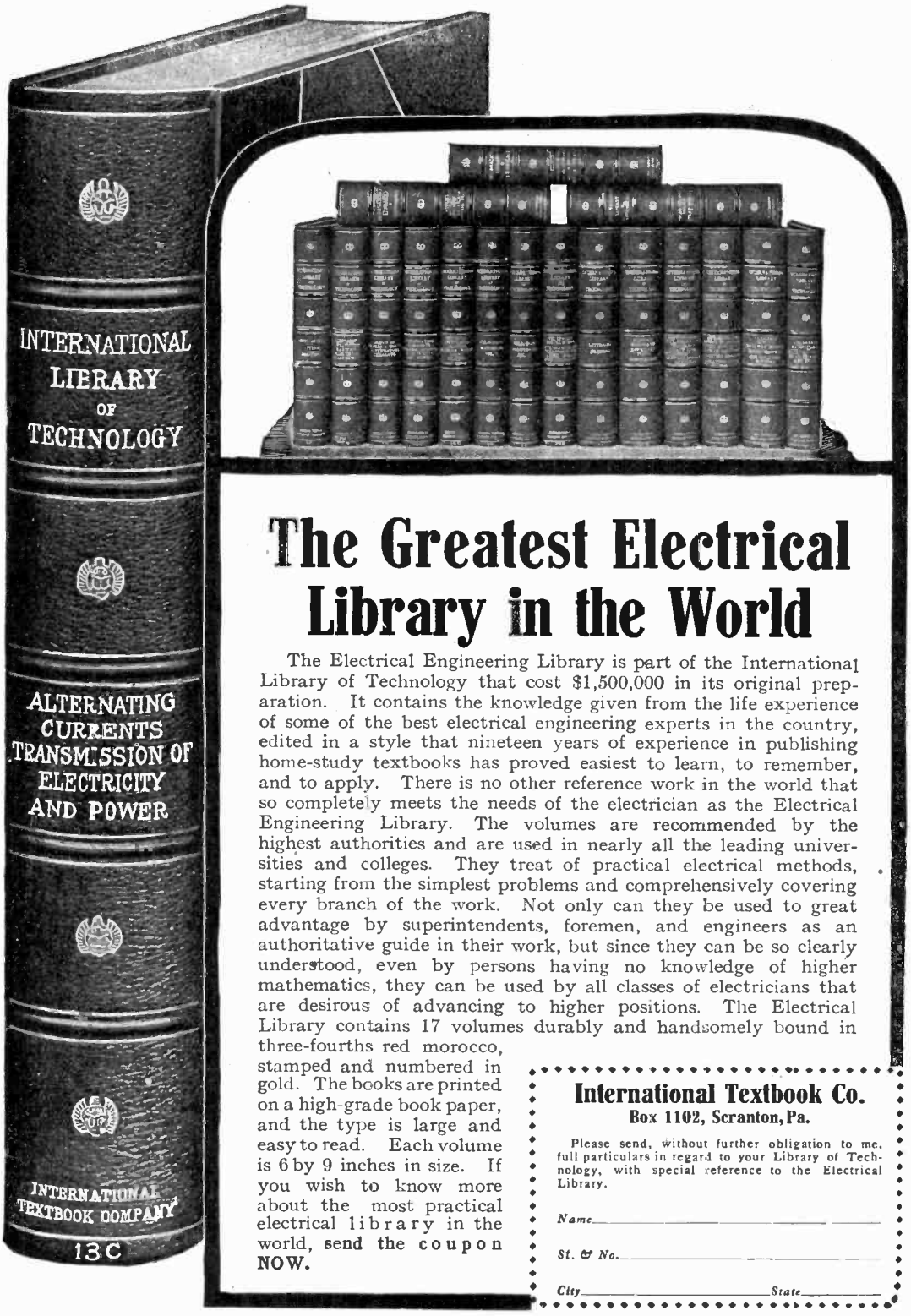

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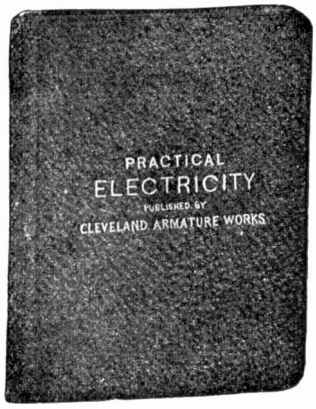

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XIV—Winding of Dynamos and Motors.
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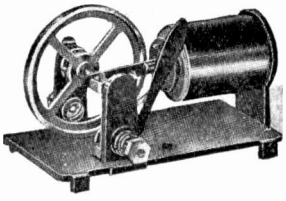

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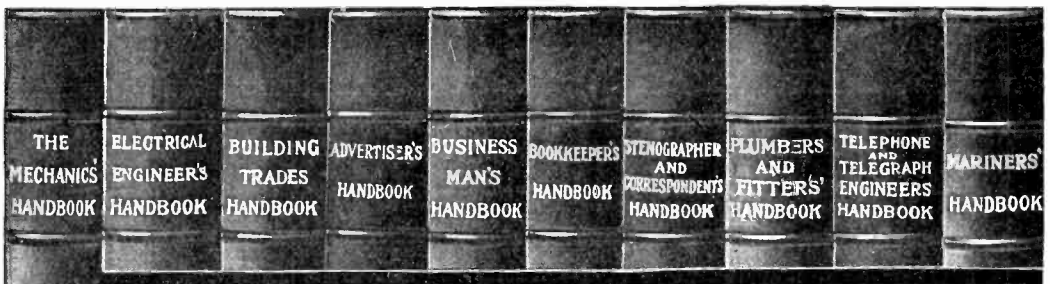

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Popular Electricity
In Plain English
Henry Walter Young, Editor

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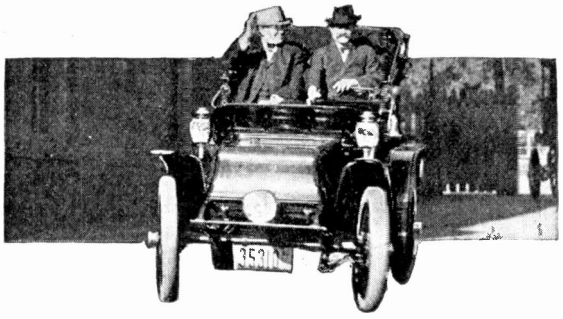
PORTRAIT OF MR. THOMAS A. EDISON, TAKEN IN JULY, 1911, JUST BEFORE HIS TRIP TO EUROPE

Popular Electricity
In Plain English

VOL. IV DECEMBER 1911 No. 8

Mr. Edison's Impressions of Europe

By W. H. MEADOWCROFT

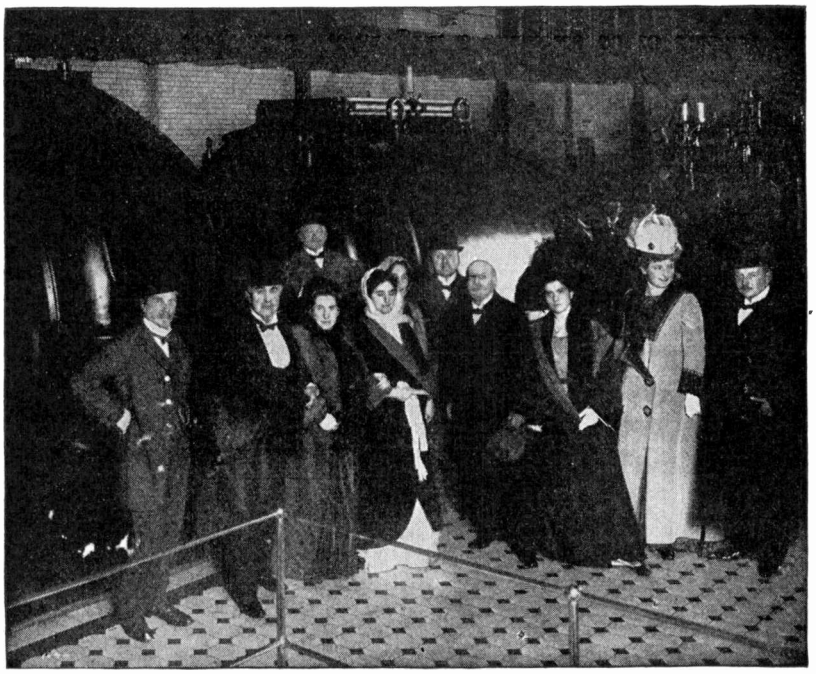


For the first time in 22 years Thomas A. Edison has taken a real vacation. Starting on August 2nd on the Mauretania, with his son Charles, he went to England to join Mrs. Edison and their daughter Madeline and son Theodore for an automobile trip in Europe, returning to New York on October 7th. Believing that the readers of POPULAR ELECTRICITY MAGAZINE would be interested in Mr. Edison's impressions of his foreign trip, I interviewed him at his laboratory in Orange, N. J., and found the great inventor looking rugged and well, and although extremely busy, willing to grant me some of his valuable time.

When asked to mention the most interesting experiences of his European trip, Mr. Edison smiled and said, "That's a large order, and I don't know that I can fill it, but let us begin at the beginning.

"One of the first things I did on arriving in England was to visit the House of Commons, where they were holding an all-night session, and where I saw two votes taken on the bill relating to the House of Lords. A seat was given me in the strangers' gallery. I could see, but, of course, could not hear the speeches. It was all very interesting, but there was no excitement. After the House adjourned everyone went out on the terrace, where I was introduced to a great number of the statesmen. They presented me with a copy of the Lord's Veto Bill, signed by Prime Minister Asquith, Lloyd George, John Redmond, John Burns, T. P. O'Connor and others. I was invited to visit the House of Lords the next day, but could not spare the time, as I had arranged to meet my wife in France.

"Next to Americans the English have the best practical brains. I like the English and admire their institutions and statesmen, and the way the country is run. They are strong on ancient tradi-



MR. AND MRS. EDISON AND PARTY WITH DR. EMIL RATHENAU AT THE ELECTRICAL GENERATING STATION AT MOABIT, GERMANY, SEPTEMBER, 1911

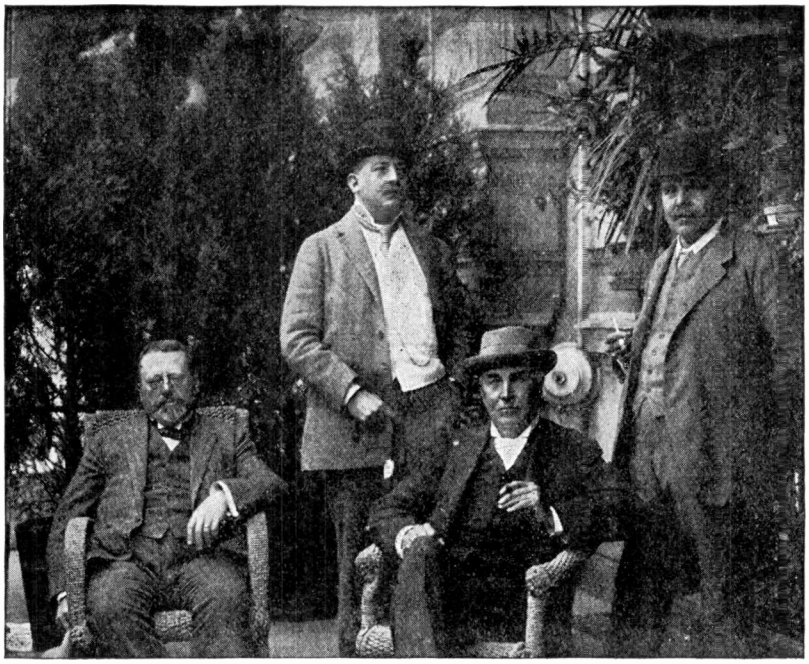
tions, but they are fast realizing that mere hereditary institutions must go. When I was in England a great railroad strike began, but the Government realized that it had a duty to perform to stop disorder, and it acted firmly. Governments are merely huge business concerns, and no allowance for sentiment should be made in their practical dealings with the affairs of the world. In this case England took energetic measures to insure the right of the individual to work for whatever wages he pleased, despite the tyranny of labor societies, and I think it is a healthy sign of her basic common sense.

"Motoring through France is a source of unbounded pleasure. I have seen no superior roads anywhere. I traveled over more than 2,000 miles of roads there and less than three miles were bad. There was not a rut more than two inches deep. We are far behind the French in this respect, and our American road engineers can get some valuable pointers from France.

"I was disappointed, however, in Paris as the so-called 'City of Light.' It bears no comparison to New York in that respect. The Champs Elysees, which is the most brilliantly illuminated street in the city, looks like twilight compared with Manhattan's 'Great White Way.' Paris is ever a wonderful city. There is much to interest the visitor, and I took no small pleasure in revisiting the familiar scenes of years ago, but my stay in the city of magnificent prospects was very short.

"I did not visit any of the great scientific institutions, the purpose of my trip being to see the country.

"The historical monuments of Paris do not impress me. I see them resting on the bones of countless victims of Napoleon's personal glory. Conquest costs; it never pays. The Germans have paid more than a thousand dollars an acre for Alsace and Lorraine and they thought they had gained it free. Their little march around the Arch of Triumph was in the end the costliest promenade



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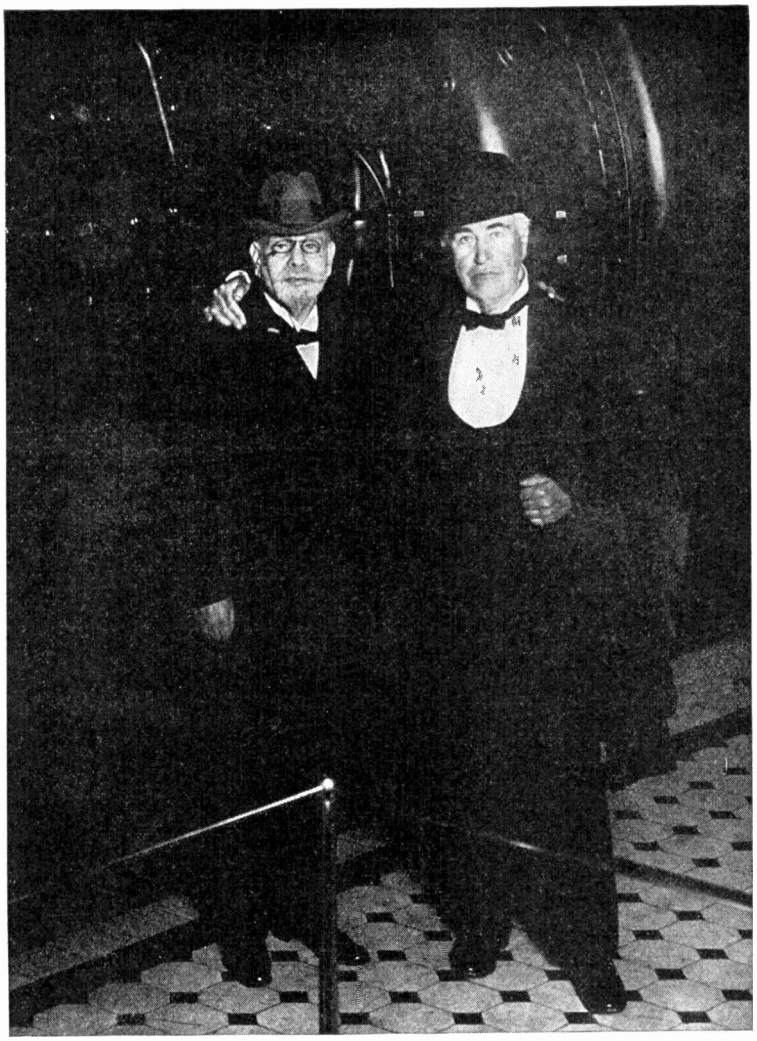
Mr. Etienne de Fodor Mr. Alexander von Stromszky Mr. Thomas A. Edison Mr. Francis Jehl

MR. EDISON WAS ENTERTAINED WHILE IN HUNGARY BY MR. ETIENNE DE FODOR, GENERAL MANAGER OF THE BUDAPEST GENERAL ELECTRIC COMPANY—VIEW TAKEN ON THE TERRACE OF THE UNION CLUB IN BUDAPEST

ever made. The glory of the war lord, wherever he may be, is fading away. There is too much independent thought, too many newspapers and schools in our present day of civilization to permit of the antiquated methods of these over ambitious men who, hiding behind their selfish aims, cry loudly for the glory of their country and force ruin on their people. The terrible price of war would be clear to coming generations if every monument had inscribed upon it the details of its cost to the people. The war game has received a solar plexus blow, anyhow, in the coming of the aeroplane. A thousand aeroplanes would cost less than one Dreadnought. But think of the frightful effect of a fleet of a thousand airmen dropping nitro-glycerin bombs. Another great international war in Europe seems impossible now so far as I can see. In other words invention has gone beyond the thirst for blood; the power of science, that has been let loose, must overwhelm aggressive diplomacy. Although Europe has learned her economic lesson, the subject of war seems to be ever in the minds of her people.

"But returning to more pleasing subjects than war, let me say that I enjoyed my tour through France. Its beautiful scenery is restful, and its agricultural richness is very impressive. I was amazed at the bountiful crops of wheat, barley and other small grain. There were no such extensive fields of one kind of grain as we see in our western states, but cultivation is done in small acreages. A few acres of wheat, with a similar patch of oats adjoining it, and so on, but all in the highest state of perfection. The farmers are successful and well to do, and it was not difficult to discern one reason of the wealth of France. The vast vineyards were particularly interesting. Unfortunately it did not happen to be the time for gathering the grape crop. I would like to have seen it, for I understand they make a great holiday of the occasion. Everywhere we went on our



MR. EDISON AND DR. EMIL RATHENAU AT THE ELECTRICAL GENERATING STATION AT MOABIT, GERMANY, SEPTEMBER, 1911

motor tour we found the people apparently happy and contented. They have savings in plenty, but they put the money out in government bonds. Land investments with them are practically *nil.* I was struck with the lack of new buildings going up. The peasants are certainly geniuses in making the most of a tiny strip of land. In one small farm I counted no less than seven different kinds of crops. The apple orchards of Normandy astonished me by their wonderful crops of ruddy apples.

"The French bread struck me as particularly good. It was palatable and nutritious, and I ate a great deal of it while in the country. The French are wiser than we in not seeking to make their bread dazzlingly white by sacrificing the nutritive parts of the wheat. Their skill in cooking is apparent everywhere, for even in the smallest villages everything that was served had the magic of their art.

"Switzerland is a country of magnificent scenery and practically unlimited

power going to waste. In motoring it is quite a change to leave the beautiful French roads where one can speed, and get into Switzerland, where sixteen miles an hour is the limit. The people are progressive, but lack the daring in business that is characteristic of the Anglo-Saxon. They are hampered by over-prudence. In some respects they remind me of the Japanese, for their genius shows itself in minute sorts of labor. They are a little people in a little land. As far as I can judge, they are more intricate in invention than in mind. Their watches, clocks, music boxes, wooden toys, and what not,—everything is little. We showed them how to make Geneva watches by machinery, and now they are imitating us in their own country. But occasionally a great engineer will arise among them. One is my friend Turitini, who constructed the great power works on the Rhone.

"Cheap electricity is waking up Switzerland, and there are some signs of growth. You will find new buildings going up, which cannot be said of all the countries in Europe. It is to be hoped that the Swiss will soon be so thoroughly awakened that the dreadful spectacle of women harnessed to the plows, yokemates with cattle, will be a thing of the past.

"Bohemia was a surprise to me. I had not expected to find much progress there, but was agreeably disappointed. New construction was in evidence not only in the larger towns, but even the smaller towns are extending somewhat. Most of the old houses are built up to the sidewalks, and there are no gardens or lawns in front, but the modern houses are different, and one sees flowers in the front yards. Perhaps this may be due to the influence of Bohemians who have returned to their country with a competence made in America, and have taken American ideas with them. There is a general tendency in Bohemia toward commercial and manufacturing development on a larger scale than ever before. Many factories are in course of construction. But the country is at present handicapped by ill-feeling between the laity and the Church, which must work itself out before any great progress can be made. I was struck with the fact, here, as elsewhere, that the European farmer makes more out of less promising land than ours, by intensive farming. Over there they spend their time and energy in carefully cultivating small areas instead of crudely cultivating large areas, as many of our farmers do. Nothing in the way of land goes to waste in Europe. Even the roadside is lined with fruit trees, principally apples, then come pears, then cherries. Ninety-nine per cent of such road land goes to waste with us. The Bohemians grow great crops of apples. There must be at least 250 square miles of the country devoted to apple growing. Their fruit is not as good as ours, however, being smaller and mostly used for the manufacture of champagne, vinegar, etc.

"In traveling through France I found myself looking always for the nation's factories, but generally in vain. Of course, she has her factories and plenty of them, but her manufactures, generally speaking, are artistic in nature, high in value and small in bulk. Hence, they do not require large machinery to produce them. On coming into Germany one immediately sees evidence of its being a great industrial nation. I saw more factory chimneys in the town of Chemnitz alone than in the whole of France.

"It seems like a humiliating thing to say, but it is the fact that Germany's manufacturing industries are pushing ahead much faster than ours are. The growth of her manufactures is constant and tremendous.

"Thousands of factories are in course of construction. I saw many factories in North Germany, and whether they were built or in building, the construction, generally speaking, was better than the construction of the best of ours. Their building methods are extremely

sensible, economical and effective. They use cement more freely and more wisely than we do. One sees everywhere buildings of loose stones faced with cement which fills in the interstices.

"Every detail of factory construction over there is hedged about by carefully restrictive laws, which are rigidly enforced. The consequence is well built buildings, safe, sanitary, admirable. There is very little danger of fire in such buildings. I was told in Prague that the city's fire loss in one year was only $26,000. The fire horrors which are continually occurring in America are impossible. The construction of the buildings is such that the workmen's health is carefully protected; they have fine light and air, and in the arrangement and management of the machinery they are carefully protected against accident. We have many things to learn from Germany in these details of factory equipment, construction and management.

"When our American people realize that the average depreciation on an average building is three per cent as against one-half of one per cent in Germany, they will wake up and throw aside tradition and take a lesson from our German friends who make liberal use of cement as a building material. We are apt to think of them as being slow and conservative. They are certainly conservative, but in that respect they have forged ahead and have made haste economically.

"Germany is up to date in all branches of mechanical and scientific advance. She is not behind us in these lines, generally speaking, although her shops are full of American machinery or imitations of it. I went through two great electrical shops in which 85 per cent of their machinery was American. This illustrates the good sense of the Germans. While Germany is the most scientific of all the nations, she does not approach us in applied science. She is pre-eminent, however, in some lines. In chemical industries she stands alone. In automatic labor-saving devices of all kinds and in their application we excel her.

"The Germans are the world's most persistent people. They usually get what they are after, and they have started now to capture our mechanical prestige. If the United States is to prevent them from outstripping us in the race, we shall have to get down to hard, intelligent work.

"The German domestic trade is enormous, but from indications in the packing rooms of several large German factories which I visited, I should say their foreign trade is still larger. They are organizers of great ability and extraordinary patience and are wonderfully energetic and intelligent. Not only are they fighting us for the world's trade, but they are also fighting England wherever she has business that they want, and they have engaged in a persistent campaign for the world's business. This campaign is not sensational, but there is no slackening up of it. If we are going to hold our own or win out, we should watch them closely, for there is much in their methods that we could learn with profit.

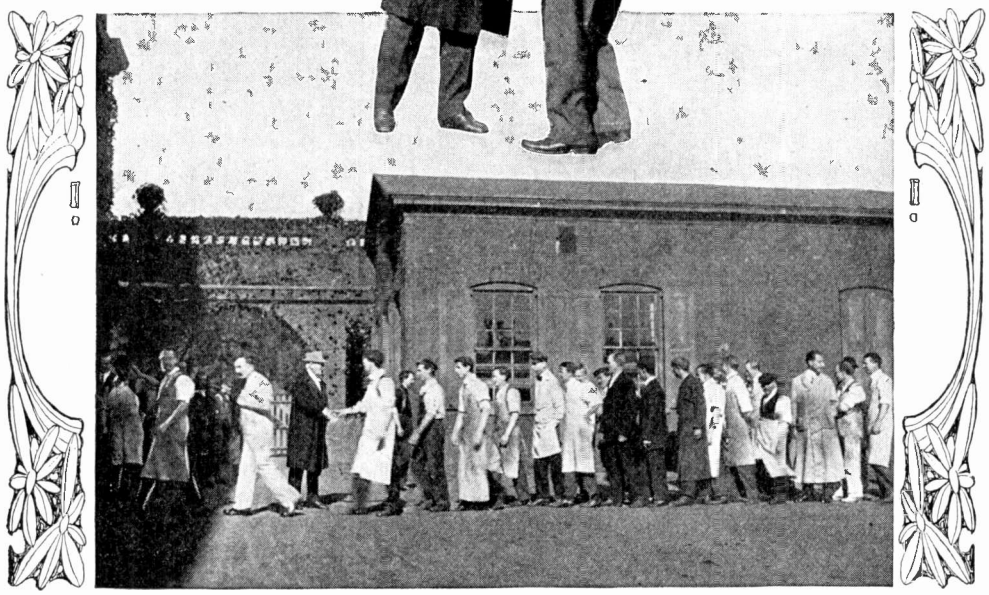
"They have gone so far as to establish banks with German capital in all parts of the world for the purpose of assisting resident German merchants, thus Germany not only exports goods and makes the profit from their sale abroad, but furnishes the necessary banking facilities, also highly profitable, through which the business is conducted, and she sends the goods in German ships.

"Another thing in Germany impressed me greatly, and that is one great advantage which their manufacturers have over us and every other country. I refer to her great promoting banks. In our country a man desiring to put something new on the market must have a promoter of his enterprise, and our promoters are notoriously irresponsible. In Germany inventions are brought out by the promoting banks.

"For instance, The Deutsche Bank, which is one of the largest banks in the world, has a corps of engineers and auditors ready to investigate any proposition. If a manufacturer wishes to exploit the invention he can get money promptly at a reasonable interest if he can prove that the proposition will be profitable. It saves time and keeps him out of the clutches of sharks.

"A good part of this plan is that the bank will carefully watch the progress of the invention and the manufacturer, and will place the stock on the Exchange, and when it has arrived at a certain point of prosperity, will sell the shares and take its money back, when it gets a fair profit for its use. This leaves the inventor or the manufacturer with his invention and factory in his own hands to proceed alone without encumbrance. This shows the wisdom that the Germans exercise in providing the utmost encouragement to their inventors and manufacturers, and I predict that it will soon put the German nation in advance of us in the origination and development of new mechanical ideas.

"I believe I see the true inwardness of the Emperor's unwavering naval policy. He does not want war; no one wants it less. But he apparently considers a large navy a good business investment. It insures protection to German capital invested in the remote parts of the world, as well as to German merchants wherever they may be. Hence their navy may be looked upon as a commercial proposition, and its cost as insurance premium.



THE LABORATORY BOYS GREETING MR. EDISON ON HIS FIRST APPEARANCE AT THE LABORATORY AFTER RETURNING FROM EUROPE. ABOVE, MR. EDISON GREETING MR. FRANK L. DYER, PRESIDENT OF THE EDISON INTERESTS

"My visit to Berlin was exceedingly interesting. I had not been there for 23 years, and the city had grown almost beyond my recognition. It has been called the Chicago of Europe, and it is certainly growing with Chicago speed. I have good reason to be interested in

Berlin, for it is the center of electrical industry in Europe. The greatest of the electrical works, the Allgemeine Elektricitäts Gesellschaft, is there, and is operated under the direction of my old friend, Dr. Emil Rathenau, employing about 60,000 workmen. I feel a sort of paternal interest in this works, as it was practically started by me, and once bore my name.

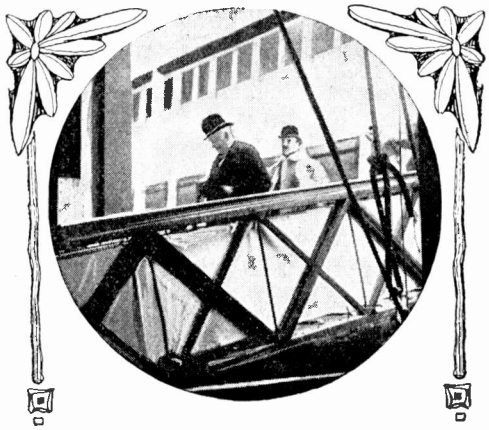
"Another of the great electrical works in Berlin is owned by another of my friends, Sigmund Bergmann. He started his electrical life with me by working at the bench in my Newark shop about 40 years ago, and later on made carbon transmitter telephones and phonographs, and afterwards became my partner in manufacturing the detail apparatus for the electric light system. His shrewdness and ability kept him ahead of the procession in this country, and he has kept up his reputation by organizing and operating his great establishment in Berlin, where he employs about 12,000 workmen and makes everything electrical.

"Still another of the great electrical shops is the one established by Schuckert, who also worked at the bench in my Newark shop with Bergmann, leaving my employ to go to Germany to settle up his father's estate. He stayed there and took up the manufacture of electrical apparatus and established the great works that bear his name, and in which many thousands of workmen are employed. He died immensely wealthy, but the works still go on.

"I also visited the Siemens-Halske and Siemens-Schuckert Works. These cover a large area and employ about 48,000 workmen. They manufacture not only everything that is used in the electric light and power fields, but also an immense variety of fine instruments and apparatus for philosophical and other purposes.

"I was much impressed with the great progress Germany is making in electrical manufactures and in the use of electricity. The people use electric light and power with great liberality, for they can buy current very cheaply. While there are many other important manufacturing plants throughout the country, Berlin is distinctly the electrical center. The importance of the electrical industry to Berlin may be readily appreciated when it is realized that at least one-sixth of that city's population depends upon it.

"I found my trip through Europe most interesting and instructive. It was made mostly by motor car, so we really saw the countries we went through, and really came in closer contact with the people who live in them than if we had traveled from place to place by train. I am well satisfied, however, to get back to my own country, for I did not see any country on the other side of the ocean that can compare with the United States, if considered as a whole."



Meters That Are Almost Human

As originally conceived electric meters were designed simply to tell the quantity of electric current flowing in a circuit, or its pressure—voltage. Since the product of quantity and pressure gives the power passing through the circuit it was natural that a meter which would record this product should soon be developed.

As soon as people began to sell electricity in large quantities it became apparent that the "flat-rate" basis would never do. The watt-hour meter, which multiplies current and voltage and takes into consideration time as well, has taken its place. This type of meter is the most important, commercially, of all. Today practically every consumer of electricity from the huge manufacturing industry to the modest suburban bungalow dweller pays for it on the say-so of a watt-hour meter installed on the premises.

In the tenement districts of some large cities there are prepayment meters into which one can drop a quarter. When the quarter's worth of current has been used up the lights go out and you must either come across with another quarter or go to bed in the dark. The dropping of the coin closes the lighting circuit, which is automatically reopened after a certain number of revolutions of the meter armature.

The watt-hour meter records only the total power which has passed through it. For some purposes particularly in the power station it is necessary to know also the fluctuation of current and voltage. This information is secured by recording meters which trace on a moving strip of paper a curve showing the variation in voltage or current during the period. Others trace these records on a revolving paper dial, the scale of which is made up of concentric circles. Then there is the recording watt-meter which draws a curve between time and power. All these instruments are called graphic meters because they draw their records.

Besides these there are meters for measuring the frequency or cycles per second of alternating current, and meters for measuring the power-factor, which is the ratio of actual power to apparent power in three-phase circuits.

There are meters used to measure temperature, called pyrometers although they are really thermometers. For the measurement of high temperatures electrical pyrometers are used almost exclusively. They are simply ampere-meters connected to the two ends of a thermo-couple. This thermo-couple consists of plates of two metals which, when heated in contact with each other, set up an electric current. The current is proportional to the temperature rise and so the scale of the meter is divided into degrees Fahrenheit instead of milli amperes. One beauty of this thermometer is that you can take the temperature of a fire without getting near it. Pyrometers are used largely in foundries, smelters and other places where molten metals must be worked at definite degrees of heat.

But perhaps the most interesting of all electric meters are the ampere-hour meters. These register the product of amperes and hours. Their greatest usefulness is in connection with storage batteries. The capacity of storage batteries is rated in ampere-hours and in charging them it is necessary to put in about 20 per cent more current than you expect to take out. The ampere-hour meter for controlling battery charging has a pointer which moves around the face of a dial. You can set this pointer for the number of ampere-hours which you wish to give the battery. When this amount of current has passed into the battery the pointer on the meter makes a contact which opens the charging circuit. Thus the battery may be fully charged without

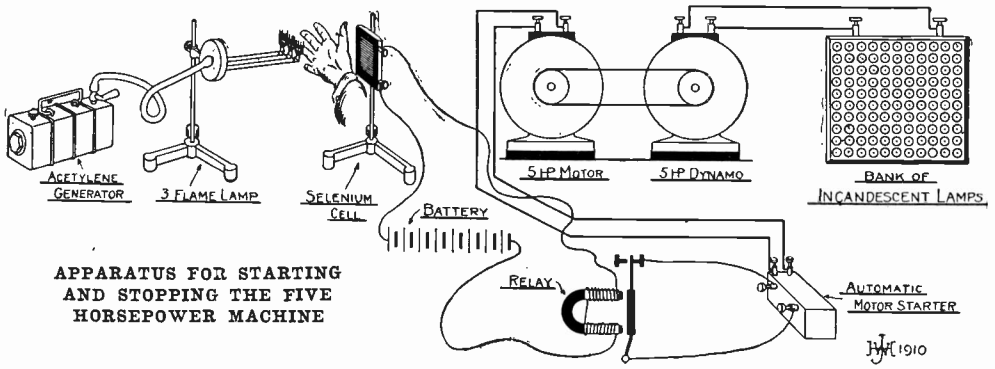
attention and without danger of overcharging.

These meters are used on electric automobiles for indicating how much "juice" is left in the battery. Since the capacity of the battery grows less as the rate of discharge increases—that is, since a battery which will deliver ten amperes for ten hours will deliver 20 amperes for only four hours—a battery discharged at a high rate might be exhausted when the meter showed it still partially charged. To compensate for this a meter has been built which automatically speeds up on discharge as the rate increases.

An important application of these meters is in electroplating silverware. This is done by immersing the article to be plated in a solution of silver salts and passing electric current through it. The deposition of silver is proportional to the amount of current passing, hence these meters are built to read in pennyweights of silver instead of in ampere-hours. By setting the meter at the number of pennyweights desired the articles can be left in the bath without attention. When the plating is finished the circuit is opened automatically and the operator notified by the ringing of a bell.

FIVE HORSEPOWER MACHINE STARTED AND STOPPED BY A WAVE OF THE HAND

An unusually spectacular feat was once performed by Mr. William J. Hammer, a prominent consulting engineer of New York. In this experiment he started and stopped a five horsepower machine many times by a mere wave of the hand. It would have been possible to break the circuit of a 5,000 horsepower machine in the same manner.



APPARATUS FOR STARTING AND STOPPING THE FIVE HORSEPOWER MACHINE

In performing the experiment the light from an acetylene lamp was concentrated on a selenium cell. Selenium, which is an absolute non-conductor in the dark, possesses the wonderful property of allowing a current of electricity to pass easily through it when it is exposed to light; that is, light reduces the electrical resistance of selenium. Under the rays of the lamp the cell became a good conductor and the current from a battery was allowed to flow through the cell and through a coil of wire surrounding a magnet. According to a well known principle of electricity, the magnet then became much stronger than before and drew to its poles an iron armature. The armature and the magnet formed what is called a relay.

As the armature was drawn up against the poles it closed the circuit of an automatic motor starter (shown only diagrammatically in the drawing). This started a five horsepower electric motor, belted to a five horsepower dynamo, and

as the machine started to revolve the dynamo generated current which lighted a huge bank of incandescent lamps.

Now for the spectacular performance. When light rays are excluded from selenium it becomes a poor conductor and current cannot pass through it. Therefore the experimenter steps up to the acetylene lamp and waves his hand once before the cell, shutting off the light rays from it. For an instant the selenium has a high resistance and current ceases to flow through it from the battery. This de-energizes the relay and the armature falls away to the "dead" contact of the motor starter as shown in the diagram, opening the main circuit and stopping the machines.

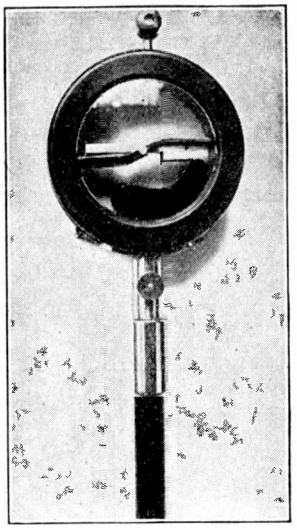
Conversely, if the operator's hand is then removed from between the selenium cell and the lamps, the light again acts upon the selenium, current again flows through the circuit, the armature is drawn up and the motor starts again.

CHARLES PRONER.

The Life Saver

This very handy little instrument, known as the life saver, is used in Paris in order to see whether electric lines are "alive" or not. It is about the size of a watch and can be detached from the ebonite rod. The rod is needed so as to hold the detector and at the same time by the insulating ebonite, protects the body from shock.

Inside the case is a small, pivoted member which is attracted by a fixed piece should the wire be live. However, in an instrument of this kind one of the main points is to know whether it is in good working order, so that it can be relied on without any risk. To find this out the case is taken off the rod and set upright on a table, then the rod is rubbed briskly on the sleeve so as to electrify it and is then touched to the button of the case. This causes the pivoted part to



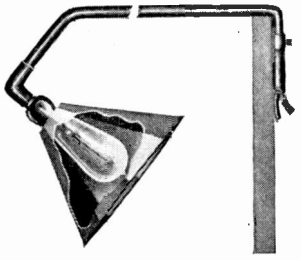
DETECTOR FOR LIVE WIRES

move when all is going well, then the rod is again attached to the case and used as a handle so as to touch the upper button against the electric wire.

Effective Billboard Lighting

It may be somewhat of a mystery to the uninitiated to see a big electric billboard brightly illuminated at night with no evidence of a wasted ray of light in the direction of the observer.

The lighting effect may be produced by a 100-watt tungsten lamp in a Reco



BILLBOARD LAMP AND REFLECTOR

mirror reflector held in position by metal conduit for the wires. The eight sides of the reflector are mirror glass fitted to a waterproof brass lamp socket and strongly reflect the light to the face of the board.

An English Idea of Advertising

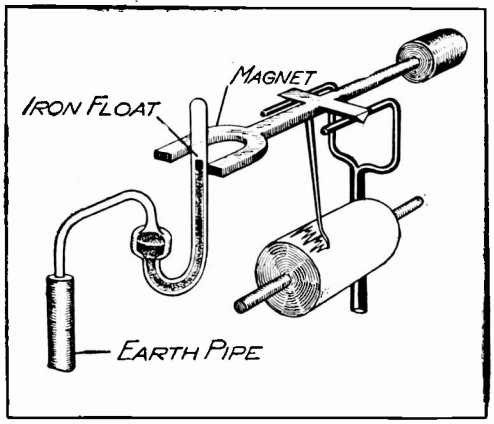
The advertising of an English firm making rubber covered cable takes the form shown in the accompanying reproduction of one of its advertisements.

AN ENGLISH ADVERTISEMENT

Whether or not the advertisement would measure up to the standard set by American advertising experts, as to effectiveness, is a question, but it is at least interesting and certainly indicates beyond argument the toughness of the product.

Recording Terrestrial Pressures

The subterranean gas pressures, which cause geysers and volcanoes to spout occasionally, also show themselves to a lesser degree in many other localities where they can be detected by connecting delicate pressure gauges to pipes run some distance into the earth. This internal pressure varies from day to day, and in many cases even from hour to hour, but neither the causes of the variations nor their connection with earthquakes and other disturbances have as yet been properly explained.



APPARATUS FOR RECORDING TERRESTRIAL PRESSURES

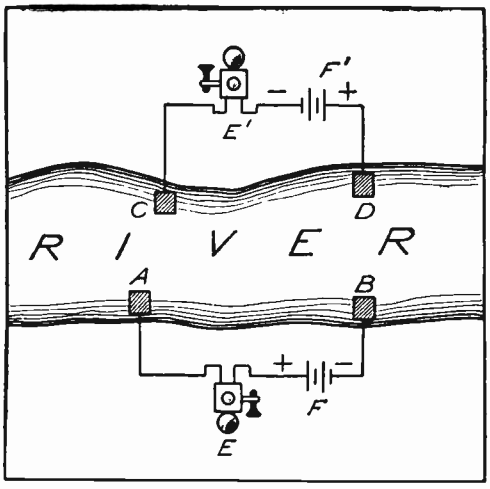
To secure more data on this subject, Prof. Boernstein has constructed a recording earth-barograph in which he cleverly uses a magnetic action for transmitting the motion to the needle. Having tapped the earth with a pipe, he connects the top of this to the mercury chamber of a barometer. Floating on the top of the mercury column is a small cylinder of iron which moves up and down as the mercury is pressed more or less by the air in the terrestrial pipe. This iron float attracts a small V-shaped magnet on the end of a delicately balanced beam, which beam carries a long arm fitted with a pencil. Consequently, the pencil follows every movement of the iron float and records the pressure variations on the surface of a cylinder which is rotated once every twenty-four hours by a small clock.

