JULY

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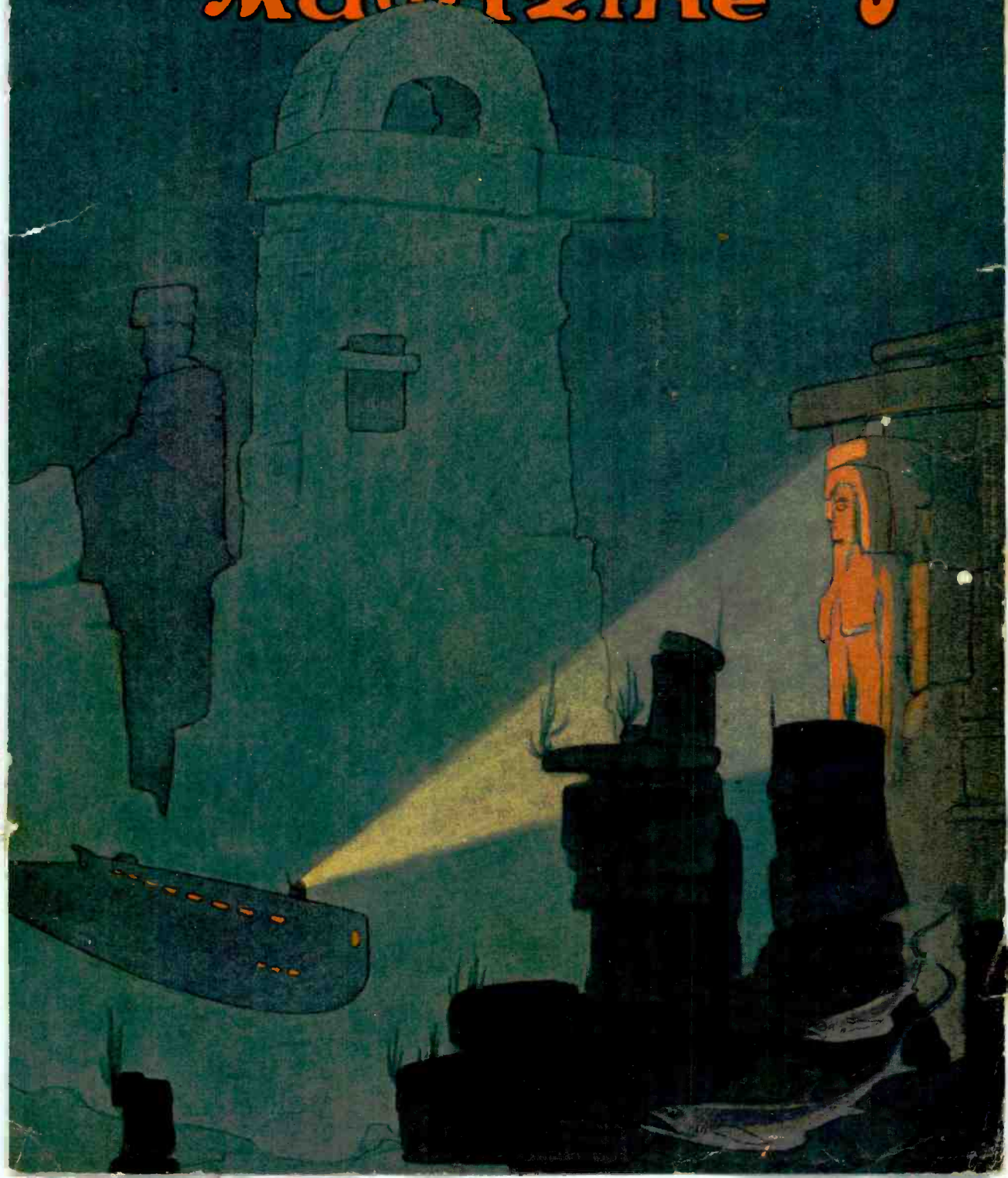
Popular Electricity Magazine



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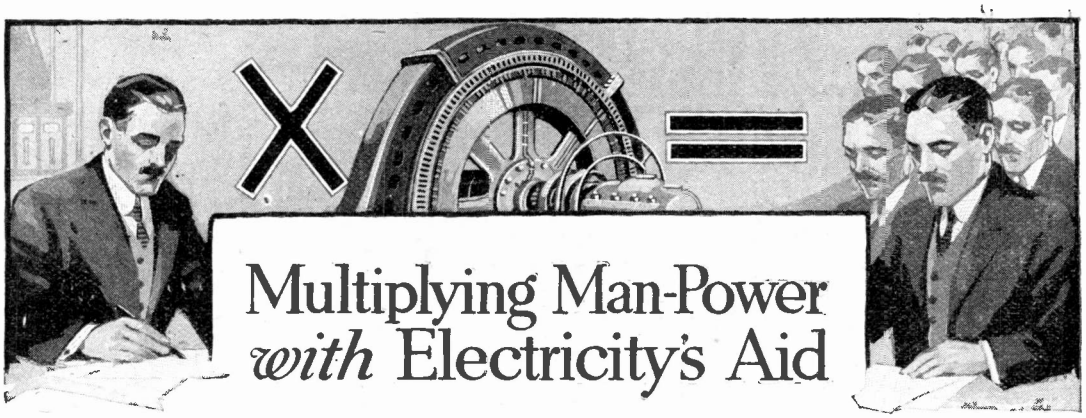

Multiplying Man-Power *with* Electricity's Aid

TO increase the efficiency of the individual man—to increase the efficiency of groups of men—to increase both by multiplying also the efficiency of mechanical helps—this is the big aim of today.

And that magic word efficiency leads you straight to that magic force—Electricity.

Whether you are a manufacturer or a merchant, a producer or a dispenser, you are directly interested in this problem of multiplying man-power—in knowing how this big aim can be realized *for you*.

If there is a way by which you can do more business and do it more comfortably and with more profit, that way is worth your consideration.

Ten years ago the general manager of a great manufacturing organization asked himself that question, then set about answering it by applying efficiency principles to his most important department. His costs amounted to ten cents per unit. In the first year he reduced losses and wastes by only a fraction of a cent. In the second year he had reduced them to seven cents, in the third year to five cents and in succeeding years finally to four cents. He was now, he thought, at rock bottom—getting the utmost results from both men and machines.

One day he met an electrical engineer who said he could point out an efficiency factor the manager had overlooked—one whereby workmen could be made even more efficient, machines even more productive, and with no change in the present efficiency method.

"No." said the engineer, "I don't mean new machinery. I mean electricity—and not merely a reduction in power expense. I mean that in addition to power saving you can increase both labor and machine efficiency by electrifying your plant. And by so doing, I venture to say, you can reduce your costs from four cents to three cents or even two cents per unit."

The engineer went on to show that, while the scientific management had sought to use up or utilize to the fullest extent the physical energy of each man, by electrical means man-power could be conserved and multiplied. Electrical tools, in countless varieties, would help workmen, skilled or unskilled, to do perhaps four times or even sixteen times as much in a day. Individual motor drive would give each operator easy and sure control of his machine. Eliminating line shafting would give more natural lighting and better arrangement of machines. On nights and dark days electric light would provide natural and satisfactory lighting. All these and many other conveniences would contribute to the comfort, health, good spirits, loyalty, accuracy and output of the workers and make every scheme of scientific management that much more effective.

The outcome was that the manufacturer did electrify his plant, did reduce the unit cost of his pet department to two cents—besides increasing output—without building a contemplated addition to his factory.

In fact this manufacturer found—as other progressive manufacturers and merchants have found—that *the efficiency route leads inevitably to electrification.*

He found that with electricity, applied on an up-to-date basis, every machine was more productive, every man was more productive—with less wear and tear on both machines and men—with lower cost and more profit all along the line.

How true this is in every business, whether of manufacture or of selling—how electricity helps raise business efficiency and maintain it—we shall show in other articles in the series of which this is the first.

If you have a problem to be solved, take it up today with your electric power and light company, or with any General Electric dealer or agent in your vicinity. You will find them more than glad to cooperate with you, and no matter how complex your problem may be, they have at their command the service of any part of our organization that may be most helpful to them or to you.

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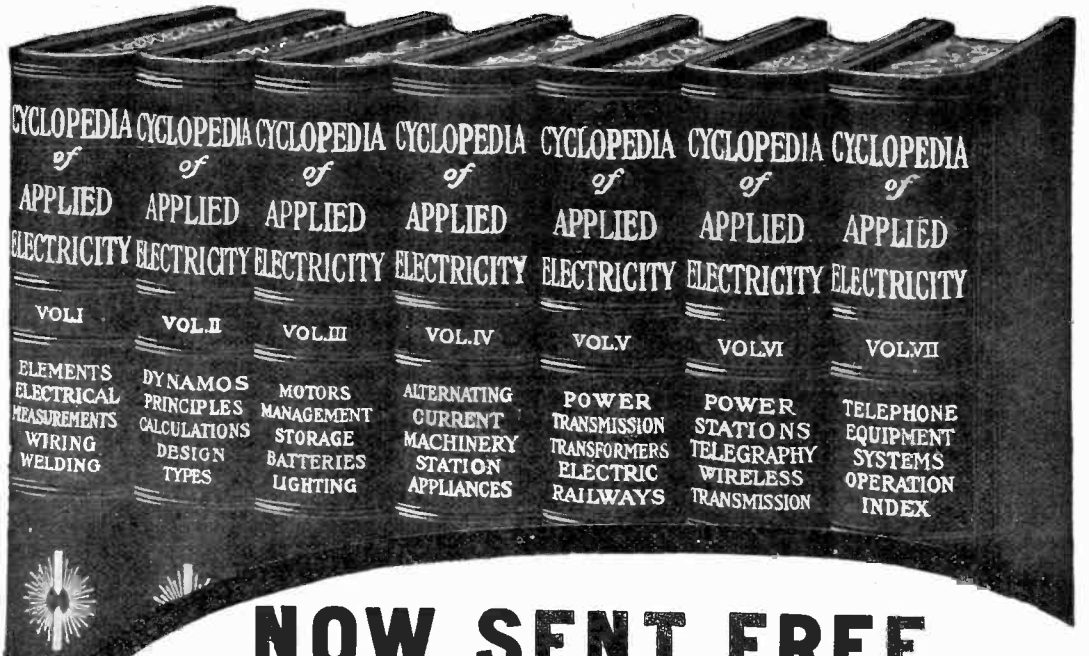

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POPULAR ELECTRICITY MAGAZINE

In Plain English

HENRY WALTER YOUNG, Editor

Vol. VI | July, 1913 | No. 3

CONTENTS

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ISSUED MONTHLY BY POPULAR ELECTRICITY PUBLISHING CO., 350 N. Clark St., Chicago, Ill.
YEARLY SUBSCRIPTION, $1.50; CANADIAN, $1.85; FOREIGN, $2.25; SINGLE COPY, 15 CENTS
No additional copies will be sent after expiration of subscription except upon renewal.
Entered as Second Class Matter April 14, 1908, at the Post Office at Chicago. Under Act of March 3, 1879.

MR. EDISON PHOTOGRAPHED WITH THE BOYS OF ACHIEVEMENT

Popular Electricity Magazine In Plain English

VOL. VI. JULY, 1913 No. 3

TURN ABOUT IS FAIR PLAY, SO THE BOYS ENTERTAIN MR. EDISON WITH A BAND CONCERT TO WHICH HE LISTENS ATTENTIVELY

Mr. Edison Entertains the Boys

By WILLIAM H. MEADOWCROFT

Mr. Edison has a liking for boys with a purpose in life and with character and training that will fit them to be of benefit to humanity. He, therefore, rescinded for this occasion his rules against parties of visitors, and on a bright day early in May threw open his laboratory and the works at West Orange to a party of about 44 American boys who are on a trip around the world.

This tour, which is purely an educational one, is being made under the auspices of the National Youths' Achievement Committee. The group of boys who visited the laboratory and works ranged in age from about thirteen to 20 years, and each one of them has a record. In order to qualify, each boy must first pass an examination which includes scholarship, general efficiency, physical fitness, a knowledge of swimming, good moral standing and an achievement which has aided some one else, and last, but not least, an ability to play a musical instrument.

An illustration of the manner in which the committee selects members of the band may be cited in the case of its one New Jersey member, Eric Mackey, sixteen years old, a son of the superintendent of schools at Trenton. Not all the members of the band started from San Francisco, but some were picked up on the way. When they arrived at Trenton, N. J., young Mackey was picked up there because he had passed the highest

of 246 pupils in his grade, was proficient in athletics and had done one thing of note, which was to take care of a blind man and say nothing to anyone about it.

Among the party is a quartette, several soloists, a troupe of acrobats and a few comedians and entertainers. When they arrive in Europe the organization will become self-supporting. Band concerts will be given, dramatic sketches presented and other entertainments provided. After visiting England and the Continent, they will take the Suez Canal trip. They will then visit Africa, Japan, China, Australia, Honolulu and the Philippine Islands before returning to San Francisco, where they will take part in the work of the National Boys' City, which is to be a real live working exhibit of the Panama-Pacific International Exposition in 1915.

On arriving at Orange the boys assembled in regular formation and marched to the Edison Laboratory, where they entered the grounds with the band playing and their flags flying. There they were received by Mr. Edison and were photographed with him, after which they proceeded to give a band concert for his benefit.

Following this, they were taken in charge by Miller Reese Hutchison, Mr. Edison's chief engineer, who escorted them through the phonograph works, the motion picture plant, and also through the storage battery plant.

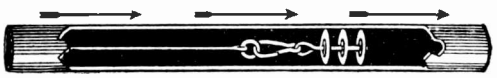
Mr. Edison, realizing that healthy, live-wire boys get a hankering for food about noontime, had ordered a well-known caterer in Orange to provide a special lunch for them, towards which they were conveyed, a happy, hungry crowd, in a special trolley car which had been chartered by Mr. Edison for the purpose.

After a hearty lunch, they returned in their special car to the laboratory, and were treated to a program of talking "movies," as well as to a number of Mr. Edison's educational motion pictures, all of which were thoroughly enjoyed. Another feature of the entertainment was a concert by the new disk phonograph which was greatly appreciated by this crowd of boy musicians. Going back into the grounds attched to the laboratory, the boys gave a drill and another band concert, and were made the chief feature of a motion picture, which was preserved as a memento of their visit.

By the time they had participated in all the exercises and pleasures of a busy day it was quite late in the afternoon, and this crowd of remarkable American boys left the laboratory for New York, cheering enthusiastically for Mr. Edison and those of his staff who had entertained them.

Threading a Conduit by Compressed Air

A simple and effective device using air for threading a cord through conduit in order to use the cord for pulling in the



CONDUIT THREADER

wires is now on the market. The cord is fastened to a series of washers loosely fitting the interior of the pipe. Air at 20 pounds pressure is introduced into the pipe by a hose into which the cord passes from a reel near the air tank. The weight of the hose, tank and air pump for filling tank, is 40 pounds.

Generator of Forty Thousand Horsepower

The Commonwealth Edison Company of Chicago has placed with the General Electric Company an order for a 30,000 kilowatt steam turbo-generator to be installed in the Northwest generating station. Expressed in more familiar terms, the capacity of this world's largest generator will be a trifle over 40,000 horsepower. The weight of the whole unit will be one million pounds, and it will be delivered in about a year.

Three Show Windows in One

The merchant who complains that he has too little show window space in which to display his goods to the public will find in the accompanying illustration of the Newman multiple show window a solution of the difficulty.

Three individual compartments each of a size to fill the window are built one above the other as indicated. The whole structure can be raised or lowered slowly or each compartment may be stopped at the window for a certain length of time.

The equipment is made to be operated

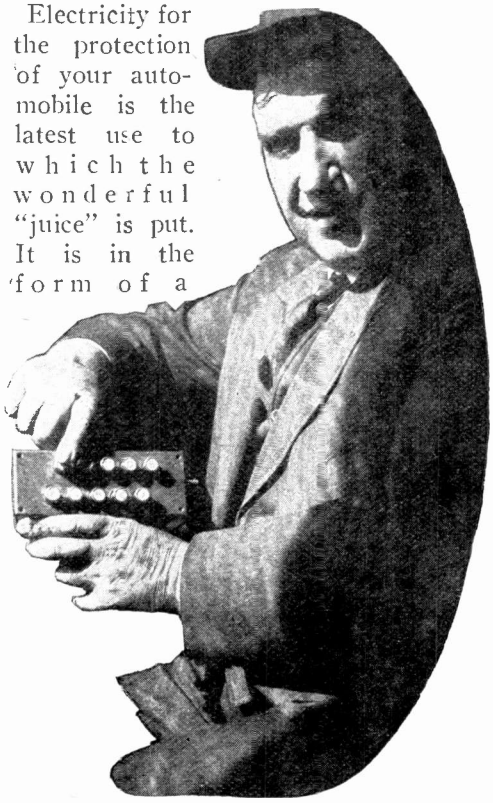
A TRIPLE DECK SHOW WINDOW

either by an electric motor or by city water pressure.

A particular advantage which the multiple window affords is the display of wares in one compartment while a trimmer is arranging a display in another.

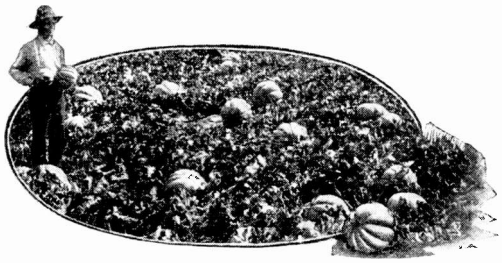
Automobile Starter Like a Safe Combination

Electricity for the protection of your automobile is the latest use to which the wonderful "juice" is put. It is in the form of a



THE BUTTONS MUST BE PRESSED IN A CERTAIN ORDER TO START THE MACHINE

small keyboard with two rows of five letters each, which when pressed in their proper order in various combinations of three or more will complete the circuit so that the car can be started. Until the proper three letters have been pressed in their proper order the circuit is broken so that the sparking device of the automobile will not operate. Moreover the touching of the wrong letter will throw out of position any of the letters that have been set in place by accident, so that the chances of a would-be thief getting the right combination are one in 30,000. After each trial, the experimenter would have to crank the car to find out whether he had hit upon the right combination.



Pumping Water for Thirsty Soil

In the Garden City Irrigation Project along the Arkansas River in Kansas electricity does its full share towards making 10,000 acres of land productive.

For a portion of the year water from the river is used but during the dry months electric pumps lift water from 216 wells and discharge it into a concrete conduit nearly four miles long, part of it being enclosed but the larger part being open in the form of a ditch with sloping sides. The wells are in groups along both banks of the river and are about one-fifth of a mile apart. At each group a single electric driven centrifugal pump installed in a concrete block house does the work, being furnished power from a high tension transmission line fed from a power house containing two steam turbines.