Wireless Telephoning Across a River

Any ordinary telephone may serve also for wireless communication across a river. The accompanying sketch illustrates how the connections are made to arrive at this end. The theory is as follows:

The electric current always seeks to travel the shorter way, if two ways are open to it. Thus it has been frequently and successfully shown that such a wireless communication across a river is by no means a difficult task.

Two plates (A) and (B) are suspended in the water of one side of the river. The distance between these two plates should exceed the width of the river at the point where one wishes to establish a wireless communication. The same holds true of the station on the other shore of the



WIRELESS TELEPHONING ACROSS A RIVER

river. There, too, the plates (C) and (D) should be plunged to the bottom of the river sands at a distance from each other, exceeding the width of the river. (F) and (F^1) are the batteries. Care should be taken as to the connections. If the negative pole of one battery is next to the plate leading directly to the river, then on the opposite side of the river the wire leading from the battery direct to the plate should be positive. In the illustration this is clearly brought out, for if the pole connected to (B) is negative then the pole connected and leading to (D) should be positive.

In order to ring up it would be more satisfactory to use a high-wound magneto, but with sufficient battery on each side an ordinary bell may be made to ring quite easily. (E) and (E^1) may be ordinary house telephones with good microphones. EMILE RUEGG.

Telephonography

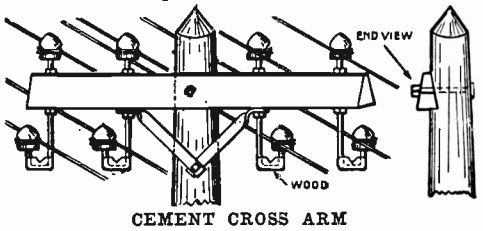
A recent issue of *L'Elettricista* tells of the results of Prof. Pierluigi Perotti's experiments with an apparatus designed to record upon a phonograph cylinder telephone conversation as it comes over the wire.

Two receivers are used at the receiving end, one in the ordinary way and the other in connection with the needle employed on the wax cylinder of the phonograph to take down the message. In reproducing a message the cylinder may be set back any number of times to repeat indistinct portions. Trials so far made are said to indicate satisfactory operation of the device.

Cement Cross Arms

The cement cross arm shown herewith is made of concrete reinforced by steel rods interwound with steel wire, and is fastened to the pole—of any material—by a single center bolt.

The arm is of nearly triangular cross-section, and may be fitted either with single iron pins, ordinary wood pins, or double iron pins below or above the



CEMENT CROSS ARM

pole; this is one of its distinctive features, enabling it to hold double the number of wires.

This arm is remarkably strong. At a recent test held before experts from various parts of the country a sample, newly made arm, fastened only by the center bolt, upheld a weight of 1,800 pounds. It may be fitted with wood in such a way that a wire, if broken from the holder, would not ground on the cement.

This arm, of course, is practically indestructible. Its initial and final cost is at present 48 cents, but the inventor, Mr. O. P. Megahan, is confident that this will be lowered to less than 30 cents before the arm is placed on the market. Molds for making the arm have been perfected, also a "fool-proof" cement mixture which the most ignorant laborer has only to mix with water and pour, doing away with the danger of weakening the arm by improper mixing. H. BEDFORD-JONES.

Just Before the Play

It was just before the matinee. "Come in" called a voice in response to the rap of the manager, and we entered the dressing room of little (everybody says "little") Miss Margaret Lawrence, the charming ingenue, in "Over Night" who has kept Chicago laughing ever since the play was put on at the Princess.

A slender, dainty girl with big, roguish, wide-open blue eyes sat in a chair before her dressing-room table, upon which were a lot of mysterious (to a man) celluloid things in pink, a mad black cat pin-cushion and a chuckling billiken. And everything was in its place.

"Oh yes," said she, "I have an electric curling iron and a pressing iron that I carry about with me. I really couldn't get along without them."

"And an electric chafing dish is the nicest thing, especially when you are hungry and don't want to go outside your room, and stage people get hungry just like other folks. We have chafing dish parties too, after the play, right here in the dressing room. I can make the best rarebit and you would be surprised at the number of edible things that can be manufactured with only a chafing dish."

"You" — but the sentence was unfinished. Miss Lawrence disappeared for the first act. When she returned at its close, there was not a trace of the "good cry" that follows the suffragette speech of the bride whom she is supposed to be.

"And you want to take my picture?" she resumed. "Is that all right?" she asked, as she assumed a pose and lifted the cover of the chafing dish to examine its contents while the photographer caught the picture.

Margaret Lawrence

Photo by Walinger

"Two years and a half ago I played for charity in 'The Two Orphans' and finally mother let me play in 'Prince Chap.' Last year I played in 'Her Son' and this year I'm here."

"They tell us you are fond of flying machines," said her visitor. "Yes, I went up with Mr. Beattie in his Curtiss bi-plane at the Boston meet. It was easy going up. You don't get a bit dizzy. But when we were coming down I thought every minute 'Now I haven't quite so far to fall if anything should happen.' "

"Would you not like to write a short letter to our readers?" asked her interviewer.

MISS LAWRENCE IN HER STAGE DRESSING ROOM —PREPARING FOR A LITTLE LUNCHEON *Photo by Walinger*

"If you really wish it," she replied, and taking pencil and pad, this is what she wrote:

"One of the fundamental requisites of a letter such as POPULAR ELECTRICITY has asked me for is a subject, but one has not been suggested.

"I presume I might write on the 'drammer' but I doubt whether that would be at all interesting, much less instructive to the readers of so scientific a magazine. How shall I begin? I have it. I will tell you about seeing Mr. Edison. Have you ever seen him? I had him pointed out to me one day on Broadway, New York City. I had pictured to myself an unusual man—a sort of colossus. I was somewhat disappointed when I found him to be a middle-aged person of generous proportions with a large head crowned by gray hair and with deep-set blue eyes.

"He seemed not to be at all interested in the goings on of Broadway, but was apparently thinking deeply all the time. I wondered then what new invention was passing through the mind of this giant of the Twentieth Century. I stood speechless and just gazed straight at him, and wonderful to relate, he looked up, and seeing me looking so intently at him, smiled. I could not help it, I bowed and he doffed his hat and then passed on and was soon lost in the crowd.

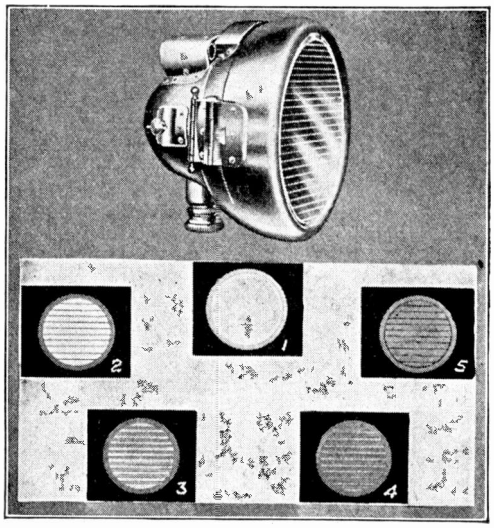
"Somehow then I felt wonderfully small, and my art too seemed altogether insignificant. He is a true genius—the greatest inventor of this or any other age. In the art theatrical, when beautiful scenic and lighting effects help us to entertain, we do not forget that to Edison we owe the incandescent lamp that makes these effects possible. I tell you it is good to think that Edison is an American. But after all, is not America the home of inventions? Nor are men alone in this circle of activity. I am not unmindful that it was Madam Curie in Paris who discovered radium, and women are coming more and more to the front in the application and adaptation of economy in labor-saving electrical devices in the home."

It may be noted that "Over Night" was written by a mechanical engineer, Philip H. Bartholomae.

Young Bartholomae was just fresh from the Armour Institute, Chicago, when he started in with the American Bridge Company. Meanwhile an unexpected deliverance waited him, for while gathering intimate knowledge of girders, beams, spans, abutments, and other technical elements of bridge construction, he was burning midnight oil on an entirely different matter. His naturally jocund intellect rebelled at the solemn details of blue prints and contract estimating and took very naturally to play writing. His play was accepted after the usual round of managers and scored a triumph when produced in New York, Boston and Chicago.

Headlight Without Glare

If the scientist who defined dirt as "matter out of place" were still alive, he would probably tell us that glare is light out of its proper place. Every increase in the candlepower of lamps when used singly has added to this the dazzle or glare which depends largely on the contrast between the light and the darker background. In automobiling, this has been a frequent source of accidents which



HEADLIGHT THAT DOES NOT DAZZLE THE EYES

even the electric headlights have not generally avoided, as they also are usually so designed as to light not only the roadway but also the path for some five or ten feet above the level of the road.

This higher lighting does little or no harm at some distance from the lamp, but close to the same it is not only obnoxious but often dangerously bewildering. If the rays of light could be directed so that they would not rise above the horizontal until they reached a distance of, say, 200 feet from the lamp, this source of danger would be avoided. A clever way of accomplishing this has been devised by Monsieur Louis Bleriot, the celebrated French motorist who was the first to fly across the British Channel and whose

monoplanes have established many new records. In seeking a safe and effective headlight for his racing car, Mons. Bleriot equipped an electric lamp with a deep mouth in which he placed horizontal slats of aluminum, black on top but highly polished on their lower surfaces. The dull black absorbs the light which would otherwise rise, while the polished surfaces reflect it to the ground.

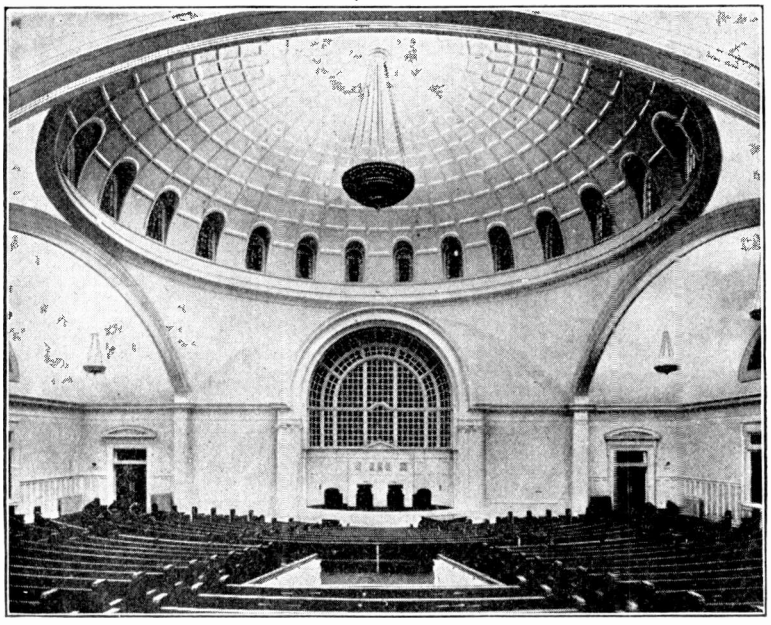
At a distance of 200 yards, these slats are invisible and the light appears as a clear bull's eye. On approaching the lamp, the slats become more and more conspicuous to one walking or driving, as their blackened upper surfaces hide the vanes which reflect the light to the ground. These same vanes or slats also keep the rays of light from rising ahead of the chauffeur, so that he is not subjected to eye strain due to the headlight.

Tree Leased for Telephone Pole

A tall fir tree on a high bank of the Lewis river in Washington has been leased to a telephone company for a period of fifteen years, the consideration being ten dollars. The span of the river at this point is considerable and the company entered into this peculiar contract because it felt that it would be cheaper to lease this tree than to put in a regular pole of sufficient height to keep the wires above navigation in the river.

In case the tree dies or is destroyed before the expiration of the lease, the company is given the right to erect a pole. It also reserves the right to put guy wires on the tree.

The maker of this peculiar lease is Mrs. Mary Bratton who leased the tree to the Etna Telephone Company.

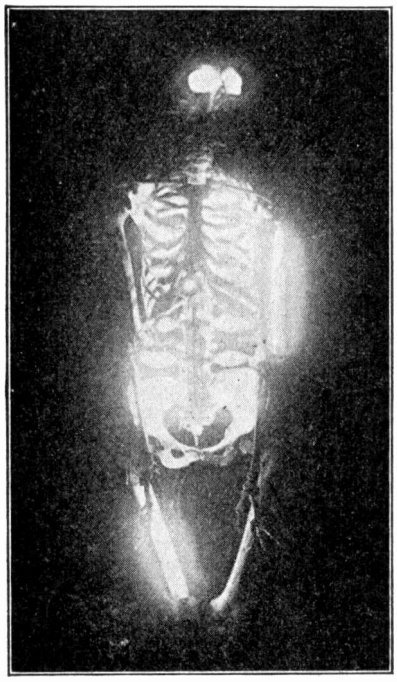


A BEAUTIFULLY LIGHTED CHURCH

This is a view of Eighth Church of Christ, Scientist, Forty-fourth Street and Michigan Boulevard, Chicago—lighted by the indirect system. The central bowl suspended from the dome is 7½ feet in diameter and contains 20 250-watt tungsten lamps in silvered reflectors controlled on 20 circuits. The auditorium is 92 by 100 feet.

Clever Electrical Device

A clever though somewhat gruesome device has been invented by a Los Angeles chiropractic physician to explain his theory of nerve treatment. It consists of a human skeleton illuminated with different colored electric lights to represent the different nerves and organs of the body. At the back of the spine is a set of switches controlling the brilliancy of the lights, and to show the nerve pressure as it would be in a living body. A set of six blue lights represents the arteries, six white lights the nerves of the spine, line-o-light tubes are attached to the arms and legs to represent the main nerves, a large red bulb represents the heart, an orange one the stomach, while two four-candlepower tungstens

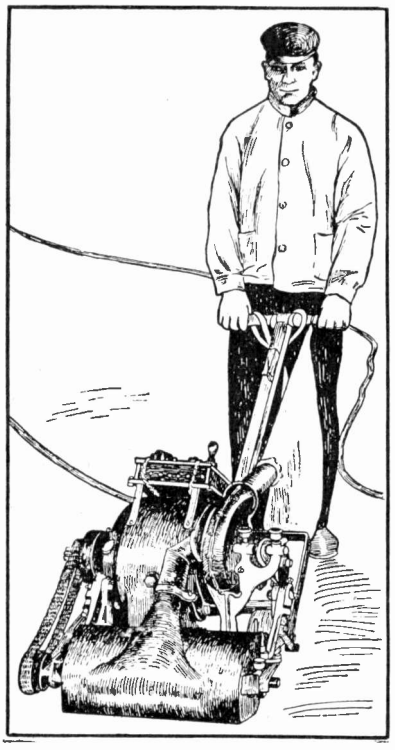


ILLUMINATED SKELETON FOR CHIROPRACTIC DEMONSTRATION

are used for the eyes. The lamps when working at full brilliancy represent the human system in health, but when any switch in the system is disturbed the lights are dimmed down to one-half their normal power to represent sickness.

Novel Floor Sanding Machine

A novel electric driven sanding machine about the size of an ordinary lawn mower is seen in the accompanying illustration upon which is set a two horse-



NOVEL FLOOR SANDER

power direct current motor or three horsepower alternating current motor. Any mechanic of ordinary intelligence can run the machine, doing perfect work in surfacing off a floor without injuring it.

The machine is easier to handle than a lawn mower, as it propels itself, and all one has to do is to guide it without, however, the necessity of pushing. The abrading cylinder is covered with sandpaper which requires only a few seconds to change. Coarse paper is used for roughing off and finer paper for final finish, each sheet lasting about half an hour. The paper is clamped firmly by jaws which constantly keep it taut and even, thereby producing the best results.

The Founders of the Electrical Industry

By GEORGE FREDERIC STRATTON

THOMAS A. EDISON.

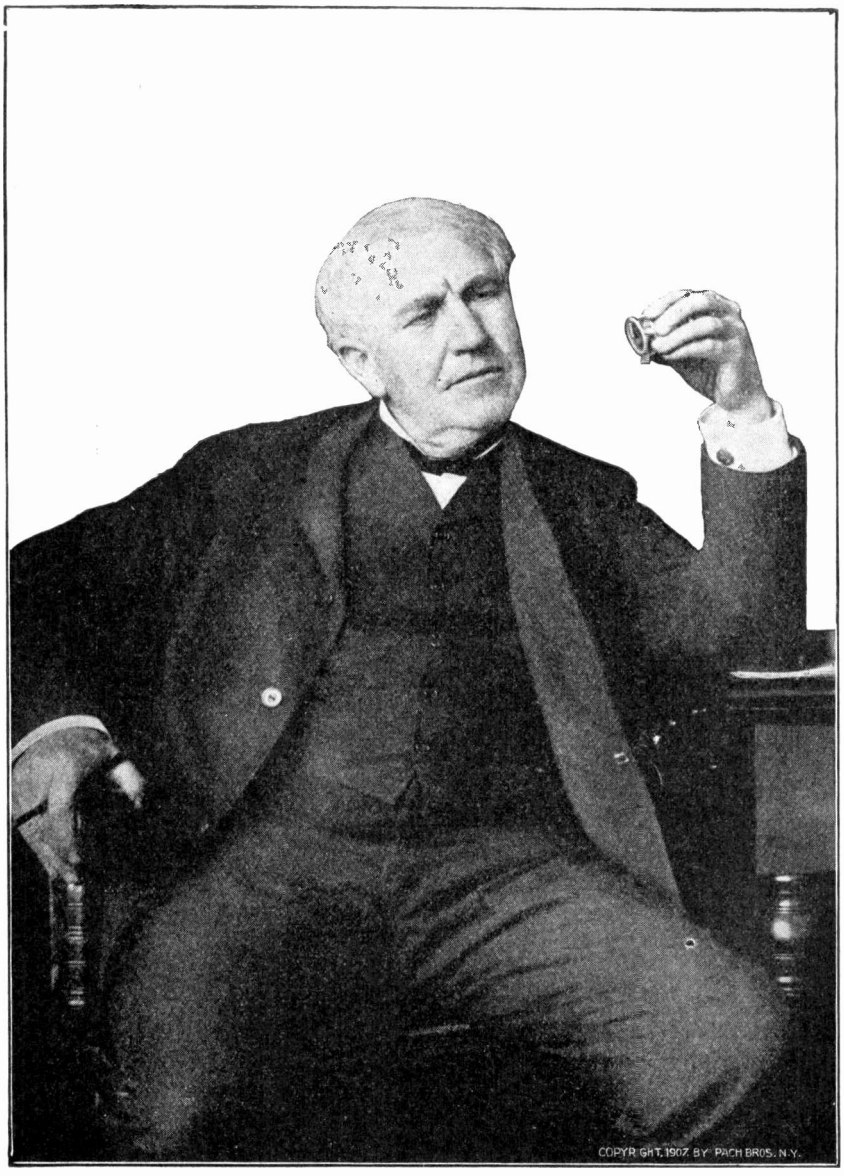
The reputation of Mr. Edison was fully established before the era upon which this article treats. His inventions of wonderful telegraph transmitting and recording instruments, of the phonograph and kinetiscope, all antedated his explorations into the field of electric lighting. Shortly previous to the year 1877 he had established a small workshop in Newark, N. J., where, in connection with William Unger, he engaged in the manufacture of electric light dynamos. This was the only period in which Edison has actively engaged in commercialism, and his distaste for business, and business methods, is graphically described in his own words:

"I kept only pay-roll accounts—no other kind. I preserved all bills and generally gave notes in payment. The first intimation that a note was due was the protest; after which I had to hustle around and raise the money. This saved the humbuggery of bookkeeping, which I never understood; and the arrangement possessed besides the advantage of being cheaper, as the protest fees were only a dollar and fifty cents."

But although Mr. Edison always asserts that he knows nothing of business, his methods of investigation, and consequent invention, show him to be possessed of an orderly system of thoroughness and minuteness which would be highly creditable to the greatest captain of industry. His search for a proper material for incandescent lamp filaments affords an admirable illustration of these qualities. He sent letters to U. S. Consuls in all parts of the world, requesting samples of reeds and bamboos; following this, by despatching special explorers to wild and uncivilized sections of South America and Africa. He secured over 4,000 different specimens and tested every one with an exactitude and minuteness which was marvelous. He followed a similar plan for obtaining a suitable vegetable wax for phonographic records, sending seven men into India, China, Africa and South America, to search for available material.

In all the chronicles of industrial exploitation probably no such remarkable illustration of confidence in a man's ability to "make good" is shown as in the formation of the Edison Electric Light Company. When Edison announced his intention, in the autumn of 1877, to at once devote himself to the problem of the subdivision of the electric current, a company was formed, of which Dr. Norvin Greene, of the Western Union Company, was an active promotor. The capital was $300,000, and out of that capital $100,000 in cash was at once placed at the disposal of Mr. Edison to defray the cost of his experiments. This before he had advanced one step towards the encouraging solution of a problem which most of the scientists of the day had pronounced impossible to solve. This action of the company is the more remarkable when it is considered that at that time $100,000 was in effect a far greater sum to devote to experimental work than it would be considered in these days of enormous combinations of industry and almost unlimited capital.

In 1879 Edison had so far succeeded with his experiments that a public exhibition of the new lighting system was given at Menlo Park. Seven hundred lamps illuminated the grounds and were viewed by a large number of scientific men and capitalists, who came from all parts of the country. The news was flashed across the Atlantic that the long hoped for incandescent lamp was an



THOMAS A. EDISON

assured fact, and so great was the excitement and exultation that the stock of the Electric Light Company jumped the next day to 3,000. (Par value, 100.)

The manufacture of the lamps was commenced at once, the rate of production being, at first, 100 per month. Two years later the company established a factory at Newark, N. J., and the production increased to 1,000 per day. Later the factory was removed to Harrison, N. J., and has been steadily enlarged until at this time the capacity is over 100,000 lamps per day.

In 1882 Edison formed a company known as the Edison Machine Company, for the manufacture of dynamos and generators. Its shop was at Goerke street, New York, and this small company was the nucleus of the present General Electric Company, the largest concern of its kind in the world. In 1886 the plant was removed to Schenectady, N. Y., in order to secure room for its enormously increased business, and in 1892 a combination was made between it and the Edison Incandescent Lamp Company and the Thomson-Houston Company, of Lynn, Mass. This combination formed the General Electric Company.

Mr. Edison is over 60 years of age, but he is working as hard now as at any time of his life. He believes in the possibility of industry and perseverance overcoming every obstacle. He has said that genius is "two per cent inspiration and 98 per cent perspiration." A man who has had intimate relation with him for years says:

"Edison knows exactly what he wishes to accomplish, and how the end may be attained. Absolute certainty of purpose and of method save him from frittering away his time on useless experimentation."

Besides material wealth, rewards of finer value have come to him. He has gained the love and esteem of every man who has worked in his shops; he possesses the unbounded confidence of every business associate; his name stands high upon the rolls of the world's greatest inventors, and the recognition of that fact is found in the honors which foreign nations have bestowed upon him. He has received the Albert Medal of the Society of Arts of Great Britain; he has been made Chevalier of the Legion of Honor by the French Government; and other countries have shown their high appreciation of his genius and his personal character by the bestowal of similar honors.

CHARLES F. BRUSH, THE PIONEER OF ARC LIGHTING.

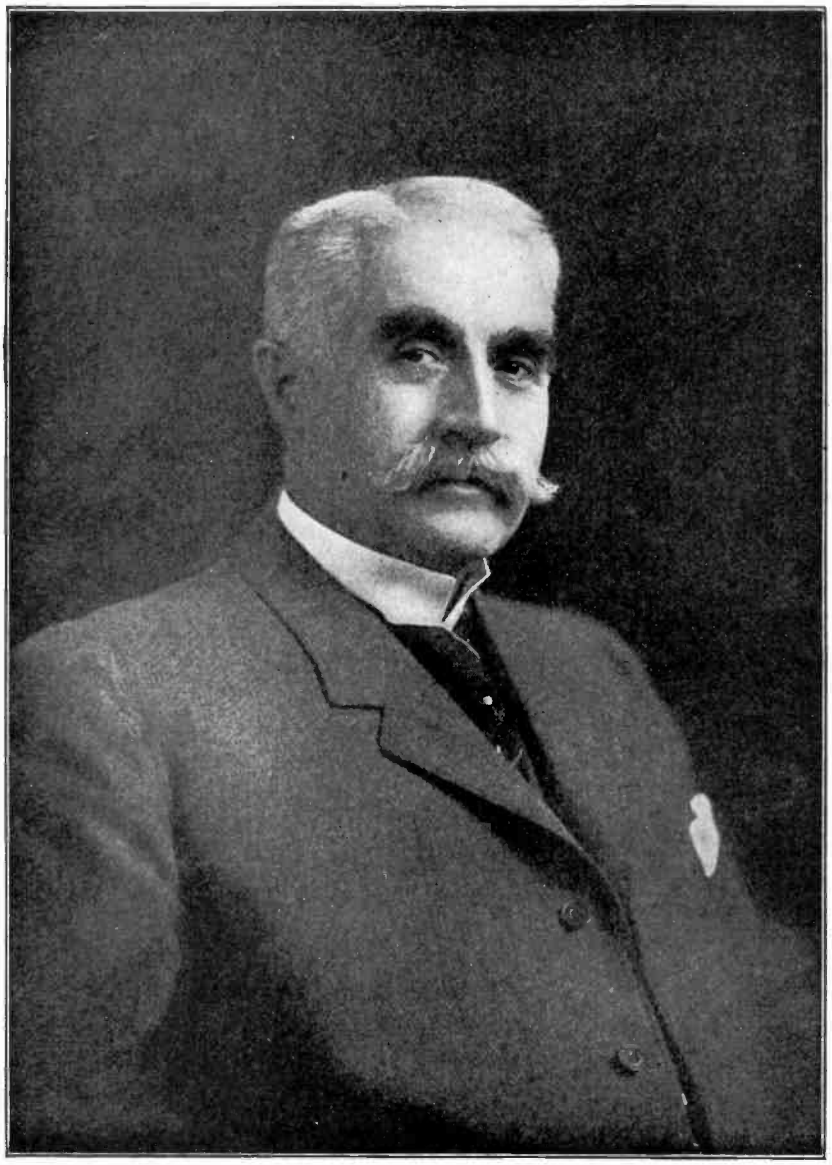
Mr. Brush was to arc lighting what Mr. Edison was to incandescent lighting. He took up the impractical apparatus which had been designed by predecessors and, by invention and improvements, placed the arc lamp on a successful basis, both scientifically and commercially.

He was born at Euclid, Ohio, in 1849, and graduated at the University of Michigan in 1869, as a mechanical engineer. Following this profession for a few years, he became interested in the study of electricity. The story of his first steps in this direction was interestingly told by him in a recent interview:

"During the summer of 1876 I took my first dynamo to my father's farm and there, where no one could see me, gave it a thorough trial. Two horses from the plow supplied me with power. So far as I could judge, the machine was a distinct success.

"That autumn a company in Cleveland began to manufacture it for electroplating purposes; but my intention all along was to make a machine that would successfully and economically produce light. Late in the year I ran a wire from our little factory to the roof of a building in the public square. I set up a lamp and, during the parade of some soldiers that evening, threw my light into the street below. That was the first public exhibition of the arc light. The men in the parade were confused, and there was some trouble with their horses. The police scrambled to the roof, and with more roughness than I thought necessary, stopped me.

"In 1878 I made it possible to operate a dynamo at a central station and to light lamps in a series and at long distances apart. Up to this time only one lamp could be operated from each dynamo. My first series plant, a six light machine, was sold to a clothing dealer in Boston. In April, 1879, arc lamps were hung in the public square in Cleveland, and thus was inaugurated the era of street light-



CHARLES F. BRUSH

ing by electricity. Sixteen-light machines followed, and in 1880 we were making dynamos of 40 light capacity."

Mr. Brush developed as great business capacity as inventive genius, with the result that capital was immediately interested and the manufacture of dynamos and lamps pushed to the utmost limits of the factory capacity, although the plant was continually being increased.

Brush also became interested in the early attempts at street car propulsion by electricity. In 1884, Bently and Knight, who were experimenting in this

direction, came to Cleveland and secured permission to use a mile section of the East Cleveland Street Railway's tracks. They obtained, from Brush, an arc light dynamo, which they belted to a 25 horse-power engine in a nearby shop. Another Brush dynamo was attached beneath an old horse-car. They made successful runs, but because of the atrocious conditions of the tracks, which were laid with light strap-iron, and the impossibility of interesting the railway company sufficiently to obtain better equipment, the project was abandoned. Brush, however, afterwards designed some very efficient car motors, but his time and ability were chiefly devoted to the development of arc lighting, in which for some years he was the undoubted leader.

The Brush Company had its full share of tangle and quarrel with other inventors. In the interview referred to, Mr. Brush spoke warmly of those troubles.

"We ran right into a most extraordinary period of patent litigation and decisions," he said. "Patent rights had been shamefully abused in all directions. Farmers, especially, had suffered. An agent, selling perhaps churns, would come along, to be followed in a little while by a man who blackmailed the farmer into paying damages for infringement. Accordingly the judges of the United States Courts went to the other extreme and, for ten years, as far as I know, not a single patent was sustained on a trial of the case. The Brush company got into the very midst of this orgy of injustice, and we had to fight infringements every inch of the way."

In 1889 the Brush Electric Company was absorbed by the Thomson-Houston Company, of Lynn, Mass. Brush retired with a large fortune and has since devoted himself to the care of his investments in his English and European patents. He has been decorated by the French Government for his achievements in electrical science, and been awarded the Rumford Medal by the American Academy of Arts and Sciences.

ELIHU THOMSON AND THE THOMSON-HOUSTON ELECTRIC COMPANY.

Elihu Thomson was born in Manchester, England, in 1853, coming to America with his parents five years later. In the '70s he was professor of chemistry and mechanics at the Philadelphia High School. In 1877-8 he became greatly interested in electric lighting, and with Professor Edwin J. Houston conducted experiments and secured patents on improved apparatus. In 1880 these gentlemen formed the American Electric Company with a small factory at New Britain, Conn., for the purpose of manufacturing arc dynamos and lamps.

In 1883 Silas Barton, a citizen and capitalist of Lynn, went to New Britain to secure apparatus for a public lighting plant for his city. He was a loyal man to his own town, for he not only bought the apparatus, but he induced the Thomson-Houston Company to remove their plant to Lynn. Mr. Barton deserves to be held in high esteem by his fellow citizens, for this achievement of his has resulted in the acquisition of an industry which gives employment to nearly one-half of the working population of his city, and the division, weekly, of over $150,000 in wages.

Upon the removal of the works to Lynn, Professor Houston severed his active connection with the manufacturing interests, continuing his investigations into the mysteries of electricity, upon which he has become an authority and an author of numerous standard works.

The Thomson-Houston Company—engaged at first solely upon arc lighting equipment—grew rapidly. In 1884 they established a branch factory in Canada, with a capital of $100,000. This was the first company to engage in the electric manufacturing business in the Dominion. In 1885 they added a factory to the Lynn plant for making incandescent lamps and, following that with determined and systematic development of car motors, on July 4, 1888, Professor Thomson ex-

ELIHU THOMSON

hibited his first working car at Crescent Beach, Mass. Four months later the High Rock Street Railway, of Lynn, was electrically equipped, and their first commercial electric car put into commission. As this road had a reputation among railway men for running over steeper grades and around sharper curves than any other road known at that time, the experiment was watched with unusual interest, and the immediate and continued success of the entire equipment resulted in such a flood of contracts for the company as has rarely, if ever, been expe-

rienced by any manufacturing company in any industry.

That first car went into commission on November, 1888. On the first of April, 1889, 104 cars were in operation on eighteen different roads. By the end of 1889, 700 cars equipped by this company were in successful and steady operation over 420 miles of electrically equipped tracks. In a report made to the stockholders in 1890, General Eugene Griffin, Manager of the Railway Department, stated that over 4,000 cars had been equipped by the company.

For several years thereafter a great new factory building was added annually to the plant. During the years 1889-90, for a period of fifteen months, $100,000 worth of machinery and tools were installed each month in these works. The rush of business was overwhelming, and was largely increased by the purchase of the plants and patents of other companies. Of these, the great Brush Company, of Cleveland, was by far the most important. The buildings at Cleveland were abandoned, and the equipment and many of the engineers and skilled workmen transferred to Lynn.

The Van Depoele Company, of Chicago, which was at the time the leader in the electric railway industry, having been successfully operating since 1885, passed into the control of the Lynn Company and was followed by the Excelsior and the Schuyler Companies.

In 1892 negotiations were entered into with the Edison Machine Company and other companies which had been formed to exploit the various inventions of Mr. Edison, with the result that a consolidation of all was effected, under the title of The General Electric Company. A portion of the Thomson-Houston work was transferred to Schenectady, where the Edison Company already had an enormous plant; and the incandescent lamp industry, which had assumed large proportions at the Lynn plant, was removed to the great Edison Incandescent Lamp Works at Harrison, N. J.

This cut the working force of the Lynn plant down, from 5,000 hands to about 1,200, and there was no small measure of gloom in the small city in consequence. But two or three years later the works were again filled up, and have since been so greatly extended that, at the present time, 12,000 hands are employed.

Professor Thomson has never severed his close connection with the Lynn works. He has an office and library there and an experimental force at his disposal. Like Mr. Edison, he is purely an investigator and inventor, having been granted several hundred patents. Although he has shown, on occasion, that he possesses business qualifications of a very high order, he has seldom been actively engaged in the commercial interests of the business.

The four great leaders whom we are considering are noted among their friends for a courtesy, a geniality and a large heartedness most noteworthy in men upon whose energies and brains the demands of their occupations are very great. And among the quartette Professor Thomson stands out, particularly, for his high social qualities. He is a very approachable man, and one who gives much of his time in lecturing before societies of workmen and young engineers. No man knows better than he how to choose a subject and adapt it to his audience. He is the author of several standard books on the science; a member of a large number of scientific associations, and one of their most valued lecturers and collaborators. His name and his achievements are as well known all over Europe as in this country, and his great qualifications have been recognized by the French Government by the bestowal of the Cross of the Legion of Honor, and by many other medals from smaller governments and from scientific institutions.

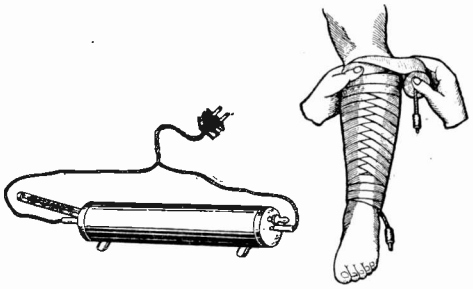
From the year when the two great companies, the Westinghouse and the General Electric commenced to avail

themselves of unified action of the greatest technical and business skill in the industry—from 1892 to the present day—is a very long period in the history of that industry; a period which revealed the astounding power, flexibility and adaptability of electricity in directions and uses previously undreamt of. And that revelation has been largely the result of the directing brains of the first pioneers, backed by the wonderful liberality, in costly experimental development, of the companies of which they were the founders, and of which they still continue to be the honored and valued associates.

(The story of this period, and the two great companies developed, will be related in the concluding article.—*Editorial note.*)

Electrically Heated Compresses

When hot compresses or bandages are prescribed by a physician, they generally lose a good part of their effectiveness by the rapidity with which they cool. To make them really helpful, some one must be at hand to replace them frequently



ELECTRICALLY HEATED COMPRESS AND STERILIZER

with freshly heated ones. If the compress could be kept continually at the desired temperature, it would be much more effective as no attention would be needed on the part of a nurse. Besides, the patient would be spared the discomfort of having the bandage replaced.

Here again electricity is meeting the need, since a fabric containing well insulated wires can be used as a compress and kept warm by current either from a storage battery or from the regular lighting circuit. For ordinary household use, it is generally sufficient to wash the removable casing or slip which covers the compress, but with contagious diseases or in hospital service the whole article should be sterilized after each application. This is done by moistening it well, rolling it into a compact cylinder and slipping it into a sterilizing tube fitted with a heating coil. When the wires leading from this are attached to any convenient socket, the resulting heat vaporizes the moisture and disinfects the whole compress.

A Memorial to Volta

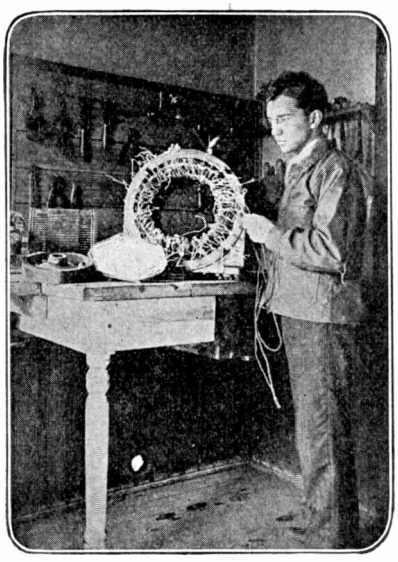
Signor Calissano, Italian Minister of Posts and Telegraphs, accompanied by telegraphers who had assembled at Como, Italy, from all parts of the world, went on September 1 to Camnago to pay a visit to the grave of Alessandro Volta, the inventor of the electric battery. The minister and delegates placed wreaths on the tomb, and Signor Calissano, Signor Battelli, a member of the Italian Chamber, M. Buels, director of the Belgian Telegraphs, and Signor Pietro Volta, a nephew of the inventor, made speeches. A memorial stone was unveiled bearing an inscription recording the esteem in which Volta is held.

Copper in Ireland

For several years copper mining in Ireland has been of little importance because of the low-grade ore found. A recent discovery in the County of Kerry indicates a large area of ore rich in copper, sulphur and arsenic, the average value being, according to consular reports, about $53 per ton.

Functions and Methods of Trade Schools

How may I become an electrical engineer? In what way shall I prepare myself to be an electrician? What is the difference between the two? These are questions which perplex many a boy or young man who aspires to a knowledge of electricity and its workings. This difference which exists between an electrical engineer and an electrician or electrical worker is exactly the difference which exists between any man who makes plans for a work and the one who carries out the plans. Of the two, the one who conceives and plans something is accorded a higher place than the one who executes these plans. It is true, however, that the man who plans must himself know how to execute, otherwise his ideas would be impracticable. Hence we find that the electrical engineer is a man possessed not only of theoretical knowledge but of practical knowledge as well.



WINDING AN ARMATURE

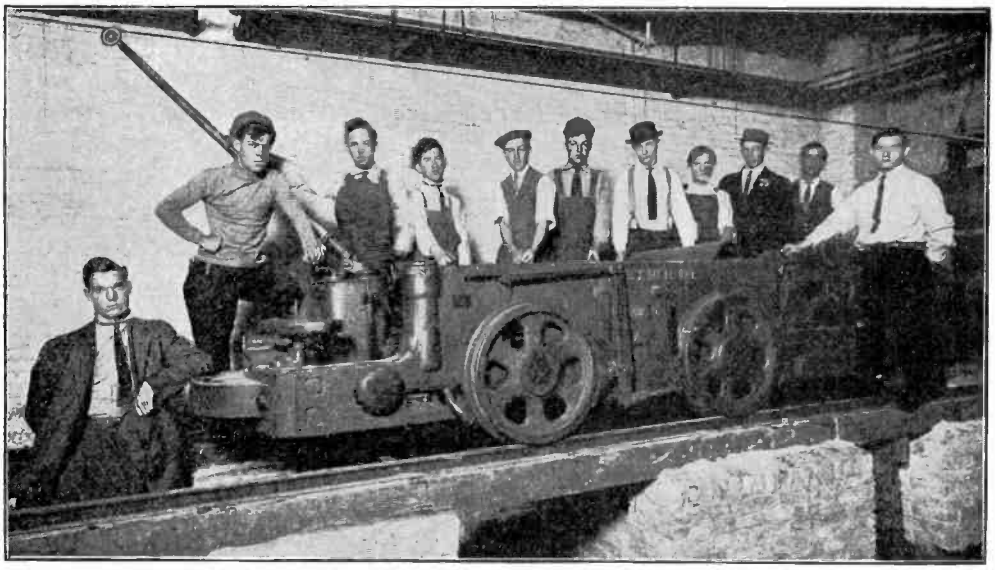
All the way down the line from the electrical engineer, whom we will look upon as the head of the procession, to electrician's helper who is learning the first rudiments of the practical side of the work there are various gradations. How to fit one's self best to progress toward the higher positions is then the question.

One method to pursue is to take a course in electrical engineering at some one of the great universities or technical colleges offering such courses. Though we have engineers today of high standing who are not college trained men it has nevertheless been demonstrated that men so trained have the advantage over the men who must gain the equivalent training in theory and practical knowledge through individual effort. A college graduate, when he first starts out, is by no means an engineer; but he has the groundwork in theory and principles, the knowledge of mathematics, right methods of thinking, etc., which permit him to rise more rapidly and easily after a few years of practical work in which he actually carries out in practice what others ahead of him have planned.

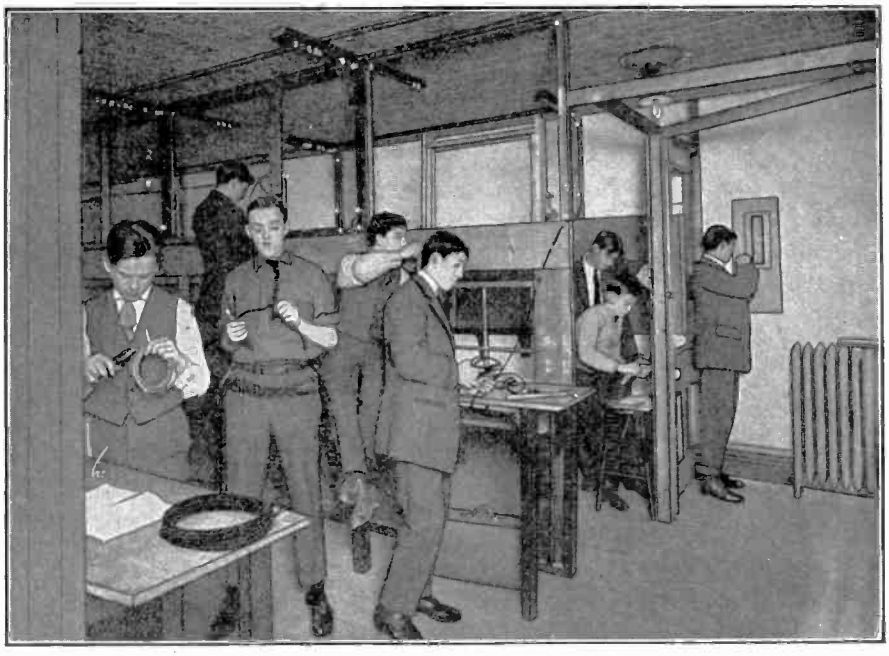
Not all can take college courses, however, which require considerable capital and four to six years of time at a period when the majority find it necessary to be at work gaining a livelihood. For the latter class two methods of advancement are open: One is the correspondence school and the other the so-called trade school. The correspondence school has many advantages and has been the means of instilling ambition into thousands to rise. It presents the opportunity to study and gain theoretical knowledge at the same time that the student is engaged in practical work in some branch of the electrical industry.

The trade school, with which this article will deal particularly, is a form of institution which has grown up in the last few years to meet the needs of a great class of ambitious men who have not the resources or the preparation to

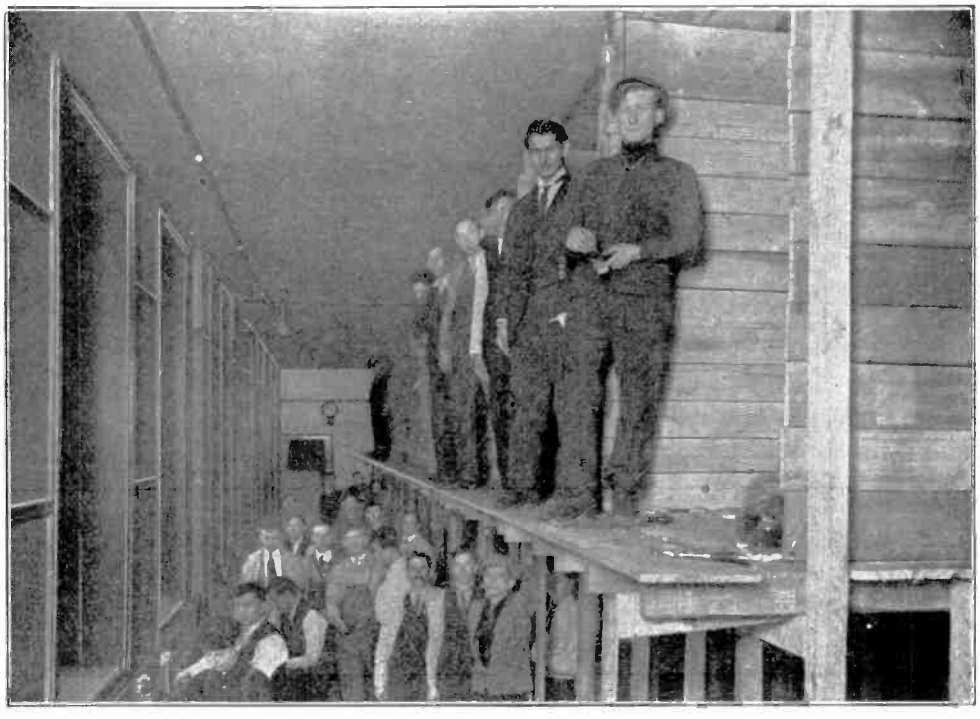
REPAIRING AND TESTING METERS—SCHOOL OF ENGINEERING OF MILWAUKEE



INSTRUCTION WITH AN ELECTRIC MINE LOCOMOTIVE—COYNE NATIONAL TRADE SCHOOLS



STUDENTS INSTALLING BURGLAR AND FIRE ALARM SYSTEMS—NEW YORK ELECTRICAL SCHOOL



STUDENTS DOING ALL KINDS OF HOUSE WIRING—COYNE NATIONAL TRADE SCHOOLS

give four years to a college course but who will not rest content at being simply wage earners in one restricted line.

There is no time in this day of intense activity and great accomplishments for the untrained man. Many efficient mechanical and electrical engineers of today gained their experience as apprentices, it is true, but they did so when engineering was practically in its infancy—before the complex and multitude of problems that now confront the young man entering engineering had arisen. They grew up with engineering and accumulated the knowledge while it was in the making. When they started, the learning was simple—it was little more than learning how to run this or that machine. But today the field is so wide and the requirements so great that the apprentice would never get beyond a mastery of the apprenticeship.

The advancement in education along trade and technical lines has placed it within the reach of every young man in the country. So that the student can learn in from one to four years what the apprentice could not learn in a lifetime.

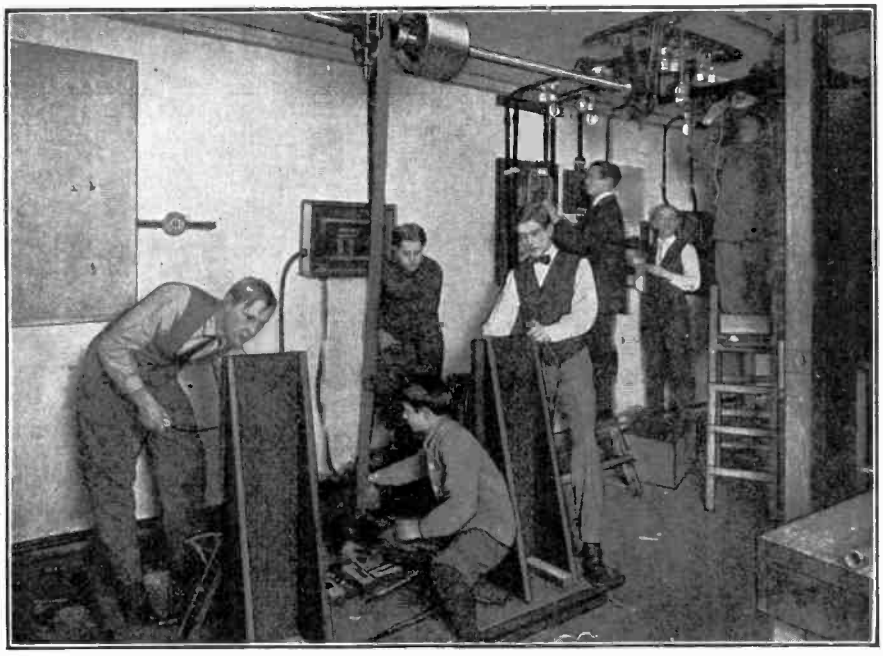
In the many trade schools now available in the larger cities the methods employed are in a way identical; that is, the student who enters them is taught to do practical electrical construction and installation work according to right methods. This he would have to do even if he were a college graduate entering the course of hard knocks in some manufacturing plant or with a contracting concern. At the same time a supplementary course in mathematics and theory is given which if properly absorbed places the graduate of such a course at an immense advantage over the man who thinks he can train himself.

Real practice coupled with theory is the principle adhered to. Visiting such a school one is surprised to find perhaps a half finished house or cottage set up in a lofty room with a group of students doing the actual work of running the light circuits through the floors and partitions. Others will be found testing and repairing motors, winding armatures, wiring switchboards, installing burglar and fire alarms, repairing and testing electric meters, installing motors for power purposes, working in the drafting room and in fact gaining practical knowledge in almost every phase of electrical work.

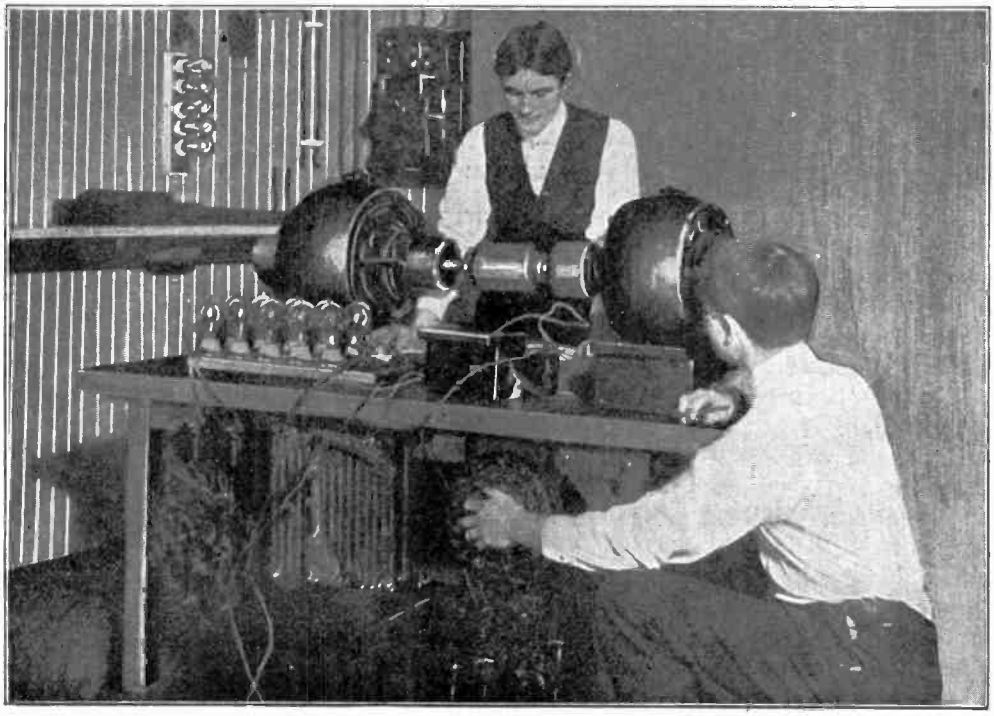
Now a man who can wind an armature, wire a house, or install a switchboard, if he stops at these things, is an electrical worker or an electrician. His vocation is a well paid one—the work fascinating. But he is not yet an electrical engineer. Give such a man an ambition to rise, however; give him in addition a theoretical training in the fundamental principles of engineering work with some knowledge of mathematics and you will find presently that, having learned a certain branch of the trade well, he will pull himself above it and in the end be himself planning while others execute.

The length of time required to complete one of the courses largely depends on the aptitude of the student, the amount of time he can devote to the work and the scope of the course as covered by the particular school which he may attend. In some of the schools the average day student, concentrating all his efforts in one direction, may complete the course in six or eight months. In others the time is longer—up to two years—and the instruction that much more thorough and complete. Most schools also offer night courses. In this latter respect they offer an opportunity for the man who must support himself or others at some regular employment to study during spare time and so advance himself.

It may be seen from this that the trade school fills a particular field of its own. It is not, neither does it pretend to be, the equivalent of a college course in engineering. The latter, though prob-



STUDENTS INSTALLING MOTORS, METERS AND DROP LIGHTS—NEW YORK ELECTRICAL SCHOOL



LEARNING TO CONTROL AND TEST A MOTOR-GENERATOR SET—WENTWORTH INSTITUTE

ably the best for those who can afford it, is necessarily for a more restricted class. On the other hand, the trade school has the advantage over the correspondence school in that individual instruction is possible and the student by actual practice learns to do things himself at the same time that his mind is being trained to grasp and apply principals so as to enable him later to advance beyond the mere execution of work and become a director of men.

New Uses for the Telephone

For two days a certain party line in the farm district service of the Pacific Telegraph and Telephone Company was overwhelmed with trouble and the office of the company was swamped with complaints. Linemen were hurriedly summoned and made tests to locate the trouble. The lines apparently were in working order, but it was impossible to secure connection with more than half of the party subscribers. The investigation was continued and after repeated inquiry the innocent cause of the trouble naively confessed that she on the two days in question had been using the telephone receiver as a darning ball.

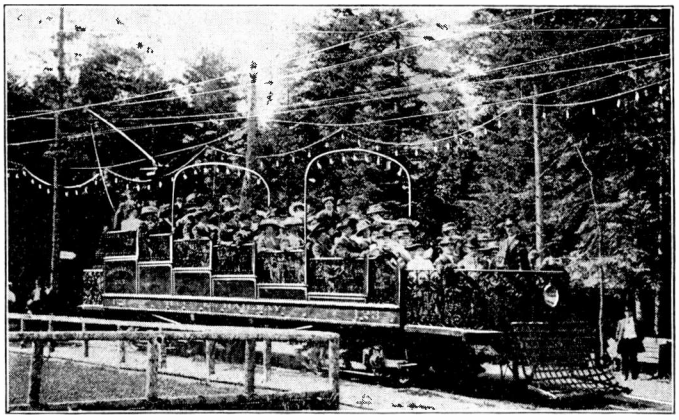
"They are just the right size and the handle makes them very convenient," explained the lady, who has gone the inventor of the telephone one better.

Electric Pumps in Raising the Maine

After the big steel coffer-dam was built around the battleship Maine in Havana harbor, the task of pumping out of the enclosure millions of gallons of water had to be completed before the ship could be examined. Large electrically driven centrifugal pumps did this work, running night and day, the current being supplied by the Havana Lighting Company through a cable laid under water.

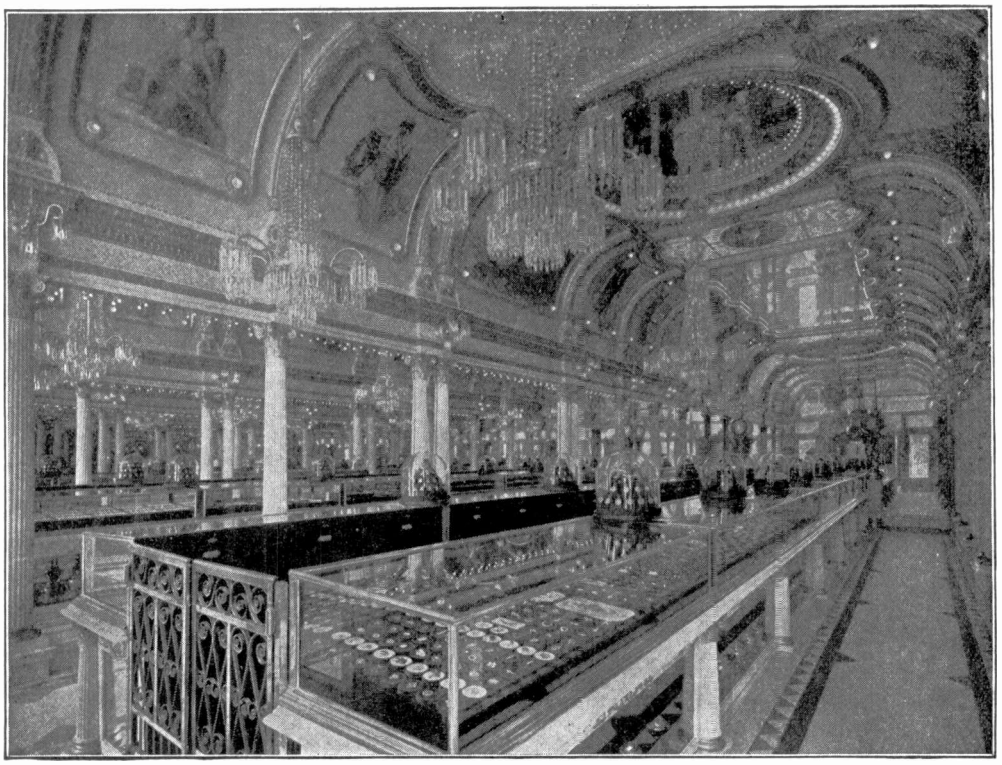
Unique Observation Trolley Car

An electric car that is different from the ordinary observation car is now in operation in Victoria, B. C., having been built after original plans by the British Columbia Electric Railway Company. As the photograph shows, the seats are arranged in tiers, those in the rear being a step higher than those in the row before, so that all passengers may have an unobstructed view. The car carries 75 to 80 persons, and is exceedingly popular as a means of transportation to the recreation park owned by the company. The method of illumination is unusual, and very attractive.



UNIQUE OBSERVATION TROLLEY CAR

The new state school for the deaf, at Indianapolis, Ind., is equipped with a complete power plant furnishing electric light to numerous school rooms and supplying power for operating all the machinery for a printing office, refrigerating and ice-making plant and an electric kitchen.



THE DIAMOND PALACE IN SAN FRANCISCO

The wonderful diamond palace in San Francisco was founded by Colonel A. Andrews 34 years prior to the earthquake disaster in 1906 and reopened with even greater splendor after the business district was rebuilt. It is not only one of the show places of the city but is known all over the world. The beautiful store is so unique in character that a word picture can give no adequate idea of its magnificence, and the photograph which is reproduced herewith falls far short of picturing its marvels.

At night, especially, its splendors are almost dazzling, brought out as they are by the hundreds and thousands of electric lamps. In its adornment a fortune has been invested. Its floors are of marble, the walls are of French plate mirrors framed in corinthian columns of white and gold, while the arched ceiling is a triumph of the painter's art. The panels are decorated with full length oil paintings of scriptural and oriental characters.

Diamonds and other precious stones are shown much more effectively at night in a room lighted by a great number of small points of light, as for instance incandescent bulbs profusely scattered over the ceiling and side walls. The points of light represented by the many lamps are reflected by the jewels in a thousand lines, and the reflections of each stone are caught up by the others and projected again and again with dazzling effect.

This principle has been employed in fitting up the diamond palace. As will be seen in the picture, there are hundreds of globes planted in the ceiling and clusters and individual lamps are mounted on the walls at every point available. These together with the mirrored sides, crystal pendants and the diamonds themselves create an indescribable radiance.

Telephone Exchange Exclusively for Negroes

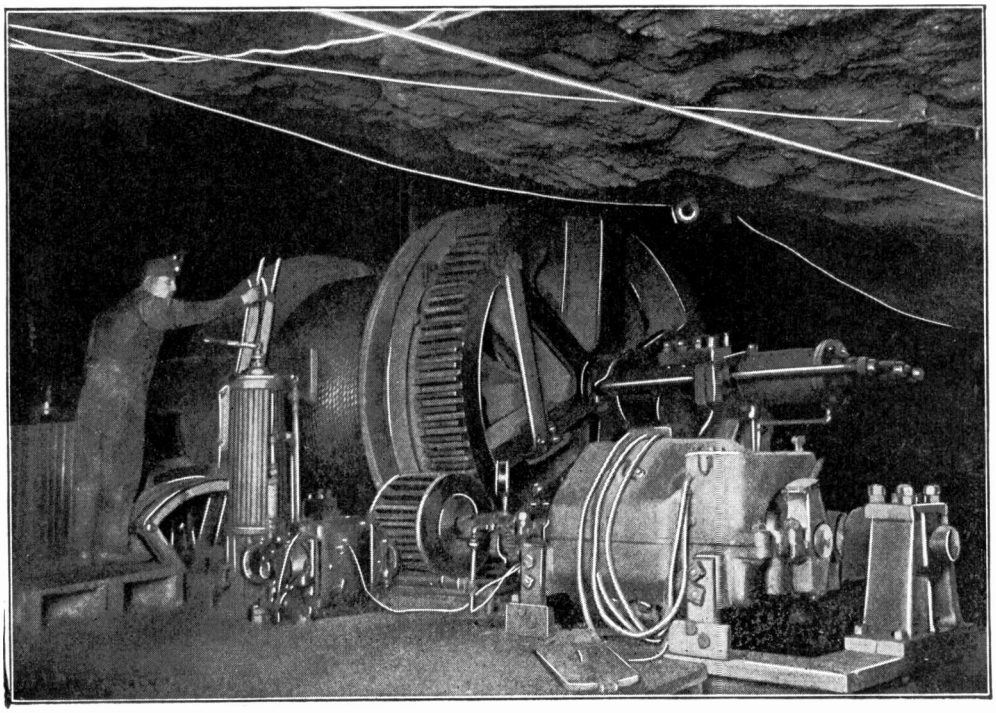
The growing town of Mound Bayou, Miss., situated on the main line of the Yazoo & Mississippi Valley R. R., a few miles south of Clarksdale, is a place inhabited entirely by members of the negro race. The town has its bank, its hotel, its municipal offices, its mayor and councilmen, its railroad depot and agent, its postoffice, its police, and it has a goodly number of prosperous looking store houses, and nice, comfortable residences; some of them are attractive, but there is one thing that it has not at all, and that thing is white inhabitants. The telephone exchange is operated as a branch to Clarksdale, but the operators and other help are all of the same class of people that have built the town.

Mound Bayou is situated in the delta, and in a rich agricultural section. The town is no longer an experiment, it is well established and on a permanent basis. There are in the neighborhood 1,000 inhabitants. The telephone exchange opened with nearly 100 subscribers, with prospects of a considerable increase in the near future.

Down in a Mine

As you step into the cage at the mouth of a mine and drop hundreds of feet down into darkness and later are carried back to daylight you may not know that electric energy, led by wires to the bottom of the shaft and there fed into motors, is the driving power. These motors are coupled by heavy cog wheels to a big drum upon which the ropes of the lift coil or uncoil as the signal is given for the cage to move up or down in the deep shaft.

The picture shows a Flory hoist in the St. Clair mine, St. Clair, Pa. Even the brake that presses on the rim of the rope drum is controlled by an electrically driven air compressor.



HOW THE ELECTRIC MINE LIFT IS OPERATED

By Courtesy of Stone and Webster

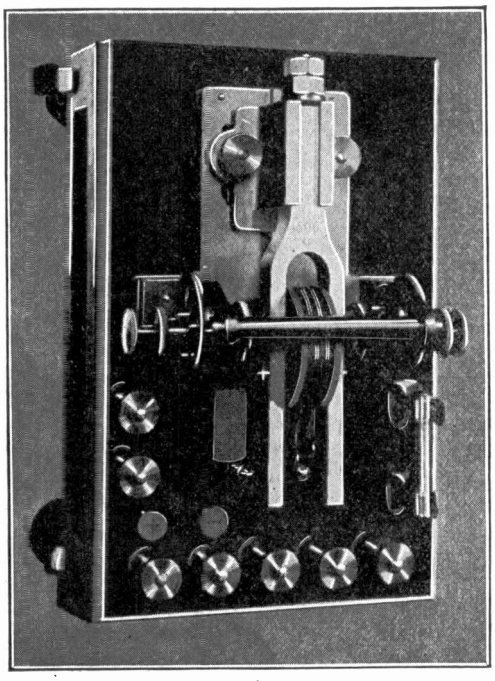
ELECTRIC LINE THROUGH VIRGIN FOREST

This unusually interesting picture shows part of a stretch of 30 miles of the Seattle-Everett interurban line, some of which is through the virgin forest of fir, cedar, spruce and hemlock. The city of Everett has a population of 22,000 and is becoming one of the greatest log markets of the West. Roosevelt in a speech there said: "No other body of water confers upon the commonwealth possessing it quite the natural advantages that Puget Sound confers upon this State." And electricity will play a most important part in developing these advantages.

Telegraphing With Tuning Forks

Eight messages over a single wire instead of two as usual can now be sent by the new Mercadier-Magunna apparatus, and telegraphers in Europe consider that it is a great step in advance for there are no complicated instruments to be handled by the operators. In sending the messages, the usual Morse telegraph key and sounder are still kept, but there are added other apparatus so as to allow of sending quite a number of messages at once.

When a tuning fork is vibrated at one end of a table, a second fork at the other end will also vibrate, provided that it gives the same note as the first one so that it is sensitive to its sound waves. Such sound waves are translated into electrical waves by a tuning fork, which is vibrated by an electro-magnet, and a vibratory current is sent over the wire. The current is received in a tuned disk which will also vibrate provided the number of waves in the wire are the same as the rate of vibration of the disk. A set of tuning forks is used on the line each at a different note or pitch, all the various sets of waves pass over without interfering with each other and each is taken up only by the corresponding tuned selective receiver or mono-telephone. These select out the right waves for which they are tuned, and each selector works with one of the forks.

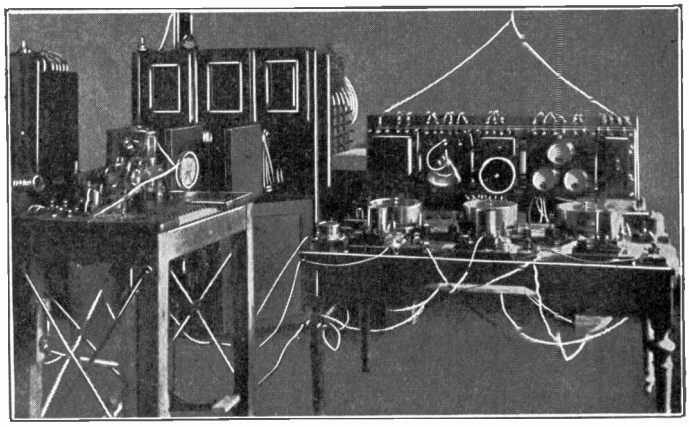


TUNING FORK TRANSMITTER

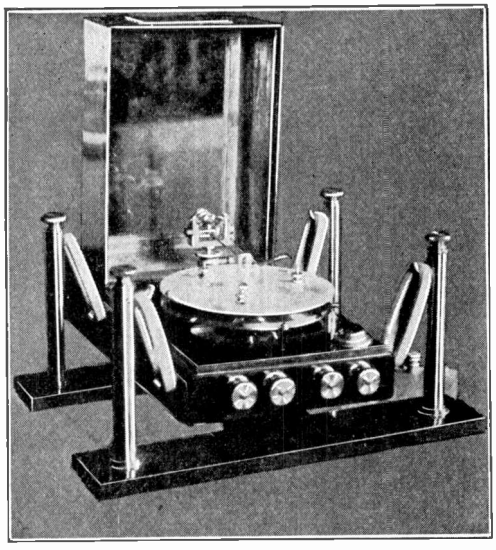
A Morse key upon each fork allows of sending dot and dash messages, and each message is taken by the proper selector, so that all the operators can be sending messages at once and these will pass over the line as waves and will reach the proper receivers.

The mono-telephones act as relays and thus work a set of sounders or printing telegraphs. Four operators can be sending one way and four the other way over the line at the same time, making the wire carry eight messages.

Trials were recently made over a wire between Paris and Lyons. In this case printing telegraphs were employed, which are harder to operate than sounders. During this test it was ascertained that as many as 10,800 words an hour could be sent without any interference, a remarkable performance.



PRINTING TELEGRAPH (LEFT) TUNING FORK TRANSMITTER AND RECEIVER (RIGHT)



MONO-TELEPHONE RELAY

An Inexpensive Farm Electric Plant

For those situated where water power is not obtainable and desiring a more inexpensive plant than that recently described in POPULAR ELECTRICITY, the following is very satisfactory:

I use a three horsepower gasoline engine, and a belt driven, 220 volt, direct current, two kilowatt dynamo, using No. 12 weatherproof line wire and 110 volt lamps, two in series.

I find the 40 watt tantalum lamps have given me the best results, as in two years' use have broken or burned out none.

For a switchboard I have mounted a rheostat, main-line switch, and two six ampere fuses, on a board covered with heavy asbestos, and have had no trouble to regulate the voltage by the appearance of the lights, as the compound winding of the generator keeps the current very constant after once being found.

I use a ¾ horsepower motor at a well 400 feet distant to pump water up a hill to a cistern for domestic use, and find it very satisfactory, using a three inch pulley on the motor and a home made 25 inch pulley on the pump jack, made by sawing 25 inch circles from inch boards and nailing three thicknesses together. I get 25 strokes per minute on the pump, which has a four inch cylinder, six inch stroke and two inch pipe, and will deliver 20 barrels per hour, raising it 100 feet high over a length of 300 feet.

The expense of installing is as follows:

2 K. W. Generator (second hand)	$50
3 H. P. Gasoline Engine (new)	90
¾ H. P. Motor, Shunt	35
Wiring material and lamps	35
	$210

As I did all work, there was no outlay for that.

The engine is started each evening at dark and averages about four and one-half hours run per night, costing $2.50 a month, and using naphtha at 11 cents per gallon, which I find as satisfactory as gasoline and cheaper.

The engine is stopped by pulling a wire from the house.

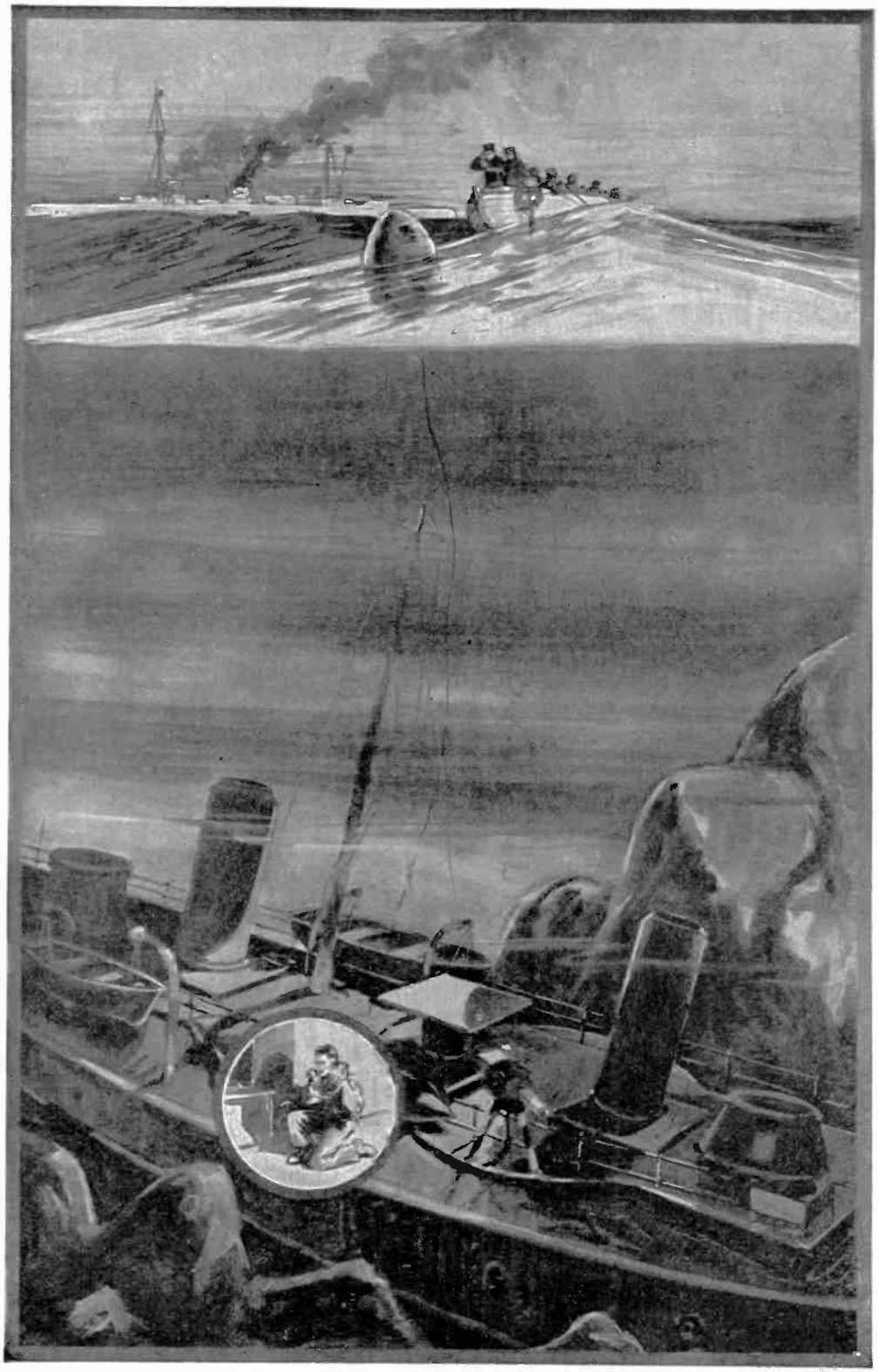
Although this is not a fully developed plant, it pays big interest in convenience on the money invested.

HARRY T. CANDEE.

Cough Diagnosed Through Telephone

A young mother, hearing her infant cough in the night, summoned the family physician by telephone. The doctor did not wish to come out in the storm, then raging, unless it was absolutely necessary, so he asked several questions relative to the condition of the child. The answers proving unsatisfactory, he instructed the worried mother to hold the baby up in front of the telephone transmitter. After listening to the child's cough, the physician was satisfied that it was merely a cold and not the dreaded croup. He then told the mother to call at a drug store across the street for a prescription which he gave the drug clerk over the telephone.

Germany, Great Britain, Canada, Belgium, Austria-Hungary and Italy require that patents taken out in these respective countries be forfeited unless worked within a certain period.



Telephoning for Aid from Sunken Boats

German torpedo boats are all equipped with newly designed submarine telephone attachments. This apparatus is attached to the outside of the boat just forward of the tower. If the boat is sunk, an officer releases the apparatus, which floats to the surface of the water by means of the buoy, which is an essential part of the equipment. This can be picked up by any other boat in the vicinity and telephonic communication be thus established with the sunken craft.

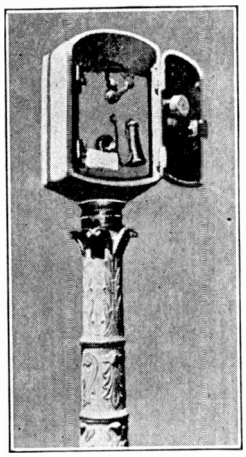
During some recent naval maneuvers in the harbor of Kiel, the German submarine "U3" was sunk, with a crew of 25 men on board. Telephonic communication was at once established with the rescuers, to whom the commander of the disabled vessel reported that the crew was in no immediate danger, as oxygen for 48 hours was available.

For three hours the crew lay prisoners at the bottom of the harbor. All this time a running fire of talk was kept up with the rescuers, whose work was directed much more effectively than if they had been compelled to work blindly and without advice from below.

"First Aid" Outfits in Patrol Boxes

Police Surgeon Zerfing, of Los Angeles, Cal., has carried out a plan of equipping the police patrol boxes of that city with "first aid to the injured" packages. They consist of the materials necessary for making an antiseptic bandage for a wound, and policemen are given instructions how to use them properly, so that the victim of an accident or assault may be properly cared for pending the arrival of the ambulance and surgeons. The packages weigh only a few ounces and contain in an airtight and germ proof covering two antiseptic compresses of sublimate gauze in oiled paper, together with various cambric bandages (also antiseptic) safety pins, etc., for adjusting same.

Dr. Zerfing states that the first dressing of any wound determines absolutely the subsequent course of healing, and if such dressings are improper the danger from blood poisoning is great. Apart from the rapid healing of a wound properly dressed, and from life saved through antiseptic surgery, the economic value to any city of this innovation should not be lost sight of, for it is a well known fact that public hospitals are called upon to care for many injured persons, whose wounds were not properly dressed in the beginning, thus resulting in protracted illness, which could have been prevented by scientific and humanitarian "first aid." So it will be seen that the money invested in installing these outfits and in instructing the patrolmen will be saved many times over, while the loss of human life may be lessened.



UNUSUAL PLACE FOR A FIRST-AID PACKAGE

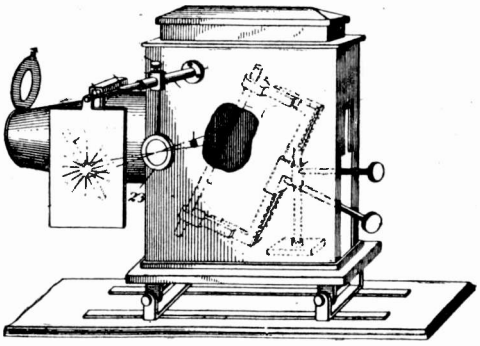
The photograph shows the small package hanging in the open patrol box, where it is not in the way, but is ready for instant service.

Missed the Light and Saved the Razors

The work of a St. Louis man took him regularly at one o'clock in the morning past a barber shop where he usually went to be shaved. Noticing one morning that an electric light which was kept burning all night in the shop was out, he concluded to investigate, accompanied by a policeman. Suspicions were well founded for a thief with a pocket full of razors was escorted to the police station.

An Aid to Adjusting Motion Picture Arcs

Strange it is, but true, that big inventions will be for years on the market with a slight imperfection that is always bothersome, just waiting for some ingenious mind to overcome the defect. This is what has just happened to the cinematograph camera and projecting apparatus of all kinds with the granting of a patent on July 4 to Sydney Julian Jacobson for an important improvement.



THROWING THE IMAGE OF THE CARBONS ON A SCREEN

Briefly told the invention is a hole, a lens, and an external "blurred image." The small hole is made in the wall of the lamp house directly opposite the arc light of the carbons or electrodes. The lens, of special manufacture, is suspended so that the light from this opening falls upon it, and the exterior picture is the reflection which passes through the lens, showing the position of the electrodes and the arc formed. The aim of Mr. Jacobson was to secure by some means an exterior view of these illuminating carbons, and for a few years he has been suffering some of the pangs common to all inventors. It took the patent office nearly two years to decide that the device was something original, despite the fact that users of projecting machines, especially those in the moving picture industry, have been clamoring for some such scheme for a long time.

It is not that the parts used are new, but the idea of adjustment to secure the exterior view of the carbons and their arc is the point of ingenuity.

The special lens, on which the patent is granted, can be so placed opposite the aperture in the wall of the lamp house that the enlarged image may be thrown upon a screen placed at the side or in front of the machine. When a view on the side will suffice, any convenient screen may catch the reflection (even the wall of the operators' room), but where this image must needs be in front of the operator, a screen attached to the apparatus is preferred. The arm from which the lens is suspended is adjustable, making it possible to magnify the picture of the electrodes to any suitable degree of size or clearness. The lens is of such power as to catch upon the screen even the sparks thrown from the consuming carbons.

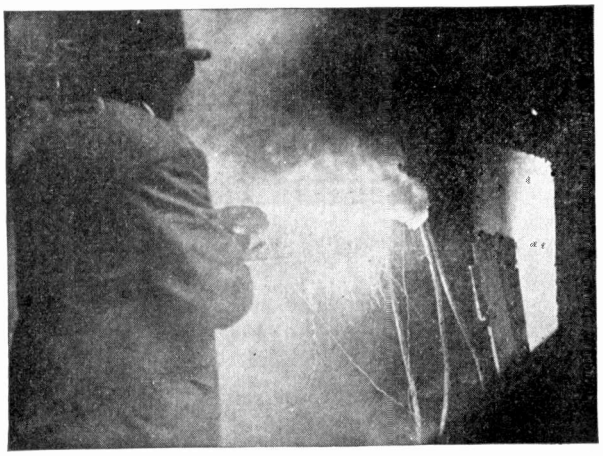
The usefulness of this invention is evident, for the operator may observe from the exterior the exact position of the electrodes, which is so necessary to maintain a clear, continuous projection of any picture or light on a stage screen. As these carbons wear away, their position naturally changes and the arc thus formed is accordingly modified, affecting the projection on the screen. In order to be satisfied as to the position of the carbons, it has been necessary for the operator to look through a red glass in the lamp box or open the door of this box and get a blinding view of the arc direct. With the Jacobson invention the position of the carbons or electrodes can be known by merely glancing at the image on the wall or screen and any necessary adjustment can be made. If desired an identification mark may be made on the screen for the proper position of the arc and this maintained continuously by simply adjusting the electrodes to coincide with this mark.