As the conduit passes the pumping stations it increases in size to accommodate the added water.

Something of the results of this project are shown in the picture of a cantaloupe patch near Deerfield, Kansas

IRRIGATING PROJECT SUPPLIED IN DRY SEASONS BY 216 WELLS

Where Edison Made Light and Sound March in Step

The good sized tent illustrated in the annexed photograph was used by Mr. Edison in a difficult detail problem in the development of the kinetophone. The illusion of the "talking movies" involves a curious psychologic feature. The eye is slow to grasp and slow to release its visual impressions, and it is this optical inertia that makes the impression of continuity or blending of the separate views of the moving picture. The ear, on the contrary, is exceedingly quick to record its impressions of sound and to distinguish one impression from another one that follows quickly and to locate the direction from which every faintest sound comes.

It is this comparative alertness and keen discrimination of the ear that makes it necessary in the kinetophone to have film and phonograph march so exactly

TENT IN WHICH THE KINETOPHONE WAS DEVELOPED

together: voice and action must be "taken," and sound and sight must be reproduced, absolutely simultaneously. Any bungling here, by the smallest fraction of a second—as by trying to accompany the action of the film by sounds made by stage hands behind the screen—destroys the illusion, and it has been on this feature of the problem that Mr. Edison's inventive effort has been mainly employed

He had to develope a sound recorder so delicate that it would catch the faintest sound waves at a distance of 40 feet—a device practically as sensitive to sound waves as the film is to light waves—and then connect this recorder with the film camera so that the two would stay in step.

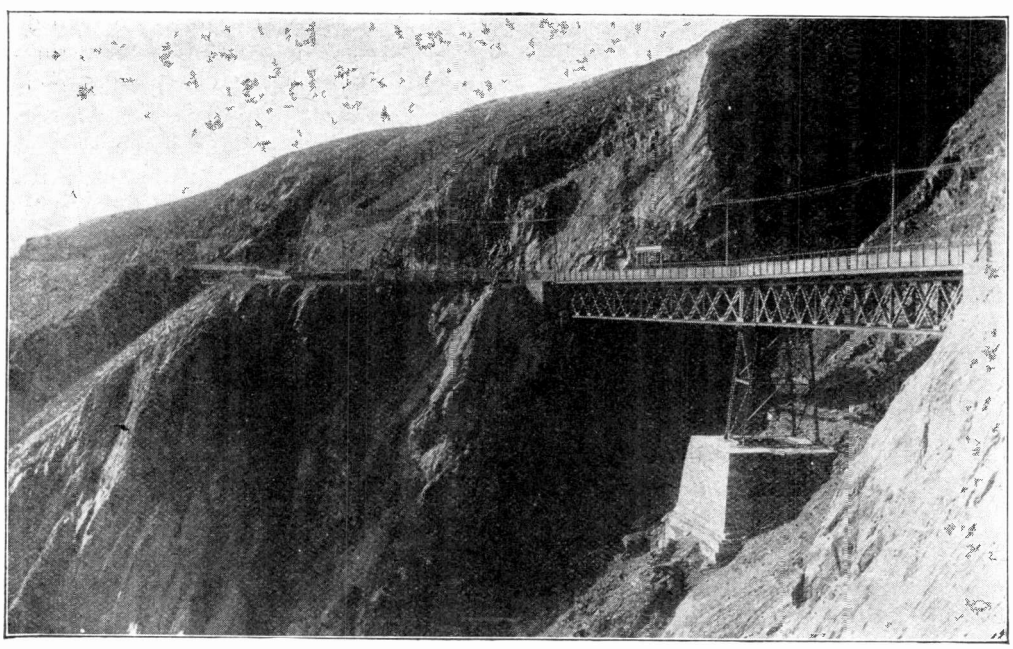
In the development of a sound recorder so acutely sensitive the apparatus must be vigilantly protected from extraneous sounds and echoes, just as the sensitive film must be protected from light leaking into the camera, and it was in order to avoid reflection from walls and ceiling that Mr. Edison conducted his experiments in this tent, pitched in the yard at his factory.

Manxman's Electric Railway

The Isle of Man, although a small and somewhat out-of-the-way island in the Irish Sea, possesses a very well equipped and interesting electric railway. The railway connects the capital, Douglas, with the several small cities on the island and in doing this crosses over the rugged interior.

A trip over this electric railway line furnishes the traveler with some of the most spectacular scenery in the world; while the mountains are not high, the cliffs and gorges are in places almost appalling; many difficult engineering problems had to be solved in building this railroad.

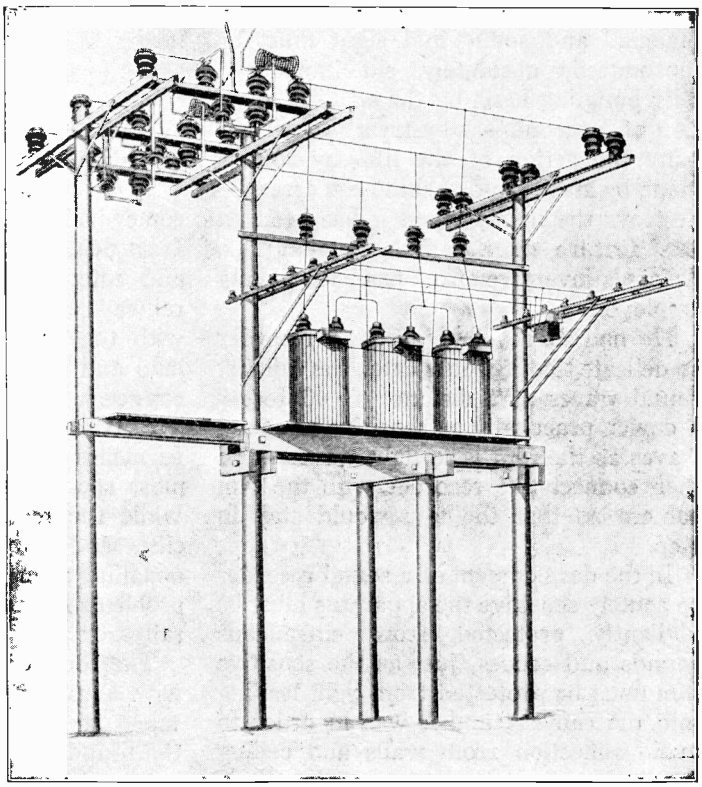
The illustration below shows a bridge with a car on it, the photograph being taken from a point on the east coast of the island.



PICTURESQUE RAILWAY IN THE ISLE OF MAN

Electricity Supply for Small Communities

The increasing demand by small communities, farmers, etc., for electricity supply where it would not pay to build a generating station has resulted in the development of weatherproof sub-stations as shown in the accompanying illustration. This type of station takes current directly from a high tension transmission system such as is common in this country and transforms the current from the high pressure of 22,000 or 33,000 volts to a lower voltage. In some cases a distribution voltage of 2,200 is used to cover a radius of two or three miles and at various points the voltage is again stepped down to 100 or 200 by means of small transformers.



A WEATHERPROOF SUB-STATION WHEREBY FARMERS AND SMALL COMMUNITIES ARE SUPPLIED WITH ELECTRIC POWER

When the load is close to the sub-station the voltage is stepped directly to 110 or 220 for use in running motors, and supplying lamps. This particular station has a capacity of 300 kilowatts or 400 horsepower and takes current directly from a 33,000 volt system. The outdoor sub-station has a low cost, does not require regular attention and enables current to be sold at a profit to small consumers in rural districts.

Shielding Off Lightning

It is reported that an official inquiry recently made in Germany concerning the effect of telephone wires on atmospheric electricity showed that a network of such wires extending over a town tended to diminish the danger from lightning during thunderstorms. Reports were compared from 900 towns, of which 560 possessed telephone systems, and the conclusion drawn was that a network of wires lessens the danger in the ratio of 1 to 4.6.

Uncle Sam's Storehouse of Electrical Knowledge

The United States government bids fair, in time, to possess one of the greatest collections in the world of literature relating to electrical subjects. Mr. Herbert Putnam, the Librarian of Congress, says that at the present time no claim is made that Uncle Sam has gathered together more lore on the subject than is contained in some of the most notable private collections. Indeed, it is admitted that the technical libraries in the possession of some of the electrical so-

cieties with headquarters in New York may surpass the government showing but it is predicted that this is only a temporary condition.

The great advantage possessed by the electrical divisions of the Library of Congress is that this Federal institution, through having as its adjunct the United States Copyright Office, automatically comes into possession of every new book on an electrical subject that is copyrighted in America. Under the law two copies of each copyrighted work must be deposited with the Register of Copyrights (a subordinate of the Librarian of Congress) and one copy of each work thus deposited, if it proves to have any permanent value, is immediately placed in the regular electrical collection. By this same process the library secures, as issued, copies of all the leading periodicals devoted to electricity in any of its branches and at the close of each year or upon the conclusion of a volume the accumulated issues of each of these trade or scientific journals are bound and become available for reference.

Two divisions or classes in the library, devoted specially to electrical subjects, embrace most of the literature in this sphere. The Division of Electric Apparatus and Instruments has at the present time something more than 800 books whereas more than 2400 volumes have places in the Division of Electrical Engineering. In addition, there are a number of works on electrochemistry, electrolysis, electrolytes, etc., so that all told the number of books on electrical topics is considerably in excess of 3500 volumes.

The Library of Congress is not a circulating library in the ordinary acceptance of the term but the public is free to make use of all the collections for reference work and students who come to Washington to have the advantages of the library are afforded all the facilities of an admirably arranged reading room. It is also possible in many instances for engineers, inventors and other persons who are seriously engaged in electrical work to make arrangements whereby any of the volumes in the Library of Congress which they may desire to consult can be placed at their disposal through the temporary transfer of the books from the Washington institution to a local library in their home city.

Stamp Cancelling and Postmarking Machine

One of the most economical of the time and labor saving devices which are being introduced by the United States Post Office Department in the post offices of all the larger American cities is the electrically operated machine which mechanically cancels the stamps and imprints postmarks on letters. The machine, operated by ordinary service current, is capable of performing the double operation of canceling and postmarking

CANCELLING STAMPS

at a speed of 650 letters per minute. Inasmuch as the average speed of experienced workers in hand stamping is 90 letters per minute it may be appreciated that this machine does the work of seven men. In addition it mechanically counts the envelopes that pass through it. The United States government does not buy these machines outright but merely leases them from the inventor and manufacturer.

Mr. Edison at His Everyday Tasks

By FRITZ G. MARSTELLER

In venturing to write a few words about Mr. Edison's personality, I do so entirely in the spirit of an impartial observer who had at one time the opportunity to observe the characteristics of the great inventor and who learned to admire him greatly. I shall attempt no character sketch, knowing well that great men are considered from many points of view and to strike the keynote of general harmony is often quite impossible. Still, some incidents recur to me of little everyday happenings at the great laboratories of Mr. Edison, in which he figured, that will be interesting to a great many.

The faculties of concentration and persistence are probably the fundamental tools of his brilliant success and his conquests upon the lonesome isle of individuality. I can remember well the following incident: I was doing night work in the electric testing department, and all through the early part of the night I heard repetitions of a particular opera, reproduced by a phonograph in the room adjoining. It was frequently exceedingly monotonous to hear the same song—excellent as it was—over and over again for hours and hours. We, of course, knew well that Edison's "bulldog" persistency was at work there, trying to search for and remedy the seat of some little fault or mechanical defect his critical ear discovered. Suddenly it stopped! This event conveyed to us about the same psychological sensation as when, out of the depth of silence itself, there unexpectedly comes forth the bursting sound of a violent explosion.

Shortly after we had recuperated from the shock, Edison himself appeared at our door and asked in his good-natured way: "Say, boys, what time is it anyhow?"

"Half-past two!" we responded simultaneously.

"Hah! Hah!" he laughed most heartily, "I thought it was about eleven!"

By this time I do not remember exactly whether the old gentleman went back to work or not; presuming however my memory is not deceiving me, I believe he decided that morning that it might perhaps be more advantageous to put off the endurance race between his personal "stick-to-it" and the mechanical perversity of the phonograph. However, we knew that in a few hours the show would begin all over again until Edison had either remedied the fault he was after or had at least made a considerable step in its improvement.

He can keep this up for days and days, weeks and weeks—in fact for months and months! In view of all this, it may seem very strange indeed, when one stops to consider the fact that Edison rarely if ever takes physical exercises of any kind. It certainly is most phenomenal.

I have never seen him walk more than was absolutely necessary, and this only within his spacious laboratory. Even to his residence, not more than ten minutes' walk from the laboratory, he is invariably driven in an electric vehicle equipped with his batteries.

It is not unusual to see meals brought in a basket from the house to his working place and he can satisfy his modest appetite either in the big library or sometimes within the very imbroglio of his phonograph testing rooms.

Like most men, Edison has peculiarities of his own. So, for instance, that unfortunate person being an innocent devotee of the fair "Goddess Cigarette" within the venerable halls of Edison's omnipotence most assuredly has not much chance of winning "the old man's" favor. In all probability, after having received from him a kindly hint to "cut it out," and having failed to

observe the same, somebody—anybody—might suddenly experience the discomfort of being confronted with the problem of looking for another guarantee of three square meals a day. Yet Edison has apparently no general objection to one's smoking a cigar or pipe, or chewing a good brand of tobacco.

It does not require any effort at all on my part to recollect the following little anecdote. It was during the latter part of a mid-winter's afternoon as I was sitting at my desk in the laboratory. It was about the time when one is in doubt as to whether it would be more economical to turn the light on or wait a little while. At any rate, while immersed in this sort of mental speculation, I was called back from the land of empty thoughts by seeing the approaching silhouette of the master. In the perversity of human nature, I quickly resumed the attitude of the diligent worker.

"What is the matter with you, are you going to smoke that stuff too?" he shouted at me in a voice that, at least, was determined. While I was still wondering what he was talking about, he came toward me and suddenly fell into a fit of most youthful laughter. After having enjoyed himself thoroughly, he turned around and said with a smile, not of the sardonic kind, "Never mind. That pencil you have in your mouth there, looked to me like a cigarette!"

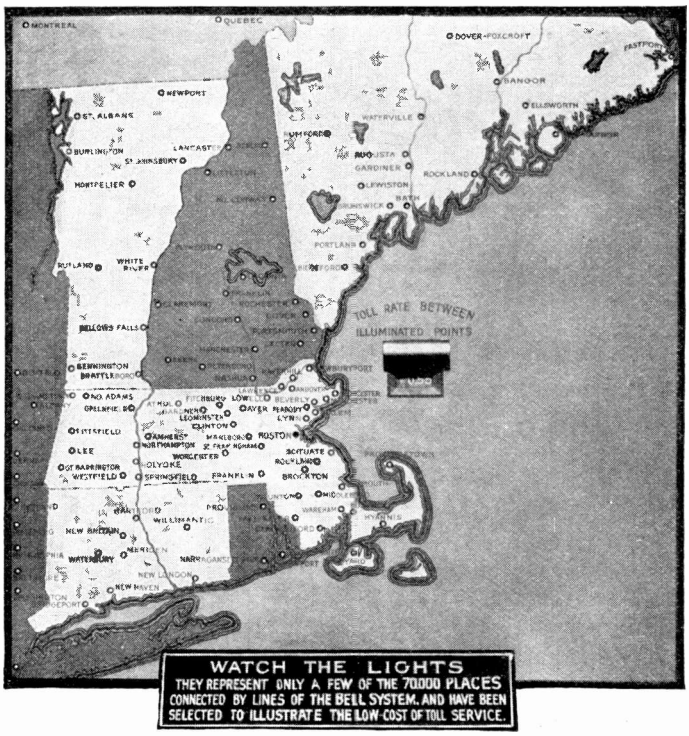
Edison was a great frequenter of the electrical testing department, which was quite natural. The storage battery, his youngest pet, needed the constant care and supervision of its creator. Now and then he would sit down and represent some of his suggestions, as they were formed in his resourceful brain, by hasty sketches upon the sheets of some pad lying around. Often he would make a skilful combination of desired lines on one sheet, without turning it over, throw it on the floor and keep this up until the sheets all around would impress me like the dead and wounded of a great battle. I often wondered why he did not turn each sheet over before using the next one and the only explanation I can make is that he saved perhaps a trifle more time, which is so invaluable to him.

Edison hates all ostentatious display and mere showing off. Among older members of the laboratory an incident representative of his propensity in this respect, is well known. A young man of the laboratory's office appeared one day with an extremely red necktie.

"Where in the world did you get that tie from?" Edison inquired, without any desire to be inquisitive about this detail. Before the speechless man of the office force could think of something to say, his master tapped him slightly upon the shoulder and spoke in solemn voice: "For goodness' sake, here is a quarter; go ahead and buy another kind of a tie!"

The more we reflect upon these few little narratives, typical as they are, humorous as they may be, yet, leaving all other considerations aside, the more they show us that a man like Edison, with all his greatness and his spectacular triumphs, is after all very human indeed.

Unique Telephone Advertising



AN ILLUMINATED TOLL MAP

An illuminated toll map of the five New England states, representing the territory covered by the New England Telephone & Telegraph Company, has recently been placed in the window of the Tremont Street, Boston, office of the company, to instruct the public in the value of using the telephone toll lines for inter-city communications and quick service. This map shows all the New England states and cities and towns having telephone exchanges and toll line connections and graphically illustrates the low cost of telephoning. The map is six feet square, made of five ply soft pine stock.

Distributed throughout the New England states are numerous small electric lights, each representing a city or town connected by the New England Company's system.

The mechanism of the map is so arranged that any one of 20 or more large toll points can be made the "key city." The lamp representing the "key city" or point of display is red and remains permanently lighted, the other 109 lamps on the map being lighted in sequence and the toll rate between the two illuminated points appearing in a space at the right of the map on an apparatus working on the principle of a cyclometer. On this particular map Boston is the fixed point or key city, but Worcester, for example, could have a similar map on display, with that city as the fixed starting point or key city.

The rates on the indicator are displayed on a four inch ribbon of blue silk taffeta, 233¾ inches in length and extended over six rollers or drums in order properly to stow its length away within the height of the map. The rates are marked upon this ribbon with a white elastic paint.