This seemingly simple device is highly important to the moving picture industry, where it has already found welcome. To theatrical managers this will also be of great service in throwing spot-lights.

Liquid Fire Extinguisher for Electric Plants

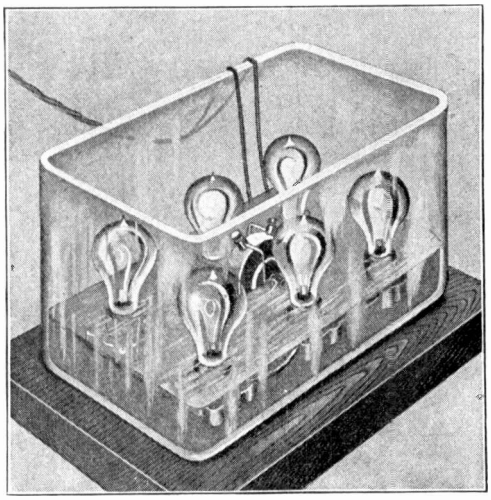
Water thrown upon electrical apparatus in case of fire does more harm than good. Fine dry sand is often used to smother an arc or blaze in a dynamo or wire tower and is favored by insurance interests.

However, a new extinguisher in liquid form called Pyrene has gained recognition by having withstood numerous tests. To demonstrate that it produces no ill effects upon electric insulation and apparatus a glass jar is equipped with incandescent lamps fed by bare wires and a small motor is also connected up with the lamps. Though motor and lamps are immersed in the liquid as illustrated, both operate as if in air. In service the liquid is contained in a sort of syringe, and upon being squirted upon an electric arc or other fire it becomes a heavy gas blanket which puts out the fire by excluding oxygen. Pyrene can be directed upon a circuit carrying 110,000 volts without danger to the operator.



ABOUT TO EXTINGUISH A 220 VOLT, 2000 AMPERE ARC

2300 VOLT, 180 AMPERE ARC BETWEEN RAIL ENDS EXTINGUISHED IN THREE SECONDS



APPARATUS FOR DEMONSTRATING LIQUID FIRE EXTINGUISHER

One illustration shows a user about to extinguish a 220 volt, 2,000 ampere arc in a test at the New York Edison Company, while the other shows a 2,300 volt, 180 ampere arc between rail ends which was subdued in three seconds.

Pay Fare Before Boarding Car

A new plan for saving time and preventing traffic congestion during rush hours is being tried out on the street cars of Kansas City. The cars are of the pay-as-you-enter type. During busy hours extra conductors are placed on the street at corners where passengers are waiting. These conductors collect fares and such passengers are admitted to the cars at the front end while others are entering at the rear.

Facial Expression Sign

It is interesting to observe how the artists in electric lights, the makers of the startling illuminated designs, work to get their effects. Here is an interesting specimen of their art, a grotesque face just before the bulbs have been set in place, and a study of the lines will show

FACIAL EXPRESSION ELECTRIC SIGN

that there are two facial expressions outlined.

The smile and the frown are both indicated and the operation of a motor driven flasher causes the face to look happy and sad in turn.

Leading Up to the Celebration

(An example of short story writing; characters, plot, incidents, climax—all there.)

It happened a few days ago. A friend of mine, a teamster, could not get his team to move an inch. Try as hard as he would, they still remained stubborn. Being in the way of passing traffic, which is very dense in New York, he was at a loss what to do.

An electric delivery truck chanced to pass, and an idea struck the driver. He hailed the chauffeur and shouted something to him. At a nod from the latter he took the reins. The auto moved up behind the truck and began to push. Imagine the donkeys' surprise at finding

the truck moving against their will. Finding it useless to resist, they trudged along. From then on they behaved themselves beautifully.

The driver and chauffeur celebrated their victory the next day at the nearest saloon.

ZIVELLO.

Night Signalling on a Battleship

All general communication aboard United States battleships is based upon a code in which a repetition of the numbers "one" and "two" is used in combinations to replace the letters of the alphabet. Signals are sent during the daytime by means of hand flags in what is known as the wig-wag code, while after dark, messages are transmitted with the aid of a torch, lantern, searchlight, or by means of a permanent set of electric lights mounted in the rigging of a vessel just below the signal yard of the foremast.

The latter method has the more general use for night communication, and the apparatus is known as the "Ardois" system, after its inventor. It consists primarily of four pairs of red and white lights mounted vertically in the rigging, each pair being about ten feet above the other.

A red light is used to designate the figure "one" while a white light represents the figure "two," which figures are used to interpret the letters of the alpha-

bet as shown in the code given in the table below.

Character	Signal	ELECTRIC SIGNALS: Steady Display W-White R-Red	ELECTRIC SIGNALS: Upper Light Pulsating
A	22	WW	C. A. U.
B	2112	WRRW	0
C	121	RWR	Repeat.
D	222	WWW	T. D. U.
E	12	RW	Error.
F	2221	WWWR	4
G	2211	WWRR	6
H	122	RWW	C. S. U.
I	1	R	
J	1122	RRWW	5
K	2121	WRWR	Negative.
L	221	WWR	G. L. U.
M	1221	RWWR	9
N	11	RR	C. B. U.
O	21	WR	C. C. U.
P	1212	RWRW	Affirmative
Q	1211	RWRR	Interrogatory.
R	211	WRR	I. C. U.
S	212	WRW	G. S. U.
T	2	W	
U	112	RRW	N. L. U.
V	1222	RWWW	7
W	1121	RRWR	Annuling.
X	2122	WRWW	Numerals.
Y	111	RRR	V. N. U.
Z	2222	WWWW	2
Cornet		RRRR	1
Letters		RRRW	3
Code		WRRR	8
Interval		WWRW	B. S. U.

The signals are operated by means of a keyboard mounted on a suitable standard and situated on the bridge of the ship. This keyboard resembles somewhat that of an ordinary typewriter except in that the letters of the alphabet are given in their regular order. A series of wires from the ship's dynamo room to the keyboard, and from there up to the signal lanterns convey the electric current necessary for operating the equipment.

In order to send a message, the signal man simply presses keys on the sending board which spell out the words which he desires to transmit, and the correct combination of lights for each letter will be flashed from the lanterns overhead. A glance at the code given above indicates that the letter "A," for example, would be shown as two white lights (WW), one above the other, while the letter "B" is displayed as a white light below, and in succession above this, two red lamps and another white one (WRRW). The letter "I," in turn, is represented by a single white light (W).

The sending keyboard is further fitted with a lever known as the "pulsator," which, when closed, causes the upper light of any signal shown to flicker, or pulsate. By this simple expedient the letters of the code are given a different significance, which are shown in the right hand column of the code printed above. In this column will be found the numerals, and also conventional signals, as well as reference to the various additional codes used in naval etiquette.

To illustrate the use of the pulsator: the letter "A," displayed as two white lights, when shown with the upper light pulsating, calls C. A. U., which indicates to the receiving ship that the message is to be sent in what is known as cipher "A."

In addition to the alphabetical letters, the sending board is fitted with four other keys. The cornet (four white lights) when displayed commands all ships in range to receive the dispatch; the signal "Letters" (four red lights) means that the receiving ship is to repeat the message letter by letter. The "code-call" indicates that the party desires to talk in code, and is followed by the display indicating which code is desired, while the "interval" corresponds to the dash between words.

Code Abbreviations.

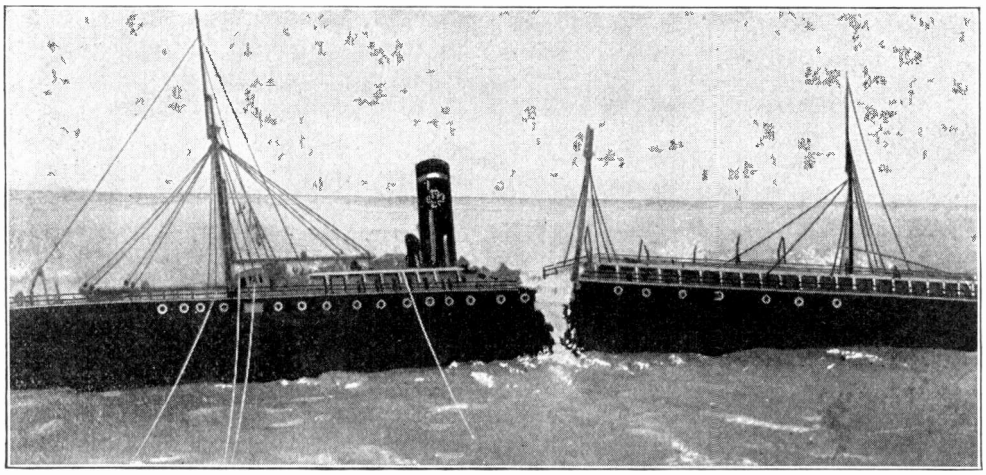
C. A. U.—Use cipher "A."
T. D. U.—Use telegraph dictionary.
C. S. U.—Use compass signals.
G. L. U.—Use geographic list.
C. B. U.—Use cipher "B."
C. C. U.—Use cipher "C."
I. C. U.—Use international code.
G. S. U.—Use general signals.
N. L. U.—Use navy list.
V. N. U.—Use vessels' numbers.
B. S. U.—Use boat signals.

By means of the "Ardois" system the sending of messages has become a very

simple matter. Their reception, however, depends on the speed with which they are interpreted by the signal men as they are flashed from a sending station. Constant practice makes the men in the service remarkably efficient, and it is not uncommon to receive messages a distance of four or five miles at the rate of ten to fifteen words per minute.

New Complications in Wireless

Broken in two amidships, the steamer Santa Rosa lies on the rocks near Santa Barbara, Cal., where it drifted to destruction on the night of July 7th. The wreck is of direct interest to wireless enthusiasts, as it developed a new complication, and possibly a new danger, in the use of wireless telegraphy in case of wrecks. The charge was made (and the subject is now being officially investigated) that the owners sent wireless messages to the captain of the vessel after it had gone on the rocks, and that unnecessary delay in getting the passengers ashore was caused by conflicting orders.



THE SANTA ROSA WRECK

Of course the danger of taking the ship out of the captain's control, while in a perilous position, might add greatly to the dangers of the sea, especially if the captain were not resolute enough to assert himself in the face of orders from the home office. As it was, the vessel lay on the rocks twelve hours before the sea became so rough that it was deemed imperative to send a boat ashore with a life line. This boat was capsized and the crew of four men drowned. The passengers were all safely landed, however, by means of a breeches buoy. It seems likely that laws will be passed forbidding such interference by wireless on the part of owners when a ship is in peril.

Impromptu Telephone Repeater

Were you to make the statement that it was possible for two parties at widely separated points to carry on a conversation over two metallic circuits which were at no point running parallel with each other, or otherwise close enough for inductive effects, and in no way electrically connected, people would wonder what new and wonderful invention had been brought forth. Such is, however, possible, and was witnessed by the writer. A young man was ill at a station we will call A. Being able to use the telephone, which in this case was an automatic, he called up his father at his office at station B. His father was just then talking to the mother at station C (over the Bell

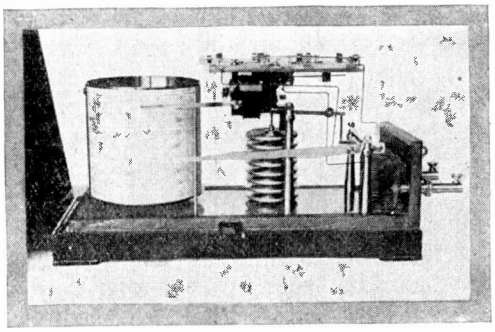
line) who was enquiring as to the welfare of the son.

The mother, when made aware of the fact that the son had just called station B, was very anxious to talk with him. This seemed quite an impossibility for the father at station B, but finally, acting upon a suggestion, he placed the receiver of the automatic telephone in his office over the transmitter of the Bell telephone; likewise the Bell receiver over the automatic transmitter, and the conversation was carried on very clearly.

C. H. STONE.

Predicting Electrical Storms

Thunder storms cause millions of dollars damage every year in various parts of the world, so that it would be a great benefit if we were able to detect ap-



INSTRUMENT FOR PREDICTING STORMS

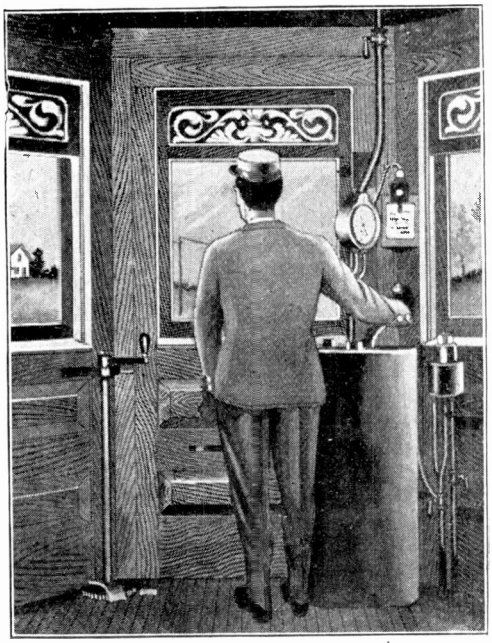
proaching storms by means of electrical instruments several hours before they occur. Professor Turpain, a well-known French scientist, has been at work on this point for several years, and is now able to foretell an approaching storm four hours before it arrives. He erected a station on the west coast of France at La Rochelle for this purpose, and it is laid out on somewhat the same lines as a wireless telegraph station.

Storm clouds even at a great distance will act upon the aerial wire owing to the electrical discharges which they produce, and the sensitive instruments in the station respond to even very weak effects coming from distant clouds. These effects are recorded upon a revolving drum so that by observing the lines traced by the recording pen we can see whether a storm is coming on, and whether it is likely to be a strong one.

A simple form of instrument shown in the picture uses a storm-recording pen which makes a record upon a revolving drum, and upon the same drum is the pen of an aneroid barometer, so that in this way the barometer pressure and the electrical state of the atmosphere are recorded at the same time, a combination useful in making scientific observations.

Motorman Cannot Forget Orders

On the trains of an electric interurban line running out of Chicago, a small electric lamp in the motorman's cab is so placed that it shines directly upon a small board on which the train orders are placed. This does away with the inconvenience of reading orders, perhaps by a poor light, and it also acts as a safeguard by placing the orders where they are in plain sight and readily referred to.



ILLUMINATED TRAIN ORDERS FOR THE MOTORMAN

Wonderful Possibilities of the Storage Battery

By NORMAN MAUL

The development of the storage battery during the past three years has been so wonderful and so rapid that within the next ten years it will have started a revolution in the electrical industry. No less an authority than Thomas A. Edison is responsible for the statement that within that period, steam engines in railroad yard limits, railroad power plants, and railroad locomotives using third rails and overhead trolleys will have ended their spheres of usefulness. In fact all great consumers of current will have become customers of the central station.

The storage battery, he said, is reaching the point where it is capable of taking an enormous charge in a relatively short time. With such a battery every current consumer will come on the central station day load, taking his current at a time when he can get it at a very low rate, and storing it in these high power batteries against the time when the central station load will begin to climb toward the peak.

When that time is reached the day of the high peak and deep valley of the central station load will have ended. In two years, Mr. Edison predicts, this industrial revolution will have begun.

It is not a new storage battery that will work this revolution—rather is it the discovery and the development of the possibilities of the standard Edison battery.

The principal difference between the high power rapid charging battery and the original Edison battery is in the number and thickness of the plates. It has been found that by using more plates and thinner, the battery could be made to take the charge more rapidly and with less danger from heating. The battery cells are of the same size as the standard battery cells, but fewer of them are required to do a given amount of work.

It is the shifting of freight and passenger cars in railroad yards that Mr. Edison predicts will open the greatest field for the high power battery. The day the battery begins its service will mark the passing of the smoke nuisance, the third rail, the overhead trolley, and the railroad generating station in cities.

Mr. Edison's plan is to use the powerful motor engines, now in service, but, instead of transmitting current to them through some feeder, to use a storage battery car to supply the energy. Such a car would naturally take the name "Battery Car" and would bear the same relation to the electric engine that the coal tender now bears to the steam engine.

The locomotive, with a freshly charged battery car attached, would haul the train to the yard limits, or to some other specified transfer point, where the change to steam power would be made. The steam engine would then take the train on; the battery car would be uncoupled and connected to charging station wires to be recharged, and the motor engine, after picking up a fresh battery car, would be ready for its return trip.

The storage battery has been developed to the point where it is easily capable of doing this work, but before being offered for general use it will have to go through the severest tests at the inventor's laboratory. Such a battery has been constructed and is meeting every test put to it. The first battery car, discharging at the rate of 1,500 horse-power, can be fully charged in three-quarters of an hour and is capable of pulling a 1,200 ton freight train ten miles at the rate

of 20 miles an hour. At the end of such a run the battery car would lay up long enough to be recharged.

Charging connections would of necessity have to be maintained at various points in the yard, just as coal pockets are now conveniently located. The difference would be that the charging connections would be scattered, whereas the coal pockets are all at one spot, causing a great congestion of engines awaiting their coal supply.

The demand of these charging points for current would of course be great, but not so great as to warrant any railroad maintaining a generating station for their supply alone. Obviously the road would come to the central station for its current and all these charging stations would come on the central station load. For the sake of having the demand come in the daylight hours the central station would offer a rate far below that for which any railroad plant could generate.

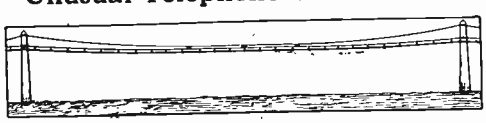
With such a load coming during the daylight hours there would be practically no peak, or rather instead of a peak and a valley the chart would show a wide plateau. The battery cars would take current every hour of the day, except on the few days of the year when the peak reaches its highest point between 4:30 and 6 p. m. On those days the railroad would stay off the load, taking enough current before the hours to carry it over.

From late at night until the morning suburban passenger rush began, the battery cars would be used chiefly in shifting freight; after a few hours on the passenger trains they would go back on freights until the evening rush began, and when that was over they would resume their freight operations.

A battery embodying all the principals of the big railroad battery is in actual service now, on a delivery wagon in Orange. The cells could easily be put in a suit case. The wagon used saw the best days of its service behind a horse. The battery is of the rapid charge type, and at the end of each delivery trip is connected to the charging board for a few minutes and enough current taken to replace all that had been consumed. A trolley line in Washington is operated in the same manner. At the end of each half trip the battery is connected to a charging board and in four minutes is completely replenished. At the end of the day, when the car goes back to the barn, its batteries are fully charged and ready for the next day's service.

"It is not a new battery," said Mr. Edison recently. "It is the same old battery. We simply discovered its greater possibilities and are working all the time to develop whatever improvements we may. With thinner plates in greater number, the battery will take an enormous charge in a very short time. With this development perfected, the day of the seven or eight hour connection with a charging board will have passed, and then will begin a new era in the use of the electric vehicle for both business and pleasure."

Unusual Telephone Construction



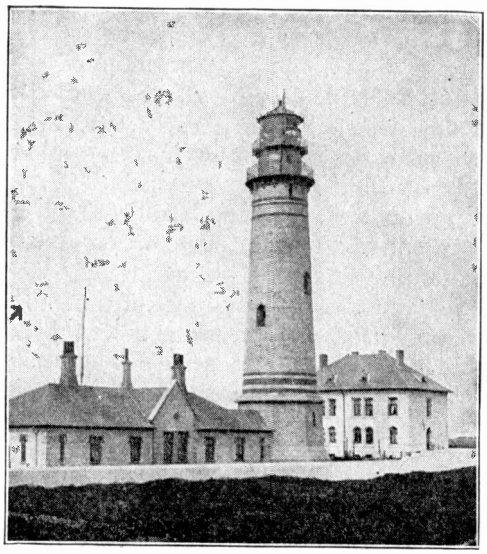
Along a certain street in Brookfield, Mo., the telephone company could obtain permission to set only one pole in each block. As the blocks were about 350 feet long it was necessary to adopt a rather novel construction. Under ordinary circumstances it is customary to use three or four poles in a block of this size.

The construction used is of a semi-catenary type, as shown in the accompanying sketch. The poles were specially selected and a number of "dead men" or anchors placed at each end of the line. The line consisted of eleven spans varying in length from 350 feet to 380 feet. The cable suspended is a 200 pair cable and weighs about 7½ pounds per foot. This cable lead has been in use about four years and has withstood several severe sleet storms.

JOHN P. KOBROCK.

The Heligoland Lighthouse

The Heligoland Island electric light is the most powerful in Germany, and is



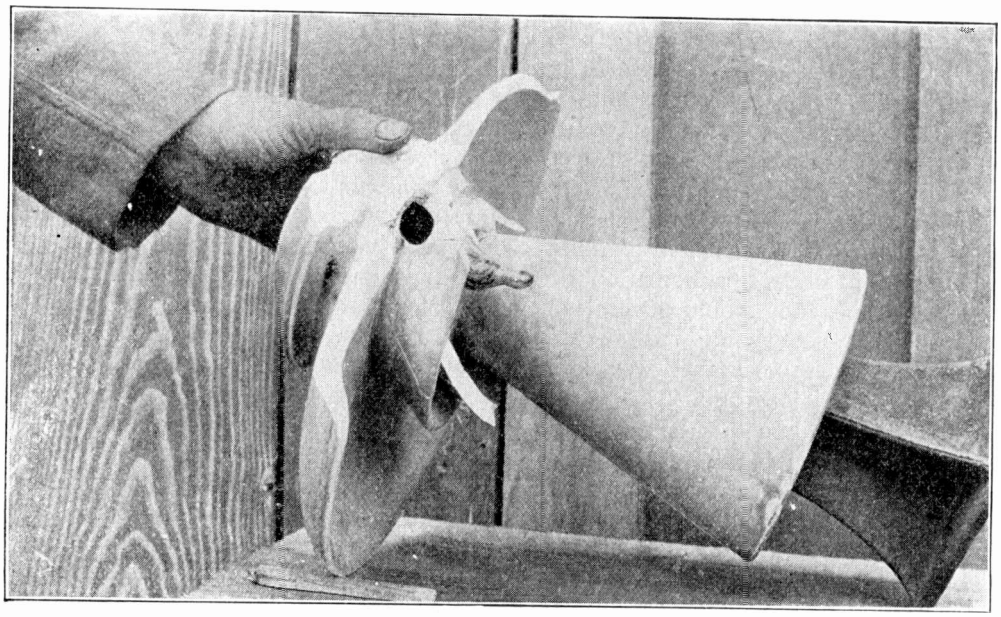
THE HELIGOLAND LIGHT—40,000,000 CANDLE-POWER

claimed to be the most powerful light in existence. It consists of a cluster of three revolving searchlights having a lighting power of 40 millions of candles. This cluster of searchlights is surmounted by a single light of the same kind and size, that can be revolved independently and three times as fast as the three lights. This is put into use in case of accident to the cluster. The electric power is generated by two steam boilers and steam engines, running belt-driven electric generators. The fog-signal is a rocket exploded in the air about 200 meters high.

This is likely to remain the most powerful lighthouse equipment in the world for the reason that the cost of developing such enormous candlepower is $8,000 per annum.

Lightning Effect on Insulator

This picture shows the effect of a lightning stroke on a 60,000 volt insulator. The latter was on a line leading from the power station at Post Falls, Idaho, to the power station at Spokane, Washington. It will be seen that in places the porcelain was melted and ran down like the guttering of a candle.



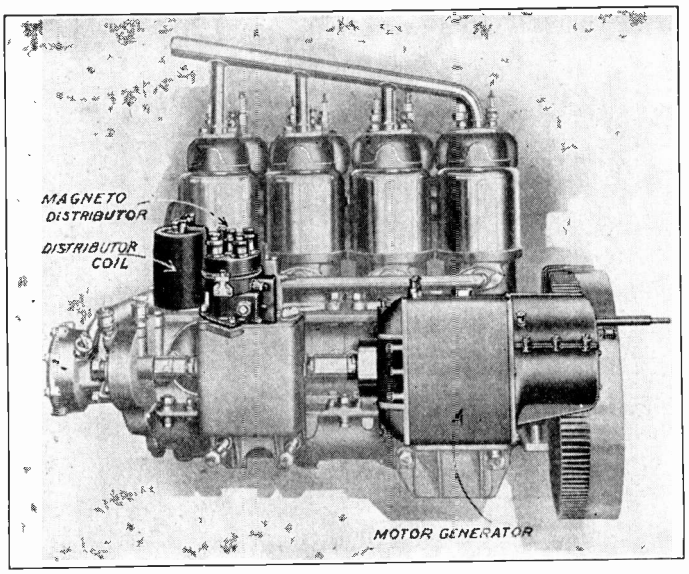
INSULATOR FUSED BY LIGHTNING

Auto Starting Without a Crank

Motorists now have something to which they have long been looking forward, an automatic starter which does away completely with cranking by hand. The Delco electrical plant in the new Cadillac accomplishes what has heretofore been accomplished by separate systems, ignition and lighting.

The plant consists of a compact and powerful dynamo operated by the engine of the car. The dynamo charges the storage battery. To start the engine, the operator takes his seat in the car, simply retards the spark lever and pushes forward on the clutch pedal. This automatically engages a gear of the electric dynamo (now acting as a motor) with gear teeth in the fly wheel of the engine, causing the latter to "turn over," thereby producing the same effect as by the old method of cranking. As soon as the engine takes in charges of gas from the carburetor and commences to run on its own power, the operator releases the pressure on the clutch pedal, the electric motor gear disengages its connection with the fly-wheel and the car is ready to be driven. The electric motor then again becomes a dynamo or generator and its energy is devoted to ignition and to charging the storage battery. The storage battery has a capacity of 80 ampere hours and as soon as that capacity is reached, the charging automatically ceases.

Current for lighting the car is also supplied from the storage battery. The car is equipped with two specially designed electric head lights with adjustable focus, two front side lights, tail light and speedometer light. The entire electrical plant has been designed with a view to compactness, simplicity and efficiency. The arrangement and operation of the Delco electric system of starting and lighting may be compared to a pressure system of water supply such as is commonly used in isolated plants for private residences.



AUTOMOBILE SELF STARTER

This apparatus has been made so nearly automatic that all that is necessary is to keep up the liquid of the battery by adding a little pure water every two weeks, and to set back the meter every two weeks.

Southern Pacific to Run Its Trains by Phone

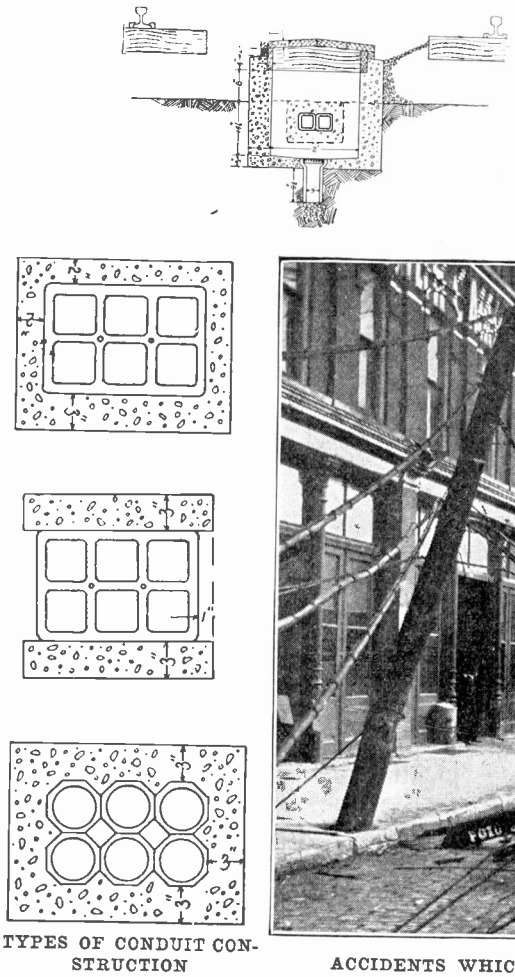
The Southern Pacific Company is rapidly maturing plans to install at a cost of more than a million dollars, the telephone train dispatching device, which it is planned will in time entirely displace the telegraphic method now in use on almost all divisions of the road.

Telephones for dispatching purposes are already used by the Southern Pacific in the Shasta Division, a small division just north of San Francisco, and in the mountain division across the Tehachapi Pass.

Underground Versus Overhead Lines

The relative merits of underground conduits and overhead construction for telephone, telegraph and light and power wires is a subject which is constantly coming up. In cities there is no doubt that underground construction is best, and every year new ordinances are going into effect compelling such construction. The cost is high, however, and it probably will be many years before overhead lines in the country districts will be seen no more. The expense of putting wires underground, is however, not all money out of pocket for the companies operating the lines. Once in conduits the wires are practically safe. As long as they are on poles immense loss is incurred every year owing to broken down lines. The above pictures aptly illustrate what may happen to an overhead line. In one instance it was a sleet and wind storm; in the other a street car running amuck that caused the damage.

The illustrations also show typical conduit construction in which the wires are always safe.



TYPES OF CONDUIT CONSTRUCTION

ACCIDENTS WHICH MAY HAPPEN TO AN OVERHEAD LINE

Electric Ambulance for Horses

An electric truck of unique construction is employed as an ambulance for disabled horses by the Pennsylvania S. P. C. A. and although it has been in use for more than a year it has at all times rendered efficient service with no cost for repairs and great economy in upkeep. As the bed of the ambulance is very close to the ground, it was found necessary to construct a motor car with a fore-wheel drive. The secretary of the society, Mr. Frank B. Rutherford, has courteously supplied the following data concerning the car.

The ambulance is driven by two independent motors direct connected to each of the front wheels through planetary type gearing, which is fully encased and run in oil. The construction is mounted on special axles, which permit the motor to turn with the wheel in steering.

The carrying body of the ambulance is large enough to haul with comfort the larger horses, such as draught animals. There is also a false bottom, or floor, which can be hauled out and used for the loading of animals which are down on the streets.

This ambulance has a speed of about 15 miles per hour, and carries a sort of a "first aid" outfit, bandages, torniquets, rope with block and tackle outfit for drawing out animals that have fallen into ditches or pits, and for night work it carries an extension light, besides a complete lighting outfit for the car itself.

ELECTRIC AMBULANCE FOR HORSES

As the ambulance carried 368 injured animals during the year 1910, it is evident that it supplies a pressing need. In addition to its far greater usefulness than the old-fashioned ambulance, drawn by two horses, the element of economy should be taken into consideration.

The photograph, showing poor old Dobbin on his way to the veterinary hospital in the motor ambulance indicates that while the motor car is putting the draught horse out of business, it may also be fairly described as the best friend of the horse.

Electrified Children

The *Dietetic and Hygienic Gazette* contains an interesting account of investigations into the effects of electricity upon the development of school children.

The walls and ceilings of a schoolroom were lined with coils of wire through which high frequency electric currents were passed. The inmates of the room were thus in an electro-magnetic field like the iron core of an electromagnet.

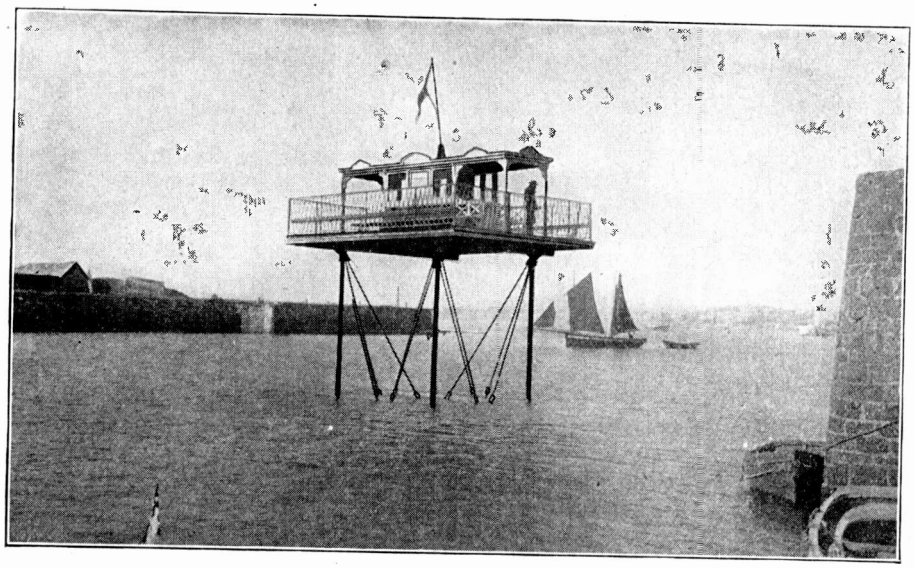
Fifty normal children were placed in this room and 50 others of the same average age, size and mental and physical development were kept in an adjoining room. The tests covered a period of six months during which time one group of children was under the influence of the electric currents. At the end of the period those children who had been subjected to the electricity showed an average growth of two inches, while those without electricity only grew one and one-quarter inches.

The "electrified children" also showed considerable increase in weight and other forms of development in proper proportion to their height. They also showed an average proficiency of 92 per cent in their studies while fifteen of them showed 100 per cent.

On the other hand, not one of the "unelectrified children" reached 100 per cent and the average proficiency was only 75 per cent.

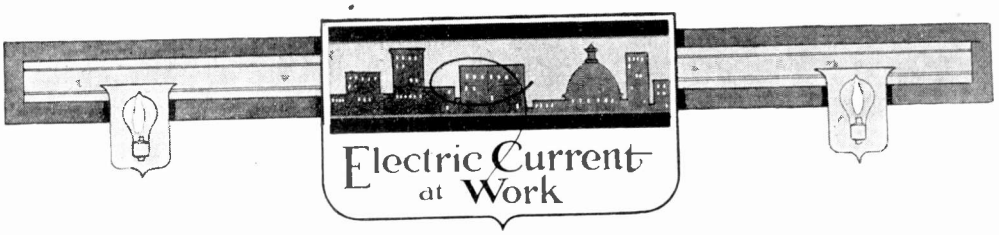
The first group of children also appeared to be at the end of the six months, much brighter, quicker and more active. They were prompter in attendance and less subject to fatigue.

The electrical apparatus generated a small amount of ozone and there was a faint odor of it present in the room. It is held, however, that the presence of ozone would not account for the results observed.



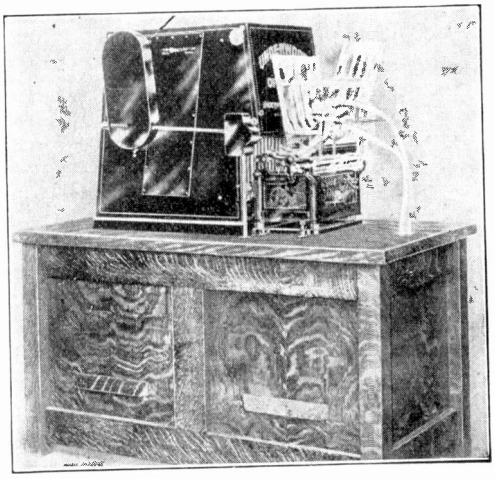
A FERRY ON STILTS.

This odd ferry is operated at St. Malo, France. The passenger platform is carried on stilts which run on rails many feet below the surface. It is drawn back and forth by motor-operated cables.



An Automatic Electric Typewriter

Large business houses have occasion to send out thousands of what are known as "form letters;" that is, letters in which the text is the same but in which the names and addresses of the individuals must be filled in on a typewriter. These letters are printed in fac simile typewriting, a very close imitation of the real thing, and a typewriter ribbon to match is given with each set of letters to fill in with. In spite of the perfection of this process it is, however, possible for a person receiving such a letter to see



AUTOMATIC ELECTRIC TYPEWRITER

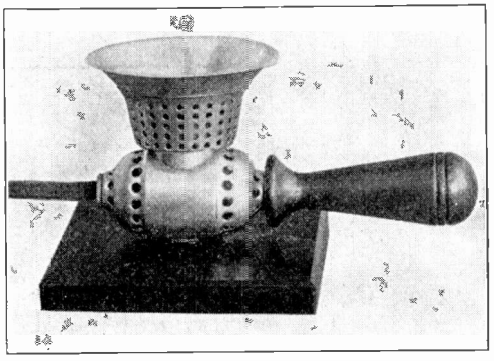
that it is a "form letter," and he does not think quite so much of it as if he knew that it was an individual letter typed for him exclusively.

An electrically operated typewriting machine has been devised to write such letters at a tremendous rate and at the same time fill in the proper name and address; in fact, making to all appearances an individual letter to each addressee.

The motor is attached to any regular electric light circuit by means of a flexible cord and plug in as simple a manner as the connection is made for an electric fan. The cost of current consumption amounts to about 15 cents per day of ten hours. The mechanical marvel writes hour after hour, turning out perfect letters, and it stops automatically when the last name has been used in the name master sheet or when the supply of paper has become exhausted. It demands no attention and needs no supervision. All it requires is to be supplied with paper filling the rack and the electric operator does the rest.

For the Theatre Dressing Room Table

Electricity, the fire insurance companies' friend, again asserts its claim to this title by the eliminating of the hazardous open gas or oil flame which actors

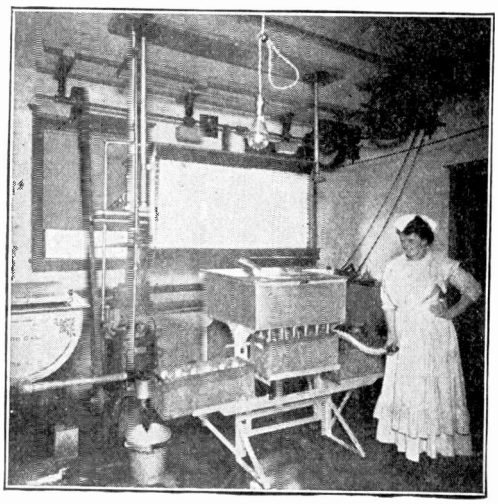


COSMETIC HEATER

and actresses often use in heating their cosmetics. The electrically heated cosmetic receptacle affords a clean and handy device for the make-up table and is so small as not to be inconvenient to pack and carry.

Model Milk Depot

What a one-horsepower motor can accomplish in a properly equipped milk depot is illustrated in the accompanying



MODEL MILK DEPOT

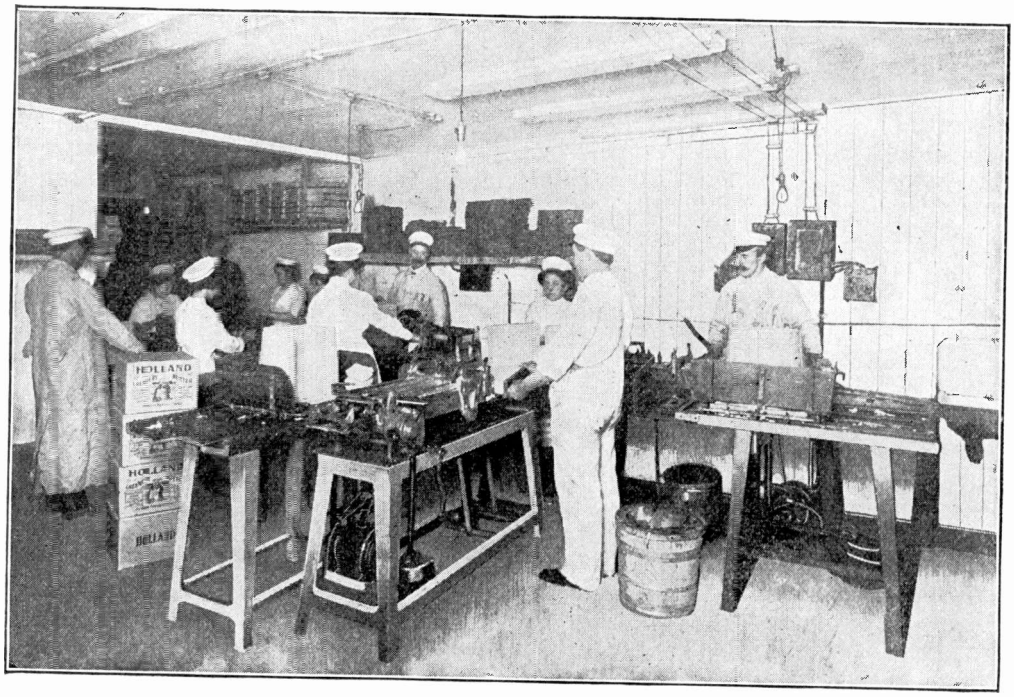
picture showing the milk being pasteurized and bottled.