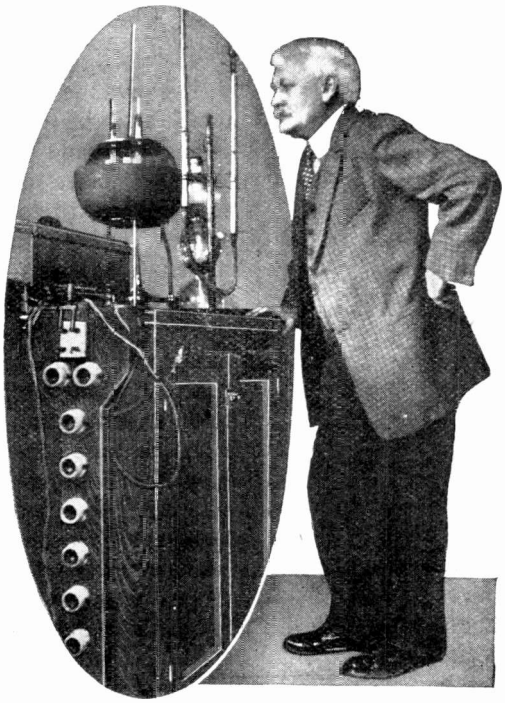
The operating mechanism is comparatively simple. A small motor, approximately 3¾ inches in diameter, is operated from a 48 volt battery current transmitted over underground circuits from the nearest central telephone exchange office. This motor is connected by means of worm and bevel gears to a large cam, which in turn is connected with one of the six drums referred to above in such a manner that every 7½ seconds this drum is rotated sufficiently to bring a new rate opposite the opening provided for display. During its rotation this drum closes an electrical contact, which in turn operates a sign flasher, lighting a lamp representing the toll point corresponding to the rate shown upon the ribbon.

Electricity and High Explosives

A number of agencies which are interested in various phases of world progress are becoming very much concerned over the subject of electricity and high explosives. The increasing use of both these forces—often in close proximity—in the arts and industries is the cause of the present organized effort to determine the relation of electricity to high explosives; the dangers incurred; the preventatives, etc.

Several branches of the national government are conducting investigations—for instance, the investigation by the Department of the Interior of the danger of using electricity in the vicinity of explosives—and they have enlisted for this research work the services of Dr. Charles E. Munroe, one of the greatest experts in the world on the subject of high explosives.

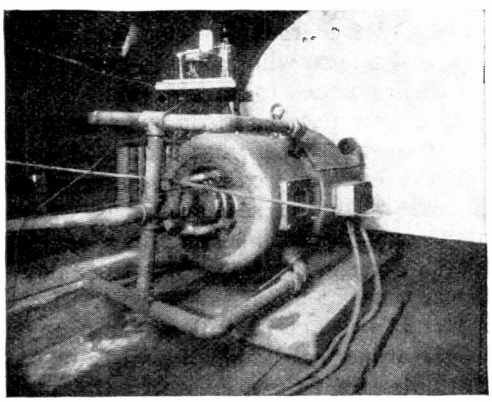
The railroads of the country are also making a very exhaustive investigation by means of a special bureau in New York City over which Col. Dunn, another expert, presides. The subject is one of increasing importance to transportation lines owing to the tendency to electrify our railroad systems.



PROF. CHARLES E. MUNROE, EXPERT ON HIGH EXPLOSIVES, MAKING ELECTRICAL TESTS ON DYNAMITE

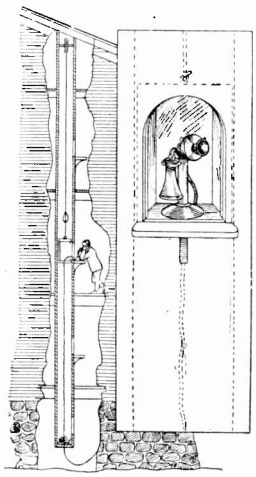
Bureau of Mines and its Electrical Investigations

The electrical section of the United States Government Bureau of Mines has as its object the investigation of all the conditions under which electricity is used underground, in order that assistance may be rendered to all who use or manufacture electrical mining equipment. It is the aim to attempt to discover the causes of accidents from the use of electricity in mines and to suggest means for the prevention of such accidents; to make tests of the safety of electrical equipment under conditions most conducive to disaster, etc. Although the primary function of the bureau is to investigate and test rather than to develop new inventions in this field, facts are frequently brought out that are proving of the greatest assistance to those who are engaged in designing this class of electrical equipment. Motor tests, lamp tests and tests of insulation are a few of the present activities.



A MOTOR UNDER TEST TO DETERMINE THE LIABILITY OF ITS IGNITING EXPLOSIVE GASES

Telephone Carried by the Dumb-waiter



TELEPHONE IN DUMB-WAITER

The manner in which a single telephone is made to take the place of extension telephones is here shown. The instrument is installed upon the lift of the dumb-waiter and a sufficiently long and flexible connection is spliced into the telephone circuit. All that is then necessary in order to answer the telephone from any floor is to pull the rope of the dumb-waiter.

Economy of Electric Ironing Machines

While at first glance the use of an electrically heated ironing machine in the home may appear to be expensive, the example of the great popularity of the ordinary electric flatiron and its superiority in every way over the old iron heated over a fire, teaches us not to be too hasty in coming to conclusions. The expense of operating the electric flatiron is from five to six cents an hour depending upon the rate charged for current; and at this cost no one who has used the electric iron will go back to the old kind.

If the electric hand iron has so strongly established itself what chance is there for the electric ironing machine to do likewise? Let us see, taking as an example a 37 inch machine now on the market, consuming 3,000 watts per hour, or six times as much as the electric hand iron. It will not take more per ironing, as the ironer would do the work in one sixth the time required to do the same work by hand and the time is by far the most important element to be considered.

In most localities the laundresses receive about $0.15 an hour for this work. No housewife would care to value her time at less than this, so that the saving on each week would be approximately $1.00 for an ordinary household. In many households the ironing is a much larger one with a consequent greater saving. The other advantage is that by reason of the greater pressure employed by the ironing machine, a more beautiful and even finish is obtained, and on account of the large volume of metal in the ironing shoe, the chance of overheating is reduced to a minimum.

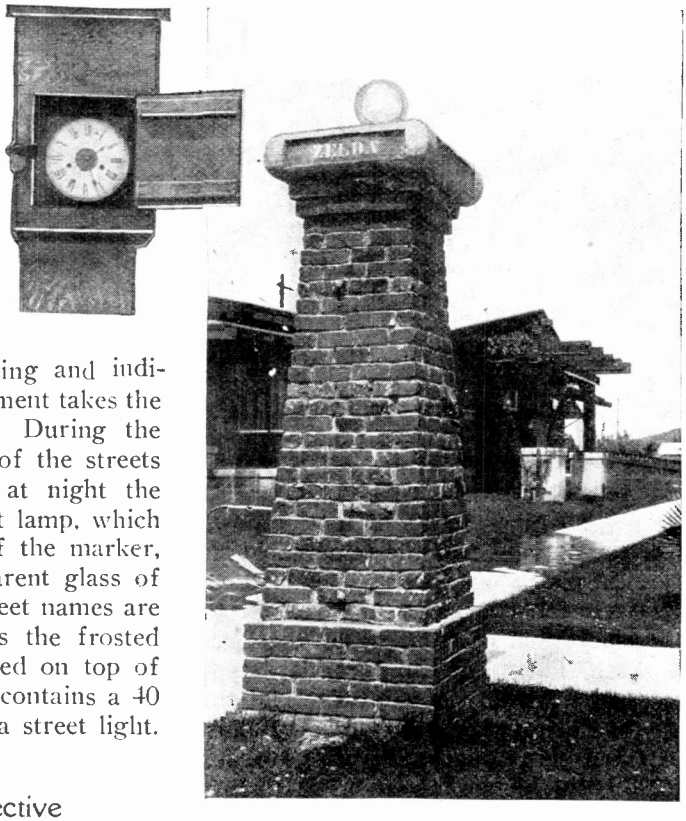
IRONING MACHINE WHICH POSSESSES ADVANTAGES FOR HOME USE

Opening a Door Over 2,600 Miles of Wires

Pressing a button on one side of the world to start a celebration on the other side is nearly always a formality in which the imagination forms the link between the two objects. At the proper moment Queen Mary of England, sitting in a room of Buckingham Palace in the city of London, will touch an electric button that will actually swing open the front doors of a new sanitarium in Toronto, Canada, 2,600 miles distant. Arrangements have been completed to that effect,

and it will require not less than fifteen wire connection, including the trans-Atlantic cable, the telegraph systems in the Old Country, and the many relays between Halifax and Toronto. The formalities at the hospital will start at 11 o'clock in the morning, which will be 4:30 p. m. in London.

Combined Street Light and Indicator



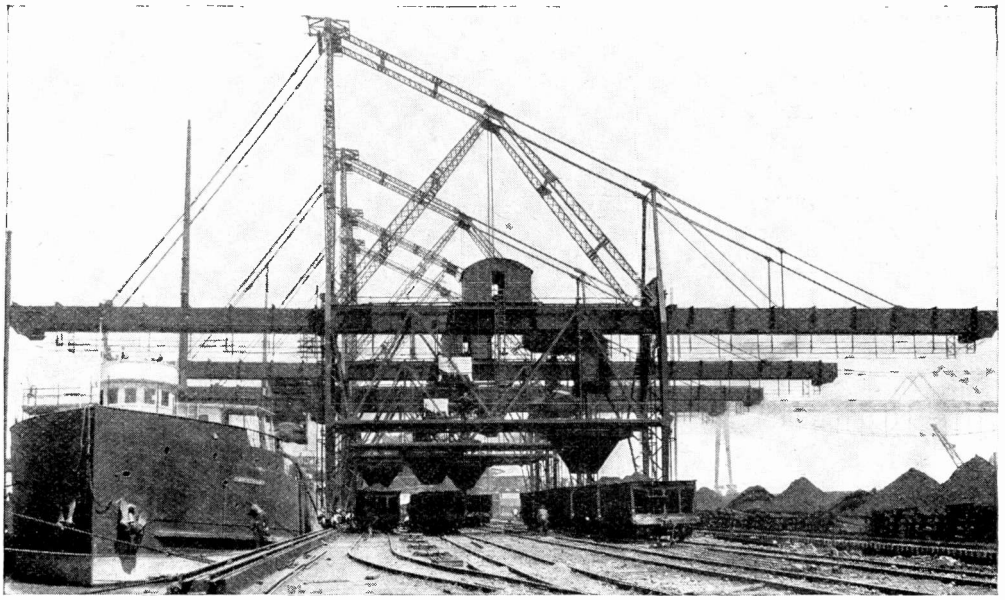
A new device for the lighting and indicating of streets in large and small tracts of land has been presented by a home building company operating a short distance north of Los Angeles. In addition to having the effect of lighting and indicating the street, this monument takes the place of a tract marker. During the daylight hours the names of the streets are plainly visible, while at night the light from the incandescent lamp, which is placed inside the cap of the marker, shines through the transparent glass of which the letters of the street names are made. In addition to this the frosted glass globe, which is located on top of the cement cap and which contains a 40 candlepower lamp, acts as a street light.

Microphone Detective

In France there is employed an application of the microphone to detect fire damp in mines. This is its principle: If sound waves from two pipes of equal pitch impinge on microphones connected in series with a telephone, a clear note is heard; but if one of the pipes emits a slightly different note, beats will be heard in the telephone. Here is the application: One pipe is placed in the mine, the other above ground, and they are blown simultaneously. If the air in the mine is charged with fire damp, it will produce a different note from that produced by clear air, owing to the difference of density, and in consequence, a series of beats in the telephone gives warning of the presence of fire damp.

Electric Time Signals

Some time ago the Harvard Observatory put into operation a most interesting method of giving time signals by electric flashes. By a relay connected directly with the great observatory clock, momentary interruptions are made every two seconds in a bank of electric lights, with a pause at the end of each minute and a longer interval at the end of each five minutes, during which time the lights burn steadily. In other words, the time signals formerly given by beats are repeated by electric lights. The flashes are visible for a distance of ten miles, or five times as far as the time call could be seen by the naked eye.



A "FAST PLANT" ON THE GREAT LAKES TRANSFERRING IRON ORE

Ore Unloaders on the Great Lakes

It is significant of the tendencies of the times that electricity is rapidly superseding all other forms of motive power for the operation of the remarkable machines which mechanically unload the great freight steamers employed for the transportation of iron ore on the Great Lakes. There are three standard types of ore unloading apparatus. The first is the "bridge tramway" type of hoisting and conveying apparatus. The second is an improvement on this known as the "fast plant" or direct unloader. The third is the automatic unloader. All three make use of clam-shell or grab buckets which scoop up the ore mechanically and these machines are so arranged that the ore lifted in buckets from the hold of the ship may be conveyed at will and dumped automatically either on a stock pile, in a storage bin, or on the cars which are waiting on railroad tracks beneath the ore unloaders and which convey this raw material direct to the blast furnaces.

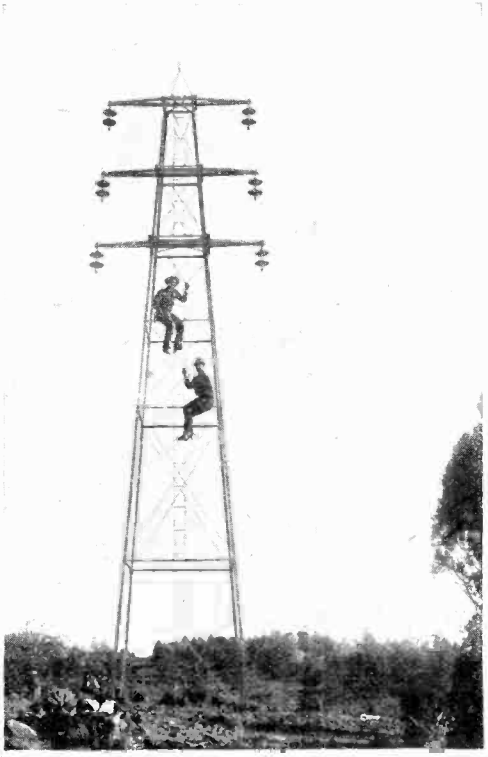
The operator of the unloader, controller in hand, is so located that he can see at all times every movement of the ore bucket under his control. By means of these electrical marvels a 10,000 ton ship may be unloaded in less than one working day.

Forest Rangers and Their Odd Observatories

Electric power transmission line towers have been "discovered" by the Forest Service rangers as lookout stations. Whether the rangers are trespassing by climbing the towers or whether the towers themselves are trespassing by being on government land has not yet been determined.

In the vast territory comprising the far western national forests, where the fire lookout towers erected by the Service are few and far between the power line masts are used regularly by rangers on fire patrol duty. In lightly timbered districts these towers in many cases furnish almost the only point of vantage for a lookout.

With the harnessing of the mountain stream to the turbine a network of these



FOREST RANGERS ON THEIR LATEST TYPE OF LOOK-OUT TOWER

lines is gradually being woven over the public domain. In the picture is shown a part of the power line which carries 22,000 volts across a corner of the Prescott National Forest in Arizona.

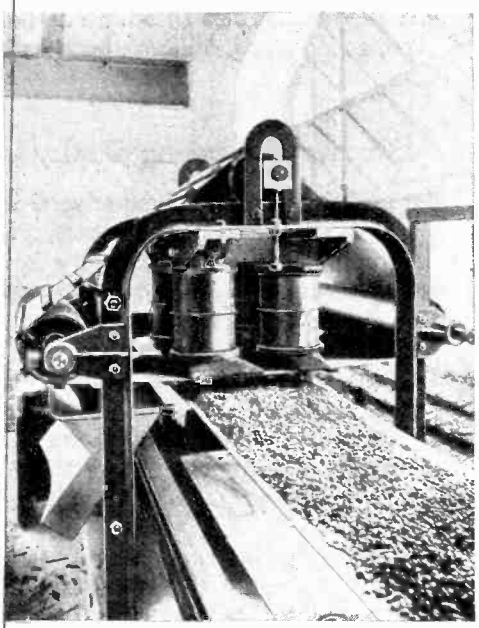
Magnetic Separator

The magnetic separator is the latest method of picking iron objects out of materials which have to be finely ground, in which case iron bolts, nuts, nails, etc. would damage the apparatus. The material is carried on an endless belt beneath a set of powerful electro-magnets. The poles of the magnets pick up the iron objects and hold them to the slatted belt which travels under the pole faces at right angles to the main belt. As the slatted belt travels to the left the nails, etc. clinging to it are carried out from the influence of the magnets and drop into a chute.

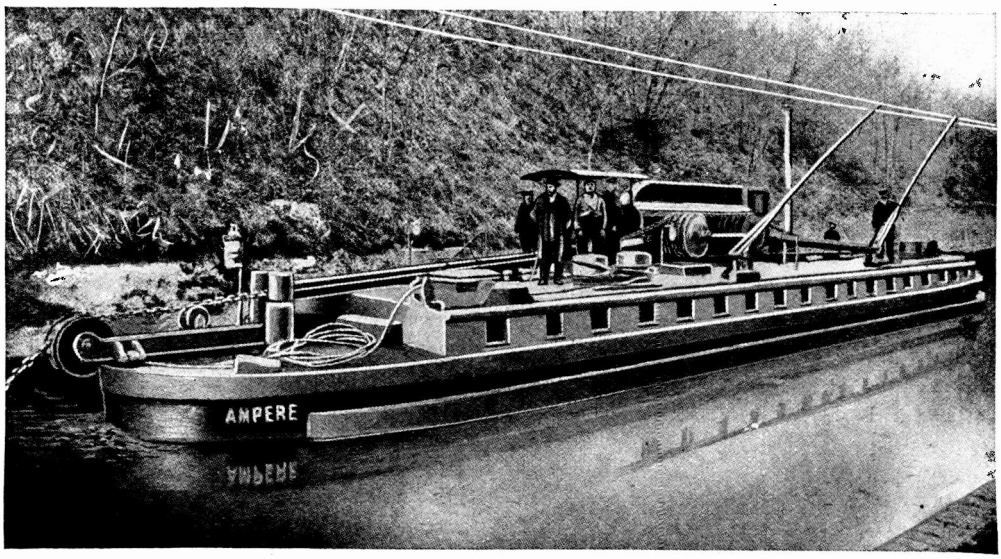
Pierre Loti on Sign Lighting

One of the most distinguished writers of the Old World, Pierre Loti, has just recorded in the *Century,* as did Arnold Bennett in *Harper's,* his night impressions of New York and in both instances it is upon "sign lighting" that emphasis is laid.

"Far, near and everywhere, words and sentences are written over the city in great letters of fire, last for an instant, disappear, and then reappear. Figures gambol and gesticulate, among which I already have some old acquaintances, as, for example, the goblin who brandishes his colossal tooth-brushes. . . . Seen from here the city looks infinitely large; as far as the eye can reach, electricity traces zig-zags, palpitates, winks, dazzles, and finally, toward the horizon, merges in a diffused glow as of the aurora borealis. Never before has New York seemed to me so unmistakably the capital of modernism; viewed at night from a height like this she fascinates and frightens."



MAGNETIC SEPARATOR



ELECTRIC TOWBOATS IN THE CANALS OF FRANCE

Electric towboats of the type shown in this picture have just been put into use on one of the canals in France and are working very well. Current is taken into the boat by a double trolley running upon the two 500 volt overhead wires. The canal boat is of the kind which runs by hauling upon a chain which is laid along the bottom of the canal, and in the middle of the boat is installed the motor driven mechanism consisting of a set of two drums each, operated by a 50 horse power electric motor. There are also used two motors of the same size for running the screw propellors with which the boat is also fitted. The boat can be run in either direction without any change, as it is built alike on both ends.

Effective Advertising Display

An ingenious motor driven advertising display is shown in the accompanying photograph taken in the yard of a large typewriter factory. The company made use of the top of a fire pump house by building a glass enclosure with a pitched roof to house a model of one of its standard machines. By means of a ½ horsepower motor in the pump house the wooden model is rotated during the day and evening at a speed of six revolutions per minute.

This unique typewriter exhibit stands within a few feet of the street and is a constant topic of conversation among passersby.

REVOLVING TYPEWRITER DISPLAY

Testing Mine Gas Ignition

The United States Bureau of Mines has had experts at work studying the ignition of mine gases by the filaments of electric lamps, and in these investigations extremely original apparatus here shown was made and employed to bring about certain desired conditions.

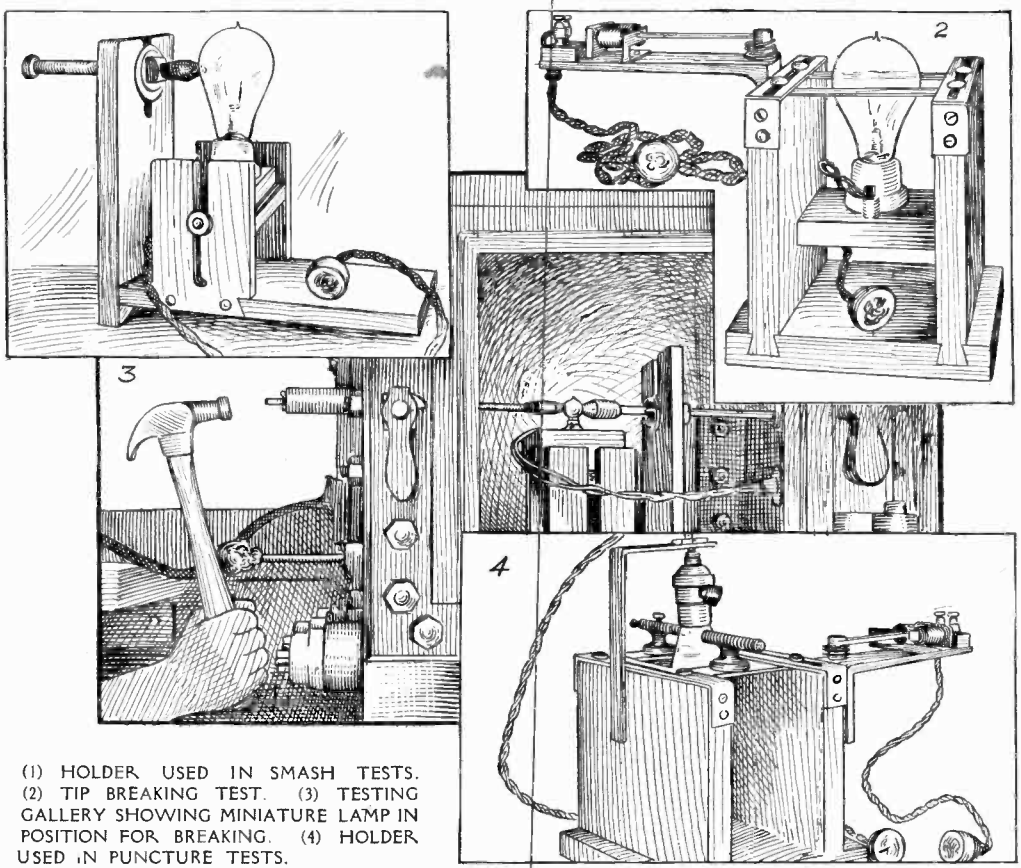
A gas-tight box, or "gallery," as it was called, was made for containing the gaseous mixture (air and gas) and inside this the lamps in the proper apparatus were tested. The most explosive mixture of natural gas and air known, namely, 8.6 per cent of the first and 91.4 per cent of the second, was used in all the tests.

One illustration shows a miniature lamp in a holder within the gallery ready to receive the breaking test, administered by a blow of the hammer upon the end of a rod communicating with the interior, the blow affecting opposite sides of the bulb.

In the smash test the bulb was held rigidly in such a way that it could be struck squarely by a sliding rod.

In the tip breaking test the lamp was firmly held in the holder, while an arm magnetically controlled and actuated by a spring swept across the tip of the bulb, breaking it off clean and allowing the explosive mixture to enter.

In the puncture test the lamp bulb was held suspended between two pointed rods fitted into small indentations made in the bulb by a blowpipe flame. One of the rods was movable. Upon closing a switch the spring actuated arm swept around and struck the movable rod a blow sufficient to punch a small hole in the glass bulb.



(1) HOLDER USED IN SMASH TESTS. (2) TIP BREAKING TEST. (3) TESTING GALLERY SHOWING MINIATURE LAMP IN POSITION FOR BREAKING. (4) HOLDER USED IN PUNCTURE TESTS.

The Painter of the Deeps

Quite a good many years ago a group of young Irish and Scotch boys were in the habit of playing tag under the surface of the shallow waters of the Firth of Forth near Edinburgh. They fitted themselves with belts to which they attached iron weights and then, slipping beneath the surface of the cool sea, for 45 seconds they were in a new world of absolute quiet, of wonderful color and dimly seen distances. With graceful, undulating strides they pursued one another until their bursting lungs compelled them to release the weights and come to the surface. It was a dangerous, foolhardy game, particularly in the case of one fat boy whose buoyancy required him to use double weights and whose short windedness more than once overcame him so that he had to be dragged to the surface by the other boys with his lungs half full of water.

This game went on during three summers and, as a consequence, years after, there was given to the world a new art—no less bold in its conception than coloring pictures in the shallow depths of the sea. One of the boys was Zarh H. Pritchard whose exquisite paintings of the submarine fairylands that exist under the Californian and Tahitian waters are now much in demand.

Young Pritchard, after the diving performances alluded to, became a painter, following the somewhat novel method of doing his work upon leather. For some years he prospered in England, his decorative work in particular being purchased by members of the royal family and other prominent and wealthy people of his country. But he never forgot the utter strangeness, the peacefulness, of the scenes which were presented to him during the times which he passed under the waters of the sea. Eventually he painted, from memory, some of the things he had seen. Upon showing these pictures in England they were laughed at, even called fakes. "He or anyone else never saw anything like that" was the general opinion.

Ten years ago he came to California, and among the friends he made was one to whom he dared to show those first submarine pictures. Robert Cameron Rogers, who had left Buffalo to live in Santa Barbara, greeted them with enthusiasm and the painter was assured that here was a new art which Americans would accept. He was told later, by Paul Elder of San Francisco, "Go down and paint while you are actually under the water. This idea is immense in its possibilities—these pictures are different from any others in the world."

From that time on the artist had but one thought—to paint at the bottom of the sea. He went out in boats over those wonderful marine growths which exist in the waters about Santa Cruz, the sister island of Santa Catalina. Then he spent seven months in the islands Tahiti and Eimeo in the South Seas. After endless experiments he used water color paper soaked in cocoanut oil and stretched on a plate of glass with surgeon's tape. Certain oil color pencils also would permit of use under water. His boyhood diving enabled him to hold his breath for 45 seconds in some 20 feet of water. He went down many times to sketch any scene in full color which he afterwards painted. But the limits of lung power were against him. The incessant returning to the surface to breathe was an exasperating interruption of fascinating work in the rendering of the wonderful coral structures existing beneath the surface. At last he obtained a diving suit and went down for the first time into the warm, marvelously clear waters, to be free to remain below for long periods, gazing at, studying, drawing and coloring the enchanting landscapes stretching away into the blue depths of the ultimate haze that surrounded him. There were mountains and between them silent rivers and lakes formed by the white coral

AFTER MANY DISCOURAGEMENTS IT COMES AT LAST TO THE REMAINS OF AN ANCIENT CITY FAR DOWN BENEATH THE GREEN WATERS

sands. In the depths were seen gliding forms, shining dimly, the great fish as phantoms. In parts of the lagoons a fairyland presented itself, of growing corals inhabitated by brilliantly colored fish disporting themselves in the clearly lit shallow waters.

"Here," said Mr. Pritchard, "I was able to obtain a perspective totally different from that seen through the glass bottoms of the boats sometimes used to look upon these scenes. That is like looking down upon a landscape from a balloon. Now I was down in the depths and could look up as well as outward, getting a far better impression of heights and masses, lights and shadows." Remember always that those mountains and rivers, those forests and lakes, those jagged precipices and unfathomable depths shown in the pictures are miniature scenes in reality. Wearing a diving suit one is able to enjoy being in the depths of from 30 to 40 feet and in clearest water his range of vision extends to no further than 300 feet. Under the surface all sense of proportion is lost. There are no trees, houses or any creatures which would enable us to gauge the size of the amazing formations. Things near one become gigantic and distances of scores of yards become scores of miles."

"And over all reigns absolute silence —absolute calm. It is this strangeness, this loneliness that fascinates me, and it is this element above all others that I think is found in my pictures.

"But I haven't yet attained the most interesting effects in my work. Wait until I have carried out the plan of an electrical engineer to illuminate these fairylands with electric light. We are now working on this scheme. The idea is simple enough, for electric lights have been used beneath the surface by divers. But imagine if you will what an immensely greater latitude will be given in making my pictures with a powerful submarine lamp suspended over my head. The light coming down from the surface is cold—its rays perpendicular to the landscape before me. Now with my electric light I shall have a sun of my own—it will give me warmer light falling as at dawn or sunset on those peaks and mountain sides making them glow and throwing shadows and highlights at points where there was only vagueness before."

This brief outline of the achievements of the submarine painter hardly gives one an idea of the absorbing interest of work of which John Burroughs said "we see here for the first time the lands from which all life has come." The painter delights in telling of the ancestors of the birds of the air, the fish and what he hopes to do in the future to enable us to understand their lives. Lead him on in conversation and perhaps he will tell you of a wild, half formulated scheme which was unfolded to him by a Norwegian, and which his adventurous spirit may sometime lead him actually to attempt. This scheme is none other than to try to find physical evidence—relics even—of the lost Atlantis. There is no absolute proof that a great continent—Atlantis—existed where is now the bottom of the Atlantic Ocean. But there are many existing facts, such as similarity in the elements of language, folklore, legends, etc., of races living on the two sides of the Atlantic; certain geological proofs, etc., which lead the scientist to believe that such a great continent existed in the past ages before it was submerged, and that a great civilization went down with it. Of this lost people, they say, there are some remnants left—the Irish, a nation of unknown origin; certain peoples on the west coasts of Spain, Portugal, France and Africa on the one side and on the other the descendants of the ancient Incas of South America—all of them with this thread of similarity running through ther languages and legends and their arts.

Now the scheme of the Norwegian in which he wishes the deep sea painter to participate, contemplates the building of

a modern submarine fitted with the latest electrical equipment—with underwater searchlights, outlet tubes for sending out divers supplied with oxygen from within the boat and any other ingeniously contrived paraphernalia which would aid in the work. This submarine is then to explore in likely places at moderate depths and try to discover traces of the lost people—perhaps submerged cities.

The idea is almost phantastic but who knows but that some day it will be tried. Imagination permits us to see this submarine monster, with its huge electric eye, prowling about in the depths. After many discouragements it comes at last to the remains of an ancient city down, far down beneath the green waters. With a shiver in the dread loneliness and darkness the diver-painter emerges from the pneumatic tube and with his electric searchlight gropes about among the ruins. At last, sitting down under a portico of pre-Inca times, he sketches what he sees of this city of Atlantis with its turrets and battlements, its palaces and slime covered walls which—but let us tell no more, awaiting some remarkable development that may give us the perfect, deep-sea going electric craft which will in safety take us down to the lands of perfect peace.

DUTCH LABORERS UNLOADING PEAT

Converting Peat Into Electricity

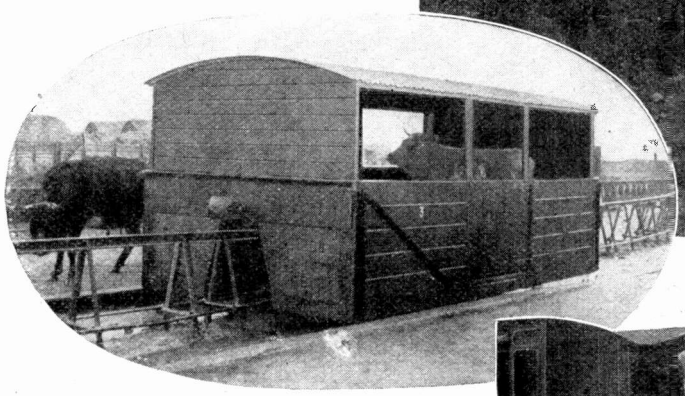
A number of the leading European nations are now expending considerable sums of money in experiments designed to discover a way in which the peat moors or peat bogs on the Continent may be converted into electricity. Peat, which has been denominated the "poor man's coal," does not permit of heavy shipping expense or freight charges, so that it is desirable that some means be found to utilize it at or near the place of production. The tests thus far made prove that it is practicable in every way to derive electricity from peat fuel on an economical basis and arrangements are completed for supplying electricity from such source to a number of German and Dutch cities and towns. Incidentally, it has been disclosed that valuable by-products may be derived. Indeed it is expected that the fertilizer, tar and other by-products will pay all expenses of operating a plant for generating electricity from peat.

The Queerest Railroad in the World to Electrify

A single rail, hung at a height of about four feet, and the engine and train split in the middle and hung on each side of the rail!

That's the kind of a railroad Ireland is to electrify if present plans are carried out.

Down in the Southwest of Ireland is the fair city of Listowel in the famous County Kerry. Here is the location of the Lartigue Railway, in a region especially frequented by tourists and society people. It

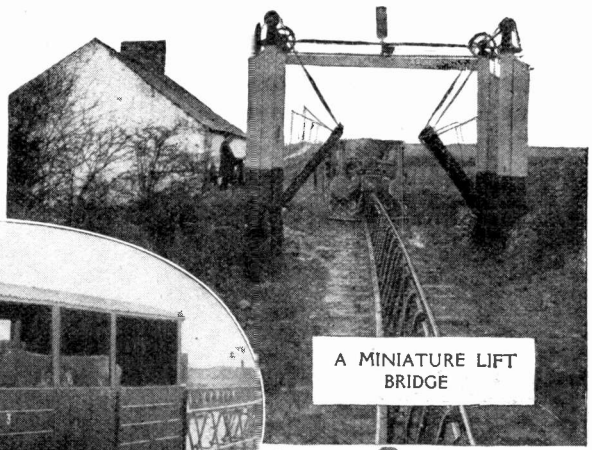


IN LOADING CATTLE CARE MUST BE TAKEN TO DISTRIBUTE THE WEIGHT EVENLY ON THE TWO SIDES OF THE CAR

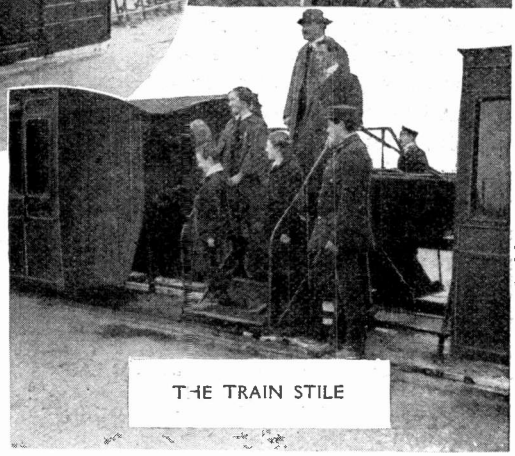
is owing to the fact of electricity's cleanliness and up-to-dateness that the present improvements are wanted. Listowel is one terminus of the Lartigue, the world's queerest railroad. Down at Ballybunion, County Kerry, on the seacoast at the mouth of the Shannon, and a famous watering place for Irish society, is the other terminus. The towns are ten miles apart.

Owing to Kerry being such a haven for tourists and Ballybunion being a resort for the minions of society, there was devised by a genius for such things the Lartigue railroad. "If," insisted he, "we can contrive the oddest railroad imaginable, we shall find all the tourists and society folk wild to ride down to Ballybunion on our line."

The idea seeped in so thoroughly that by February, 1888, there had been set up the Lartigue railroad and bookings for passage were one constant succession. To be dragged up to Listowel and back astride of a steel rail was the funniest thing you could do.



A MINIATURE LIFT BRIDGE



THE TRAIN STILE

They didn't have to hunt for the fun either. In order to ride comfortably or safely, the weight in the cars had to be as evenly balanced as possible, exactly the contingency that has to be considered in fitting out a train of pack mules with panniers.

A fat woman and a lean lover would find themselves comfortably stowed away perhaps in the same compartment, but

two fat lovers were likely to be separated. Many are the quarrels that the guards have had to meet when they have tried to "balance" their load of passengers.

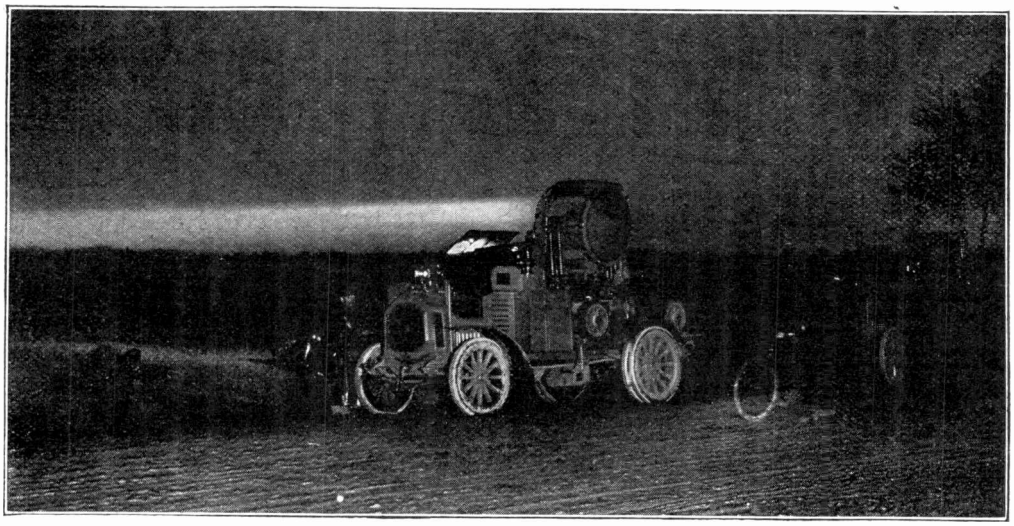
Indeed, to "sort out" a group of tourists for the Lartigue railroad is no small task. The exact mixing of the lean with the fat and the fat with the lean, so that the dinky little passenger coach shall hang on the rail as nicely balanced as the needle in a compass, is no easy undertaking.