From 90 to 100 gallons of milk are taken care of each morning, being emptied from the cans into the semi-cylindrical tank at the left. It is then pumped through the pasteurizer and forced into the tank above the cooling coils to be chilled in running over them into the bottling tank. Twelve bottles are filled at a time by operating the lever which lifts them up against the filling tubes. In the operation the motor (not shown) by means of the jackshaft runs all pumps including the one that forces cold water from the ice tank through the cooling coils. A cream separator, churn and bottle cleaner are also motor-driven.

Handling Butter by Electricity

Over on South Water street, Chicago, is a butter handling establishment where 2,000 pounds of butter a day is cut, printed, wrapped and put up in small cartons for distribution—all done by electric driven machinery.

The butter is received in large boxes or tubs and is placed upon the cutting table where several knives all at once slice it into slabs. These slabs are laid

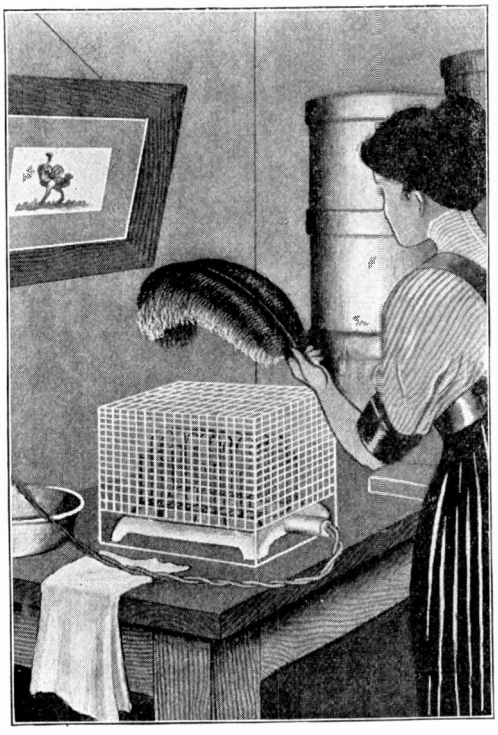


ELECTRIC APPARATUS IN BUTTER HANDLING

one at a time in a movable rack run by a motor which passes the butter under a wooden roller and stamps the word "Holland" upon each pound. The stamped blocks are then placed one at a time in another motor-driven machine which wraps each pound in wax paper and drops it on a belt conveyer running along the center of the table. As it passes along, girls at each side place it in cartons ready for delivery.

Curling Feathers with an Electric Toaster

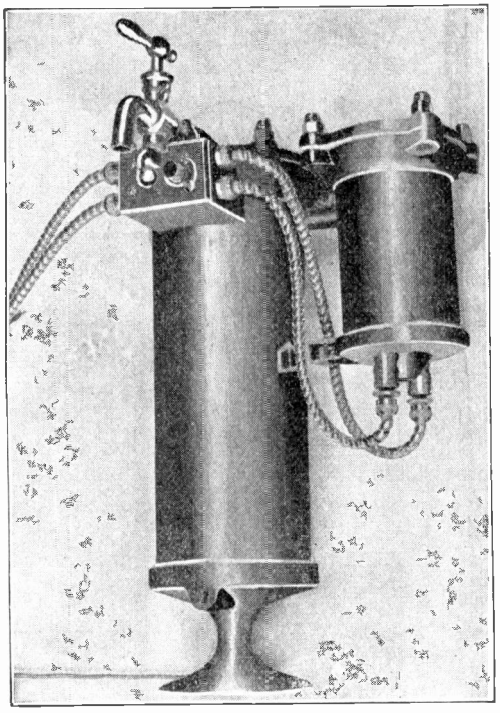
The Edison Electric Illuminating Company, of Brooklyn, was compelled to recognize the truth of the old proverb "Necessity is the mother of invention" when in receipt of a request from a millinery establishment for a heating appliance that might be used to curl feathers. The company was equal to the occasion and experimented with an electric toaster. The device was enclosed in a wire screen so that the plumes might not accidentally come in contact with the coils. The arrangement was sent out and proved so satisfactory that several toasters are now being used.



CURLING FEATHERS WITH AN ELECTRIC TOASTER

Water Purified as Used

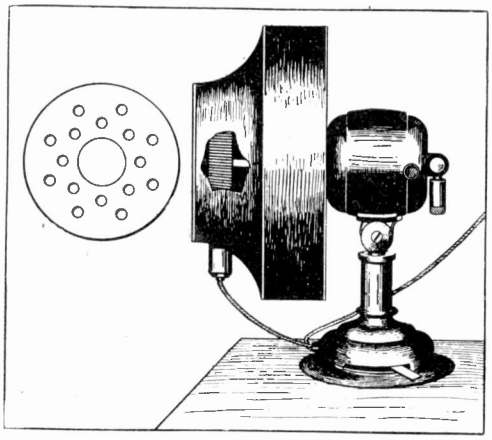
The electric filter for household use here illustrated combines the method of passing the water through close grained stone, with the application of electricity between two aluminum plates within a second small cylinder. The passage of the current through the water produces a chemical reaction which acts to purify the water. As few as twelve dry cells are used to operate the smallest filter, though 110 volts, either alternating or direct, is usual. A distinct feature of the device is a push button switch just below the faucet, so arranged that in turning the water on and off the switch is operated by a metal finger attached to the faucet handle, thus the current is used only while the water is flowing.



WATER PURIFIER

Fan Used as a Heater

The very latest in electric fan improvements is the addition of a wire wound circular heater placed directly in front of the fan and protected by a brass hood as



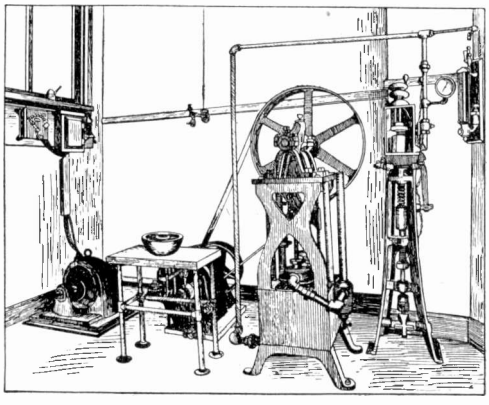
A WARMING FAN

shown in the illustration. The heater receives current from the fan circuit and the air is warmed as it blows through the coils. The heater can be purchased separate from the fan and is attachable to any fan.

Sealing Up Canned Fruit

In fruit canning factories where hundreds of cans are sealed up for storage and shipment every day quick methods are employed.

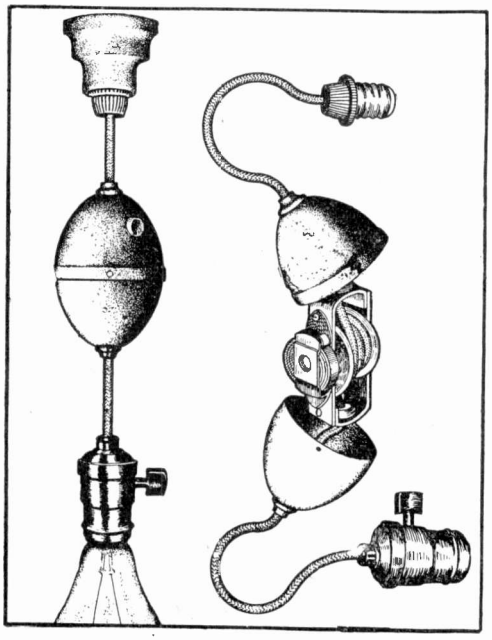
The picture shows a motor-driven outfit consisting of a glycerizer for softening the gaskets placed in the caps of the jars, a vacuum pump and a vacuumizer. The jars filled with fruit and capped are placed in a box-like receptacle in the vacuumizer, the pump removes the air which forces the cover on using atmospheric pressure. Starting the pump also automatically closes the door to the vacuum chamber. By a foot pedal the electric heater is applied to the cover melting a gasket and effectively sealing the can or jar. Releasing the foot pedal the door opens and the can is replaced by another.



SEALING UP CANNED FRUIT

Extension Cord Adjuster

It has always been a hard task to keep extension light cords in good condition, because the cord must be long enough to reach distant objects and also be serviceable for objects nearer at hand. Consequently the unnecessary cord is part of the time in the way, thus becoming unnecessarily worn.



EXTENSION CORD ADJUSTER

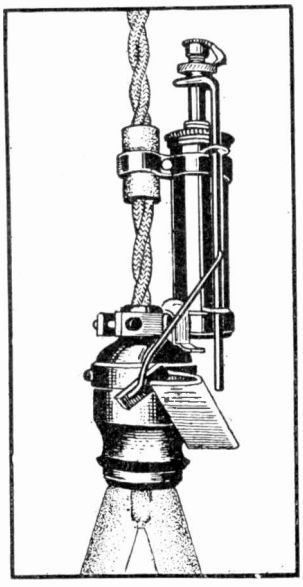
The picture illustrates an adjuster upon the market which keeps the cord out of the way. It consists of a metal shell enclosing a spring controlled ratchet

mechanism which operates cone-shaped rolls on which the cord is wound.

When, after using, it is desired to wind up the extension, the rolls or spools, which are held under tension by the spring, are released by pressing the push button on the outside of the shell, thus taking up the cord from both ends and maintaining the adjuster in the middle of the length of lamp cord at all times.

Turns Off Forgotten Lights

Not infrequently lights in the cellar, pantry, toilet room, stock room and other out-of-the-way places are neglected and



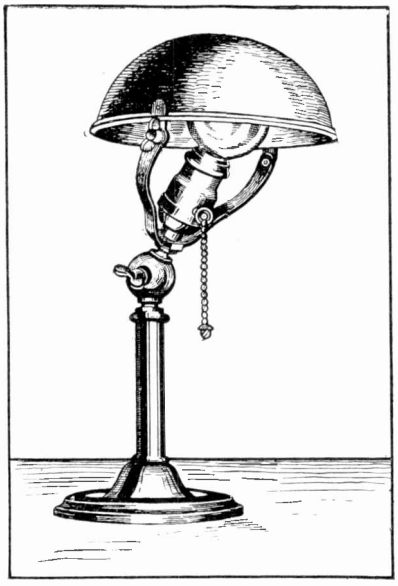
AUTOMATIC CUT-OFF FOR LIGHTS

left burning for hours, sometimes for all day or all night.

The Dixon automatic cut-off is a small device attachable to any drop light and can be set to turn the light off after any desired length of time from one minute to three hours. The length of time required for air to escape from beneath a piston in a cylinder determines the time the light will burn before being turned off. The escape of the air is controlled by an adjustable valve cap and the device resets itself every time the light is turned on.

Adjustable Electric Portable

This electric portable lamp is provided with a ball joint which permits the lamp

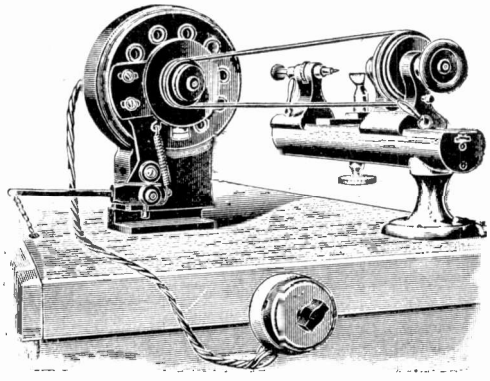


ADJUSTABLE PORTABLE

to be adjusted at any angle. The reflector is also adjustable. The base is slotted so that the whole device may be hung on the wall and used as a side light.

Watchmakers' Lathe Motor

This little motor, designed especially for jewelers' work, will run on 110 volt



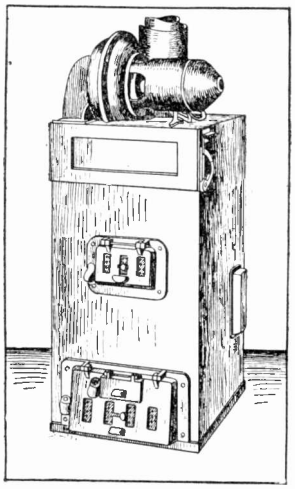
WATCHMAKERS' LATHE MOTOR

current, either alternating or direct. It is arranged for starting, stopping and

controlling the speed by means of a foot treadle. The Fidelity motor, as it is called, comes complete, ready to fasten to the bench, including reversing switch, chain, belt and treadle, and plug and cord to fasten to an ordinary lamp socket. A double pole snap switch enables the operator to run the motor in either direction.

Forced Ventilation for Cars

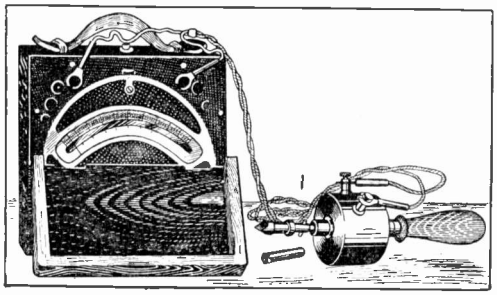
A new hot-air heating and ventilating system for cars embodies a small motor and blower mounted on top of the heater. The fan drives the heated air through a duct extending the length of the car and beneath the ends of the seats. There is an outlet under each seat. The little motor and fan thus keep the air in constant circulation.



ELECTRIC VENTILATING AND HEATING FAN

An Electric Speed Indicator

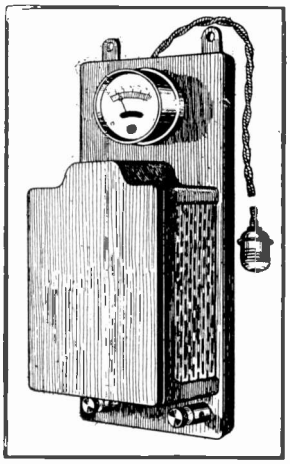
To read a speed indication or the revolutions per minute of a shaft from the dial of a voltmeter is quite out of the ordinary, yet this is what is done in using the Hopkins electric tachometer. The device consists of a small direct current magneto, which is nothing more than a little dynamo, enclosed in a case fitted with a handle and applied to a shaft just like an ordinary speed indicator. The magneto runs at the same speed as the shaft and generates a voltage proportional to this speed. Connecting the magneto by flexible leads to a voltmeter and making a voltmeter scale to read in revolutions per minute as well as volts, the voltmeter needle moves over the scale in direct proportion to the speed of the magneto and machine being tested.



ELECTRIC SPEED INDICATOR

Rectifier for Charging Storage Batteries

As simple as an electric bell and as easily connected to a circuit as a cord and attachment plug can make it, the Wagner alternating current rectifier is a handy device for the automobile owner.

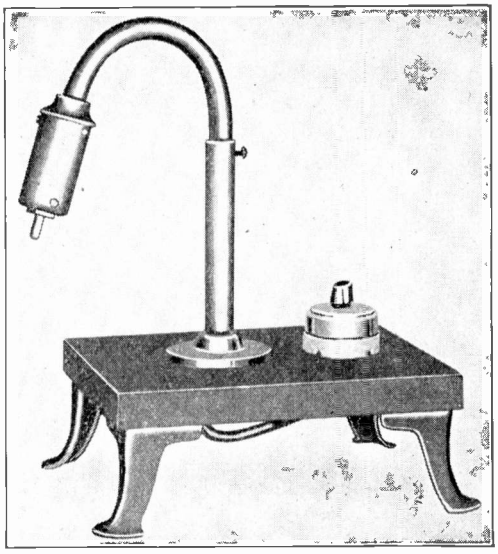


RECTIFIER

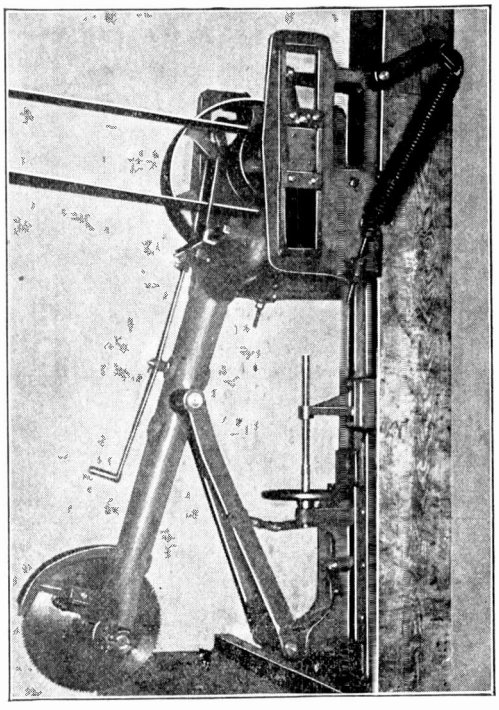
He may connect the rectifier to his battery when he puts up his car, and from the ammeter, which is mounted on the board above the rectifier, can tell just what current is going into the battery, cutting it off at the end of an hour or two hours, according to the condition of the cells. The charging can all be done while his car is not in use and without the necessity of removing the battery from the machine.

An Old Tool in a New Guise

A soldering iron in a form quite unusual is shown in the accompanying illustration and is designed for use in shops where the articles worked upon are small and readily handled. The work is held up to the iron under the eye of the operator instead of being covered by the iron itself.



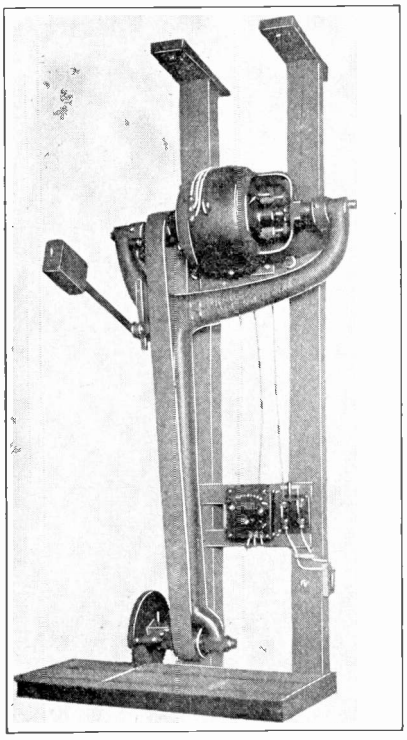
STATIONARY SOLDERING IRON



THE PYRIBIL SAW

Odd Swinging Saws

Wood-working establishments contain some very interesting electrically operated tools, notably in the line of saws designed with a view to rapidity of opera-



THE RELIANCE SAW

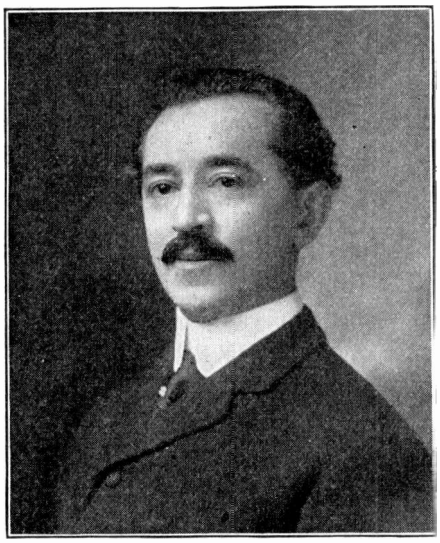
tion and safety to the operator. The Reliance saw swings from a vertical arm, the motor being mounted on top and driving the saw by a belt. By simply swinging the carefully protected saw it is drawn across the work.

The Pryibil saw is also mounted on a vertical arm, which is jointed to the mechanical system in such a manner as to cause the saw to move in a line parallel with the table. The upper part of the carriage, which carries the belt pulley, slides up and down in order to obtain this horizontal motion of the saw.

Electrical Men of the Times

LOUIS B. MARKS

Do you recall the arc lamp of 20 years ago, that glaring light of high intensity, now hissing, now flaming and sputtering? Do you remember how it flickered and shifted its shadows and how it needed recarboning every day? Then you may also recall how a few years later there came a change. A small inner globe softened and steadied the light without detracting from its effectiveness and instead of making daily rounds, the trimmer called only once every week or ten days. What had happened? A young man hardly out of college had shown arc lamp makers that they could at once overcome the objectionable flickering, soften the glare of the light, save a large part of the attention needed by the lamp and reduce their bills for the carbons. He had found that by improving the quality of the carbons and using a simple gas checking device, these carbons could be burnt in an atmosphere of carbon dioxide and carbon monoxide, gases automatically produced by the arc itself. Then the same pair of carbons which would last only eight hours in the open air, would burn 150 hours in this gas chamber, saving over 90 per cent in the cost of the carbons.



How this "enclosed arc" lamp displaced most open arc lamps, how it greatly extended the field of electric lighting and how it saved huge sums in a single year in the cost of carbons and attendance, is now a matter of history. It is also a fine example of what can be done by a man specializing in a given field, for Louis B. Marks had paid particular attention to arc lighting even while a student at Cornell University. Barely of age when he left there in 1890, he soon presented the first micro-photographs showing the influence of the structure of the carbon upon its life and its light-giving efficiency. Then the perfecting of both carbons and lamps came in rapid sequence and in 1900 the Paris Exposition awarded Mr. Marks a gold medal for his invention of the enclosed arc lamp, which by that time had come into widespread use.

Since then Mr. Marks has been prominent as an expert in the lighting field, and many fine examples of indoor lighting testify to his ability, such as the new Carnegie Libraries and the new postoffice at the Pennsylvania Terminal, both in New York. Seeing the time ripe for concerted action toward improving all classes of lighting, Mr. Marks issued the call six years ago which led to the founding of the Illuminating Engineering Society, of which he was the first president, an organization already numbering over 1,500 members scattered throughout the United States and foreign countries. Besides speaking before this and

other prominent technical societies, Mr. Marks has lectured before the International Electrical Society in Paris, the Royal Institution in London and the Johns Hopkins University.

Edison's Cubic Foot of Copper

Thomas A. Edison made the remark a few months ago that he would like to see a cubic foot of copper. In deference to the wonderful impetus given to the copper industry as a direct result of his inventions, the presidents of a number of the big copper companies decided to gratify this little whim of the great inventor. So they had a cubic foot of copper cast. Half a dozen trials were necessary before a perfect casting was obtained. This was engraved with Edison's name and that of the presidents interested, together with an appreciation from the latter. It was presented to him recently at a dinner at the Waldorf in New York. He remarked that it made the best paper weight he had ever had. It weighed 548 pounds.

Customers Frequent the Bright Ways

The value of good street lighting as a means of attracting customers to a district was strikingly shown in a large Canadian city. It is stated that in one of the principal business streets the rental of shops on one side was over 50 per cent greater than on the other. The explanation was that a much larger number of people walked on that side of the street, which was busier and more brilliantly lighted than the other. Some of the more enterprising shopkeepers on the "dark" side realized this, and proceeded to arrange a special installation for their block of shops. The new lighting attracted customers, sales increased rapidly, and the cost of the new installation was soon paid for out of the additional profits. The ultimate result was a marked improvement in the general lighting of the whole street.

A Night Watchman for Sixty Cents a Month

Eight candlepower porch lights are advertised under the above heading by the Southern California, Edison Company, Los Angeles, as providing protection from burglars, night prowlers, porch climbers, etc. In its advertisements for this business the company reproduces photographs of installations and states that at the present rates charged by the company it is possible to burn an eight candlepower lamp ten hours a night for a month for 60 cents.

NEW BOOKS

VEHICLES OF THE AIR. By Victor Lougheed, Chicago: The Reilly and Britton Co. 1911. 514 pages with 270 illustrations. Price $2.50.

A modern book in every respect containing comprehensive and not too technical descriptions of all the types of aerial craft from the balloon to the most modern aeroplane and hydro-aeroplane.

A HANDBOOK OF WIRELESS TELEGRAPHY. By J. Erskine-Murray. New York: D. Van Nostrand Company. 1911. 380 pages, 194 illustrations. Price, $3.50.

This book is the third edition and is thoroughly revised. It is intended for the use of those who, for reasons of business or pleasure, have already made themselves acquainted with at least some of the truths of the theory and practice of wireless telegraphy, and to whom, therefore, the ordinary technical terms will convey something more concrete than a mere definition in words.

Correction

In the November issue of POPULAR ELECTRICITY a description was printed of the Kunz self-heating hot water bottle. The description is in error, for the heating element is described as being an incandescent lamp, whereas it is a resistance element encased in a tube which is inserted in the bottle. This is regulated by a switch so that three temperatures may be obtained—low, medium or high.

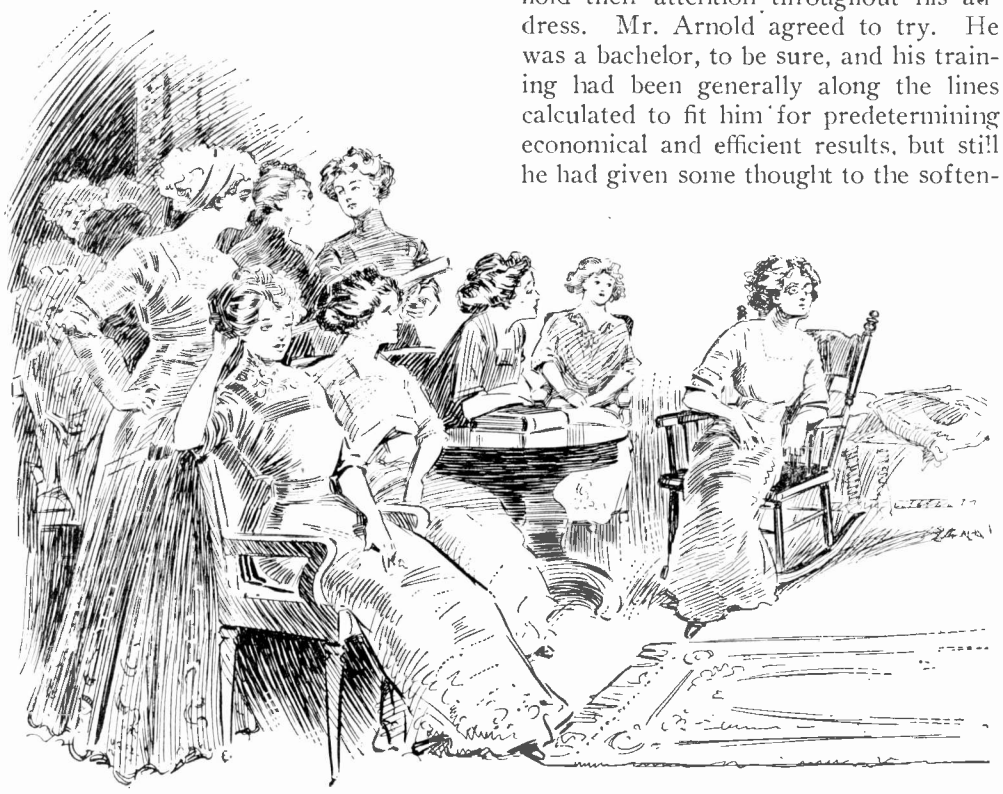
Electricity in the Household

EDITED BY GRACE T. HADLEY

Mr. Arnold Illuminates the Elektron

Mrs. Fitzgerrell found herself very busy and happy one bright day in the early Fall, arranging for the second meeting of The Elektron. Mr. Allen Arnold, the new illuminating engineer of the Consolidated Light and Power Company, had consented to give several illustrated talks before the club; and after a conference with Mrs. Fitzgerrell had decided upon "The Illumination of the Home Beautiful" as his first address.

After her experience with th organization of the club Mrs. Fitzgerrell was of the opinion that "The Luminous Efficiency of the Incandescent Lamp" had better be postponed until the scientific sense of the club as a whole had been subjected to some further cultivation and development. Now if Mr. Arnold could only work into his talk something about Bridge, she was quite sure that he could not only interest the ladies, but hold their attention throughout his address. Mr. Arnold agreed to try. He was a bachelor, to be sure, and his training had been generally along the lines calculated to fit him for predetermining economical and efficient results, but still he had given some thought to the soften-



The new illuminating engineer floundered a moment, then

ing and embellishment of his hard practical work.

The original 25 ladies who had been invited were all present at the second meeting of The Elektron and there was a subdued murmur of approval when Mr. Arnold was officially introduced by Mrs. Fitzgerrell to the Club.

"He is rather good looking," admitted Mrs. Norman Van Ess after a careful scrutiny through her diamond set lorgnette.

"His father was a Navy officer, so I've heard, said Miss Lindsey softly, who was glad Mr. Arnold had found favor in the eyes of her official chaperone.

"Where did he come from?" whispered Mrs. Flannerty to Mrs. McGinnis.

"I think from Chicago."

"You don't say!"

"Yes, Mrs. Fitzgerrell told Mrs. Marshall, who told me that it was quite the thing now for all the big light and power companies to have an illuminating engineer whose services are free to the public."

"Well, I declare, what will they do next!"

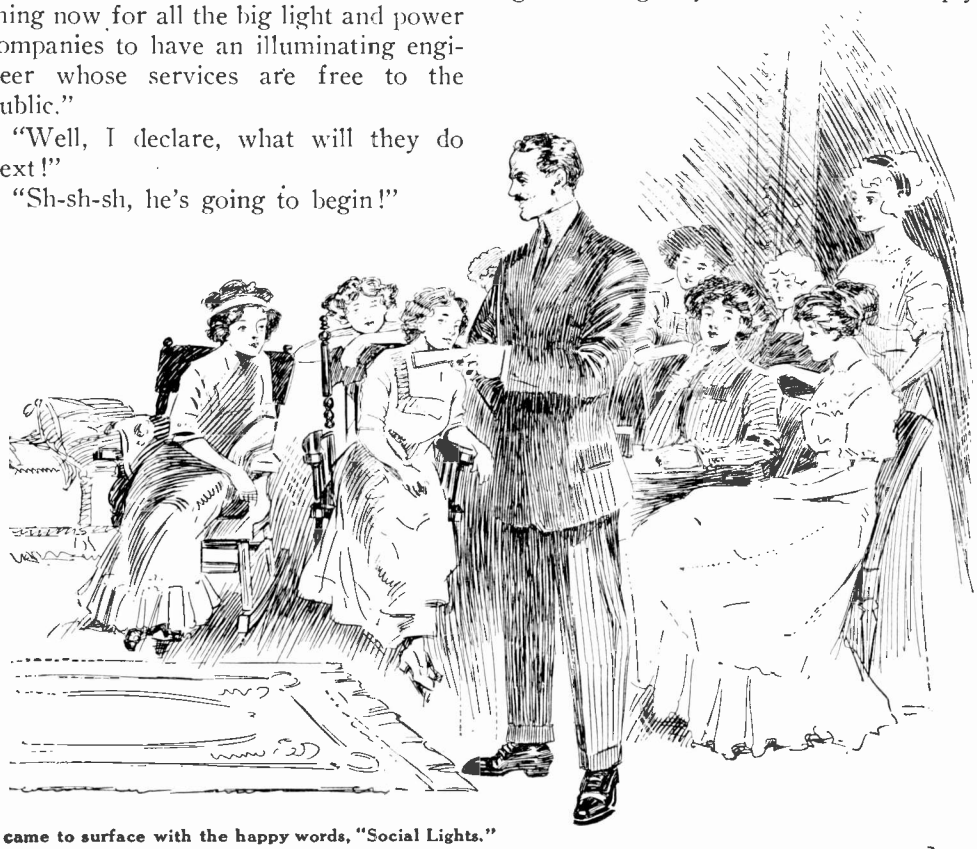
"Sh-sh-sh, he's going to begin!"

"Madame President and Ladies of The Elektron: It is with pleasure that I accept your kind invitation to address a club consisting of so many bright and shining——" the new illuminating engineer floundered a moment, then came to the surface with these happy words, "social lights——"

"That shows he has a nice sense of values," whispered Mrs. Van Ess approvingly to Miss Lindsey.

"And my only hope," continued the speaker, following up his lucky thought, "is that I may be able to say something worthy of your earnest consideration." With this subtle flattery the new illuminating engineer won the hearts of The Elektron, and from that moment his success was practically assured.

"Illuminating engineering in the broad sense of the term means the intelligent use of artificial light. In using artificial light intelligently, it does not simply



came to surface with the happy words, "Social Lights."

mean that it is to be used economically and efficiently, but it further means that the results obtained by such usage must satisfy the eye as well as the pocketbook. Illuminating engineering is not simply a science, but an art as well. It is one of

Now if Mr. Arnold could work in something about bridge

the branches of applied science that must be thoroughly blended with applied art; otherwise results, as a rule, leave much to be desired." At this moment the room was darkened and the speaker, by means of a lantern, threw upon a white canvas curtain a cross section of the human eye. Commencing at the front of the eye he pointed out the various portions of the eye, the cornea, the iris, the crystalline lens and the retina, on which light rays fall, the effect there produced passing thence to the brain through the agency of the optic nerve, where the sensation of vision is produced.

"The eye is a camera and therefore may be relatively compared with an ordinary collapsible camera. The cap or shutter used to exclude the light has its counterpart in the lids which perform that function for the eye. The shutter performs one duty, while the lids of the eye do at least several important ones, namely, open for "seeing" and close for rest; assist in distributing water fluid over the cornea for cleansing and moistening purposes, and act as a protector against the things from the outside."

Mr. Arnold worked out his simile of the human eye as a camera in a most interesting manner. He then took up the effect of bright light sources coming in the field of the camera and the eye, the effect of direction of light on the eye, and lastly, the use of unsteady or flickering illuminants. These, he declared, should be avoided because the eye, when operating under such conditions, is compelled to work the muscles much more than is proper in its efforts to adjust itself to the constantly changing condition; and if subjected too long to such conditions it will become very tired and more or less injured.

"The principal considerations," said the illuminating engineer, "affecting the illumination of any interior room or area are: First, the use of the room; second, the selection of the kind of lamp best suited to that use; third, the proper quantity of the light required for such use as the room may be put to, either specialized or general; fourth, the location of the outlets at such points that the light will best perform its office; fifth, the satisfaction of certain esthetic requirements which are inherent in every lighting problem, and sixth, the selection of a fixture of such a type and nature that it will properly perform its office as a light carrier and also be designed along lines which will be esthetically satisfactory with regard to its environment. The use of the room is profoundly important in its relation to illumination.

"Naturally in the decoration of the home the question arises, What constitutes artistic illumination? Display windows and show rooms require a penetrating white light, but the home does not. A bright light thrown into the remotest corners quite destroys the variety and picturesque effect of the room. There must be some shadow, some light and shade. Leave something to the imagination in decoration and illumination of the home beautiful. Remember,

the lights make for the joy and happiness or peace and repose of the home. The joys of home life, the family dinners, the impromptu dances in the music room, the afternoon bridge parties, the quiet reading hour in the library, all are made or marred by the arrangement of the lights.

"Life affords a vast amount of material for art. To select the proper elements, to harmonize them, is the work of the artistic homemaker. Almost everyone would rather have a happy, well-ordered home than anything else on earth. The home is the stage upon which the domestic drama is played. Simplicity is the keynote of truest and sincerest art. The real artist of the home takes the elements or materials at hand and creates an atmosphere of artistic beauty and harmony.

"In the social functions of the home, consider how important a part the lights play in a successful entertainment. A very good example of this is found in the ever popular bridge parties and receptions. Where is the hostess who entertains with all the shades up and the garish light of a bleak winter day drifting in at the windows? No! The shades are drawn, the lights are turned on and softly glow in tinted or frosted globes, and the air is heavy with the fragrance of blossoms. The eyes of the guests shine with pleasure, the ornaments in their hair glisten, their jewels sparkle in the simulated sunshine and there is a shimmer of silks and satin and the warm glow of velvets. The joy of the

She felt that her efforts had been rewarded

party is deepened and intensified by the warm tond light and colors."

Enthusiastic applause filled the room as Mr. Arnold sat down. There was no doubt in Mrs. Fitzgerrell's mind but that he had made a "decided hit" with the ladies of The Elektron. She felt that her efforts had been rewarded and that the second meeting of the club was a pronounced success. All the members were now flocking around the illuminating engineer and Mrs. Fitzgerrell radiant and triumphant presented to him personally the various members of the Club.

YULETIDE

"This is Yuletide! Bring the holly boughs
Deck the old mansion with its berries red;
Bring in the mistletoe, that lovers' vows
Be sweetly sealed, the while it hangs o'erhead.
Pile on the logs, fresh gathered from the wood,
And let the firelight dance upon the walls,
The while we tell the stories of the good,
The brave, the noble, that the past recalls."

A Modern Christmas Masque

CHARACTERS.
(WHICH SPEAK.)

OLD FATHER CHRISTMAS, Who Embodies the Christmas Spirit.
YOUNG GRIMSBY, Amateur Wireless Operator.
RICHARD THE FIRST.
ROBIN HOOD.
HENRY VI.
CHRISTOPHER COLUMBUS.
CHARLES II.
KING GEORGE III.

CHARACTERS.
(WHICH DO NOT SPEAK BUT DO THE WORK OF THE WORLD.)

VOLT—A forceful Italian.
OHM—A sturdy German.
AMPERE—A lively Frenchman.
WATT—A brawny Scott.

SCENE—Young Grimsby's wireless telephone room on top floor of his home. He is seated in front of apparatus.

YOUNG GRIMSBY. (*Christmas Eve, 1911.*) This morning I completed my improved wireless telephone. It is the most wonderful wireless telephone ever invented, but strange to say, I have not received any messages as yet. I wonder why! Maybe there was too much interference, or too much static Christmas spirit in the air. I will try once more before I go down stairs to decorate the Christmas tree. (*Puts on head phones, adjusts detector, moves slide and listens. A sudden joy illumines his face.*) I hear a voice! It is very faint. (*Moves slider again.*) Now the voice is stronger. I hear it better. What? Who is it? (*Excitedly.*) Richard the First! Surnamed Coeur de Lion! Can it be possible? Am I dreaming? You wish to give me Christmas greeting! Indeed, yes.

RICHARD THE FIRST.—

"Christmas is a time full honest;
Kyng Richard it honoured with gret feste.
All his clerks and barouns
Were set in their pavylouns
And served with grete plente
Of mete and drink and each dainte."

YOUNG GRIMSBY. I am highly honoured to get such a greeting from you, King Richard. The spelling is a bit queer and I don't quite know the meaning of pavylouns, but I know you were a great KING. I've always envied you that wonder-working sword.

KING RICHARD. "The gude sword Caliburne that Arthur luffed so well."

YOUNG GRIMSBY. Yes, and I remember it was you who developed tilts and tournaments. I was always crazy to see a tournament during the days of chivalry, but say, for real excitement, you ought to see the city championship series between the Sox and the Cubs. (*Pause.*) Who are the Sox and what are the Cubs? Why—botheration—tuned out!"

(*The young operator is wild with excitement. His eyes glow. His cheeks are aflame with emotion. He listens intently.*)

Another voice. Who? Robin Hood?

ROBIN HOOD. I departed this life on Christmas Eve in the year 1247. History calls me a famous freebooter, but I suffered no woman to be oppressed. Poor men's goods I spared, abundantly relieving them with that which by theft I got from the abbeys and the houses of rich old earles."

YOUNG GRIMSBY. I was ever your fervent admirer, Robin Hood, and when I was a small boy I fully intended to be a Robin Hood outlaw and follow your illustrious example but I was diverted and became a harmless Boy Scout; and then I graduated into a baseball fan and a wireless operator. Gone! But wasn't it great to hear his voice just once! (*Pause.*) Another voice. What, Henry VI?

HENRY VI.

"Christmas is near:
And neither good cheer,
Mirth, fooling nor wit,
Nor any least fit
Of gambol or sport

Will come all the Court,
If there be no money."

YOUNG GRIMSBY. That's the truth, Henry. It's tough luck not to have any money Christmas time. I remember that you "borrowed your expenses" rather than leave Christmas unobserved. *(Pause.)*

(In great excitement.) Christopher Columbus.

CHRISTOPHER COLUMBUS. On Christmas Day, 1492, I, Christopher Columbus, landed at a newly discovered port in Cuba which I named Navidad because I landed there on that day.

YOUNG GRIMSBY. I say, Chris, you don't know what you did for us that day. I have always wanted to thank you personally for your wisdom in making that remarkable discovery. Your courage and your fortitude were wonderful and—gone! (*Listens intently.*)

The "Merry Monarch" Charles II, the so-long-fugitive Prince. Do I wish to hear the sentiment of your merry boys? I certainly do.

CHARLES II.

"Then here's a health to Charles our King throughout the world admired,
Let us his great applauses sing, that we so much desir'd,
And wished amonghst us for to reign, when Oliver ruled here,
But since he's home return'd again, come fill some Christmas Beer."

YOUNG GRIMSBY. Another voice—King George III.

KING GEORGE III. The first Christmas of my reign there was high festival at Court, when I, preceded by my heralds, went in state to the Chapel Royal and heard a sermon preached by his Grace the Archbishop of York; and it being a collar day, the Knights of the Garter, Thistle and Bath appeared in the collars of their respective orders. After the sermon was over I went into the Chapel Royal and received the sacrament from the hands of the Bishop of Durham; and I offered a wedge of gold in a purse, for the benefit of the poor, and the royal family all made offerings. I afterwards dined with my royal mother and in the evening returned to St. James's."