Goodness, but it is a crazy railroad! The sight of it makes the tourist grin. The engine bisected right through the gizzard, as it were. With two smoke-stacks, two boilers, and two everything else! The little coaches looking something like two ash sheds hitched together and straddling a clothesline.

" 'Tis the r-road of tin thousand jokes, sorr," a guard on the Lartigue line told me, "an' there's a gossoon do be plannin' a book about this r-road. Shure, I bet 'twill be a big wan!

"But 'tis a proshperous vinture. We ar-re niver troubled f-r-r lack av passingers. Th' throuble is in sushpindin th' load so 'twill swing aisy. Make it too heavy on one side an' it seems as if ye was dhrunk an' was runnin' into the ditch ivery furlong ye thravel. Av coorse, in shwingin' round a cur-r-ve, th' 'cintrifigal foorce,' they calls it, sort av shwings th' outer half av a coach outward an' if we wint fasht enough we'd land in a bog intirely, f-r-r 'twould shplit th' dommed thrain down the shpine!"

The man who devised the Lartigue line certainly was a genius. It's the queerest and the funniest railroad in the world.—LIVINGSTON WRIGHT.

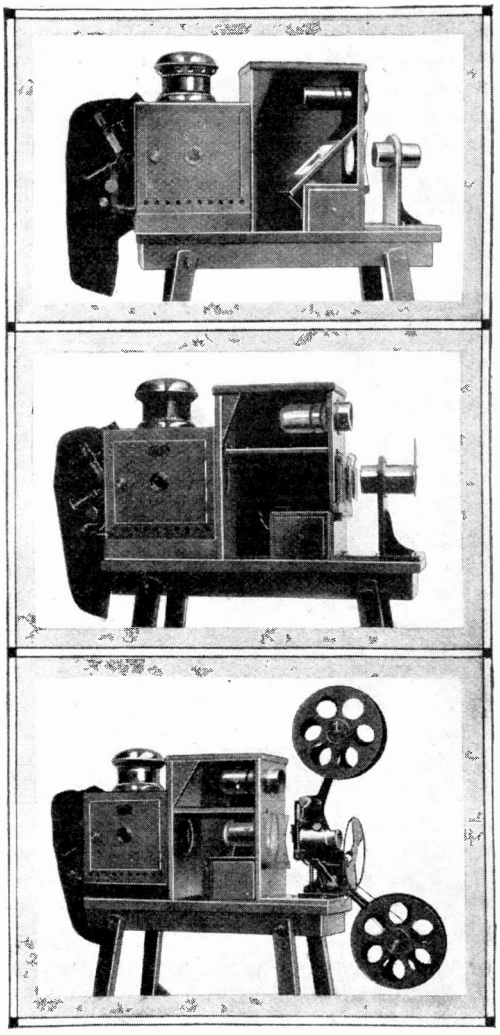


LOCATING THE ENEMY BY SEARCHLIGHT

This night photograph of a Dion war automobile searchlight was taken under actual service conditions during manœuvres in the vicinity of Paris and Versailles, France. It shows how the beam is sent out over a long distance in order to discover the whereabouts of the enemy. The current for the powerful arc lamp comes from a dynamo driven by the engine of the automobile. A second searchlight illuminated the automobile on the side toward the observer during the time that the exposure of the negative was being made.

Universal Projecting Lantern

The problem of a universal arc lamp projecting lantern seems to be very well solved in the neat and compact apparatus which is coming into use in Paris. In the first place it allows of projecting postal cards, book or newspaper prints, botanical specimens and the like by an entirely new method. The card lies upon a sloping board and the arc light falls upon it. Above is a silvered glass mirror of special kind with a lens in front of it, so as to throw the reflected image on the screen. To transform for lantern slide use, the sloping board is swung up to a horizontal position to allow the light to pass directly across and through the central hole, putting the slides in the spring holders on the outside and using the lens which is seen in front. The upper lens and mirror are now out of use. The same position of the lantern is used for moving picture projection, and here the picture machine is mounted in front of the lantern, as the lower view shows.



UNIVERSAL LANTERN—AT THE TOP ARRANGED FOR PROJECTING POSTAL CARDS, IN THE MIDDLE FOR DIRECT PROJECTION OF SLIDES, AT THE BOTTOM FOR MOTION PICTURE FILMS

Respect the Power of Electricity

Although electricity as a means of applying power no doubt causes less accidents to workmen and people generally than mechanical sources, due to the respect in which it is held and the slight possibility of coming in contact with it owing to perfection in modern insulating methods, still it should be understood that all electrical currents of sufficient power to be of use industrially may be dangerous, and whether the tension is only 100 volts or reaching into the thousands, a current passing through the body may, under certain conditions, be fatal. A writer in *Cosmos,* the Paris scientific journal has this to say upon the subject: "The danger depends upon the amount which passes through the body; any current greater than one tenth of an ampere may have fatal results. A case may occur in which the tension of the current exceeds 100 volts; if the subject is in contact with large conductors, or conducting surfaces, metallic or moist, or if he is wet in any way or sweating, the intensity may reach or exceed one tenth of an ampere. Therefore the tension of the current is not the only element to be considered. Thus a dog weighing 25 pounds has resisted a tension of 4500 volts applied at seven points in such a way that the amount of current passing through his body was less than one half

an ampere; when by changing the contacts the intensity was raised to nine tenths of an ampere, he was immediately killed. Another dog was submitted to a tension of only 58 volts; he was unaffected as long as the intensity remained below one tenth of an ampere, but as soon as it rose above that point he was killed, notwithstanding the low tension.

"Practically, the duration of the passage of the current through the body does not seem to be of consequence; at least when the contact has continued for five seconds; at the end of that time the victim is dead.

"The heart is the organ of the body which is most susceptible to the effects of the current; in practically all accidents its stoppage alone is the immediate cause of death. Animals which have resisted perfectly when the current was introduced by means of electrodes applied one at the top of the head and the other at the chin, succumbed immediately when the electrodes were placed on the fore and hind paws, so as to cause the passage of the current through the heart.

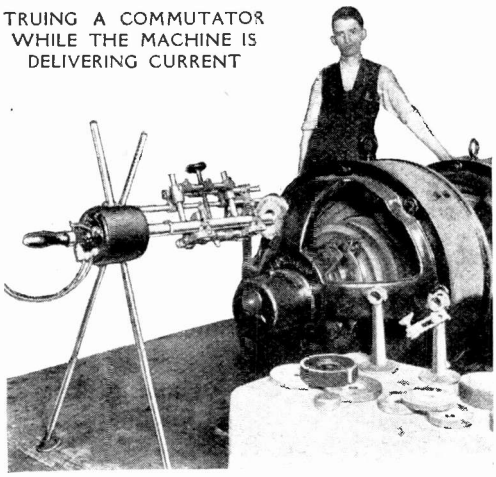
"The frequency of industrial alternating currents, whether of 25, 42 or 75 periods per second, does not appear to affect the gravity of the accidents produced. But it has been found that the alternating current is always more dangerous than the continuous current. The reason of this seems to be that the alternating current provokes muscular contraction and excretions of the skin, two phenomena which, in affecting the contact, facilitate the passage of the current through the body and consequently aggravate the effects of the accident."

Ice Cream Frozen Without Ice

An English firm has developed an ice cream freezer which does not employ ice in its operation. Instead, the outfit embodies a miniature refrigerating plant. A motor of one horsepower capacity drives a pump which compresses carbonic acid gas. This compressed gas passes through coiled pipes in the freezer, and surrounding the cream can in place of the usual cracked ice. As the gas expands in the pipes it absorbs heat as in the usual refrigeration system and the pipes become extremely cold, freezing the cream.

Truing Up the Commutators

In many installations of direct current machinery, the "truing up" of the commutators (which is periodically necessary, the frequency of same depending upon the care and intelligence with which they are operated) usually means that the machine is out of commission during the operation.



TRUING A COMMUTATOR WHILE THE MACHINE IS DELIVERING CURRENT

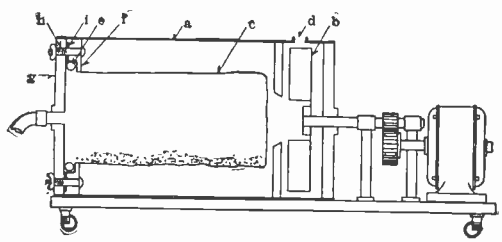
The illustration shows a device recently designed and marketed that can be used while the dynamo is supplying current, and, in case he dynamo under repair is the only source of electricity, it is necessary for it to run, as the motor which drives the grinding wheels would have to obtain its current therefrom.

All that remains to be done after the standards are adjusted and the coarse, non-conducting wheel placed in contact with and revolving in the opposite direction to the commutator, is to change the wheels as the work progresses to ones of finer abrasive construction so that a smooth, final finish may be obtained.

Homemade Vacuum Cleaner

With a little mechanical ability and inexpensive materials, this device for making the housekeeper's work easier was built by the owner. The dust receptacle, motor and fan are mounted, as shown in the diagram, on a rolling platform. There is a cylindrical tank (a) and a volute fan (b), which draws through the dust bag (c) and discharges through the outlet (d). The partition ends are of wood, fitted so as to be air tight. The motor which runs at 1,120 revolutions per minute operates the fan at 3,000 revolutions per minute by a rawhide gear. The dust bag is held by a wire ring (e), which fits into an angular groove in the wood seat (f). The head (g) is held in position by carriage bolts (h) and wing nuts and the felt washer (i) makes the joint air tight.

A Westinghouse 1-6 horsepower small motor is attached to the vacuum cleaner platform by bolts and wing nuts so that it can be easily removed for other purposes.



SHOWING THE HOMEMADE VACUUM CLEANER IN USE AND THE PARTS ENTERING INTO ITS CONSTRUCTION

Presidents and the Telephone

Garfield was the first among American presidents to possess a telephone. An exhibition instrument was placed in his house, without cost, in 1878, while he was still a member of congress. Neither Cleveland nor Harrison, for temperamental reasons, used the magic wire very often. Under their regime, there was one lonely, idle telephone in the White House, used by the servants.

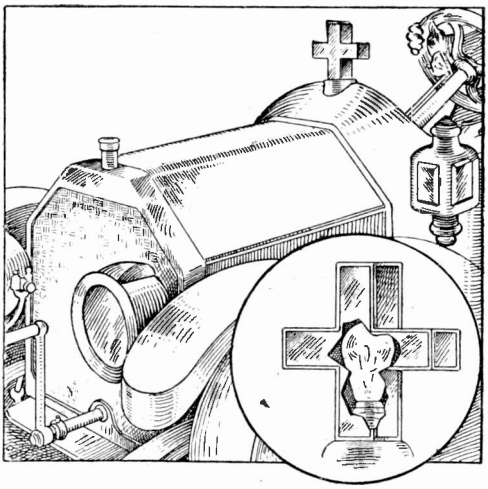
With McKinley came a new order of things. To him a telephone was more than a necessity. It was a pastime, an exhilarating sport. He was the one president who really reveled in the comforts of telephony. In 1895 he sat in his Canton home and heard the cheers of the Chicago Convention. Later he sat there and ran the first presidential telephone campaign; talked to his managers in 38 states. Thus he came to regard the telephone with a higher degree of appreciation than any of his predecessors had done, and eulogized it on many public occasions. "It is bringing us all closer together," was his favorite phrase.

To Roosevelt the telephone was mainly for emergencies. He used it to the full during the Chicago Convention of 1907 and the peace conference at Portsmouth.

To Taft the telephone was the common avenue of conversation. He introduced at least one new telephonic custom—a long distance talk with his family every evening when he was away from home. Instead of the solitary telephone of Cleveland-Harrison days, the White House has now, in President Wilson's time, a branch exchange of its own—Main 6—with a sheaf of wires that branch out into every room as well as to the nearest central.

Red Cross Sign for Physician's Auto

It is frequently the case that doctors have to exceed the automobile speed limit on their way to emergency cases. At night, when their usual red cross signs are not visible, frequently delays occur on account of necessary explanations. To avoid these interruptions a doctor had a sign constructed of metal and glass and mounted on his machine as shown. Inside the cross is placed a small electric light connected with a storage battery circuit.



RED CROSS SIGNAL FOR PHYSICIAN'S AUTOMOBILE

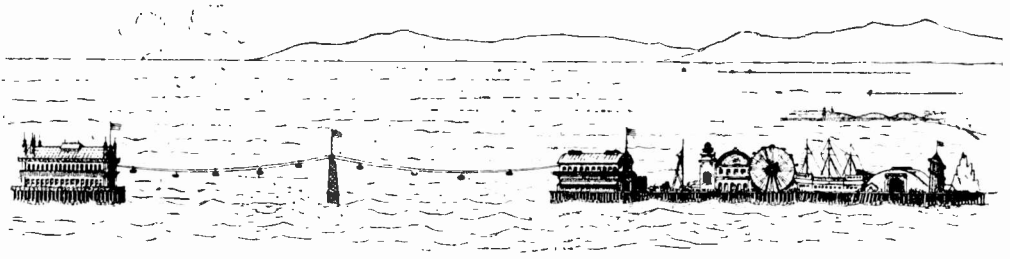
Aerial Railway Over Niagara Whirlpool

An aerial railway will be constructed over the Niagara River, some time during this summer. The line, which will be about a third of a mile long and operated by electricity, will be composed of a single strand of cable, suspended immediately above the celebrated whirlpool. The company which has applied to the Niagara Park Commission is a Spanish one, operating aerial roads to the summit of the mountains in Spain. The banks of the Niagara being of a great height will require the erection of two towers of gigantic dimensions in which the aerial cars will take on their passengers. Cables will draw the vehicle from side to side at a leisurely rate and several stops will be made on the way to give patrons their fill of scenery. At night the cables and cars will be brilliantly illuminated and it is planned even to carry a searchlight. The company claims to have had a history free from serious accident.

An Ocean Cableway

A company has been organized at Los Angeles, Calif., to construct an amusement device at Venice, Calif., one of the beach resorts near Los Angeles. It is planned to build a pier 2,000 feet out in the Pacific Ocean to serve as the sea end anchorage of an endless cable, the shore end to be placed at the sea end of one of the piers already in use.

The cable is to carry small passenger cars seating six people and the trip can be made from the shore pier out over the Pacific 2,000 feet and return, or passengers may stop off at the outer pier to enjoy deep sea fishing, dancing and other amusements there provided. The company intends to lay a cable from the shore to the pier and string colored electric lights below the surface of the ocean for the entire distance. The power is to be electrical.



The Lord of the Ether

An Autobiographical Sketch Written in 1949 in which is Related the Coming of the Wave Annihilator

By HY. GAGE

I have been asked to sketch a brief history of my career as "Lord of the Ether." It does seem absurd to again put into print the story of the coming of the Wave Annihilator, a tale which every school child knows by heart.

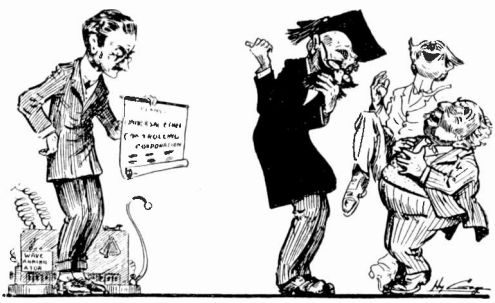
Nevertheless I will jot down a few facts, for since the United States government took over the control of the Ether Trust two years ago (1947), time has hung heavily on my hands.

I was graduated from the University of Nebraska, class of 1898, with a degree in electrical engineering. I had dabbled in electrical research, but it was not until 1913 that I hit upon the great discovery which as you know gave me absolute control of the world for a long period of years.

A copy of our prospectus dated March 17, 1913, will explain:

ANNOUNCEMENT EXTRAORDINARY!!
THE UNIVERSAL ETHER CONTROLLING CORPORATION!

At last we are ready to spring it on an unsuspecting world!



AS A JOKE I WAS DUBBED "LORD OF THE ETHER"

We have a proposition that will make the Oil Trust, the Steel Trust, the Beef Trust and the Peanut Trust fade to insignificance.

This "Ether Trust" as it has been dubbed by the press is to be owned by the little fellers, the common people, and it will give the Boodle Barons the jolt of a lifetime.

On June 1, 1913, we will receive subscriptions for the stock.

There are to be one million shares, par value $100.

No person can buy more than *one share*.

A certain number will be allotted to each country of the globe, according to population.

THE WAVE ANNIHILATOR!

We have absolute control of the ether on this planet! This is made possible by the invention of the Wave Annihilator, a very simple machine which has at its mercy every form of ether wave motion known to science, be it electricity, light, heat, sound, magnetism or what not.

As you know, all these wave motions are made possible through the existence in all space of an intangible medium which is called the ether.

From the day our company begins actual operations, without our license, no one can produce or make use of electricity, light, heat or sound!

We are prepared to sell rights to use the ether to any and all companies or individuals who pay our price. All others are hereby warned to keep out.

Our patents are granted in all countries. Our rights are secure.

We want only the common people in this company. No rich men need apply.

We are going to put the control of this world into the hands of the working man who produces its wealth by the sweat of his brow!

Will you be one of the lucky men to get a share on June 1?

Needless to say, the announcement of

my proposition started a laugh that was heard round the world. It was then that I was dubbed "Lord of the Ether," as a huge joke, but you all know how the joke reacted.

The wise guys, the scientific sharks, the high-brows, and the know-it-alls pooh poohed until they didn't have a pooh pooh left. It all worked out just as I had planned. The big fellers sat on the fence and laughed themselves to suffocation.

But the crop of suckers is now and ever shall be unlimited. I depended on them to take my stock. I knew they would bite on any kind of a hare-brained, wild-eyed scheme that promised big returns.

June 1, 1913, saw such a wild scramble for stock that riots resulted. To be brief, the allotment was over subscribed 50 times in this country, and nearly the same in others.

Now I had them all just where I wanted them. The Lord of the Ether was ready to go after the scalps of the scoffers. I had been called forty thousand kinds of a crook and scoundrel, but had put a padlock on my lips and had thrown away the key.