YOUNG GRIMSBY. Well, I guess that is some improvement on the way Charles II spent his time with his horse-racing and ranting, roaring Boys. (*Pause.*) Now what jovial voice is this on the aerial? Old Father Christmas! Will I wait up for you? Most assuredly I will, for I am Official Decorator of the family Christmas Tree!

(ENTER OLD FATHER CHRISTMAS. *Young Grimsby greets him with hilarious enthusiasm.*)

YOUNG GRIMSBY. Good Father Christmas, what have you in your pack this year?

OLD FATHER CHRISTMAS. EVERYTHING ELECTRICAL!

(Deposits pack on floor in front of him and out hop little Volt, Ohm, Ampere and Watt. They dance an electric jig.)

YOUNG GRIMSBY. How fine. You keep up with the times, Old Father Christmas!

OLD FATHER CHRISTMAS. Yes, the spirit of Christmas is ever the same, but the contents of my pack change from year to year. As Official Decorator of the family Christmas Tree I will leave with you the gifts for all your family.

YOUNG GRIMSBY *(eagerly)*. What have you for father?

OLD FATHER CHRISTMAS *(handing out the parcels)*. An electric shaving mug and a cigar lighter.

YOUNG GRIMSBY. Good gifts, couldn't be better. And for mother? She's a mighty good mother, you know. I hope you have something especially nice for her.

OLD FATHER CHRISTMAS. A combination electrical dining set, coffee percolator, tea pot, cereal cooker, egg boiler, electric disk stove, all in burnished copper. It was invented by Harry Weeks,

now of Chicago, but formerly with a great electric company in the near East.

YOUNG GRIMSBY. Oh, I have heard of him. This electrical set is the best present you could have brought mother. She will be simply delighted with it.

OLD FATHER CHRISTMAS. This set is welcomed by all women. Harry Weeks is also inventing something else of interest to women which I will bring to your mother next Christmas.

YOUNG GRIMSBY. What have you for grandmother and grandfather?

OLD FATHER CHRISTMAS. A luminous electric radiator for your grandfather and an electric heating pad for grandmother.

YOUNG GRIMSBY. Thank Heaven, then I won't have to fill the hot water bottle any more. Now what for Sister Sue?

OLD FATHER CHRISTMAS. An electric curling iron complete with cord and plug.

YOUNG GRIMSBY. There's little Ben and Baby Blue.

OLD FATHER CHRISTMAS. Well, here's an electric toy for little Ben and a milk bottle warmer for Baby Blue. Your own gift you will find Christmas morning at the foot of the Christmas tree.

(A clock chimes the hour of twelve.) I must be off. I have many homes to visit and many hearts to cheer. *(Whistles and Volt, Ohm, Ampere, Watt hop into sack.)*

YOUNG GRIMSBY. Good-bye, Old Father Christmas; this has been the most wonderful Christmas Eve of my life. Thanks, thanks for EVERYTHING ELECTRICAL.

(Curtain.)

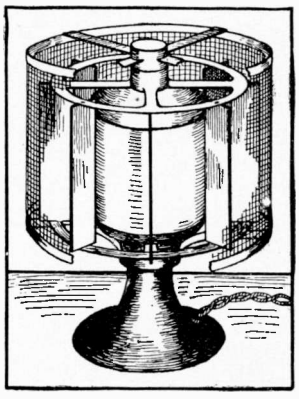
Low Priced Electrical Devices

Every successful device or apparatus placed upon the market is bound to call forth a score of similar devices some of which will have put into them the best of workmanship and design and the best of material, while other like devices will be made with a view to reducing the price. This latter course often places an article under the suspicion of not having the best material and skill provided in its manufacture.

An instance of this kind occurred recently in the sale of an electric pressing iron at the low figure of $1.98. While not attempting to pass upon the quality of this particular low-priced iron attention is called to the fact that in buying household electrical conveniences, as in the case of other utensils, you get what you pay for. If they are sold far below the regular price without good reasons, you have a right to question their serviceability and their economy in current consumption.

An "All-Round" Fan

Confirming the fact that even the most common devices present opportunities for making improvements or changes, a Texas man has constructed a fan of novel design which should quite evenly dis-



AN "ALL AROUND FAN

tribute a cooling breeze to a group of people around a table for example. The shaft of the motor is vertical and turns the fan blades about the circumference of a vertical frame in which they are mounted.

The device measures about seven inches in diameter, nine inches in height and is entirely enclosed in a neatly finished wire meshing which is fastened to the base, as shown in the drawing.

Novel Treatment for Dark Halls and Interiors

The decorator who follows closely the essential principles which underlie the natural manifestation of beauty in its various phases is the one who creates permanent satisfaction.

The home is, primarily, a refuge, a place of rest, a retreat from the excitement and distractions of life outside.

It should be something more than a storehouse for the latest fad in furnishing.

Not only the walls and draperies, but every article of furniture should express the refinement of good form and color.

First impressions of a home are usually created by the appearance of the entrance or hall.

Modern halls are now more of a social office or reception room than anything else. Great care is taken with the furnishings, and the color scheme is carefully selected with regard to the impression it may have upon the chance caller as well as the family.

But notwithstanding the great improvement that has been made in designing halls and vestibules, there still remains in many city houses that long, narrow, box-like passageway, having the straight line of stairs ascending from the front door on one side and the dimly lighted parlors on the other.

Such halls are impressive features of the home. Impressive because they convey the idea of distance, a long, dreary distance leading into darkness.

No matter how perfect the light at the doorway, it cannot penetrate the inevitable gloom at the extreme end of the hall.

From the early colonial days to the present every conceivable method of lighting has been employed to overcome these mysterious shadows, that lurk like dusky foes in the dim distance, but most of the efforts have been unavailing.

However, nothing is hopeless. A modern decorator aided by electricity conceived a new idea, and proceeded at once to put it into execution.

A large space was cut through the side wall of the hall that opened into the parlor; half of the opening was in the front parlor and the other half in the back parlor; both of these rooms were quite dark.

The space was four feet high by six long, the sides were cased in and it was supplied with glass shelves for bric-a-brac. The sides were then closed with stained glass doors. The glass used in the doors was in several shades of amber, with touches of red and green. When the glass cabinet was completed, electric lights were placed inside which could be turned on and off at will.

The effect of this arrangement was most satisfactory, as it placed in both parlors and the hall what appeared to be a beautiful stained glass window with the sunlight streaming through in golden tones.

This slight alteration gave an entirely new aspect to the whole interior of the house; the hall no longer appeared dark and dreary, the dismal parlors became light and attractive.

There is no conflict between the daylight and the artificial, for the stained glass produces a perfect harmony in illumination that is just as pleasing on bright, cheerful days as when the sun is obscured.

Stained glass, when carefully selected in regard to color, may be used in connection with electric lighting to great advantage in many rooms that are hopelessly dark and dismal without it.

When selecting glass for this purpose the color effects should be carefully studied by placing lights behind the glass before it is cut and leaded. Much of the glass is exceedingly crude in color even in daylight, and is absolutely intolerable when dependent upon electric light for illumination. The colors must correspond and harmonize with the general color scheme of furnishing, else a window such as described will be useless.

A Marvelous Electrical Christmas Tree

By MARGARET JOHNSON

Alfred Norton had been in a brown study for two days. A very wonderful clock, the work of some mechanical genius, had been on exhibition in the city in which he lived. It played tunes, rung chimes, moved figures and did all sorts of interesting things. All this was very fascinating to Alfred, and he made daily visits to the clock while the exhibition lasted. Then he had come home looking thoughtful, and had had little to say. He seemed to be trying to work out something in his mind.

Tantalizing as these attacks were, Alfred's mother never questioned him while they lasted. She knew that when the time came he would tell her what the problem was, and the failure or success he had had in working it out.

This morning she had heard him whistling in the bath room, which was always a good sign, and, when in addition, he had come down to breakfast two steps at a time, she had greeted him with a look of eager inquiry.

"I've got it, mother!" he said gaily as he entered the dining room. She and his sister Edith were interested at once, and his father looked over the top of his newspaper to hear what the latest scheme was.

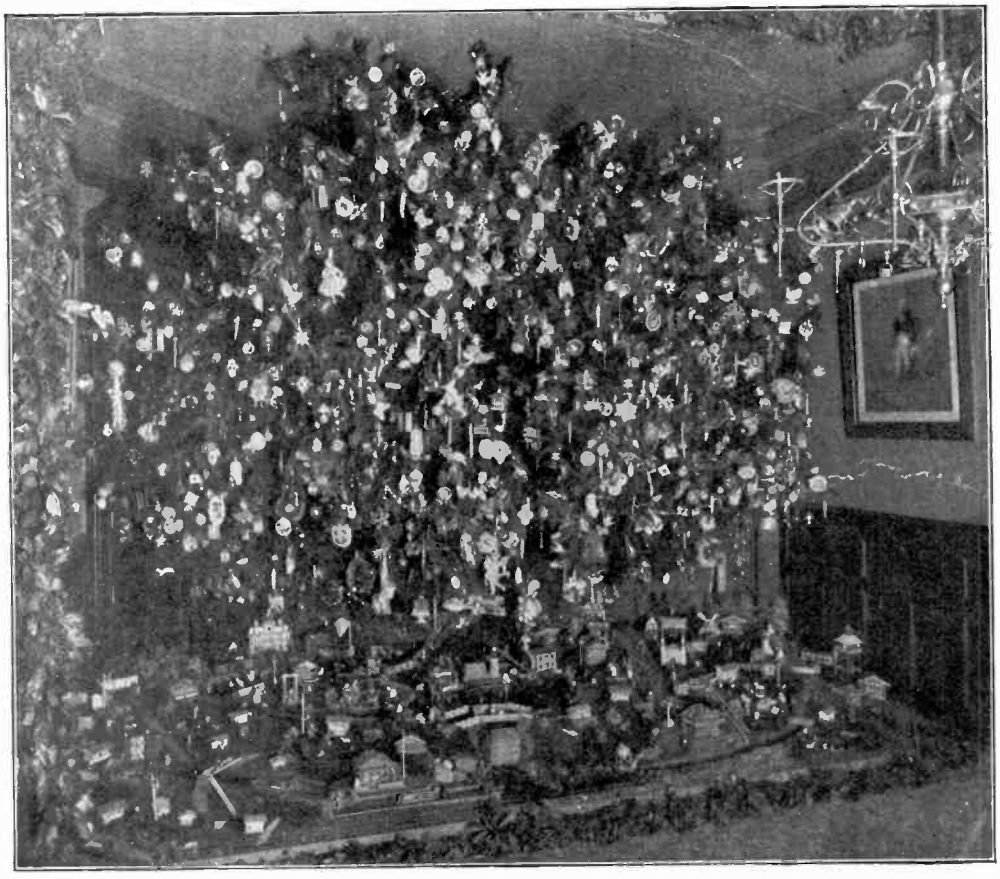
"Something about electricity, I suppose?" said he. "Yes, and it is something great!"

Alfred stopped and looked at Edith. "I can't tell you while Edith is here." Edith looked almost ready to cry. She was always so interested in his schemes.

"Never mind, Sis, you will know pretty soon," said he, consolingly, as he finished his breakfast and went out to feed the chickens. Edith's school began earlier than his, so she was gone when he came back to the house, and he tried hard to give his mother some idea of his plans before it was time for him to start to school.

"Mother," said he, as he opened the door, "I am going to fix up an electric Christmas tree for Edith. These things that run by clockwork are clear out of date. I know father will help me, and all the little things for the tree we can make on my new lathe." This turning lathe was Alfred's idol. It was such a fine one that tears had come into his eyes when, after going to see it almost every day of the exposition, and worshiping it from afar, so to speak, he was told that it was to be his very own. Every spare moment since had been spent in his workshop, and he and his father had made many little things for the house; but here was something definite, something worth while they could do, and he talked until his mother fairly had to drive him off to school.

Once begun, it was the most absorbing work either he or his father had ever done. As week after week passed, each one bringing some tempting idea to elaborate their original plan, it was almost more than he could do to keep the thoughts of the tree out of his mind when he ought to be studying, and his father even found thoughts of the tree



THE WONDERFUL ELECTRICAL CHRISTMAS TREE

obtruding themselves when he was busy with the pages of his big ledger.

His mother, too, was pressed into service, and so many were the demands made upon her to dress dolls, make tiny curtains and other articles of house furnishing, that she finally had to beg to be allowed time to do her own work.

Poor little Edith had a hard time. There was so much mystery. This was the first time she had been deprived of the pleasure of helping, so for a while it seemed there was danger of the workmen enjoying the Christmas present more than the little girl for whom it was intended. As the time grew shorter the mystery deepened. Some strange men were busy downstairs. Then her meals were served in the sitting room, and every time she went anywhere something was hustled out of sight. When Christmas eve came she declared that if Christmas was more than one day off she would burst! She was glad when it was time to go to bed, and was so sound asleep when Alfred tiptoed in, that she heard none of the final preparations.

Not a sound did she hear Christmas morning till papa, mamma and Alfred, fully dressed, called that Santa Claus had been there and gone.

She never had dressed as quickly, yet Alfred could hardly curb his impatience. Then all went downstairs and the door of the dining room was thrown open. Edith screamed and clutched her father's arm. The sight was so brilliant, so beautiful that it frightened her. She scarcely knew whether to laugh or to cry, but sensibly concluded to laugh, then they all went up to examine the tree.

This was, in fact, eight large trees placed across the end and along the sides of the long, narrow room. From the branches hung everything that could possibly be imagined in the way of tree ornaments—glass balls, chains, fishes, birds, baskets, wheels, fans, stars, cornucopias—all the things that had ever been seen on other Christmas trees, and besides all these hundreds of gaily dressed fairies, each one holding in her hand the tiniest electric light. It looked like fairyland itself.

THE ELECTRICALLY EQUIPPED VILLAGE BENEATH THE TREE

But that was not all. In the space enclosed by the trees was a model village and its suburbs. Across the front of the enclosed space was a stream of water which, passing through two canal locks at the left, flowed into a small lake on whose banks stood the boat house with the sign "Boats to Hire." Canal boats passed through the canal from lock to lock, the gates opening to allow them to pass through, then closing after them, the water rising and falling exactly like the water in a real canal. Back and forth on the lake passed brilliantly lighted electric launches stopping at the boat house, then starting off again. There was no danger at night, for the most modern of lighthouses stood on the bank, its revolving tower flashing out the signal of danger. Back of the lake was an electric waterfall, which rapidly changed from color to color, showing all the hues of the rainbow as it fell into the lake. At its narrowest place this lake was spanned by a bridge, across which a horse and wagon passed slowly, being warned by a sign that there was a fine of $20 for riding or driving faster than a walk.

Back of the stream and the lake was the village. This was regularly laid off in streets with the coziest looking little houses on each side. Some had the sign "To Let" on them, while those which were supposed to be occupied were brilliantly lighted by electricity. So were the streets, and through them ran electric cars, each one with a row of lights along the top.

In the center of the village stood the power house with the tiniest electric motor imaginable. One set of wires set everything in motion, another set of wires turned on the hundreds of lights everywhere.

Alfred insisted upon Edith's taking a little doll in each hand and walking them over the village to see the sights. From the merry-go-round a short walk took them to the look-out tower. It was just like the ones they have at all the exposi-

tions. A man stood at the gate to admit visitors. Edith seated the little dolls in the elevator and they were carried up, up to dizzy heights, whence they could see all the surrounding country. Down again they came, the man opened the door, and Edith lifted the dolls out.

Then Edith took the dolls to see the churches. All denominations were represented. There was even a tiny alabaster temple from India through whose transparent walls the light glowed in the friendliest way. If, however, the dolls were not in a devotional mood, they could cross to the other side of the village and see a balloon ascension. This was always a great success. The man in the car smiled continually, and never met with any accidents, so there was nothing to make one nervous. From there Edith continued the dolls' walk, taking them to visit the flour mill, whose wheel almost deafened them with the noise it made in its revolutions.

Edith was afraid the dolls were not particularly interested in machinery, so she took them over to the palace of St. Nicholas, which stood in another part of the village. They were fortunate enough to reach this just as the old gentleman was climbing out of his chimney with a pack of toys large enough to tire anyone less strong and energetic than this benevolent old person. Off he went and they waited to see him come back and go down his chimney for a fresh supply.

Now Edith declared the dolls must be tired. She said they should have a ride on the railway which ran around the outer edge of the enclosure. They could take this train with the assurance that nothing could possibly happen to them, even in passing through the tunnels, for the latest block system was in use on that road, and they could see the signals change from red to green as they passed rapidly along. This train took them all around the village, depositing them at the head of the canal, where they could begin their sightseeing afresh.

"No wonder you and papa have been busy," said Edith, with a little catch in her voice. "Just think! All this for one little girl. How could you know how to do it, and how did you have patience enough for all this?"

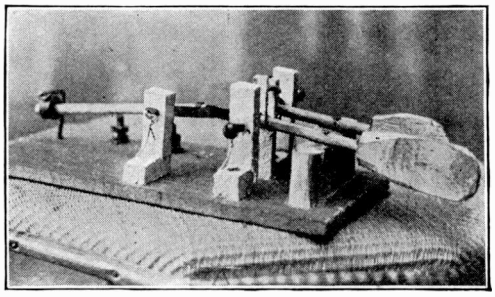
Alfred hardly knew. His completed work had surprised him and his father. It exceeded all their expectations.

Their delight equaled Edith's, so when their mother, who thought it a shame that one small girl should enjoy all this, suggested inviting all the children they could find to come and see it; all agreed it would be a fine scheme. Each day that week the house was crowded with children who had come to see the wonderful tree of which they had heard such glowing accounts. Sometimes it was their little friends, sometimes the children from orphan asylums or children's homes, and Alfred had never been so proud as he was when, standing by the tree, he explained all its wonders to the little ones to whom the sight was one never to be forgotten.

Even the grown people standing there and seeing the boats moving from place to place, the elevator passing up and down in the tower, the street cars, the trains, the balloon, the merry-go-round—all the other things—each going its appointed way—the tiny lights flashing from each, from the houses, from the street corners, hanging by hundreds from the tree, involuntarily drew a long breath and felt that the wand of some beneficent fairy had been at work, instead of a modern boy, who had chained the mighty giant, Electricity, compelling him to do his bidding.

How One Boy Made a Telegraph Transmitter

A candidate for a position in the civil service list came across this question in his examination: "A stream is to be bridged as quickly as possible. The



ODD TELEGRAPH TRANSMITTER

bridge must be of sufficient strength to support heavy artillery. How would you build it?"

Instead of drawing plans, giving stress, wind pressure, etc., his answer was: "With the best materials nearest at hand." His answer received the full percentage.

The maker of the instrument shown in the illustration, a boy of fifteen must have had that idea in his mind when he constructed it.

Seeing the original instrument in a telegraph office and not having enough money to purchase one like it, he set about making one from "the best materials nearest at hand."

The original is one of a type now on the market designed to make the dots of the telegraph code with one movement of the wrist and the dashes with another. This is a great help to the operator, as it prevents paralysis of the wrist, or as it is known among operators, "glass arm."

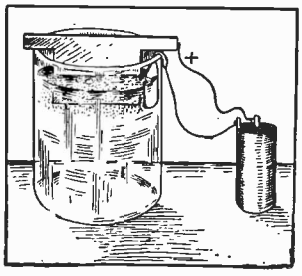
Note the unsoldered contacts, the marks of the jack-knife and saw, and the knot in the elastic band to increase the tension. It is complete in detail and operators who have tried it out say that the strangest thing about it is that "it works" and works well.

Experiment Illustrating Electrolysis

You have probably heard the word "electrolysis," but do not know just what it means.

Place a thin sheet of lead cut as shown in the illustration in a jar of water and to it connect the positive pole of a dry cell. Suspend another piece of lead in the water and connect to it the negative lead from the cell. In a short time the water around the sheet of lead will assume a gray color, due to small portions of the lead being decomposed and carried from the sheet with the passage of current.

This action is called electrolysis and is one of the things street railways have to guard against. Street car systems with a single overhead trolley wire use the track rails as conductors for the return of the current to the power stations after it has passed down the trolley through the car motors and then to the track.



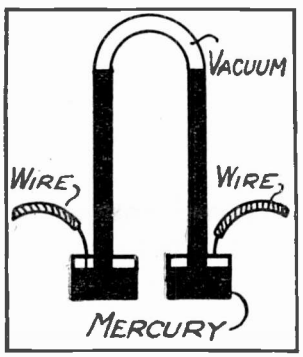
ILLUSTRATING ELECTROLYSIS

Where two rails come end to end a heavy copper wire called a "bond wire" is connected from one to the other for the return current to get from one rail to the next.

But sometimes the bond wires become loose and current leaks into the ground and travels along a gas or water pipe for a ways. When it jumps off the pipe to the soil or to some other conductor it carries small bits of the decomposed pipe with it, and this action is called electrolysis. By running a wire from the pipe to the rail or to a return wire the current leaves the pipe on this and does not decompose the pipe.

Experimental Geissler Tube

Select a U-shaped tube about 33 or 34 inches high. Fill it with mercury, close the ends with the fingers and insert it into two cups of mercury. When the fingers are removed the mercury will



GEISSLER TUBE

fall a few inches, leaving a vacuum above it, known as a Torricellian vacuum.

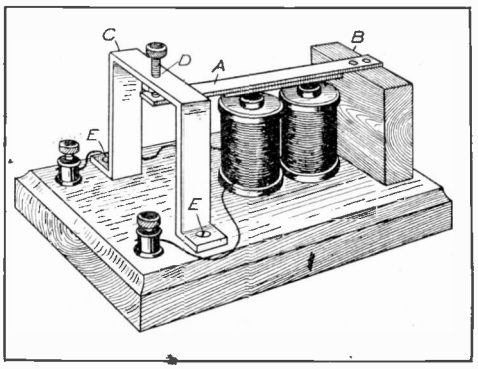
If wires from a spark coil are brought in contact with the mercury in the two cups, as shown, a luminous phenomenon is produced in the upper section of the tube. SPENCER M. GOWDY.

Telegraph Sounder from an Old Bell

If an old bell with the magnets held to the yoke with screws can be secured, a simple sounder can easily be made in the following manner:

Remove the magnets from the bell and screw them to a base in the position shown in the drawing.

Next remove the soft iron armature and take the spring off it. Solder to it a brass strip (A) and fasten to the support (B), which is a piece of wood held in place by screws. The bridge (C) is made of brass. It may be tapped to take a small adjusting screw at (D), or if too thin brass for tapping, a small nut may be soldered on to take the screw. Drill holes at (E E) and fasten the bridge down with small screws in the position shown. Connect one magnet wire to one binding post and the other to the other

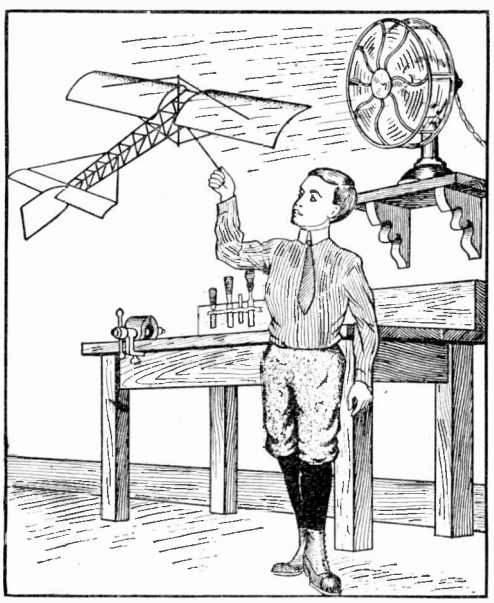


TELEGRAPH SOUNDER FROM AN OLD BELL

binding post. By moving the adjustment screw the stroke of the armature may be altered and the best length of stroke secured. S. V. COOKE.

Testing a Model Aeroplane

Boys who are building and experimenting with model aeroplanes will find the electric fan a handy thing to try out and test in various ways the flying qualities of their air ships. By running the fan at different speeds the balancing and lifting power of an anchored model may be studied with a good deal of pleasure and profit.



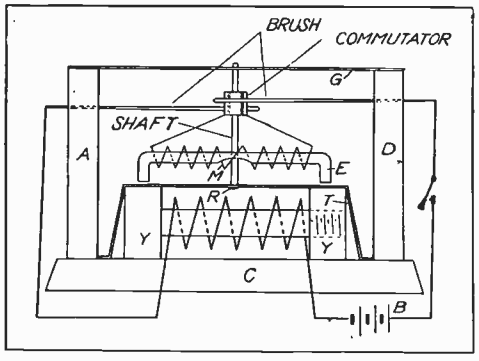
TESTING A MODEL AEROPLANE

THE YOUNG EDISONS' CLUB

Under this heading will be published letters from readers of the Junior Department. These letters should describe briefly and accurately your experiences in the making and operation of electrical devices and in the performing of electrical experiments. See how good an "engineering report" you can make of your investigations.

The Young Edisons' Club:

The motor here described I constructed at very little cost. The field (Y) is a wagon bolt wound with six layers of No. 22 magnet wire. The bolt is held to the base (C) by means of a heavy tin



SIMPLE MOTOR

strap (T) about ¾ inch wide and placed over the bolt in the position shown. A small dent (R) made in the tin with a nail will serve as a bearing for the shaft, which can be made from a length of wire. The armature (E) is a piece of heavy soft iron bent as indicated and wound with four or five layers of No. 28 cotton-covered wire. The ends of the armature winding are connected one to each segment of the commutator. At the point (M) where the shaft goes through the armature I flattened the armature to make it easier to drill the shaft hole. The brushes are made from a sensitive watch spring or flattened copper wire and are supported by (A) and (D) so as to have a slight pressure upon the commutator. To hold the shaft in place a piece of copper plate or tin (G) is nailed over the top of the frame, the shaft passing through a hole in the plate

The commutator is a small wooden roller which fits snugly on the shaft. A piece of tin or lead is glued on the roller. After it is dry the foil should be cut in halves and a strip cut out to separate the parts. Fasten the foil on the armature by means of sealing wax or cotton thread. Connection should be made as illustrated.

GEO. KOELKE.
1008 Twentieth St., Milwaukee, Wis.

The Young Edisons' Club:

As we have made several electrical articles and have found them interesting we describe them for other Young Edisons. We constructed a wireless receiving set as follows, using an extra strong battery, a good telephone receiver and a needle. Connect the receiver as shown in Fig. 1. If a gas pipe is used for a ground connect the wire to the street side of the meter. The positive (carbon) pole is lead to the aerial. File a groove in the carbon pole and lay a needle in

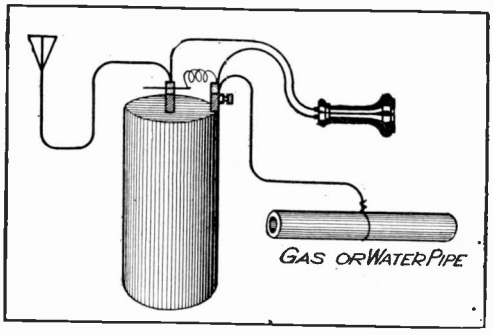


FIG. 1—SIMPLE WIRELESS RECEIVING SET

this groove. Connect the needle to the zinc pole by a wire and the set is complete. The principle is, as the receiver offers a high resistance, part of the current will try to take the path through the needle. When a wireless wave strikes the needle through the aerial, the resistance is lowered and less current travels through the receiver.

When the wave ceases the resistance is increased and more current goes

through the receiver, thus causing the clickings in the receiver that can be interpreted through the Morse or Continental code. This set will receive up to

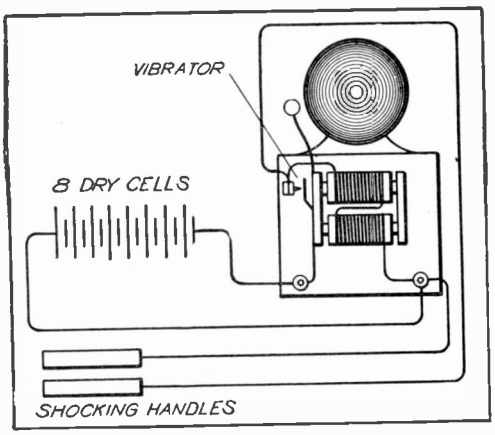


FIG. 2. SUBSTITUTE FOR SHOCKING COIL

3,000 feet under good conditions, with a strong battery.

An electric shocking set—a substitute for a coil—we made by taking an electric bell and connecting up to it as shown in Fig. 2. On one occasion we connected the wires of the handles to table knives and forks and surprised everybody.

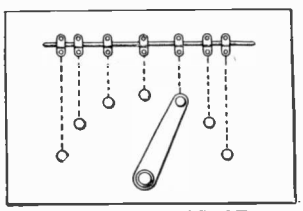


FIG. 3. RHEOSTAT

A rheostat was constructed as in Fig. 3 from the lead from a pencil. By placing contacts on a base and providing a seven-point switch we were able to reduce 40 volts down to five.

HERBERT HEINLEIN,
3711 Bank St., Pittsburg, Pa.
MARTIN LUESSENHOP,
250 38th St., Pittsburg, Pa.

The Young Edisons' Club:

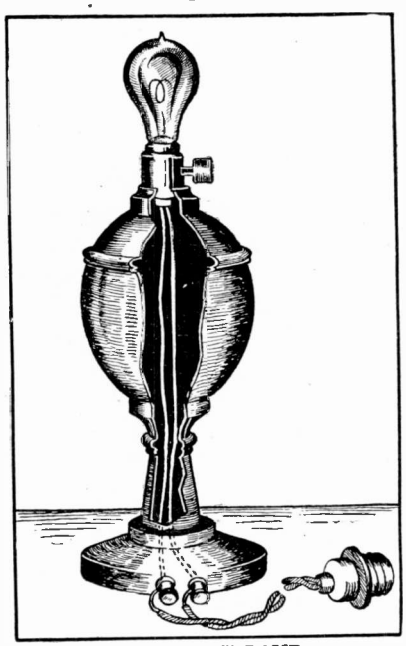
While experimenting with chemicals I put some hypo, which is used for photography, and some sal-ammoniac in a test tube, which I filled to near the top with water, and dissolved the crystals. Then I put some copper wires from a battery into the solution, which was perfectly clear. Soon the solution turned a dark brown, and had a sulphurous smell. The positive wire wore off and the negatives got a coating of black substance. I tried this in several solutions with the same result.

I would be glad to find out from some young Edison the cause of this change.

M. MERCER,
Walnut Mountain House.
Liberty, N. Y.

The Young Edisons' Club:

From a metal lamp of the round wick variety a very nice study lamp can be made as follows: Remove the wick and burner. Connect a globe and socket to one end of a length of lamp cord and run the other end down through the lamp. Fasten two binding posts, properly in-



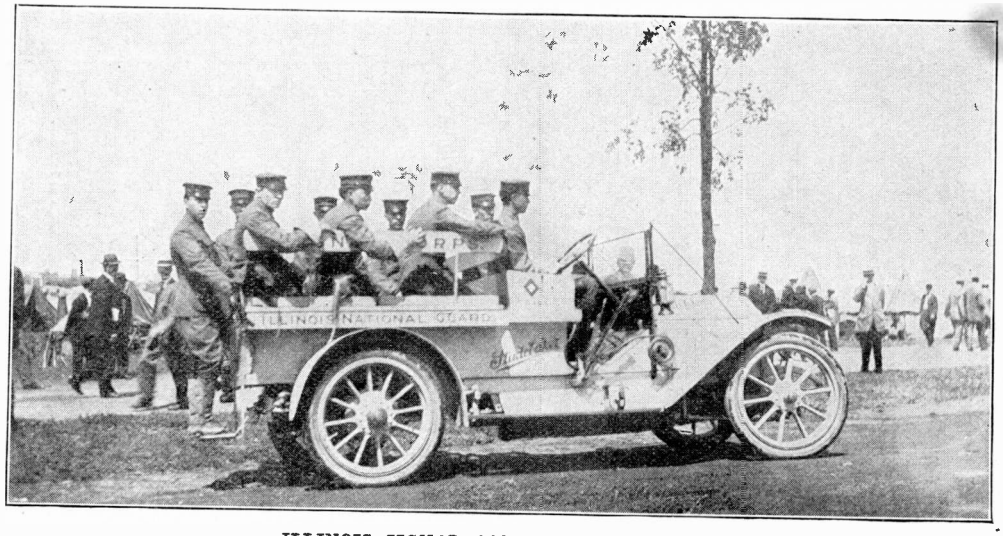
STUDENTS' LAMP

sulated, to the outside edge of the base Fasten the cord to these on the inside of of the lamp about 1½ inches apart. base, drawing tight so as to make the socket rigid. Connect a plug and length of wire to the outside of the binding posts and the lamp is complete.

WILLIAM M. SHERRILL.
Johnson City, Tenn.

Illinois Signal Corps Wireless Car

The Illinois Signal Corps of the Illinois National Guard takes great pride in its wireless equipped automobile which took a prominent part in the military tournament, at Grant Park, Chicago, last summer. The car is a Studebaker-forty with special body seating eight men. The set used is a regular United States pack set with a radius of 30 to 50 miles over land and 90 miles over water.



ILLINOIS SIGNAL CORPS WIRELESS CAR

Sergeant H. A. McCauley, Acting Master Signal Electrician of the Illinois Signal Corps, describes the equipment as follows:

"The mast used is carried in sections and is raised a section at a time by hand; height from 60 to 80 feet according to number of sections used. While our mast is more bulky to carry than that described in your magazine (Oct. issue), it is easily taken care of in racks provided for it and is out of sight when not in use. The aerial is of the "umbrella" type. A counterpoise of rubber-covered "cable core" is used in place of a ground as being more efficient in overcoming static and being more quickly handled. Two 6-60 storage batteries are used for power with a hand generator for emergencies. It has been found impractical to use the motor of the car for generating purposes on account of delay in starting, as it is impossible to receive while engine is running. Instruments are used without removing from the car, as it has been found that the insulation provided by rubber tires adds materially to the efficiency.

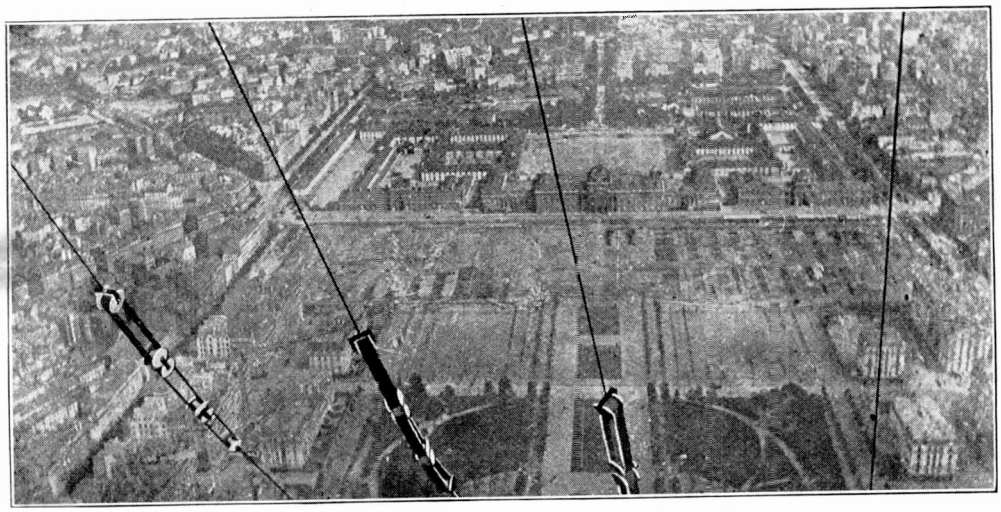
"Our method of handling affords considerable saving of time in opening station. The station is ready for business within 30 to 35 seconds after the command 'Open station' has been given. Our record is 18 seconds.

"The troop, which is at present located at the Second Regiment Armory on Curtis and Washington streets, Chicago, is

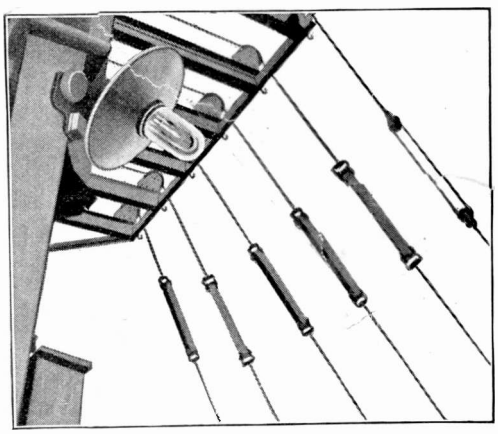
now working upon a high power, permanent station to work with that of the Ohio Signal Corps, A troop, which has already been installed."

Aerial Insulation on the Eiffel Tower

This unusual picture was taken from the top of the Eiffel Tower in Paris with the camera pointed downward at the city a thousand feet below. There is a wireless station operated in connection with the tower and in the foreground of the picture are shown some of the antenna wires and the method of insulating them. As will be seen, there are in all six porcelain insulators interposed in each wire.



VIEW FROM THE TOP OF THE EIFFEL TOWER



ARRANGEMENT FOR RAISING AND LOWERING ANTENNA WIRES

A Local Newspaper's Wireless Scheme

We received a very interesting letter recently from Mr. H. J. E. Knotts, editor and publisher of the *State Center-Record,* of Illiopolis, Ill. It contains among other things a very good suggestion in regard to the use of amateur wireless outfits in furnishing news to local newspapers. It is a plan which a great many local newspapers might follow profitably, and which would give many amateur operators good practice in reporting. His letter follows:

"Shortly after subscribing to POPULAR ELECTRICITY, I became somewhat enthused over wireless telegraphy through your columns and, not knowing the requisites of joining the 'Wireless Club,' I asked for membership.

"In your reply, you stated that it was necessary that I should have a wireless outfit before being eligible to membership. Since that time I have been actually devouring every issue that came and, in addition, have purchased and studied A. P. Morgan's wonderful work on the subject.

"During the month of August, I offered a special wireless sending and receiving outfit to the boy or girl bringing in the most subscription money. With this offer went the assurance that this office would be equipped with an outfit.

"Neil Garvey, son of a wealthy farmer living close to town, got the outfit and immediately his chums asked me to put on another offer for September, which I have done. These outfits send ¼ mile and have an electrolytic detector, condenser and a 75-ohm receiver.

"Already young Garvey's father has had me order a one-inch spark coil for the outfit and the boy who is leading in this month's contest assures me he will get better equipment if he gets the outfit. So much for the success of 'Wireless' as a subscription getter.

"For the equipment of this office I have a ½ K. W. transformer coil, two pint leyden jars, helix, zinc spark gap, high tension key; electrolytic detector, two-slide tuning coil, fixed and variable condensers, 1,000 ohm double-pole single receiver, with headband.

"Leads to aerial and ground are No. 8 rubber covered wire, hung on high-tension insulators. The lead to the aerial is protected at the exit by a porcelain rosette threaded with three ampere fuse. On the outside of the window casing a 15 ampere double throw switch connects either with the interior, or with a No. 6 copper wire grounded by an eight foot zinc grounding rod. One hundred and fifteen volt, 25 cycle alternating current will be used for the transformer.

"My aerial is composed of four strands of No. 12 aluminum wire stretched from a 40 foot pole, across lots to the rear of the building of which we occupy the second floor. The pole is grounded with a No. 6 galvanized wire connected to an eight foot zinc grounding rod.

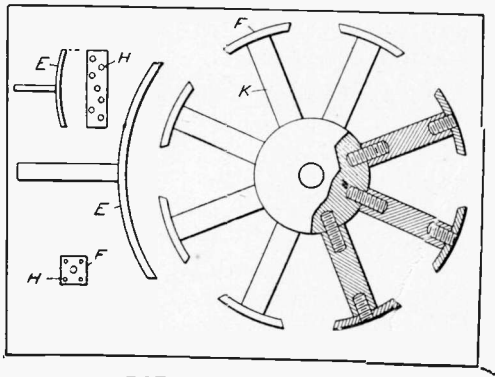
"Mr. O. C. Little, first trick dispatcher for this division of the Wabash, has assured me that on the opening of the equipment, he will come and send and receive the first messages. We expect to have a great time at the opening, with lots of publicity.

"The boys who get the wireless sets on the contest will agree to use them for sending in the rural news to my publication and in turn their names will head the columns of their news."

Uniform Sparking Distance

From time to time we hear of a new form of spark gap pointing out some advantage over its previous one. The stationary, series, synchronous rotating, non-synchronous rotating, and too, even every combination of these have been devised, but it is surprising that the features pointed out in this article have never before been made public, as I have followed these for the past two years with record results.

We know the source of power lies in the spark gap, and that the ideal spark



ROTATING SPARK GAP

gap would be one which would insulate perfectly while the condenser was charging and conduct perfectly while it was discharging.