Things began to happen.

First by way of a sample demonstration, the biggest wireless company was served the following notice:

On and after twelve (noon) July 1, 1913, you will be required to remit to this company annually, for use of the ether, the sum of $50,000. If your check is not in our office by that date your ether will be shut off.

"Universal Ether Controlling Corporation."

Again the world was set a-giggle. This was richer than French pastry. The ether would be shut off? Wow! That's a corker! The newspapers threw a fit, the cartoonists handed me a vote of thanks for giving them someone besides Teddy to cartoon.

A few days later I issued this ultimatum to the Associated Press:

As a demonstration to the public I will put out of business for two days any New York newspaper which prints tomorrow any knocks on Yours Truly, "Lord of the Ether."

* * * * *

Next day the press went wild. Some even declined advertising to get more space to swat me. I picked the one most offensive, and gave out this interview:

The New York Daily Blank will issue no paper tomorrow or next day.

By Order, "Lord of the Ether."

THROUGH THE CONTROL OF ETHER WAVES WE ARE GOING TO GIVE THE MANAGEMENT OF THE WORLD INTO THE HANDS OF THE WORKING MAN.

Thinking perhaps I was going to throw a bomb, the Blank office was surrounded by detectives, and I was shadowed by a flock of them.

The first edition of the Evening Blank was on the press at ten next morning. The pressman threw the switch of the big motor, but not a wheel of the giant presses turned.

"Phone the boss, quick!" shouted the foreman.

"Can't get any answer! Phone's out

o' whack!" answered an assistant soon after.

The managing editor was reached by messenger. He went up in the air, and tried to go down in the elevator.

"Nothin' doin'!" said the elevator man. "The electric motor is on the fritz!"

Just as the editor ran down the last of the fourteen flights of stairs into the press room, the electric lights went out. Total darkness in the sub-basement was the result.

No paper was issued by the Evening Blank for two days.

July 1 approached and no check came from the wireless company.

At noon I phoned to the manager.

"This is the Lord of the Ether," said I. "I have received no remittance for your license. Your ether is now shut off."

And it was. Their spark went crashing to the aerials, and the message seemed to be on its way, but they soon found no answer could be received from any station.

I will give another of these early experiments which will help to show how the big fellers were taught to sit up and beg and eat out of my hand.

I served this notice on the telephone company:

It has come to our notice that you are using the ether without license from our company. We have fixed a flat rate for unlimited calls at $100,000 per year, for you. Same is now due. If not paid within three days you will have to import your ether from another planet as you cannot use ours.

"Lord of the Ether."

And three days later, not a phone in the great city was in operation. The metropolis was at a standstill, and the world stood aghast!

Next day I received a check for $100,000 from the telephone company and for $50,000 from the wireless company, and had served similar notice on most of the big corporations throughout the United States.

Then I went after the theatrical trust. Told them to ante up their license or not a sound would come from the lips of one of the performers in their theaters that night.

The plays opened, the actors appeared, the choruses trooped in, but not a peep issued from their throats, and not a person in the audience could utter a word for the space of fifteen minutes.

As I expected, I received a hurried phone call from the manager.

"Let our shows go on. I am sending a messenger with check for our license."

And so it worked all over the country. I was Lord of the Ether in reality, and the common people for once in the history of the world became masters of the universe.

The Ether Trust stock soared to fabulous prices and within a year every owner of one share became a rich man.

Within two years they rammed into the millionaire class. In five years they were crowding the multi-millionaires out, and usurping their places by buying up interests in all the ether using monopolies. In ten years they owned and controlled all the great corporations of the world.

This brings us to that eventful year of 1923, when the one great fact came home to me, that the common people whom I had lifted up to undreamed wealth and power were oppressing the former upper classes, and gradually reducing them to a state of abject slavery.

Another five years would see the certain establishment of an oligarchy of the new money power. This was more than I had counted on. Something must be done. How fortunate it was that I had assumed perpetual control of the Ether Trust from the beginning. It was now up to me to avert the coming disaster.

The result was a series of consultations with the president of the United States and his cabinet. Under conditions which I named I proposed to give the control of the Ether Trust into the keeping of the government.

In the agreement ratified by the senate, the government was to take over all nations of the earth. They could offer no resistance whatever. They were helpless. They could not make use of electricity, light, heat or sound without our permission, so there was nothing to do but come into the fold and establish the International Republic of United States.

War was to be abolished absolutely forever, and many other far reaching reforms were specified, most of which have been worked out since then, as you know.

And it all came about through my invention of the Wave Annihilator. And it was such a simple proposition at that.

Power Cables in the Baltic Sea

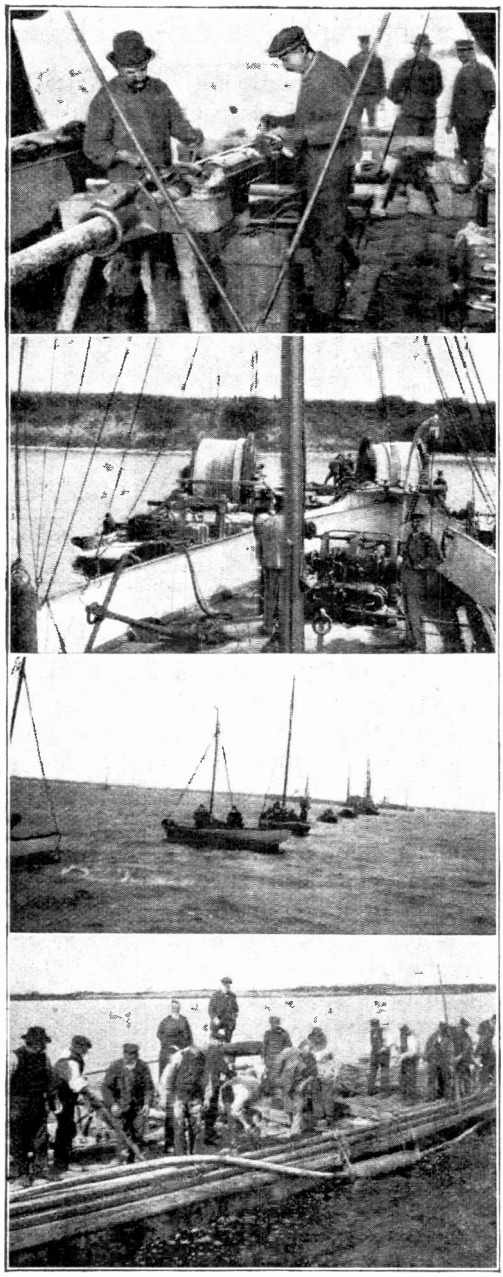
The extremely interesting scheme of power transmission by high tension submarine cables has been carried out in the Baltic Sea to supply the Isle of Rügen and the Peninsula of Wittow from the Stralsund power station, and the Isle of Fehmarn from the Lübeck power house.

The cable connecting Stralsund to the small island of Dänholm on the way to Rügen is one-fifth of a mile long and the remaining cable from here to Rügen is five-sixth of a mile in length.

The cables were carried on cable drums upon two barges coupled together by iron girders. Laying began at the Isle of Rügen when the sea was quiet and the weather favorable.

The longer cable was put down in two parts and spliced by a coupling sleeve at sea—an unusual thing to do.

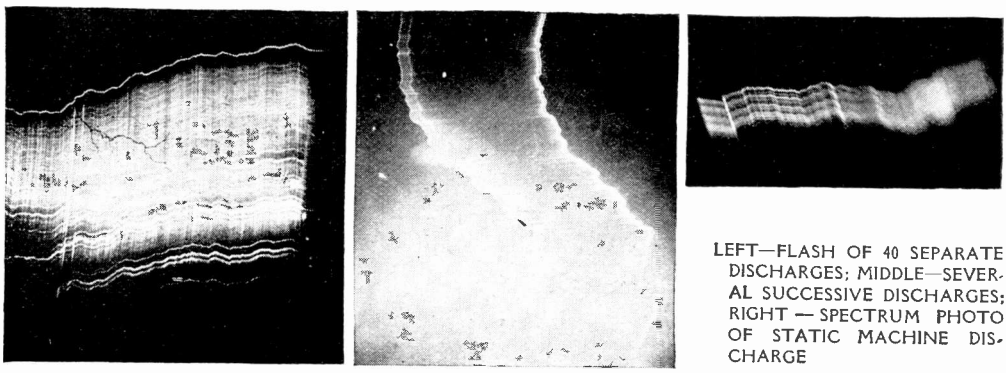
In laying the two cables to the peninsula of Wittow, fishing boats were employed. Upon each side of a boat a cable was fastened by rope. This boat was then hauled out 75 feet by a capstan on the cable steamer when another boat came up and acted as a support for the cables and so on. Shipping was interrupted on the day the cable was let go, and the night before the fishing boats were lighted by searchlights played upon them from the cable steamer, thus causing passing vessels to stop.



SPLICING AND LAYING A SUBMARINE POWER TRANSMISSION CABLE IN THE BALTIC SEA. THE LONG CABLE WAS PUT DOWN IN TWO PARTS AND SPLICED BY A COUPLING SLEEVE

Photographing Lightning Flashes

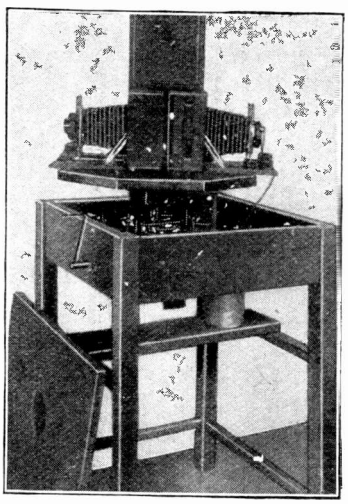
From the standpoint of electrical research the methods usually employed in making photographs of lightning, and the results attained, are as child's play compared with the achievements of Mr. Alexander Larsen, a student and an expert who, laboring on behalf of the Smithsonian Institution, has been working for several years past to disclose new found attributes of lightning by means of a unique form of photographs.



LEFT—FLASH OF 40 SEPARATE DISCHARGES; MIDDLE—SEVERAL SUCCESSIVE DISCHARGES; RIGHT — SPECTRUM PHOTO OF STATIC MACHINE DISCHARGE

The object of this systematic photographing of lightning has been to prove that a lightning flash instead of consisting of a single line of light as discerned by the human eye, is, in reality, composed of several discharges which follow one another at certain intervals in the path of the first discharge.

It was some years ago that Mr. Larsen, while making some ordinary pictures of lightning and noting the flickering of the flash, conceived the idea that if the camera could be moved in a circle at right angles to the flash the resulting picture would show not only a widening of the flash, provided it was composed of separate parts but would also determine the duration of the flash. The first experiments were made with a camera moved by hand and swung from right to left and back again, each swing occupying about one second and covering an angle of 60 degrees. The negatives obtained showed that a lightning discharge was composed of as many as 34 to 40 separate rushes or discharges but the evidence was not as complete as Mr. Larsen desired.



MOVING CAMERA APPARATUS FOR PICTURING LIGHTNING FLASHES

Accordingly, a new method of moving the camera was devised. With this improved apparatus some very remarkable photographs have been obtained as is attested by those reproduced herewith. The energy for swinging the camera under the present arrangement is supplied by a spring motor of the kind used to operate revolving stands for exhibiting goods in show windows.

The employment of a motor movement of uniform speed has rendered it possible to ascertain the exact duration of a flash or the intervals between the rushes. Mr. Larsen's experience to date is that a speed of one revolution in ten seconds is the most suitable one for the turntable.

Latest Advances in the Science of Radiography

During the last few years wonderful advance has been made, both in the manufacture of powerful high tension transformers and induction coils for radiographic purposes and work is now

A PASTE, GRADUALLY FORCED INTO THE ARTERIES, PERMITS THE LATTER TO APPEAR IN THE RADIOGRAPH

being done in seconds and even fractions of seconds where many minutes were required but a few years ago.

The progress in designing and building of apparatus, however, has not been porportionately greater than the development in the science of radiography. In former years it was believed that the radiograph or X-ray plate was limited in its usefulness to showing bone structure, fractures, dislocations and foreign bodies which are dense enough to cast a shadow. To-day, however, radiographs are being made of nearly every part of the body and such parts as the lungs, heart, kidneys, stomach, intestines, etc., may be seen on the radiographic plate. In order to show such parts, the operator must necessarily be a skilled one.

The discovery that salts containing silver or lead cast a shadow has led to the adoption of certain chemicals which are harmless when pure, and when administered in limited quantity.

Thus Reider, the German scientist, first used a preparation of bismuth which was mixed in food and eaten by the patient and the exact shape of the stomach shown. The bismuth can be followed by a series of plates so that the intestines can be shown.

The accompanying illustration shows the way in which the arteries may be shown for the purpose of study. The hand of a cadaver was severed and the arteries located. A powerful syringe previously filled with a paste made of bismuth and vaseline was attached to the artery. The paste was then gently forced into the arteries. A great deal of care is required so as not to rupture the arterial walls, but if the work is done slowly the bismuth will flow even into the fine capillaries as shown in the thumb.

The practical value of such a plate lies in the ability of the student to study the circulation, and it is probable that the medical student of the near future will in this way be able to avoid some of the disagreeable dissecting.

After seventeen years of continuous service, meter No. 1 of the New York Edison Company is still in use. It came to New York with the first shipment of the present type of meters in the summer of 1896, and after being tested was installed in a dry goods warehouse. Since then it has been moved six times and now is back in its original line of commercial activity, but in an uptown establishment. Its wanderings, though, have taken it to a fishmonger's stall, a café, a retail shop, a paper warehouse and a dwelling.

Resuscitation by the Autogenor

An oxygen generator which yields pure oxygen under any desired pressure is now on the market under the name Autogenor. It is a simple instrument thirteen inches high and weighing but seven pounds. It embodies an outer and an inner cylinder, the latter designed to receive a cartridge composed of a chemical compound, the trade name of which is Oxone. When water is introduced between the two cylinders and comes in contact with the Oxone through an opening in the inner cylinder, the Oxone gives off 322 times its volume of pure oxygen. By a suitable arrangement of valves this is allowed to escape through a tube and may be used for medical purposes, for resuscitation work in cases of drowning, asphyxiation and electric shocks and also in connection with oxy-hydrogen and oxy-acetylene blowpipes. Particularly in remote centers of distribution it has a marked advantage over the cumbersome and heavy oxygen tank containing compressed gas. Greater purity of the oxygen is also claimed.

THE AUTOGENOR IS A VALUABLE AID TO FIREMEN WHO OFTEN MUST WORK WHERE THERE ARE POISONOUS GASES

Oxone is made from sodium peroxide by a process patented by Foersterling & Phillip. The sodium peroxide is melted by the heat of an electric current, the temperature being maintained at such a point as to liberate any carbon dioxide therein without freeing the oxygen from the molten material. The product is then briquetted in suitable molds. The illustration shows the Autogenor in use at a recent fire in Chicago for resuscitating firemen partially overcome by sulphur fumes.

After June 1, 1913, wooden molding for wiring will not be allowed in New York City.

How Do You Spell It?

A large electric light company finds in its correspondence with patrons regarding the tungsten lamp the following spellings of the word "tungsten:"

Tonyston, thonks, tunxon, tonsican, tonksels, tonsend, tunshan, tungeson, thugssen, thonson, thankssten, tangstein, T Lamps (them that save current half).

Reducing the Cost of Living from the Electrical Man's Viewpoint

One cannot pick up a magazine or paper nowadays without reading of the "high cost of living"; one can hardly talk of the weather over the backyard fence with his neighbor without the same topic coming up. There is much talking and writing of the condition but unfortunately very few helpful or practical solutions are suggested for even one little part of this big burden of expense. I have often wondered if we could not cut out a lot of needless expense by teaching the public where the needless expenses are. Much money is spent by people because they do not know about cheaper though better ways of living. Not by you alone, "Brother Poor Man." The man with means is just about as bad.

My own line interests me most, of course, as I see the places where a large saving could be made there if you users of electricity could be made to see that you can do so. You have been told about it of course but it came from the electric light company. Ah! there is the rub! Wasn't it just a scheme of the company to get you to spend some more of your hard-earned cash?

Had you read the numerous articles which have appeared in the electrical magazines you would know about this, but you don't read these—only the electrical man does. They are too technical for you. What is needed is a series of articles in the popular magazines which you *do* read. That is why I am offering this article and hoping that I shall start something I can't stop. Maybe the coalman will tell us how to run our furnace to save coal or the plumber and gas man have something to say. Who knows? I for one will be glad to hear them.

A few days ago I noticed that a very prominent man had had one of the electrical contractors of my city (Denver, "The City of Lights") fix his residence so that he could use tungsten lights to advantage throughout the house. This

man is not a poor man, but he has been spending about twice as much as he needed for electric light for the past three years and then not getting a good light. When the most valuable asset we have is our eyes and we do most of our reading by artificial light, and our wives much of their mending and sewing, why don't we save our eyes when we can save our pocket books as well?

The sixteen candle power carbon lamp, which is the lamp most used for lighting, is not sufficient light to read by and it costs just three times as much to get sixteen candlepower of light this way as it does with the tungsten filament lamp. The smallest lamp you should use for reading is a 32 candlepower and if the source of light is from a chandelier you should use about 50 candlepower. This applies to the ordinary residence and not to stores or very large rooms, as the distance from the source of light will of course vary the amount required. The first tungsten lamps that came on the market were very fragile, but they have improved until they are now not much more so than the old carbon lamps.

Now let us study electricity a minute. You buy milk by the quart, sugar by the pound and electricity by the watt-hour. A kilowatt-hour is 1000 watts used for one hour. You pay about ten cents per kilowatt-hour for your electric current. The sixteen candlepower carbon lamp uses from 55 to 60 watts per hour of current, and the 32 candlepower lamp 120 watts per hour. Tungsten or Mazda lamps are known by the wattage they consume. The 40-watt lamp gives about 32 candlepower light and the 60-watt about 48 candlepower.

Suppose you have fifteen lamps in your electric fixtures and your electric bill is three dollars a month, the rate for current being ten cents per kilowatt hour. You would then be using 30 kilowatt-hours of current which is the equivalent of burning one 32 candlepower carbon lamp 250 hours per month, or about eight hours per day—which is the average for the ordinary residence, as we must remember that a large part of the time there is more than one light burning.

Now let us equip this house with tungsten lamps and see how much we can save in six months even if the company does exchange the burned-out carbon lamps for new ones, as they do in some cities.