It is our aim to work for the highest efficiency; then we must consider the following: Perfect insulation; frequency produced; high frequency travels mostly on the surface of the conductor; sufficient surface; heating of electrodes.

Some are under the impression that as long as the spark gap is mounted on a well insulated base that more perfect insulation cannot be obtained. The fact is,

any object happening to be near may cause a loss unnoticed to the eye. Such objects should not come within at least six inches of the spark gap, and it is well to rest the base on four insulated legs or suspend from the ceiling, insulating the cord well.

The frequency at the spark gap depends on the frequency of the alternating current supply, but not entirely. It is noticeable that the electrodes of almost every spark gap are U shaped, and even if they are perfectly flat when first used they soon wear to this shape, the time depending on the metal employed. The cause is that high frequency current travels mostly on the surface of the conductor. Then if holes (H) are cut, as in (E) and (F) in the drawing, the current reaches the center of the electrodes as well as the outside edge, and to check the spark from creeping up the outside the electrodes extend over the supporting legs and have their edges beveled. They may need attention after long usage to be kept in this condition.

When the discharge is passing, while using the U shaped electrodes, one frequency is produced at their opposite centers and a lower frequency at their opposite outside edges, consequently we are producing several different frequencies, thereby producing rough signals at the receiving station, which are probably not noticeable, but with a uniform sparking distance, which is the feature of this gap, where the frequency must be equal and constant there will be a surprising result as the incoming signals will be clear, smooth and have a higher pitch with a pure musical note.

The electrodes (F) can be made square, which will give more surface than if cut round. For one and two K. W., ½ inch square and 1-16 inch thickness will be sufficient. (E) should be ¾ inch in width, ⅛ inch thick for heating surface, and long enough to just overlap two electrodes. Great care should be exercised in forming the arc so as to obtain equal distance from the revolving electrodes to insure a uniform sparking distance. (E) and (F) are preferably made of zinc or aluminum. Brass will answer the purpose for (K), but should be square, so as to stir up as much air as possible in order to keep the gap cool. Four and one-half inches or five inches in diameter over all make good dimensions for this gap.

These features work equally good in any form of stationary spark gap. Zinc electrodes should be avoided if the gap be muffled unless a blower is attached.

We have said the spark frequency depends on the alternating current supply also. If this supply is not constant, not much difference will be noticed when using a rotating gap, but with a stationary gap the supply must be kept nearly constant in order to produce clear, smooth signals, but by employing the uniform sparking distance method the signals will be more distinct than when using the U shaped electrodes.

The better the above can be fulfilled the more efficiently will the spark gap perform its duty.

A. L. PATSTONE.

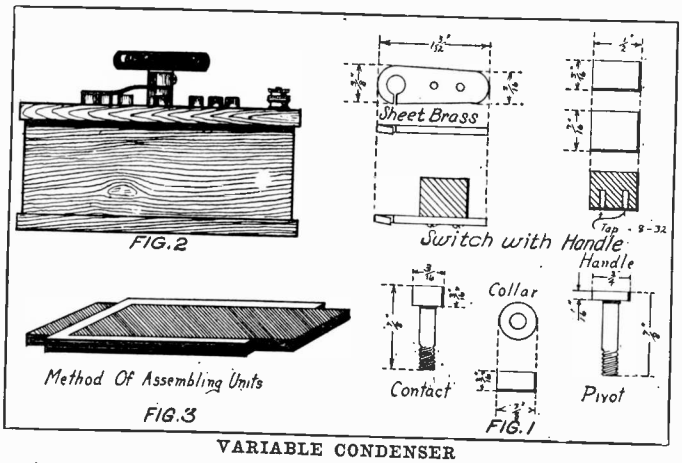
How to Build a Variable Condenser

The following is a description of a condenser which combines the large capacity of a fixed condenser with the gradual variation of capacity as obtained in the variable condenser. This condenser is of the "built-up" type and employs paper as a dielectric.

It is composed of eight separate units, the second having a larger capacity than the first, the third a larger capacity than the second, etc. Seventy-two sheets of tinfoil 1½ inches wide and four inches long are used in all. The paper is a good grade of very thin linen and is carefully prepared by dipping in a hot bath of clean paraffin until all bubbles cease to rise. It is hung up to dry and then cut into strips 1¾ inches wide and four inches long. The paper and tinfoil strips in each unit are piled up alternately, al-

lowing about 5-16 inch on each tinfoil strip to project beyond the paper, as shown in Fig. 3.

The first unit is composed of two strips of tinfoil and three strips of paper, 80 strips of paper being employed in the eight units. The second unit is composed of four strips of tinfoil and five strips of paper, and so on until the eighth unit, which is composed of sixteen strips of tinfoil and seventeen strips of paper. A heated flatiron is now pressed on the tops of each of the units until the paraffin starts to melt. Upon cooling, the units will be found compact and hard.



VARIABLE CONDENSER

If a receiving cabinet is used the units may be placed in the bottom of the cabinet and a switch arm of 1-16 inch hard sheet brass, as shown in Fig. 1, or a hard rubber handle may be used, as shown in Fig. 2. The contacts as shown in Figs. 1 and 2 are turned out of 5-16 inch brass rod and are threaded with an 8-32 die at the lower end. They are 7/8 inch long over all and 3-16 inch high above the top of the case. If the condenser is not mounted in a receiving cabinet, a small box like the one shown in Fig. 2 can be used. The units are all connected together at one end and then connected to the switch arm, while at the other end each unit is connected to a contact. Connections are thus made so that the capacity is gradually varied upon turning the switch arm or handle. JESSE JAY.

Examination to Secure Wireless Telegraph Operators

Many inquiries have been received from readers interested in wireless telegraph regarding qualifications, salary, examinations, etc., of wireless telegraph operators.

An announcement of the United States Civil Service Commission for an examination held October 4, 1911, to fill a vacancy in the position of electrician and wireless telegraph operator (male) in the lighthouse service. Territory of Hawaii, at $900 per year, and vacancies requiring similar qualifications, answers some of these queries. Further the announcement states:

As considerable difficulty has been experienced in securing eligibles for the position mentioned, qualified persons are urged to enter this examination.

The examination will consist of the subjects mentioned below, weighed as indicated:

	Subjects.	*Weights*
1.	Spelling (20 words of more than average difficulty)	5
2.	Arithmetic (fundamental rules, fractions, percentage, interest, discount, analysis, and statement of simple accounts)	5
3.	Penmanship (the handwriting of the competitor in the subject of report writing will be considered with special reference to the elements of legibility, rapidity, neatness, general appearance, etc.)	5
4.	Report writing (test in writing in letter form a report of from 150 to 200 words in length, summarizing and arranging in logical order a series of facts included in a given statement of 400 or 500 words)	5
5.	Copying and correcting manuscript (test in making a smooth corrected copy of a draft of manuscript which includes erasures, misspelled words, errors in syntax, etc.)	10
6.	Practical questions	20
7.	Practical experience as wireless telegraph operator	50
	Total	100

Competitors who fail to attain an average rating of at least 70 in the sixth and seventh subjects, combined with the relative weights given above, will not be eligible for appointment, and the remaining subjects of their examination will not be considered. Applicants should state specifically in answer to question 16 of Form 1800 what experience they have had as wireless telegraph operators. Applicants must have reached their twenty-first but not their fortieth birthday on the date of the examination. This examination is open to all citizens of the United States who comply with the requirements.

Easily Adjusted Silicon or Galena Detector

The following is a description of a detector employing either galena or silicon as crystals and possessing a quick and sensitive adjustment of simple design. All the holes in brass are drilled with a No. 23 drill and tapped with an 8-32 tap. All parts can be made by hand with the exception of the two cups (C C), which can be turned out on a lathe.

The base (B), Fig. 1, may be 3/8 inch fibre or polished hard rubber, 5¼ inches long and 2⅞ inches wide. The two posts (A A) are pieces of ½-inch brass rod, each 1½ inches long. A hole is drilled and tapped in the bottom for the base screws and another 3/8 inch deep in the center of the top of each of these posts for the thumbscrews (thumbscrews of binding posts can be used). Two more holes are now drilled through and tapped 3/8 inch down from the top of the posts (A A) to receive the adjusting rods (D D).

The two cups (C C) are ¾ inch outside diameter and ½ inch long, with a 5/8 inch hole drilled to a depth of 5-16 inch. A hole is now drilled and tapped ⅛ inch deep in the center of the back of each cup to receive the rods (D D), and another hole is drilled and tapped through the wall of each cup equidistant from each end. The screws (E E) are round-headed brass machine screws ¼ inch long. The spring (K) is cut from either thin bronze or a steel clock spring, two inches long and 5/8 inch wide, a hole being punched 3-16 inch from one end to receive the machine screw (L), and another 3-16 inch from the other end to receive the brass headed tack (J). (F) is a piece of 1-16 inch brass 5/8 inch wide and 2½ inches long and is bent as shown in the cut. A hole is now drilled and tapped to take the adjusting screw (G), which varies the tension of the spring (K). (H H) are lead pellets, which are cast in a plaster of Paris mould. The mould is made by cutting a wooden plug to fit the cups (C C) and then pressing

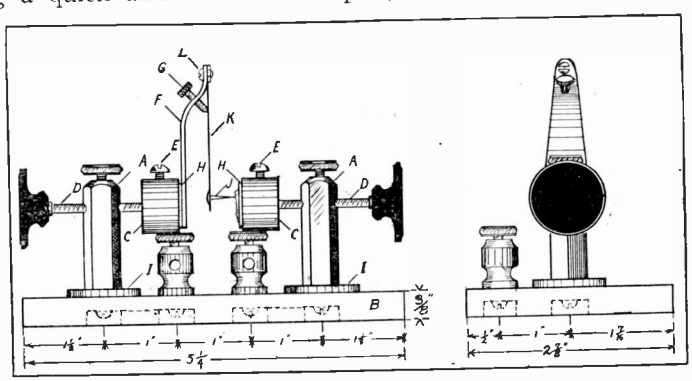


FIG. 1—GALENA DETECTOR

it down 3/8 inch in wet plaster of Paris, which is held in a small cardboard box one inch in depth. After the plaster of Paris has become sufficiently hard the plug is removed and a hole measuring 5/8 by 3/8 inch is formed. The pellets are made by pouring this hole full of molten lead and extracting same when hard. The brass strip (F) is now soldered to a pellet, thus holding the spring in position.

A small piece of silicon or galena with a flat surface is now pressed into another pellet before it has cooled. After soldering a silicon crystal it is a good plan to

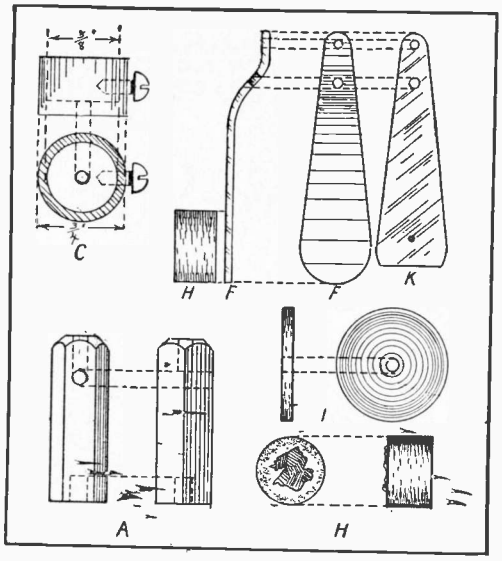


FIG. 2—DETAILS OF GALENA DETECTOR

grind its surface flat on an emery wheel, as this affords quicker adjustment. It is also well to mount a number of crystals so as to change from one to another until the most sensitive one is found. (I I) are brass washers one inch in diameter and having a hole in the center sufficiently large to allow an 8-32 machine screw to slide through. The adjusting rods (D D) are 2½ inches long and are threaded their full length with an 8-32 die. (N N) are hard rubber handles which can be obtained at any electrical supply house. Two binding posts are put in place and the detector assembled.

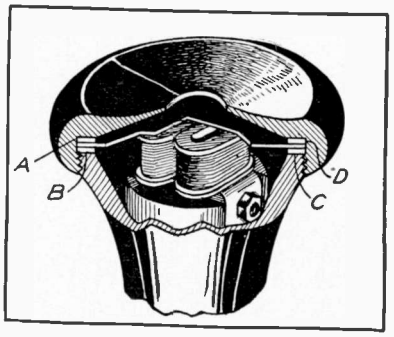
JESSE JAY.

Wireless Interference Preventer

The average experimenter seems to find the adjustment of tension on receiving detectors for wireless telegraph communication the chief trouble. It is necessary before describing the construction of the above apparatus to note that the sensitiveness of the receiving apparatus does not depend alone upon the kind of detector used, but also largely upon the telephone receivers used in conjunction with the receiving detector.

The sensitiveness varies with the resistance and winding of wireless telephone receivers, also with the thickness and composition of the diaphragm.

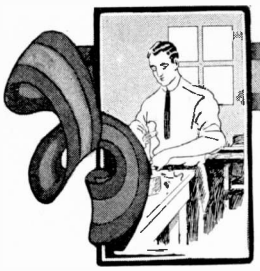
The feature of the interference preventer is a simple variation of the distance of space between the diaphragm and the magnets. Any telephone receiver can be converted into an interference preventer. There are various ways of obtaining the regulation of the space distance between the diaphragm and mag-



ADJUSTABLE RECEIVER

nets. Either of the following methods may be employed: By regulating the magnets with a thumb screw, to make them move toward or from the diaphragm within the receiver case, or by adjusting the receiver cap to which the diaphragm is pasted, so that by regulating the cap the distance is regulated as shown in the cut. (A) (B) (C) and (E) represent two rubber rings one on each side of the diaphragm. By carefully screwing and unscrewing the cap the diaphragm may be moved toward or from the magnet poles a very small amount but sufficient to do the work.

During recent experiments with the interference preventer the best results have been obtained by having the diaphragm away some distance from the magnets. By so doing the loud incoming signals have been cut down to a lesser efficiency and weak signals cut out altogether. If two or three in-coming signals only were heard it often enabled the operator to cut out so as to copy each signal separately. ISIDOR WOLFF.



For Practical Electrical Workers

Enameled Wire

By PHILIP EDELMAN

When enameled wire was first introduced, some three or four years ago, great qualities were claimed for it. Here at last was a perfect insulation for wires! It possessed a high degree of insulation and great heat and chemical resisting qualities. It could safely stand a temperature which would char cotton or silk insulation. Like rubber, it resisted the action of acid fumes. In addition to all these, it actually occupied less space than single silk insulation.

At first thought it would seem that this was indeed a perfect insulation. Then why did it not come into general use to the exclusion of all other insulations? It was tried for innumerable purposes and gradually came into extensive use. But its limits were soon found and its weaknesses became apparent. No doubt many have wondered why it was abandoned for use in fine telephone receivers. Others may wish to know why it was found impractical for large sizes of wires. It is only fair to say that in spite of its impracticability for some purposes, great quantities are now used and that for many other purposes it is unequalled. The reasons will appear or be suggested in the following:

The first enameled wire was all black and came to be known as "black enameled wire." The enamel itself has no relation to the enamel sold in paint stores, as many suppose. It consists essentially of cellulose acetate. This cellulose acetate is a solid transparent jelly. It is prepared by mixing together in a kneading machine cellulose and magnesium acetate in the proportion of 25.39 ounces of cellulose to 21.87 ounces of magnesium acetate, with 27.57 ounces of acetyl chloride and 15.87 ounces of anhydrous acetic acid and heating the mixture. When the interaction starts 4.65 quarts of nitrobenzol are added slowly in small portions. The mixing and heating is then continued for three hours. A thin fluid containing traces of uncharged cellulose and acetates is then obtained.

This warm solution is poured into alcohol (23.76 quarts) and the precipitated acetate separated by filtering the fluid. This mass is then washed with warm alcohol, subjected to heavy pressure, mixed with water and boiled until all the solvent has been removed. It is again filtered, washed, compressed and finally dried. Upon dissolving in nitrobenzol and then being cooled it finally results in a perfectly clear jelly This is known as the "Henckel-Donnersmark" process.

The cellulose acetate combination thus formed is a better insulator than rubber or guttapercha. It is non-inflammable and softens only at about 300 degrees F. Unfortunately, as is readily explained by the foregoing, this cellulose acetate is quite expensive. This fact alone prohibits its use for many purposes, as, for instance, for distribution wires.

The actual covering of the wire and application to the various sizes is another interesting step. Contrary to common belief, the covering does not consist of a single coat of the material, but of sev-

eral coats (usually six). This is a very critical part of the operation. In the early days great difficulty was experienced by the cracking of the enamel on the final product. Sometimes one batch was good and then again the next batch would be useless. Without doubt this unreliability caused many manufacturers to become prejudiced against its use. The material was always colored black. Now the very success of enameled wire depends on the obtaining of an elastic coating on the wire. If the coating is brittle the enamel will crack or peel off. It was found that this elasticity or brittleness of the enamel coating depended upon the temperature at which it was worked and cooled.

In practice the bare wire is passed through the hot enamel and then cooled. It then passes on through the enamel again and is again cooled, forming the second coat. This is continued for six coats.

If the enamel is too suddenly or too slowly cooled each time before applying the next coat of enamel, the covering becomes brittle and cracks easily. The whole difficulty then was to work it at the proper temperature. With black enamel there is no apparent difference, as far as appearance is concerned, whether the coating is elastic or brittle. However, by coloring the cellulose acetate red instead of black the difference is visible and it has become possible to obtain uniform results. This has resulted in "red enameled wire" being placed on the market. While there is but little difference between red or black enameled wire except as to color, the red is preferable for the foregoing reason. Black enameled wire is more desirable for some apparatus because of its more pleasing appearance, but the red is more liable to be uniform.

Enameled wire, on account of its many good qualities, has come into a great and varied use. It is particularly suitable for all kinds of magnets, bells, sounders, relays, coils, instruments and wireless apparatus, as well as many less common uses. Unfortunately its cost is quite high, though it is cheaper than single silk covered wire. The enamel takes up very little room, which allows for a maximum number of turns in a given space. It is a very good non-inflammable moisture and acid proof insulator, and when properly applied to the wire it does not peel off. It is very neat in appearance and is unequalled for exposed coils of all kinds. On account of its high electrostatic qualities it is unsuited for cables, wireless telephone receivers, fine non-inductive instruments and the like. For induction coils and transformer secondaries, as well as for small motors, enameled wire has no equal.

Machine for Winding Ring Armatures

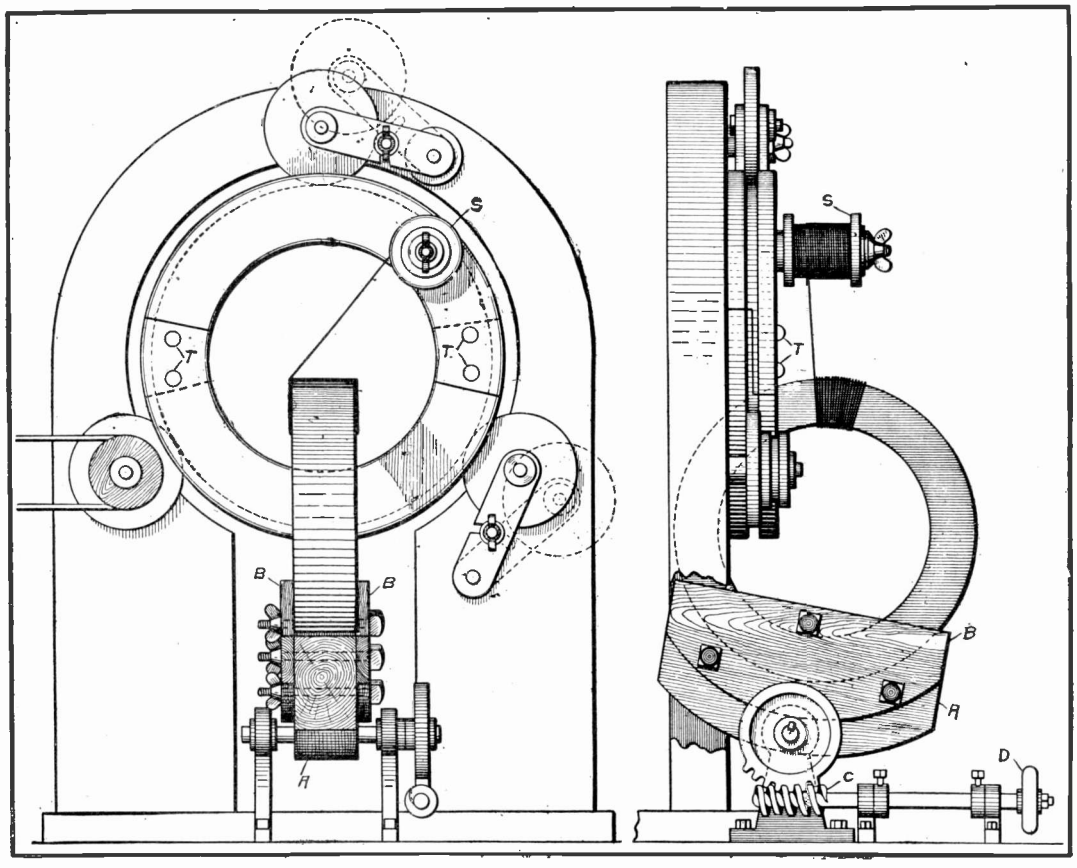
In winding small ring armatures with wire not to exceed No. 18 in size, considerable speed may be obtained by using the machine shown in the drawings.

The frame, cut from two pieces of ⅞ inch oak about 12 by 16 inches, is glued and screwed together to prevent warping.

The winding ring, about eight inches outside diameter and five inches inside, is made preferably of two thicknesses of ½ inch hard fibre, but may also be made of oak with the grain crossed. This is made in two halves, and held in place by bolts with thumbscrews. A square groove, ¼ inch deep by ¼ inch wide, is cut around the circumference to take the idlers and the driving wheel as shown.

A wooden spool (S) designed to hold the right amount of wire for each coil—or for two coils, if desired—is situated at some convenient point on the ring. A coiled spring under a thumbscrew and pressing against the spool can be adjusted to give the wire the required tension. It will be found convenient to have a number of these spools on hand, ready wound.

The idlers, which may be 2½ inches in diameter, of hard fibre, are arranged in adjustable bearings and locked to the



MACHINE FOR WINDING RING ARMATURES

frame with thumbscrews. These serve as a runway for the ring and are only lifted out of position to allow its removal when beginning or finishing the winding.

A clamp for holding the work is made of an oak block (A), six inches long, shaped to fit the armature. The width of this block must be such as will take the armature with its finished coils when that point of the winding is reached where the already wound coils come within the clamp. Two hard fibre pieces (B) of ¼ inch material are used as side pieces for this block. One of these, in which three square head bolts are countersunk, is made fast to the block. These bolts, provided on their other ends with thumbscrews to facilitate shifting the armature at the winding of each new coil, pass through the other side piece and thus clamp the armature in position.

The clamp is made secure to a shaft fitted with suitable bearings and provided on one end with a gear wheel operated by the screw (C). Motion imparted to the hand wheel (D) tips the armature back and forth while the winding wheel is turning through the armature. The bobbin feed used on the Singer sewing machine makes a splendid gear for this purpose.

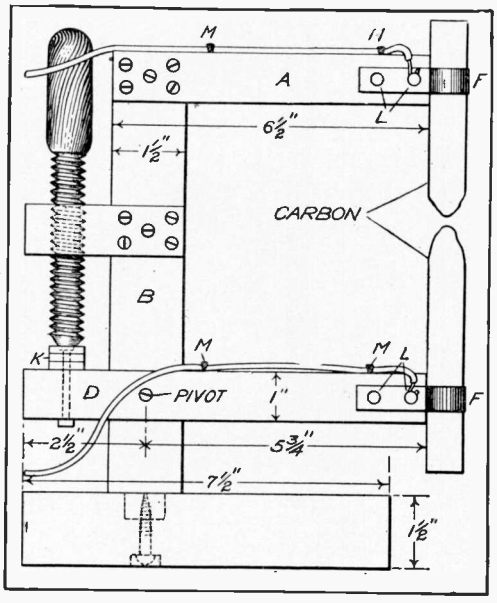
The operation of the machine is as follows: Motion from a small electric motor imparted to the driving wheel revolves the winding ring with its spool of wire through the armature. The armature is swung back and forth by the hand feed as the wire is wound on.

To insure accuracy and speed all revolving parts must be turned true in a lathe and snugly fitted to prevent lost motion.

C. K. THEOBALD.

Making a Simple Arc Lamp

Many amateurs wish an arc lamp for various purposes, but not wish to make the difficult and costly solenoid type. I have built and operated a hand feed lamp



A SIMPLE ARC LAMP

which will run for a considerable time without adjusting, and is easy on the meter.

The base is of wood, or preferably of asbestos board, 4 by 7½ inches, with a thickness of not less than 1½ inches. A wooden upright (B), 1½ by 9½ by ¾ inches, is made as shown in the cut. Two arms are next cut from asbestos board. One is 6½ by 1 inch, the other 8 by 1 inch. The shorter is screwed or bolted to the top of the upright, while the longer is pivoted about two inches from the base on the same upright. The arms should have the same length on one side, while on the other side (D) extends 2½ inches from the upright.

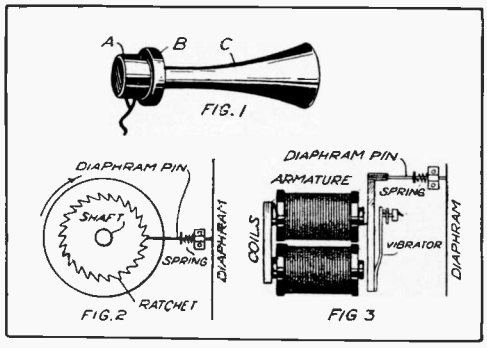
The adjusting screw and nut are taken from a woodworker's clamp. In order to obtain a seat for the end of the screw, bolt several thicknesses of asbestos board on at (K). The strips (F) are cut from copper and are ¾ inch wide by three inches long, plus three times the diameter of the carbon. When the bolts (L) are tightened the carbons are held securely in place. Connections are made with asbestos covered wire held in place by small metal clips (M). To operate the lamp have arms (A) and (D) parallel with the carbons just touching. Separate the carbons, turn on the current, then touch the carbons and quickly separate them. It requires some experimenting to find the right distance to separate them, but good results can be obtained with a little experimenting.

HAROLD L. KESSLER.

How an Automobile Electric Horn Operates

You have no doubt often wondered how the automobile horn, controlled by a push button, really operated.

The inside workings of two different types are here described and illustrated. One type, perhaps the oldest of the electric automobile horn family, is made in four sizes, ranging in price from $25 to $50. This horn is operated by a small battery motor concealed within the drum (A) in Fig. 1. This motor has a pulley, or flywheel attached to the shaft, on the



PARTS OF AN ELECTRIC AUTO HORN

outside of which is a raised ratchet (Fig. 2.) This ratchet, passing rapidly over the small pin which taps on the diaphragm, inclosed in (B) Fig. 1, causes a startling shriek. The diaphragm is similar to those used in telephone ap-

paratus, although it is nearly five inches in diameter. The wiring of this horn is simple, being merely from battery to push botton, or switch, switch to motor, motor to battery, the circuit closing through the switch and starting the motor. The horn (C) in Fig. 1 is used to concentrate and throw the sound and is really nothing but a miniature megaphone.

The second type of horn is constructed on the principle of the electric bell, Fig. 3. An armature, to which a spring is attached, is caused to vibrate rapidly by a pair of electro-magnets. The vibrating armature, striking rapidly the diaphragm pin, causes the horn to utter its warning cry. This horn is made only in one size, at $25. It can be used in two different tones; a moderate tone for regular use and a loud tone for emergency. The difference in tone is caused by the pressure applied to the push button.

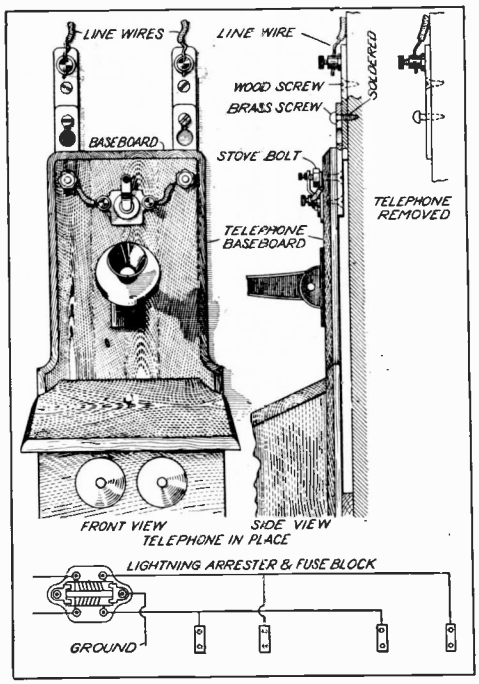
GEO. M. PETERSON.

Making the Telephone More Convenient

The accompanying diagram will show how an ordinary telephone, when the batteries are in the same box, can be moved instantly from one place to another, as from the parlor in the day time to the bedroom at night, or out in the barn or workshop when more convenient.

Procure six pieces of brass 1 by 3 inches and about ⅛ inch thick and fit four of them up as follows. Solder a binding screw to one end, then drill a 3-16-inch hole, about an inch from the other end and put in a close-fitting round-headed brass wood screw, leaving the head out a trifle more than the thickness of the brass pieces and solder it in the hole. Then drill and countersink a hole for a flat headed wood screw close to the binding screw and between it and the other screw.

Take the other two pieces and drill a hole in each, about one inch from the end, large enough to allow the head of the brass screw to go through, and cut a slot about ¼ inch wide, from the hole to within ½ inch of the end, then drill and countersink at the other end for a flat headed wood screw, which should be long enough to go nearly through the



MAKING THE TELEPHONE MORE CONVENIENT

baseboard of the telephone box. Screw the pieces to the upper corners of the baseboard with the slot pointing upward, leaving the round hole a trifle above the top of the baseboard. Then drill a hole for a 3-16-inch stove bolt through both brass and baseboard, and countersink the brass and put in a flat-headed stove bolt long enough for two washers and the nut on the front of the board, which makes a binding post, and run a wire from this to the regular binding post of the telephone. Place the telephone where you want it and mark the exact center of the slots at the top and make a hole with a brad awl and set the brass screws of the wall pieces in the holes and put in the wood screws. If the brass screws are in the right place you can hang the telephone on them, and it will cause the screws to

slide into the slots, locking it on the wall and making a good electrical contact.

Put up the other two pieces at the other location and connect up the line the same as a regular bridge telephone system.

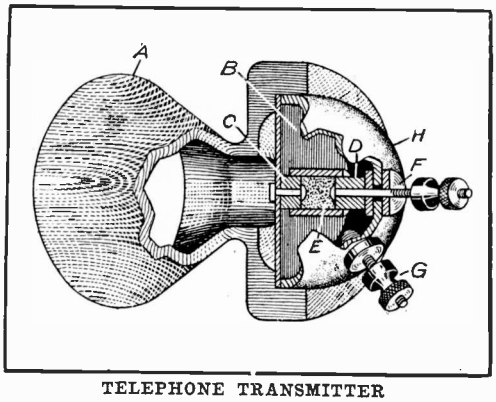
As many locations as desired may be fitted up, because when the telephone is removed it breaks the connection.

Put a lightning arrester and fuse block between the line and first location of the instrument. B. J. CHENEY.

How to Make a Telephone Transmitter

While telephone transmitters can be purchased at small cost, amateurs who would like to make such a device may find the following description of interest:

The parts for transmitting the sound are encased in a covering (H) made



TELEPHONE TRANSMITTER

from a gong of an old electric bell. A round button (D) is turned or filed from a carbon electrode of an old dry cell and a hole drilled through the center to fit the binding post taken from the same cell. This button must be carefully insulated from the shell (H) by running the binding post through a small rubber tube, where it passes through the hole and placing a rubber or paper washer (F) under the carbon button and an insulating washer under the nut on the outside. This will provide one of the terminals of the instrument.

Construct a paper tube having the same diameter as the button with a length equal to the depth of the bell case less ⅛ inch. Glue or paste this tube to the button so it will form a paper cup with the carbon button as the bottom.

The diaphragm (B), which is the essential part of the instrument, should be made as carefully as possible from ferrotype tin, commonly called tintype tin. Cut a circular piece from this metal the exact size of the outside of the shell. A hole is made in the center of the disk a little larger than a binding post that is taken from another old cell.

The second electrode (C) is made the same as (D) and fastened to the tin diaphragm with the binding post without any insulating. A third binding post (G) is fastened to the shell through a drilled hole for the other terminal. The mouthpiece (A) may be turned from wood in any shape desired, but should have a flange on the back side that will make a tight fit with the outside of the shell.

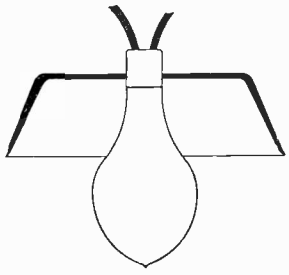
Fill the paper tube with powdered carbon (E), which can be made by pounding and breaking up pieces of carbon to about the size of pinheads. Powdered carbon can be purchased, but if homemade be sure to sift out all the very fine particles. Assemble the parts as shown, and the transmitter is ready for use. If speech is not heard distinctly, put in a little more carbon or remove some of it and try until you get the instrument working correctly. SAMUEL COHEN.

See it Churned

One of the customers of the New York Edison Company has a very up-to-date grocery store and has recently added to his list of electrically driven appliances a 1½-horsepower motor for driving a churn. His patrons purchase cream at the store and for a small charge have it made into butter on the spot. The method is not only an excellent advertisement for the grocer, but is also instructive for the children and others in the neighborhood.

Odd But Effective Reflector

Could you find a simpler or more effective reflector than that shown in the sketch? This shade for an electric light was used by a contractor working a crew

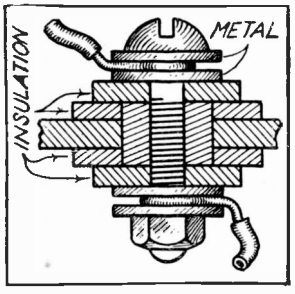


ODD REFLECTOR

of men in a deep ditch at night. A hole was punched through the bottom of an ordinary tin basin, the wires attached and the current turned on. The device was rigged up in a moment and was as good as anything could be for the work required.

Insulating a Terminal on Metal

The placing of a wire terminal in a metal casing and insulated from it may be accomplished as follows: Provide a piece of hard rubber tubing to go over the shank of the screw and two fibre washers having the same sized hole as



INSULATED TERMINAL

the diameter of the tubing. Drill a hole in the casing large enough to allow the tubing to be forced in. Place two metal washers, a small rubber washer and a large one on the bolt and after crowding it through the tube arrange in the same way on the inside. I have found such an arrangement effective on high voltage by increasing the weight of the insulation accordingly. Small rubber tubing 1-16 inch on the inside is almost indispensable in repairing small motors. A drop of thick shellac on a bunch of silk or cotton wound wires meeting in a confined place will become solid and do much to prevent accidental short circuits. Taped joints in hot places may be wound with hard twine or silk to avoid loosening of the tape by heat. LEO J. WERNER.

Electro-Plated Letters

An easy way to make copper or nickel-plated numbers for houses, etc., is as follows: Procure a piece of soft wood of the thickness of the number or letter it is desired to make, and after drawing the letter on it cut out with a fret-saw. Sandpaper till the wood is smooth all over. Next dip the wooden letter for a moment in melted beeswax and while the wax is still warm, powdered bronze or tin should be applied with a soft brush all over it.

Stick a pin into the top of the letter and wind the bare end of an insulated wire around it. Dip the joint in beeswax to insulate it, leaving only a small part of the pin bare, next to the letter, so as to start the plating.

Suspend in an ordinary copper or nickel plating bath in the usual way till the letter is well plated, then remove and polish and you will have a quite solid metal letter. S. V. COOKE.

Aluminum on Switchboards

Aluminum is being widely used in Germany for switchboards, busbars, etc., the cost being less than copper. The connections are made by binding screws. If aluminum and copper have to be brought into contact the copper should be tinned and all contacts must be protected from damp by enamel varnish or some other effectual means.

On Polyphase Subjects

Editorial Announcement

We take pleasure in introducing to the readers of POPULAR ELECTRICITY MAGAZINE, especially to the many women who pay us the compliment of reading its pages, the new editor of the Household Department—Miss Grace T. Hadley. Beginning with this issue she will have complete charge of this department which will be enlarged and improved as a result of her efforts.

Miss Hadley is well qualified to undertake this work. As a special student in English at Leland Stanford, Jr., University, she studied under Professor

GRACE T. HADLEY

William Henry Hudson, an Englishman and a scholar, at one time private secretary to Herbert Spencer. Added to this qualification, she is an authoress of ability, a newspaper woman and a student of electricity. Her knowledge in the last named field has been gained through downright hard work—constant reading, observation and questioning of experts in the engineering line. In evidence of the fact that this study has not been superficial, it may be said that she has contributed to such highly technical publications as the *Electrical World* and the *Electrical Review and Western Electrician.*

It was while in St. Louis doing special newspaper work that she became impressed with the great importance of electricity in everyday affairs and her interest once aroused, she made such a careful study of the subject that she was able to assume the responsibilities of associate editor of the *Electric St. Louis Magazine* in which work her ability to write of technical subjects in everyday English at once became manifest.

As Miss Hadley expressed it, however, she "had an eye on Chicago" and as a consequence we are permitted with pleasure to make the announcement of her connection with this magazine.

Writing for Catalogues

A good point to remember when writing to a manufacturer for catalogues is to specify as nearly as possible the particular device or line of devices in which you are interested. Most electrical concerns manufacture many lines of apparatus. Sometimes running up into the hundreds. A general catalogue covering all of them would be impracticable and experience has demonstrated that a special bulletin on each subject is a better method of distributing information, therefore, if you write and simply say: "Send me your catalogue," the manufacturer must either send you a great mass of literature covering all the lines, most of which may not interest you, or else write you a letter asking in what particular line you are interested. The former procedure is expensive, the latter wastes time. In a great many ad-

vertisements you will find that you are asked to send for a particular bulletin or booklet. In answering such an advertisement be sure to ask for that particular piece of literature. If in addition you wish information on other lines your requirements should be stated specifically.

The Switchboard Operator

Here is a heart throb, sent in for publication by a switchboard operator. His attitude toward his work may not be altogether commendable, but at any rate his views are interesting. He writes:

"Very few know much about the switchboard operator. His is a business so different from others. Most people think it is an easy matter to operate a switchboard in a central station or sub-station. The graduate of the technical school always thinks it is simple, but he soon finds his mistake. He finds it difficult to put his theories into practice.

"The switchboard operator must be quick, not easily excited, and very careful. A mistake on his part may be dangerous not only to his own life, but to the life of others. Careless operating may ruin valuable equipment or render it inoperative for a time, which means good money out of the company's coffers. Good service is not noticed by the consumers, but let them be deprived of it for awhile and you will hear from them. If the company we are considering has competitors poor service is dangerous.

"Please do not get the idea that the operator has an easy time. Although he has but little manual labor to perform, he must be at his post nearly every day in the year, he usually has long hours and much night work. While other people are having a holiday he is working hardest. If his is a railway load it is always heavy on holidays. If he has a power load, and some of the machines are idle he finds repairs to make.

"We find the operator is nearly always at one of the two extremes in weight. He is either too light to do heavy work or too heavy to do any thing but light work.

"He is a man who comes and goes. Most of them have seen the United States, and many of them have seen other countries.

"There is a reason for this roving disposition. He is poorly paid for his services. The average salary of a good operator is about $75 per month, for 365 days a year. He works for these small wages long enough to save money to purchase transportation to another city. He is a builder of air castles. He thinks he will surely get better wages farther on.

"The corporations are slow to learn the true value of a good operator. They know there are many operators to supply the demand.

"Conditions must change some day. The corporations will learn the real value of a good operator, and pay him reasonable wages at least."

It is quite true, that $75 a month is not a munificent salary. But, as our friend says, there are many operators to supply the demand. Almost any careful conscientious man with a level head can learn to operate a switchboard and after a time have as few errors chalked up to him as the best trained technical graduate. But there his advancement will stop and there a level stretch in his salary curve will appear if he does not by study and self improvement and constant push advance himself beyond that point. His roving disposition is not the result of poor pay. The pay and the position which he holds are the result of his roving disposition.

Great corporations may be cold, dispassionate, but almost universally they do recognize ability and persistent work. Efficiency and economy of production are their watchwords and the men who will stick and help increase these are generally given pretty nearly the advancement that the results of their work warrant. Men have risen to the top of the engineering profession from a switchboard start. But among them you will not find the rovers.

National Electrical Code for 1911

The 1911 edition of the National Electrical Code, which is the standard for rules regarding electrical construction in more than 200 large cities of the United States, is now ready for distribution. It is issued as one volume instead of two, as was the 1909 edition. The book contains 190 pages and has been more elaborately indexed. Inquiries for copies should be addressed to the National Board of Fire Underwriters, 135 William street, New York City, or to the nearest underwriters' board.

"Have you any ancestors, Mrs. Kelly?" asked Mrs. O'Brien.

"And phwat's ancistors?"

"Why, people you sphrung from."

"Listen to me, Mrs. O'Brien," said Mrs. Kelly, impressively. "Oi come from the rale sthock av Donahues that sphring from nobody. They sphring at thim."

* * *

"Is this your family or a picnic?" remarked the conductor to the lady with a bunch of children.

"This is my family and it's no picnic," replied the lady.

* * *

"What do you do for a living, Mose?"

"I'se de manager ob a laundry."

"What's the name of this laundry?"

"Eliza Ann."

* * *

A lady who was not posted on geography said to the captain, "Please show me the equator." "Certainly," answered the captain, who was a red-headed Scotchman. He took a spy glass, adjusted it carefully and then handed it to the lady and told her where to look. Meantime, he pulled a hair out of his head and held it in front of the glass. "Oh, yes," cried the lady, "I can see the equator plainly. And isn't it queer, there's a camel walking on it!"

* * *

"Something's wrong!" cried a lover most sad,
To a maiden, while flying from dad;
"We are falling, I fear!"
Quoth the maiden, "Oh, dear!
But how lucky for me that I pad."

* * *

"How many candles did Miss Elderly have on her birthday cake?"

"There wasn't room on the cake for them all, so we stuck in a 32 candlepower incandescent."

* * *

Olaf Larson, working in a warehouse, backed into an elevator shaft and fell down five stories with a load of boxes. Horror stricken, the other employes rushed down the stairs, only to find him picking himself unharmed out of the rubbish.

"Ess de boss mad?" he whispered cautiously. "Tal' 'em Ay had to come down for nails annyway."

Nurse Girl—Oh, ma'am, what shall I do? The twins have fallen down the well!

Fond Parent—Dear me! how annoying! Just go into the library and get the last number of The Modern Mother's Magazine; it contains an article on "How to Bring Up Children."

* * *

"I understand they have a family skeleton."

"Yes, she was in the surf this morning."

* * *

The proofreader on a small Middle-Western daily was a woman of great precision and extreme propriety. One day a reporter succeeded in getting into type an item about "Willie Brown, the boy who was burned in the West End by a live wire."

On the following day the reporter found on his desk a frigid note asking, "Which is the west end of a boy?"

It took only an instant to reply: "The end the son sets on, of course."

* * *

Chinaman—You telly me where railload depot?

White—What's the matter, John; are you lost?

Chinaman—No, me here, all-light; depot lost.

* * *

She—And knowing my sentiments on the subject, did that odious Mr. Binks insult you by offering you a drink?

He—That's what Mr. Binks did.

She—And how did you resent it?

He (meekly)—I swallowed the insult.

* * *

"Will you allow me to ask you a question?" interrupted a man in the audience.

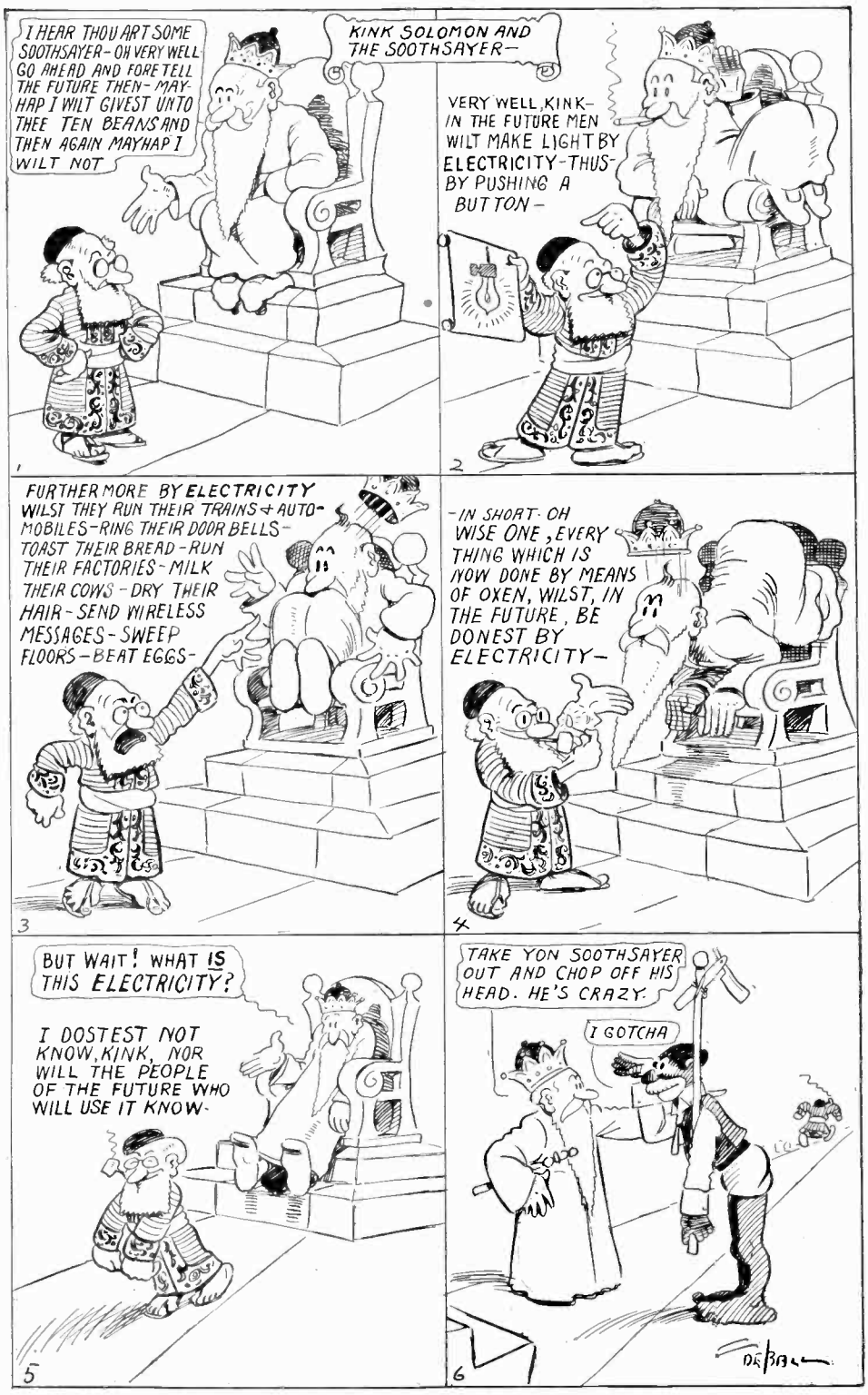
"Certainly, sir," said the lecturer.

"You have given us a lot of figures about immigration, increase of wealth, the growth of trusts, and all that," said the man. "Let's see what you know about figures yourself. How do you find the greatest common divisor?"

Slowly and deliberately the orator took a glass of water.

Then he pointed his finger straight at the questioner. Lightning flashed from his eyes, and he replied, in a voice that made the gas jets quiver:

"Advertise for it, you ignoramus!"


I HEAR THOU ART SOME SOOTHSAYER - OH VERY WELL GO AHEAD AND FORETELL THE FUTURE THEN - MAYHAP I WILT GIVEST UNTO THEE TEN BEANS AND THEN AGAIN MAYHAP I WILT NOT
KINK SOLOMON AND THE SOOTHSAYER -
1
VERY WELL, KINK - IN THE FUTURE MEN WILT MAKE LIGHT BY ELECTRICITY - THUS - BY PUSHING A BUTTON -
2
FURTHERMORE BY ELECTRICITY WILST THEY RUN THEIR TRAINS & AUTOMOBILES - RING THEIR DOOR BELLS - TOAST THEIR BREAD - RUN THEIR FACTORIES - MILK THEIR COWS - DRY THEIR HAIR - SEND WIRELESS MESSAGES - SWEEP FLOORS - BEAT EGGS -
3
- IN SHORT - OH WISE ONE, EVERY THING WHICH IS NOW DONE BY MEANS OF OXEN, WILST, IN THE FUTURE, BE DONEST BY ELECTRICITY -
4
BUT WAIT! WHAT IS THIS ELECTRICITY?
I DOSTEST NOT KNOW, KINK, NOR WILL THE PEOPLE OF THE FUTURE WHO WILL USE IT KNOW -
5
TAKE YON SOOTHSAYER OUT AND CHOP OFF HIS HEAD. HE'S CRAZY.
I GOTCHA
6
DeBeck

Common Electrical Terms Defined

In this age of electricity everyone should be versed in its phraseology. By Studying this page from month to month a working knowledge of the most commonly employed electrical terms may be obtained.

FRYING.—The noise emitted by an electric arc lamp when the carbons get too close together.

FULLER'S BATTERY.—See Battery, Fuller's.

FUSE BLOCK.—A block usually of slate or porcelain upon which are placed the fuses necessary to open the circuit in case too much current for the carrying capacity of the wires flows over them.

FUSE LINKS.—Low melting metal in the form of wire or strips having copper terminals for securing the strips on a fuse block. These protect wires connected to the block by melting and opening the circuit in case too much current flows.

GAINS.—The spaces cut in the face of a telegraph pole and into which the cross-arms are set.

GALVANIC BATTERY.—See Battery, Volta's.

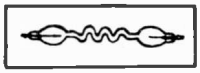
GALVANOMETER.—An instrument for measuring current flow. A magnetic needle is suspended within a flat coil of fine wire. Current flowing through the coil sets up lines of force with which the needle tries to place itself parallel. The deflection of the needle will be proportional to the strength of the current.

GASSING.—In charging a storage battery the electrolyte will assume a milky appearance often referred to as "gassing" or "boiling." Gassing occurs because the lead sulphate on the positive plate is nearly all converted to lead peroxide, thus gradually diminishing the material in the plate to be acted upon. Consequently the current proceeds to decompose the water, the rising of the gas bubbles being termed gassing. Gassing does no harm unless the paste is loose, when the agitation may remove some of it.

GASTROSCOPE.—A device for lighting up the interior of the stomach, using an incandescent lamp and then by prisms reflecting the rays of light so that the walls may be seen.

GAUSS.—The name of the unit of flux density.

GEISSLER TUBE.—A tube of glass from which the air has been exhausted and rarified gases substituted. Into each end of the tube is sealed a platinum terminal. When connected across a source of static electricity very beautiful luminous effects are produced, varying in color according to the kind of gas in the tube. (See cut.)



Geissler Tube

GERMAN SILVER.—An alloy of copper, two parts, nickel, one part, and zinc, one part. Wire made of this alloy is much used in electrical apparatus because of its high resistance, low cost and slight variation in resistance with a change in temperature.

GILBERT.—The unit of magneto-motive force.

GILDING METAL.—Brass having a large proportion of copper in it, used to make objects which are to be electroplated.

GOLD BATH.—A solution of gold used in electroplating.

GOLD LEAF ELECTROSCOPE.—See Electroscope.

GRAPHITE.—A variety of carbon used for commutator brushes, for preparing surfaces to be plated and for mixing with the manganese powder in Leclauché cells.

GREEN VITRIOL.—A trade name for ferrous sulphate.

GRID.—The perforated or ridged lead plate employed to support the active material or paste in storage cells.

GROUND.—Commonly employed to mean the connecting of an electrical conductor to earth either intentionally or accidentally.

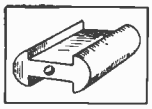
GROUNDED CIRCUIT.—A conductor having a connection with the ground or earth.

GROUND PLATE.—Usually applied to the buried copper plate or metal to which the ground wire from a lightning arrester is connected.

GROUND WIRE.—The wire from a lightning arrester, detector or other electrical apparatus to a ground plate or rod.

GUTTA PERCHA.—The gum from a tropical tree so prepared that it is serviceable as an electric insulator of high quality.

H ARMATURE. — The first armature built by Siemen, the name arising from the shape of the core, a cross-section of which resembles the letter H. (See cut.)

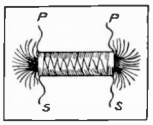


H Armature

HAND HOLE.—See Distributing Box.

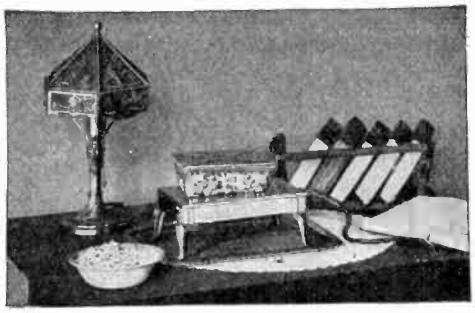
HAND RULE.—See Fleming's Hand Rule.

HANGER BOARD.—A board of noncombustible material placed on the ceiling from which to suspend an arc lamp. Mounted on the board are two terminals, a suspending hook and often a switch.

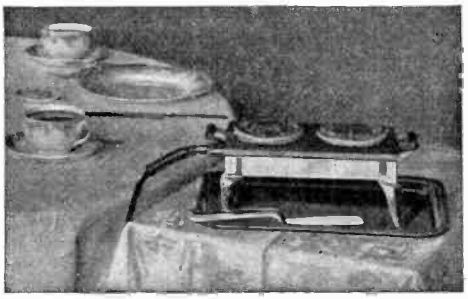


Hedgehog Transformer

HEDGEHOG TRANSFORMER.—A transformer made in the form of an induction coil, the core being a bundle of iron wires which project beyond the coil windings at each end and are spread out, hence the name, and turned back to increase the efficiency. (See cut.)



Popping corn on the living room table. An ordinary ten-cent corn popper just fits the Toaster-Stove. Use on stove without toaster grid or steel plate



Making griddle cakes on side table. Two good sized griddle cakes can be baked at once. Use steel plate, top side up. The cake turner in foreground is part of the outfit

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Size of cooking surface 9 x 5½ inches. Outfit consists of stove with two tops, tray, cake turner, plug and cord. Attach to any electric outlet and it is ready for use. It will last for years. Send for booklet giving full description and prices to **Publicity Department F, East Pittsburgh.**

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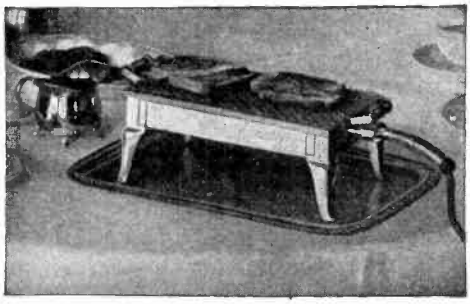
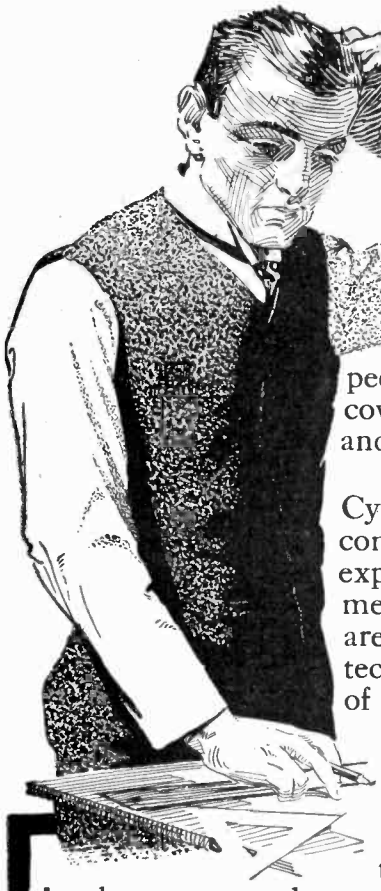
Making coffee and toast at the same time. Turn toaster grid upside down and around and set coffee pot on stove top without using steel plate



Four pieces of toast being made on the toaster grid of the Electric Toaster-Stove. The toast is always in view and you can take it off at just the right instant

The world makes way



IN this age of efficiency you can't ***guess,*** or ***suppose*** or ***think*** a thing is right—you must ***know.*** The man who does know is the man who is marked for success—he is the man the good job seeks—he is the man who gets the money—he is paid for what he knows—not for what he does.

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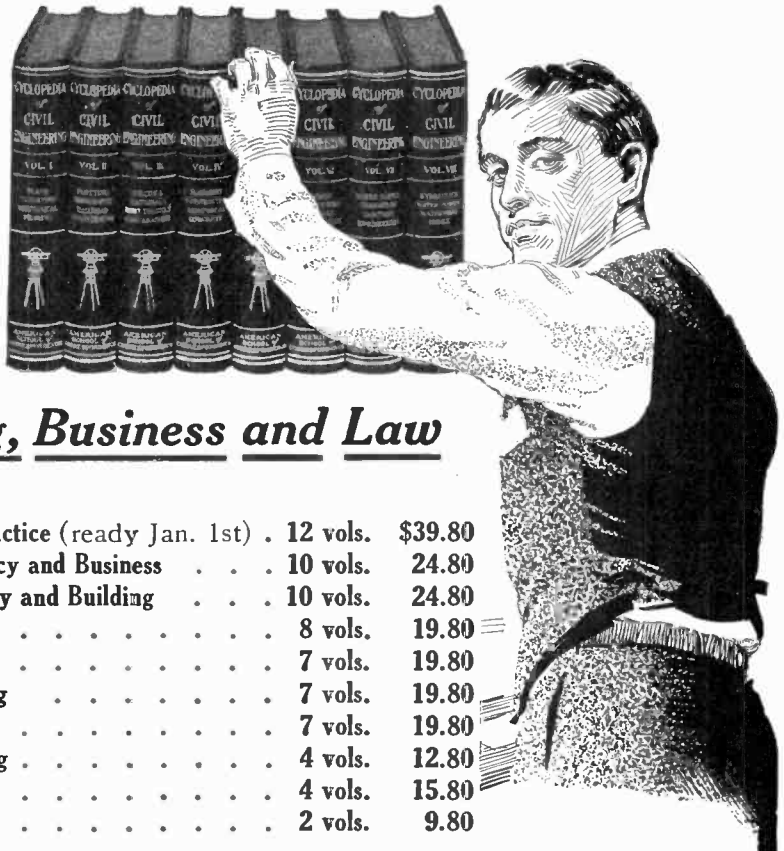

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WE HAVE A COMPLETE LINE OF WIREless Supplies. Send 2c stamp for catalogue and lowest prices. The Merker-Flocker Electric Co., 957 Liberty Ave., Pittsburgh, Pa.

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It Pays $3600 a Year

There are thousands of just such jobs awaiting the trained man. In every section, in every state, and in every city there are factories to be superintended; machinery to be repaired; railroads to be built and maintained; residences and business blocks to be erected; canals, cuts, and tunnels to be dug; dams to be constructed; and power plants to be operated.

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The progress of this age is not going to stop, and some one must do this work. Will it be you or the other fellow? One thing is certain: it will be the man best qualified for the job.

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You need only mark and mail the attached coupon and you will receive, without obligation or cost, full information about any position in which you may be interested.

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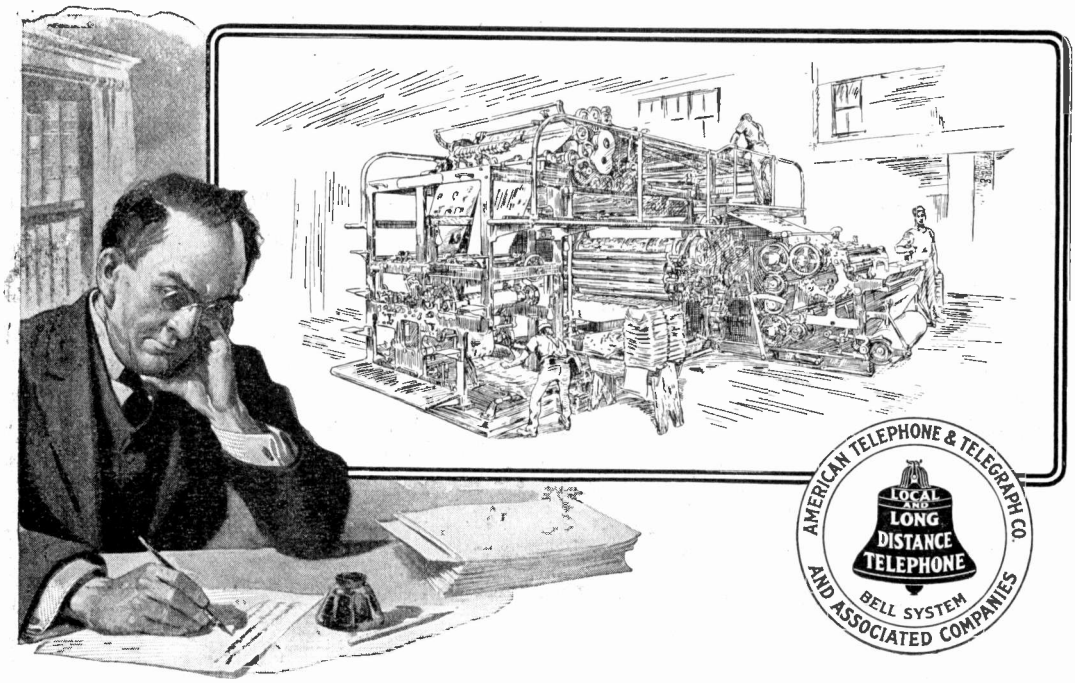

For Universal Service

The Press and the Bell System

The power of the individual writer is multiplied by the printing press. In the same way the power of the individual telephone is multiplied by the Bell system. In both cases, increased usefulness comes from progress towards universal service.

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By co-operation with telegraph and cable systems, universal service for communication is being made international.

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One Policy ***One System*** ***Universal Service***

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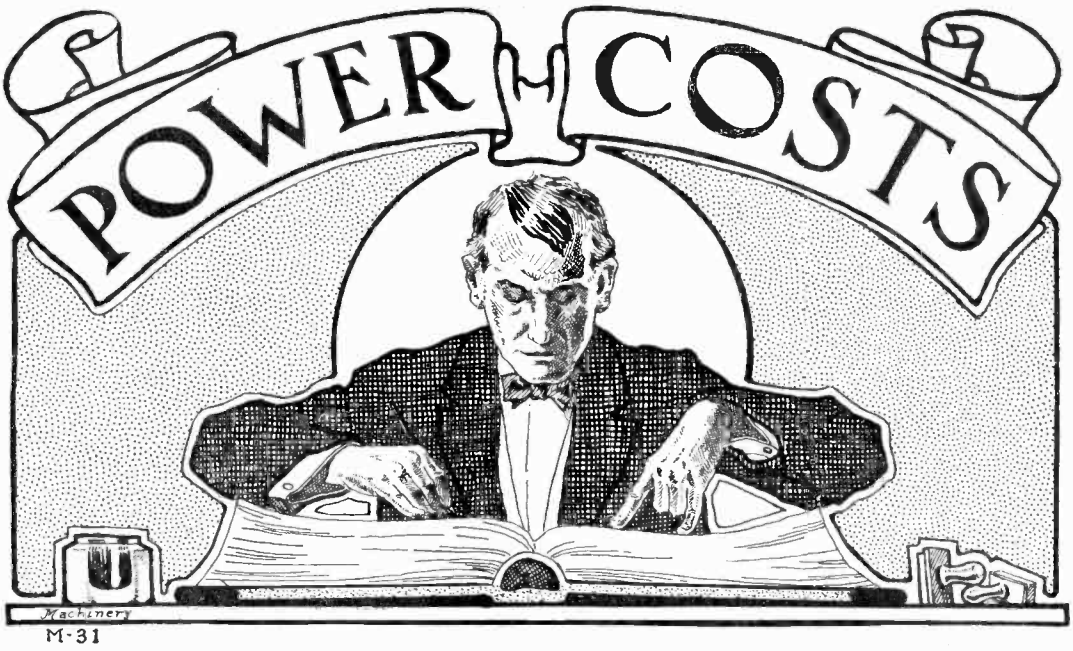

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Whether you are operating a single lathe or the largest kind of a factory

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1603 BROADWAY **"WOOD" SYSTEMS** FORT WAYNE, IND.

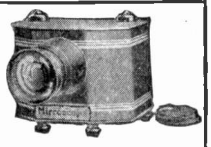
Branch Offices in Most Large Cities

Electrical and Wireless Goods

Of Recognized Quality and Merit

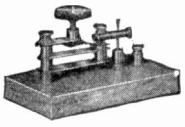
At Prices That Will POSITIVELY Save You Money

16 light Xmas Tree Outfit for use on 110 volt current. Sold elsewhere at $8.00.
Special Price....$4.75



No. 209 Mirrorscope. Only.....$2.50

8½ in. long Miner's Flash Light with Mazda Lamp and Tungsten Battery. Sold elsewhere at $2.50.
Special Price... $1.65
Postage, 22c



Celebrated Ferron detector. Regular price $8.50.
Special Price....$7.00

The most up-to-date book on wireless yet published. Contains all the latest diagrams. *Every wireless experimenter should have it.*

Wireless Book by V. Laughter. Regular price $1.00.
Special Price.....75c
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Our prices to consumer generally LOWER than most dealers' cost.

Our New Big 250-page Catalog Just Out

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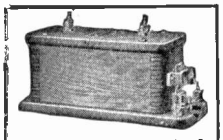
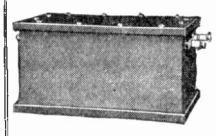
Catalog Mailed Only Upon Receipt of 6 Cents in Stamps or Coin

Which may be deducted on first order of $1.00. Our exceedingly low prices make it commercially impossible to send this elaborate catalog without the postage, which is our only means of knowing who is interested in our goods.

The special prices quoted on margin of this page cease December 25th. Patrons must refer to this advertisement when ordering at special prices.



Standard one-inch Spark Coil for wireless. Sold elsewhere at $5.
Special Price....$4.15



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¼ K. W.....$15.00
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Celebrated Western Electric 2000 ohm Head Set. The equal of any $12.00 head set made.
Special Price....$6.75

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80 pages Wireless Instruments	15 pages Flash Lights and Miniature Lamps
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15 pages Launch Lighting Outfits	20 pages Telegraph Instruments
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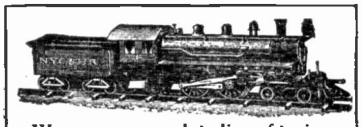
And a complete line of electric lighting plants, washing machines, sewing machine motors, Xmas tree outfits, magnet wire, mechanical tools, electrical books, and in fact anything and everything in the field of Electrics.



We carry a complete line of trains.

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In the cut is shown our experimental magnetic detector which is practically equal to our commercial detector except that it is hand operated. Price $10.00.

This detector and a pair of our 13 oz. 160 ohm, double head band phones designed for use with it. Price $16.25.

Remit by Postal or Express Money Order or New York Draft.

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Marconi Wireless Telegraph Company of America

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Commercial Wireless Receivers

Up to 3000 Ohms

The proper relation of Resistance, Inductance and Ampere Turns which gives a Wireless Receiver a proper degree of *sensitiveness* is the unexcelled feature of our instrument which induced the United States, the British and other governments, the United Wireless Co., the Marconi Co. and Ocean vessels to adopt same. Particulars by mail.

COSMOS ELECTRIC CO.,
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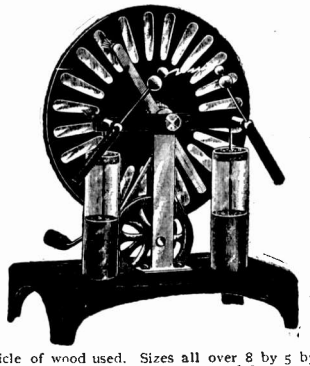
THE "ELECTRO" STATIC (WIMSHURST) MACHINE



Guaranteed to generate in any kind of weather, no matter how foggy or rainy. First machine ever constructed which can truthfully claim this. We absolutely guarantee fat, powerful 3-inch spark. Used successfully to operate Geissler and X-ray tubes, charging the biggest Leyden jars, firing powder, working wireless sets, raising a person's hair, etc. Anybody interested in electricity owes it to himself to possess one of these wonderful machines. Can be used to perform thousands of interesting experiments. Cut shows machine plainly. We furnish solid cast iron base, cast iron wheels, two fine Leyden jars and there are two electrite plates revolving in opposite directions. All metal parts are nickel plated or highly polished. Not a particle of wood used. Sizes all over 8 by 5 by 11 inches. The weight is 3 pounds. The machine is guaranteed for one year. Nothing to wear out, no batteries, no trouble, *simply turn the crank the machine does the rest.*

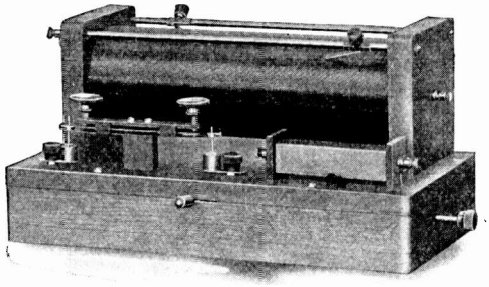
Price complete boxed, **$3.75. This price will be raised later.** If you are interested in this machine send at once for our new booklet giving a lot of experiments to be performed with same.

Send today 4c postage for our famous 106 page Electrical Cyclopedia No. 9 containing over 400 illustrations, lots of information on electrical and wireless subjects, etc. **POSTAL CARDS NOT ANSWERED.**

THE ELECTRO IMPORTING CO., 233B Fulton St., NEW YORK CITY

"EVERYTHING FOR THE EXPERIMENTER"

WIRELESS RECEIVING SETS



Receiving Set No. 1

SET No. 1: Consists of Double Slide Tuning Coil, air spaced aluminum plate Variable Condenser, Fixed Condenser, Double Detector with switch attachment for quickly changing from one mineral to another. The Box base is of Quarter Sawed Oak. Complete except Head Set.....**$20.00**

SET No. 2: Same as above except that the Tuner is of the Loose Coupled or Inductive type, instead of Double Slide...**$26.50**

SET No. 3: This set is mounted on Oak base instead of box, and has Fixed Condenser only; Detector is single and Tuning Coil is same as set No. 1.....**$9.00**

SET NO. 4: Same as set No. 3 except has Loose Coupled Tuner instead of Double Slide.....**$15.50**

WIRELESS RECEIVERS

We are agents for the celebrated "Brandes" Long Distance Wireless Receivers—same prices as follows:

"Superior" Type	2000 Ohms Total	$ 5.00
New Model Trans-Atlantic	2800 " "	9.00
New Model Improved Navy Standard	3200 " "	13.00

The above are complete Head Sets, i. e., two receivers, Double Head Band and a 6 ft. Green Silk Cord. The Head Bands for the "Superior" are German Silver; The Trans-Atlantic and Navy Standard are Hard Rubber covered.

Single "Superior" Receivers—1000 ohms Double Pole $1.50, postage 10c extra.

Single "Superior" Receivers with Leather Covered Head Band and 6 feet cord $2.50, by mail extra 15c.

Receiving Sets 1, 2, 3 and 4 as well as complete Head Sets should be ordered sent by express "collect." A 2c stamp brings our wireless catalogue to you by return mail.

Dawson & Winger Electric Co., 727 S. Dearborn St. CHICAGO, ILL.

WIRELESS COILS

Giving ¼" to 4" Sparks Our Leaders

Years of experience and our superior manufacturing facilities enable us to give the most for the money.

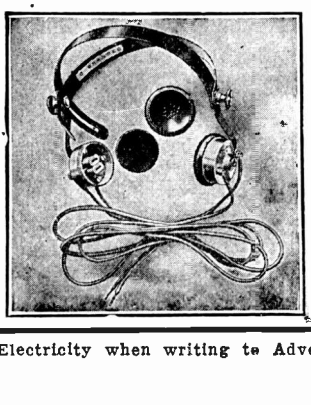
Points of the best platinum iridium; guaranteed spark length, and also against breakdown.

Our prices will interest both jobber and individual.

NEW YORK COIL CO.,

338 Pearl Street **New York City**

BRANDES LONG DISTANCE RECEIVERS



Guaranteed to be the Best Long Distance Reading Receivers made. Sent **on trial** to give you the opportunity to test them out thoroughly before purchasing.

Improved Navy,	**$13.00**
Transatlantic	**9.00**
Superior,	**5.00**
Single Superior,	**1.60**

Send stamp for catalog

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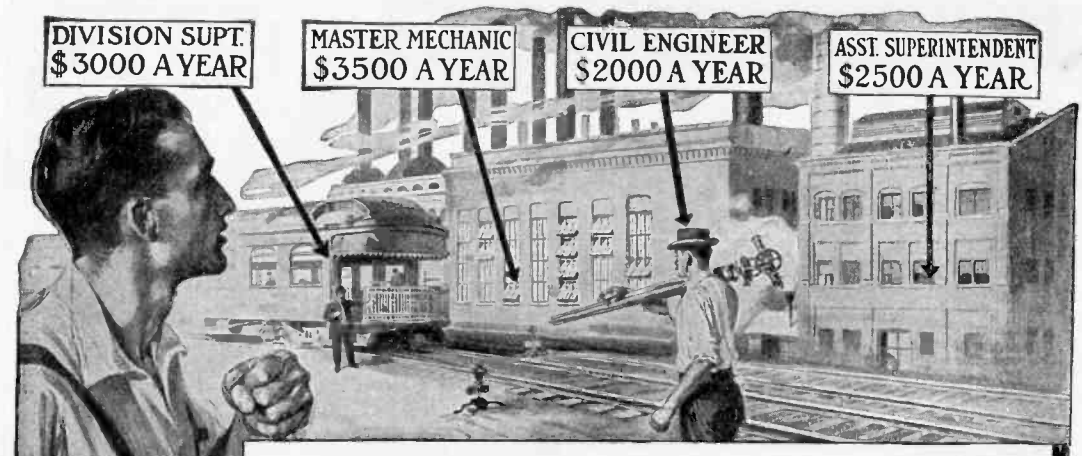
111-115 Broadway
New York

Ford King, No. 623 Balboa Bldg., San Francisco, Cal.

C. E. Cook Electric Co., No. 745 So. Spring St., Los Angeles, Cal.



YOU can do what others do!

You *can*—if you really want to. You can fit yourself to earn *more* than the other fellows. For they are not naturally any smarter than you. They haven't any more brains or ambition than you. They don't work any harder than you. They are simply *trained men*—that's the difference. They have *special knowledge* that you don't possess—*special knowledge* and *training* that makes them *worth more* to their employer than you can possibly be until *you* equip *yourself* with special knowledge and training.

The American School is training *hundreds* of men to become draftsmen, engineers and architects. It is training hundreds to fill executive positions, to earn *good* salaries, to play a man's part in the business game. *And what the American School of Correspondence is doing for others it can do for you.*

Opportunity Coupon

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Please send me your Bulletin and advise me how I can qualify for the position marked "X." Pop. Elect. 12-11

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.....Civil Engineer	.....Stenographer
.....Electrical Engineer	.....Accountant
.....Elec. Light & Power Supt.	.....Cost Accountant
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NAME .....

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and send it back to us *on the next mail.* That's the first step towards getting your name higher up on the payroll—the first step towards getting the kind of position *you'd like to have,* the kind of a salary *you ought to have.*

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CHICAGO, U. S. A.

WHIRLPOOL

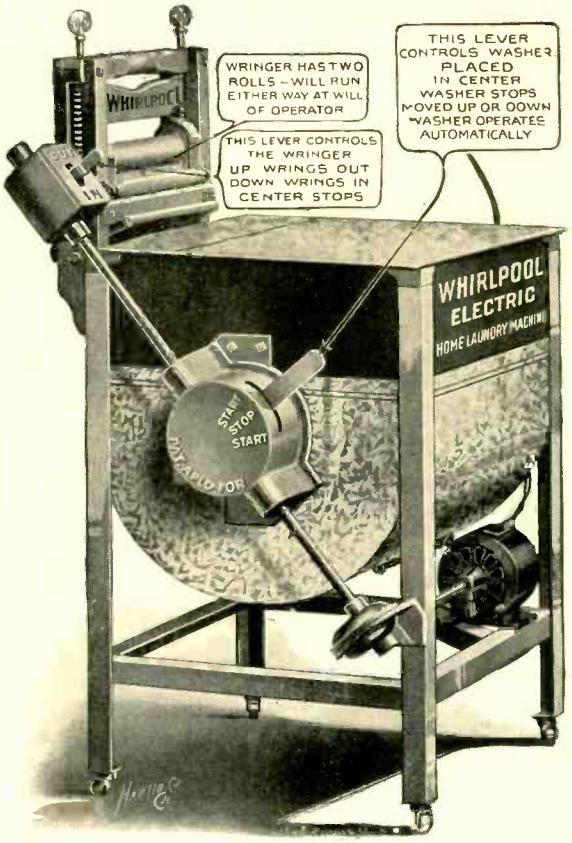
TRADE MARK

Electric Home Laundry Machine —The World's Best

"Whirlpool" is an Automatic Servant that is **never sick,** never tired and never quits. It is always ready, willing and efficient.

It is designed for home use and can be attached to any electric light fixture and operated by anyone. Experience is not necessary.

It does all the washing and all the wringing and does it to the Queen's taste.



It saves time, money, work and clothes.

There are no belts, wheels, chains or pulleys to break or get out of order. All moving parts are encased so that it is perfectly safe for a child to play around it.

It is built to last and represents the latest and best development of the greatest labor-saving machine ever produced.

It is Light, Compact, Simple, Safe, Noiseless, Clean, Economical, Convenient and Inexpensive. ***You Push the Button*** **"WHIRLPOOL"** ***Does the Rest.***

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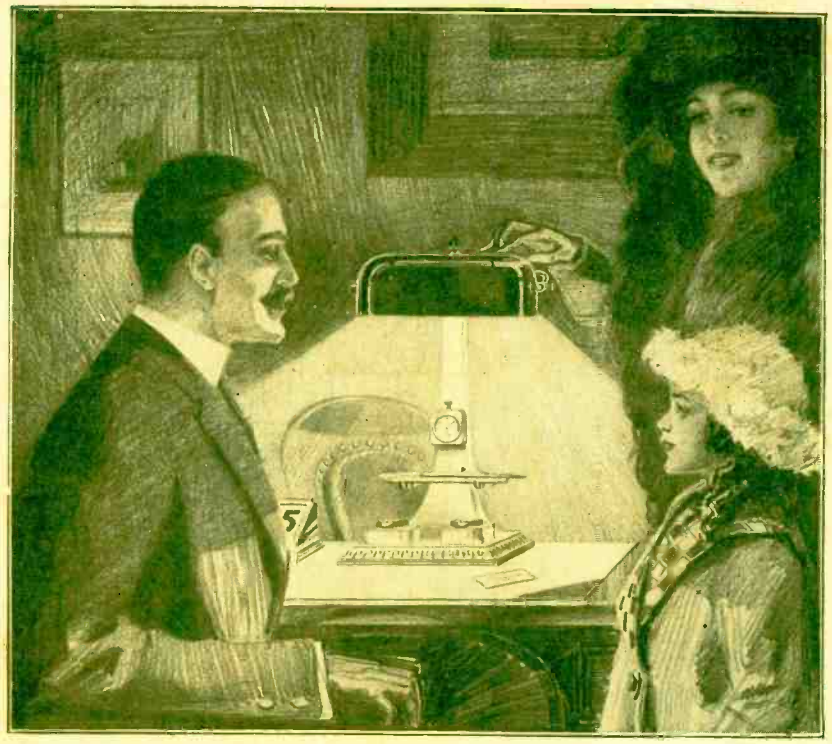

This Desk Lamp Would Make an Ideal Christmas Gift

Nothing adds more to the pleasing appearance of a desk in a well appointed office, or in the home, than a rich and substantial looking Desk Lamp. In the Desk Lamp shown above, lighting efficiency has been combined with beauty and quality of material and workmanship to the utmost degree. The lamp is quite equally desirable

For Use in the Office or the Home

The lamp stands 17 inches high, and is finished in Old Brass with green relief, or in Statuary Bronze with green relief—the latter being a light brown effect, especially recommended for its rich appearance and durability. The standard has an ink stand base, 7 x 9½ inches, with two covered ink wells. A pen rack, and a watch that keeps good time are affixed to the standard.

The lamp is equipped with a green plated glass shade, having a white opal reflecting surface inside. The soft emerald green glass relieves the eyes from strain, while the opal lining concentrates the maximum of light just where it is most needed, without a direct glare in the eyes. The shade is adjustable by a simple and efficient clamp at the right end, which holds it securely at any desired angle.

Price, complete with shade, watch, pull chain socket, plug and 6 foot of silk cord, ***$18.00.*** *Price, without watch,* ***$15.00.***

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