15 40-watt Tungsten lamps @ 45	$6.75
Current for 6 mos. @ 10c. per killowat hr.	6.00
Total	$12.75

Subtract this from $18.00, which is the cost of current if we use carbon lamps, and we have a saving of $5.75. Suppose you break two lamps, you still save about $5.00. After the first six months what will it cost you? The life of the tungsten lamp is 1000 hours, you average 250 hours per month. That is only one new lamp every four months. Let us allow one every month and we have:

1 40-watt lamp	$0.45
Current, 250 hours × 40 watts = 10 KW. @ 10c. =	1.00
Total	$1.45

You are now paying $1.45 per month and you have been paying $3.00 and we have not said a word to you about saving your eyes! Isn't this worth trying? —ROBERT C. GROUT.

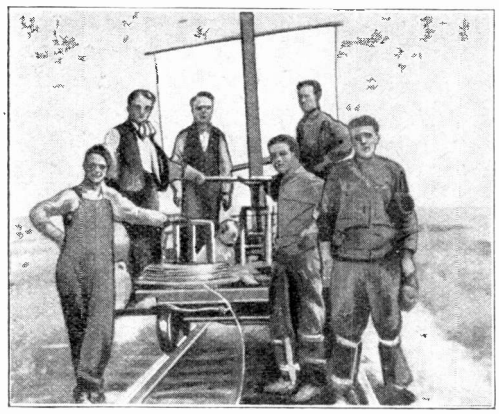
A New Application of the Telephone

There has recently been discovered in England a new application of the telephone. In order to be able to control the speed of electric motors without the need of going to the engine room, which may be at some distance, a microphone is installed on each machine in such a way as to be affected by the vibrations of the collector. Each microphone is connected by means of a double line to a small annunciator installed in the office of the manager. On this annunciator a telephone receiver can be mounted, and from the pitch and regularity of the hum of the motor reproduced in the receiver can be determined the speed and regularity of the motors.

Stringing Wire by Wind Power

The accompanying photograph shows how the prairie winds, which are the source of great annoyance to telephone men, are harnessed and made to string the very wires which they later attack with vigor.

A mast, fashioned from a small telephone pole is mounted on the front of a



SAIL PROPELLED HAND CAR USED IN STRINGING WIRE

hand car while the reels carrying the wire are placed on the rear. The brake is put in operation to prevent too speedy progress and, presto! the work begins.

Truck for 90 Foot Poles

The Philadelphia Electric Company has solved one of its most troublesome problems—the distribution of wooden poles—by the employment of electric trucks built for this purpose.

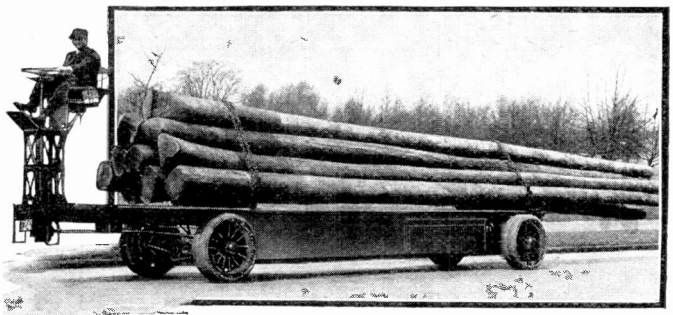
A truck that will handle poles efficiently, some of which are 90 feet long, must be designed so that the space occupied by the loaded truck will be limited to the length of the poles, this to be accomplished by allowing the poles to overhang at both the front and rear ends; it must turn in a comparatively small circle; cover more ground at a greater speed than a horse drawn vehicle and permit of the loading and unloading of poles by electric power.

The truck shown possesses these advantages, the last being accomplished by a winch located in the center of the truck and controlled either from the seat or at either side of the truck. The truck will carry a load of 12,000 pounds.

Electrokali; A New Fertilizer

A new fertilizer, which has been called electrokali, is produced in the electric furnace by treating feldspar or another mineral base of potassium with a suitable amount of carbon and iron; it produces a chemical combination of iron and silicon which can be used in steel and iron foundries, and a potassic slag which is easily soluble. This slag is first ground in a mill and then sifted. Experiments made with electrokali have shown that it is easily assimilable in all soils; it possesses also the advantage of being free from chlorides, which are supposed to be injurious to certain soils. It is also suggested that the material may be used for the manufacture of salts of potassium and aluminum.

A Swedish electro-metallurgist, Axel Lindblad, one of the builders of the



Trolhatten furnaces for the manufacture of nitrates, has already begun the manufacture of this new fertilizer, which will probably take the place of the Stassfurt salts which are imported into Sweden to the value of $2,000,000 annually.

PSYCHOLOGICAL TESTS FOR MOTORMEN

That a motorman or chauffeur should be examined by systematic psychological methods, so that accidents may be avoided and the best workers obtained, is the contention of Professor Hugo Munsterberg, the celebrated Harvard psychologist, in his new book, "Psychology and Industrial Efficiency." This he would also apply to engineers, electricians in charge of important work, and

PROF. HUGO MUNSTERBERG, CELEBRATED HARVARD PSYCHOLOGIST

other workers where there is a demand upon the brain for quick action in emergencies.

"The Best Possible Man," and "The Best Possible Work" are his two main topics. He has been making experiments at Harvard on motormen and others for some time past, and on the results of these bases his conclusions.

"The problem of securing fit motormen for the electric railways," he says, "is an easy one to study. The mental process which is the central one for the problem of accidents is a particularly complicated act of attention by which the manifoldness of objects, the pedestrians, carriages and automobiles are continuously observed with reference to their rapidity and direction in the rapidly changing panorama of the street. In the face of such manifoldness, there are men whose impulses are almost inhibited and who instrictively desire to wait for the movement of the nearest objects; they would evidently be unfit for the service, as they would drive the car too slowly.

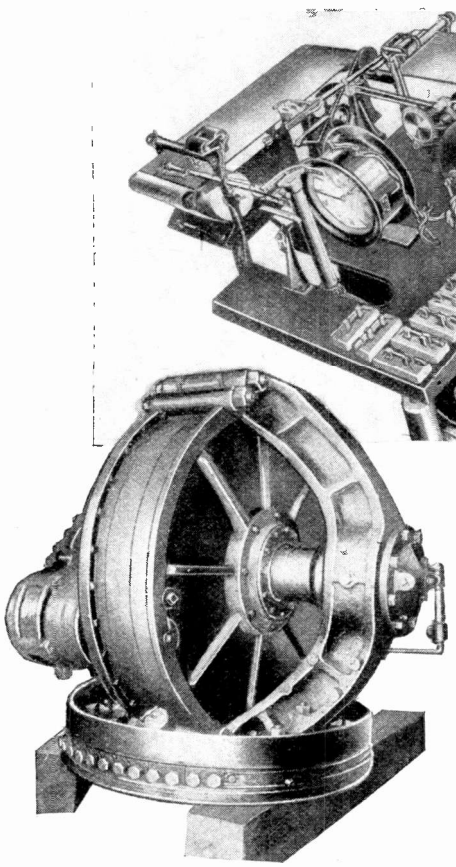
"There are others who, even with the car at high speed, can adjust themselves for a time to the complex moving situation, but whose attention soon lapses, and while they are gauging a rather distant carriage may overlook a pedestrian who carelessly crosses the track immediately in front of the car."

He explains a device by which he can obtain the same mental attitude in the motormen undergoing the tests that they experience on the moving car—a miniature track, moving figures and a crank for the motorman to turn at different speeds—which numbers of the best motormen on a great electric railway in Boston which supported his experiment declared gave them the same feeling they have on the cars. These experiments he proposes to have converted into tests to be used by railway companies in the employment of motormen.

"If the many thousands of injuries and the many hundreds of death cases could be reduced by such a test," he says, "then the conditions of transportation would be improved more than by any alterations in the technical apparatus. The whole world of industry will have to learn that of the three, material, machine and the man, the man is not the least, but the most important."

The Gyro Versus Seasickness

From the viewpoint of the naval man, a non-rolling ship is to be desired because she would be a steadier platform from which to fire guns and would burn less coal than an ordinary craft. To the layman, however, the steady ship means less fear of seasickness, and anyone that has passed through the throes of this distressing malady will promptly say, "Enough said!"



SPERRY GYROSCOPE FOR PREVENTING THE ROLL OF SHIPS

Engineers have been working to obtain this desideratum for years and a variety of methods and means have been invented and tried—the latest acceptable form, prior to the advent of the gyroscope stabilizer, being the anti-rolling tank of the German, Dr. Frahm. Without elaborating, it is enough to say that these several earlier efforts were designed to act in opposition only after the ocean's swell had given the ship a considerable rolling movement.

Now the only effective way to deal with the problem is to counteract the push of every wave at the very beginning and especially to offset the action of the smallest wave, because it is the cumulative result of a number of these rather than a single big swell which sets a vessel rocking. A ship is virtually a pendulum, and you know what properly timed but moderate pushes will do toward amplifying the sway of the latter.

Some years ago, Dr. Otto Schlick, of Germany, employed a gyroscopic stabilizer in a very small torpedo boat, the *See-Baer,* and he did succeed in a measure in steadying that little craft in a seaway. But Dr. Schlick just missed the secret of the corrective agency which he employed. His big spinning wheel was not sensitive to small wave disturbances; it did not get busy reactively until the boat had acquired a very considerable heeling movement.

To Mr. Elmer A. Sperry credit is due for having found the key to the mystery. Theoretically, the gyroscope should feel and act against any disturbing impulse, but friction of moving parts make it somewhat sluggish, and, to that degree, insensitive. The larger the gyroscope, and it must be big enough to meet practical requirements, the greater its measure of initial inertness. The puzzle was how to get the necessarily weighty spinning wheel alive to its duty and to make it exert instantly its opposition upon the arrival of the least disturbing wave.

The movement of the pivoted ring in

which a gyroscope is in its turn supported is called "precession," and the manner in which this precession may be stimulated by the application of outside force regulates the reaction or the corrective impulse of the spinning gyro. Therefore, even a sluggish gyro if artificially "precessed" can be aroused to its duty where otherwise it would be dormant. But how to awaken this slumbering but spinning giant? That was what Mr. Sperry set out to discover.

After some experimenting, he found that he could arrange two little gyroscopes of extreme sensitiveness in such a manner that they would be continually alive to an upsetting force exerted from a single direction—in this case, a lateral one coming sidewise through the ship. The way in which he associated these little gyros placed them at the end of a theoretical pendulum miles long reaching skyward and, therefore, responsive to the slightest vibration. But you will rightly say, "These little spinning wheels could not keep a ship on an even keel." That is so, but they can serve as pickets and summon to their aid, intermediate facilities of ample power. Mark you, these gyros are spun electrically, and by another electrical apparatus they are able to supply steam through a valve to an engine capable of "precessing" the big stabilizing gyros—the U. S. torpedo boat "Worden" having two of the larger ones, and these, too, are rotated by electric motors.

What follows, then, but that the smallest wave that can start the torpedo boat to roll is sufficient to disturb the little picket gyros, and these instantly start the "precession" engine or motor which tilts the big gyros to the proper degree and in the right direction so that they shall throw the momentum of their spinning mass in opposition. Each agitating wave is met at the moment of its arrival and its power to set the boat rocking killed at once—there is no chance for cumulative impulses, and even in a heavy sea way the "Worden" was wonderfully steady. The system calls for very moderate space and but for little propulsive energy, and the apparatus is constantly on the alert when required at sea.

Elliott Woods and His Wireless Telegraphy Hobby

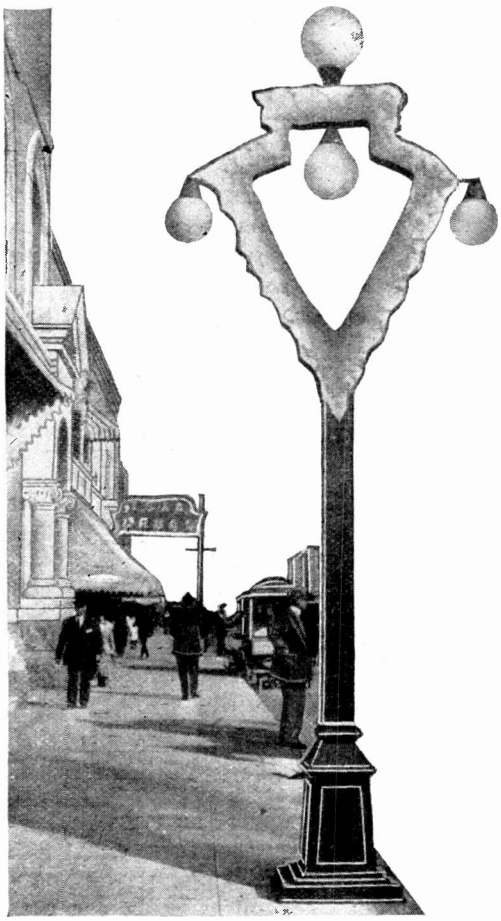
The attention of persons of an electrical turn of mind, who visit the United States Capitol grounds at Washington, is instantly arrested by the sight of a wireless telegraph mast towering conspicuously above a modest frame structure under the very shadow of the white dome of the Capitol. The common supposition on the part of strangers is that this is a government wireless station. Nothing of the sort. It is merely the private experimental plant of one man in his individual capacity. But inasmuch as the individual is Elliott Woods, superintendent of the United States Capitol, he has the benefit of this advantageous location.

ELLIOTT WOODS, SUPERINTENDENT OF THE UNITED STATES CAPITOL

In pursuit of his hobby, Mr. Woods has probably gone farther than any other amateur in this country—if amateur he may be called. It has been said "he has four offices and thirteen jobs" and took up wireless telegraphy purely as a diversion. But his tests and experiments have given him the ideas for several inventions.

Arrowhead Design for Street Light

San Bernardino, Calif., is known as the City of the Arrowhead, because it is



THE ARROWHEAD ELECTROLIER DESIGN

within sight of one of Nature's most remarkable carvings in the shape of an arrowhead several acres in area, which is seen on a mountain slope near by. From the earliest times the Indians have woven myths about this strange landmark, and many tourists come every year to see this natural wonder. For these reasons it is proposed to have all the street lights in the central part of San Bernardino carry this symbol, and Councilman C. W. Smith has originated and copyrighted a design for a lamp post which now stands on the principal street of the city for the criticism and approval of the business men.

Ball Lightning

To the Editor of Popular Electricity Magazine:

I saw with interest a paragraph in your May issue in regard to "Ball Lightning" or the electric meteors.

The theory of their origin, as advanced, is a little difficult to understand. Whence comes the ozone? And why?

Besides, of nineteen cases in my own notes, there were but two where the ball seemed to descend from the sky. In all the others the formation of the phenomena seemed near the ground. Nor have I observed any steady falling. The motion of the meteor is very eccentric—darting hither and thither at times, and again, nearly or quite stationary.

Nor is the phenomena confined to natural high potential currents. I have seen one formed by a short circuit on the Broadway car line of New York. This floated about two feet above the slot, slowly gliding along for, say, 100 feet, when it exploded. An account of another in the papers shortly after was similar.

I have advanced the following theory of their formation: that they are vortex rings of ionized air, formed at the instant of the arcing of a very high potential current. We know the ability of a vortex (or whorl) to maintain its energy, as in smoke rings, the tornado, etc. While a smoke ring dissolves calmly when its rotating energy is dissipated, the difference between a ring of ionized air and its environment would be so great that at some critical point dissolution would be instantaneous. The electrostatic charge of such a ring would naturally be great, accounting for damage done in the transformation of energy when the ring ceases its existence as an entity. The smell of ozone, etc., is also accounted for. It is not difficult to con-

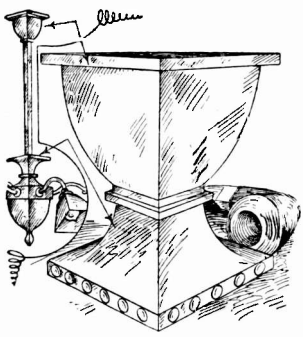
ceive that a vortex could form around the path of a high pressure discharge.

While open to objections, it seems to me the idea is worth consideration as giving at least a rationale to an otherwise inexplicable phenomena. The idea advanced in your issue really explains nothing. It substitutes a mass of unaccountable ozone for an equal mass of unaccountable "electricity."

Sincerely,
HENRY WALLACE PHILLIPS.

A Novel Ash Tray

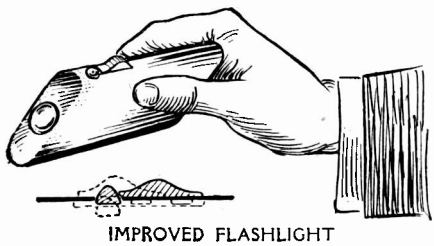
A novelty in the line of ash trays was recently noted in the office of an electrical contractor. It was made by using two pieces of an electric light fixture — the canopy and the piece usually found just above the point to which the fixture arms are fastened. The two pieces were soldered together as shown and a block of wood to which a piece of velvet was glued was fastened in the bottom by driving brass tacks through the side. —H. G. WILSON.



ASH TRAY MADE FROM A FIXTURE CANOPY

Holds Flashlight Button Down

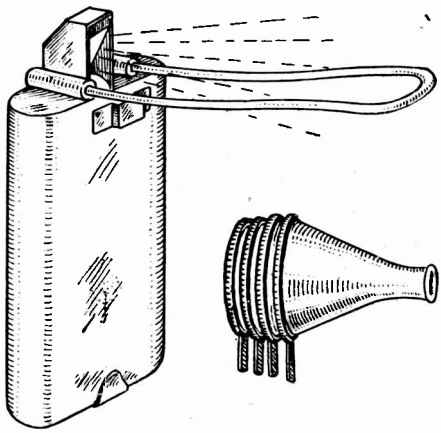
When some devices may seem so perfect as to be beyond improvement some one comes forward with something better. This is illustrated in the pocket flashlight switch here shown. The push button is of metal and sliding in a groove in the case is a piece of metal convenient to the thumb. When pushed over the button the metal slide holds the button down steadily without the necessity of steady thumb pressure as in the usual flashlight switch.



IMPROVED FLASHLIGHT

Lamp for Examining the Throat

A battery, miniature, tungsten lamp and reflecting mirror are embodied in a self contained pocket set. The handle like wire arrangement holds down the tongue when examining the throat, and the mirror, adjusted at an angle behind the lamp, throws the rays down the throat. For examining the ear and nose cavities a set of four specula are provided of various sizes. Each is provided with a metal lug which slips into a holder on the side of the battery case.



LAMP FOR EXAMINING THE THROAT

To Save Telegraph Poles from Rotting

In France a system, invented by Dubois, is used to preserve telegraph poles from rotting. The bottom of the pole up to, and a little above, the surface of the ground is encased in an earthenware pipe. The space between the pipe and the pole is filled with a mixture of sand and resin, which, on solidifying, becomes waterproof.

The Galatia Illusion

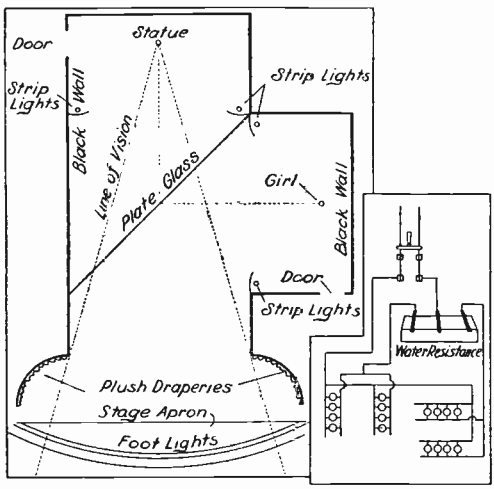
Those who read Mr. T. J. Newlin's article in the April number of POPULAR ELECTRICITY MAGAZINE on The Blue Room Mystery will be interested in The Galatia Illusion, presented by a method which seems superior to the one described by Mr. Newlin.

In The Galatia Illusion, in which a statue turns to life and vice versa, instead of the mirror, a large plate glass is used. This glass is stationary and set at an angle of 45 degrees from the stage opening. The diagram shows the arrangement of the stage, which is, as in the case of The Blue Room Mystery, built especially for this purpose, being about twelve feet wide at the opening and over twice as deep.

About six or eight feet from the front, on the right hand side, is a room of exactly the same size and proportions as the upstage end of the main room and built at right angles to it. The plate glass is set so that the upper end strikes the exact corner of both these rooms, while the other end strikes the opposite wall of the main room at a point exactly opposite the down stage side of the room at the right. The distance in a straight line from any point on this glass to a corresponding point in either room will measure exactly the same. For example, the distance from the place marked "girl" to the center of the glass equals that from this point to the point marked "statue." This is absolutely necessary for the success of the illusion.

The interior of both rooms, as well as all the rest of the stage, is lined with a dull black color so as not to reflect any light. At each front corner of both rooms is a little wing behind which is placed a strip light containing several incandescent bulbs. These lights are arranged in two circuits and connected to iron plates in a box filled with water that serves as a dimmer.

Referring to the diagram it is easily seen that the only thing necessary in turning the light from one room to the other is to shift the middle plate back and forth between the other two plates, the water serving as the resistance. When the curtains are first drawn back the lights in the upstage room are on full while the other room is in darkness. The effect is an oblong room brightly lighted at the upper end. The performer brings the statue down and shows it to the audience and when they are satisfied as to its character he takes it back to the stage. The plate glass while invisible to the audience makes it impossible for him to go to the upper end of the room from the front, so he usually hands the statue to his assistant to place on the pedestal. A door is provided at one side of the upstage room and a corresponding one in the room at the right. Very little is thought of the assistant going back and entering at this side door and to dispel any suspicion that the statue may have been changed he—accidentally of course—lets its head fall off while placing it on the pedestal. He replaces this and goes out. The performer in the meantime walks to the front of the stage and calls attention to the feat he is about to perform, while the girl dressed up in duplicate of the statue, takes her place on the corresponding pedestal in the room at the right. Care must be taken that they



STAGE ARRANGEMENT FOR THE GALATIA ILLUSION

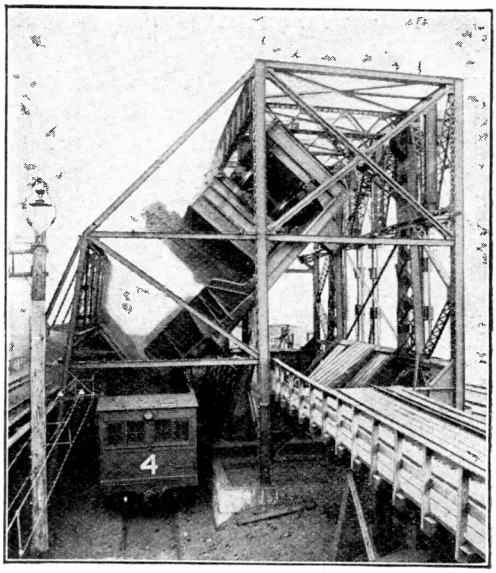
both stand in the same position, which is usually facing straight ahead as indicated by the dotted lines in the drawing. However they may stand in any position that is desired just so these positions correspond. The electrician now operates his dimmer and the light is gradually turned from one room to the other and the audience see—as they suppose—the statue turning to life. After the lights are on full in the room at the right the plate glass forms an invisible barrier through which it is impossible to see and the assistant may go in and make any changes desired.

In changing the girl back into the statue it is only necessary to slide the center contact of the water rheostat the other way and the light is automatically turned back into the other room again.

It is easy to see how the illusion can be varied in many ways even causing both girl and statue to vanish. The object in using a water resistance over the ordinary stage dimmer is, that in the latter there is always a distinct jump between each contact as the resistance is cut in or out, while with the former the change is absolutely steady and the audience cannot tell that the lights in the cabinet are being tampered with.

Unloading 50 Tons of Coal in Two Minutes

In the two-million-dollar coal unloading plant of the Virginian Railway at Sewall's Point, Norfolk, Va., the electrically operated car dumper is the most interesting feature. It empties each railroad car, holding 50 to 54 tons of coal from the West Virginia mines, in two minutes on routine work as easily as pouring a few pounds of coal out of an ordinary coal scuttle. The car is "spotted" in the dumper cradle by the brakeman, and the brakes are released; then the dumper motors operate to clamp the car down firmly on to the cradle track and simultaneously begin tipping the cradle about its hinge. The total movement is about 100 degrees, which is enough to pour out the coal. The latter is not actually dumped—it is poured out, and received on a deflecting apron leading into the pier car below, thereby avoiding breaking up the coal into dust which would lower the market value. The clamping and turning are accomplished by two 130 horsepower motors with a controller arranged to slow down the movement of the dumper at both limits of its travel.

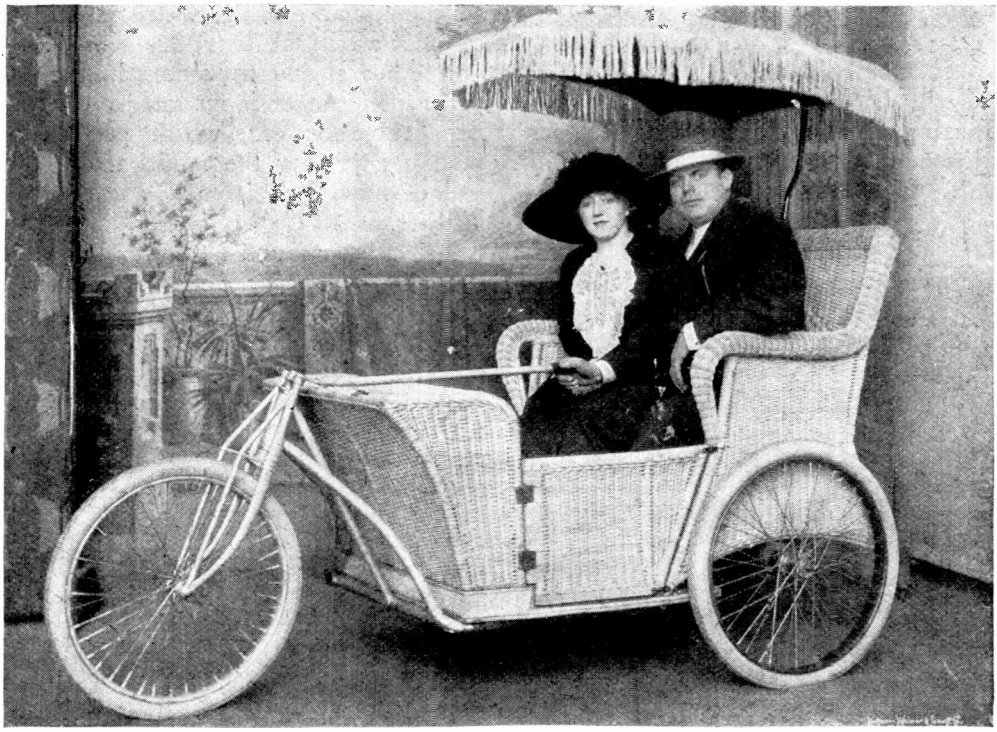


IT PICKS A COAL CAR UP BODILY AND DUMPS THE LOAD

Motor Chair for Boardwalks

Electric motor chairs at fairs, expositions, summer resorts, etc., will doubtless soon replace chairs pushed by men, just as the electric vehicle is taking the place of the horse. This chair innovation is the invention of Chas. B. Chrysler of Chicago.

The chair consists of a frame made of cold drawn steel tubing such as is used in the construction of motorcycles. The wheels have steel spokes, are ball bearing and are equipped with pneumatic tires. A three-eighths horsepower motor is furnished with power from an Edi-



THE ELECTRIC BOARDWALK CHAIR RUN BY A MOTOR AND WHICH EXACTS NO TIP AT THE END OF THE RIDE

son battery which will run the chair four hours without charging.

One important feature of the chair is that it can run only as fast as one ordinarily walks—about four and one-half miles an hour. The chair is guided by a handle that extends back to the passenger's seat as in a child's tricycle. There are two small pedals, one under the toe of each foot. Pressing down on the pedal marked "start" sets the chair in motion. Pressing the pedal marked "stop" brings the chair to a standstill.

Further, the passengers have privacy and comfort, each operates his own chair and need not return to the station on a hot day out of pity for the pusher. And more, the chair demands no tip at the end of the ride.

The first electric railroad in the Canal Zone at Panama is being built. The new road is to run between Panama City and La Boca.

Signaling in a Grand Opera Production

In the less conspicuous but equally important field of interior signaling the Boston Opera Company installation in many respects surpass any previous attempt to provide for silent but positive communication over wide areas behind the curtain. The signaling system centers at the conductor's desk in the orchestra pit and in addition to private telephone service between the conductor, the stage manager and the opera house library, an extensive lamp control service is in use for governing the work of chorus performers concealed from the conductor's baton. Four contact keys in the conductor's desk control illuminated transparencies in the fly galleries and at various points on the stage, these showing the beats of the baton when operated by the conductor and also indicating the beat upon which the music is to start.

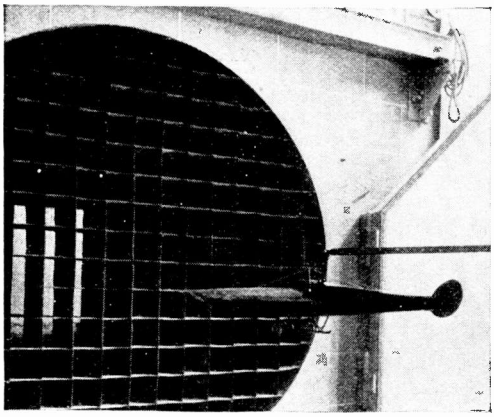
Model Air Craft Testing Laboratory

At Auteuil, France, Gustave Eiffel has erected an aerodynamic laboratory for studying the effects of air upon the operation of model aeroplanes and other air craft.

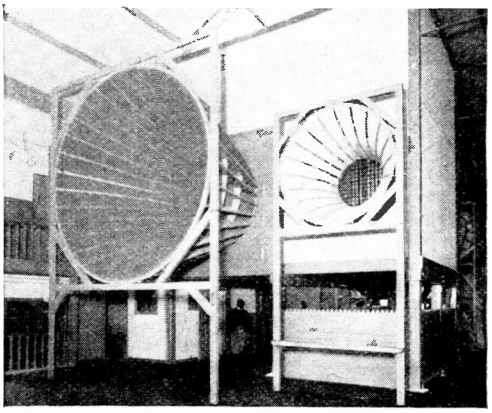
The wind tunnel through which the air is drawn is shaped from end to end like a Venturi tube. The air is sucked through, instead of being blown through, by a suction blower operated by a 50 horsepower electric motor. After entering the inlet tube the air passes through a rectangular grating, which is said to produce a uniform current.

The measuring apparatus in the experiment chamber is mounted on a rolling bridge or car, which permits of readily adjusting the model under test and of moving it from one position to another.

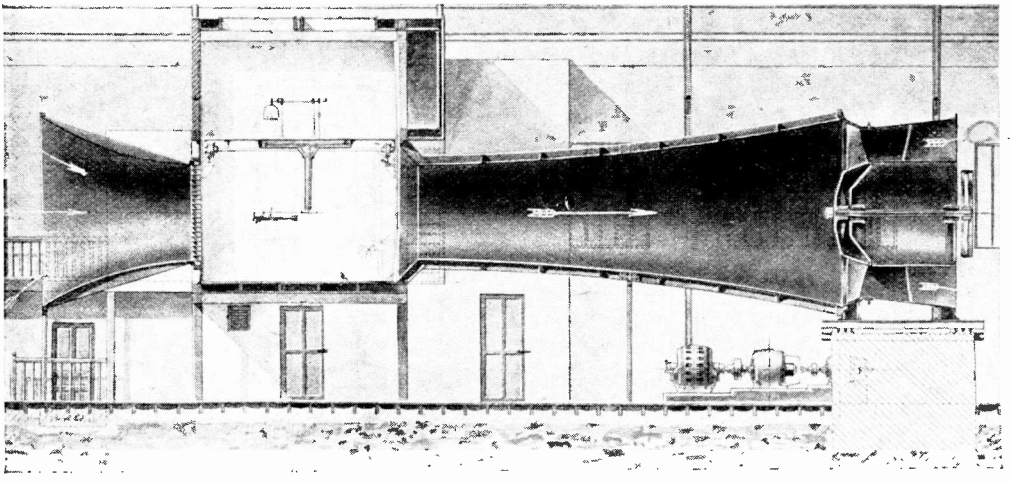
It has been found necessary to firmly seal all openings by means of solid iron doors. The artificial current of air produced by this installation is the most powerful ever used in aerodynamic laboratories, being 71 miles per hour.



MODEL AEROPLANES ARE TESTED IN BREEZES CUT UP AND MADE UNIFORM BY THE RECTANGULAR OPENINGS



THE SPEED OF THE AIR CURRENT MAY BE MADE AS HIGH AS 71 MILES AN HOUR

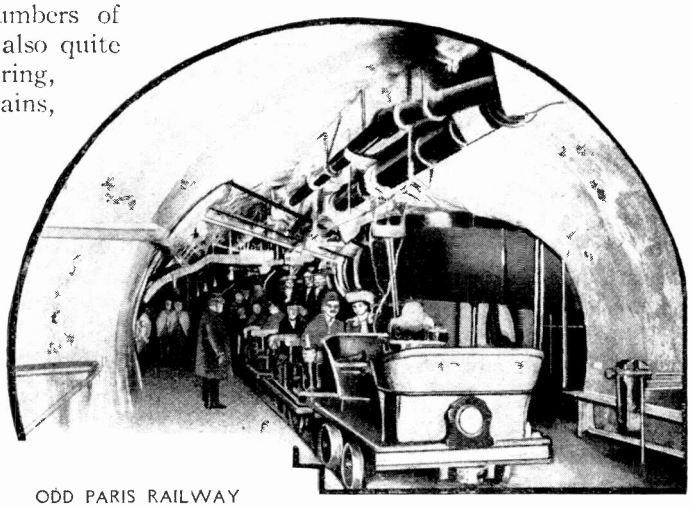


GREAT WIND TUNNEL THROUGH WHICH AIR IS DRAWN TO PROVIDE AIR CURRENTS IN AEROPLANE TESTING

Electric Railway in a Paris Sewer

The great sewers of Paris are one of the sights of the city, and as the roomy galleries are kept very clean, the visit is by no means a disagreeable one. In the galleries are not only numbers of water and gas pipes, but also quite an amount of electric wiring, such as electric light mains, telephone and telegraph cables. Such wires take the shape of well protected cables, so as not to be affected by moisture. The galleries are also well lighted up by electric light so as to be readily inspected and cleaned.

Not long ago there was installed a miniature electric railway in some of the galleries where the flooring allowed this to be carried out, for in most cases the sewer water, as in the Baltimore system, passes in an open canal in the middle of the tunnel and beneath the floor.



ODD PARIS RAILWAY

One Cent Invested in Electricity

The above amount will pay for the heat or power to:

Poach or fry two eggs each for six persons.

Broil a steak for two persons.

Cook a shrimp wiggle for four persons.

Prepare lobster à la Newburg for four.

Perfectly percolate coffee for a dinner party of four persons.

Perfectly toast bread required for a breakfast party of four persons.

Supply the hot water for tea for a tea party of eight persons.

Percolate coffee, toast bread, and fry or poach eggs for breakfast for one person.

Crisp bacon enough for four persons.

Warm up a quart of cooked beans or other vegetables.

Heat two quarts of water to the boiling point.

Keep a twelve inch fan running for 1½ hours.

Make a linen suit (sewing-machine power).

Do one-quarter of the ironing of a small weekly washing.

Enable a woman to curl her hair every day for two weeks.

Operate a twin glow radiator in the bath room for fifteen minutes.

Keep a heating pad hot and at an even temperature to soothe a toothache for two hours.

Operate a vacuum cleaner for one regular morning cleaning.

With three other cents, complete the washing and wringing for an average family.

Fry buckwheat cakes for breakfast for two persons.

Keep a 25 by fourteen inch warming oven hot for fifteen minutes.

Broil lamb chops on an eight inch disk stove for two persons.

Incubate an egg into a chicken.

Make 20 hot drinks.

Sterilize one gallon of water.

Stitch 30,000 sewing machine stitches.

The above figures are based on the average rate of lighting current, ten cents per kilowatt-hour.—*Silk Cord.*

The Wonderful Horograph

The need of a device that will register very small fractions of a second is apparent when it is considered that in races, aeroplanes or automobiles are started separately, and that frequently the elapsed time between the start and the finish of two machines is extremely close, making the ordinary stop-watch methods of timing entirely inadequate.

It has been found that when a half-dozen experienced and conscientious observers hold stop-watches each invariably will give a different report on the time made by the same aeroplane or automobile.

A solution of this problem has been found in the horograph. This instrument is operated by electricity in connection with electro-magnets and is almost as rapid in action as the electric flash itself. It indicates the elapsed time of an aeroplane or automobile to the hundredth part of a second and prints a permanent record of this time in figures on a paper ribbon.

A statement of an actual accomplishment will perhaps give a better idea of the almost incredible rapidity with which the horograph works. A car traveling at the speed of 80 miles an hour covers 117 feet every second, which means the depth of a city block at every tick of a pendulum clock. The horograph has given a printed record of the time of each of two cars traveling at a speed of 80 miles an hour, when the front wheels of one car were overlapping the rear wheels of the car in front.

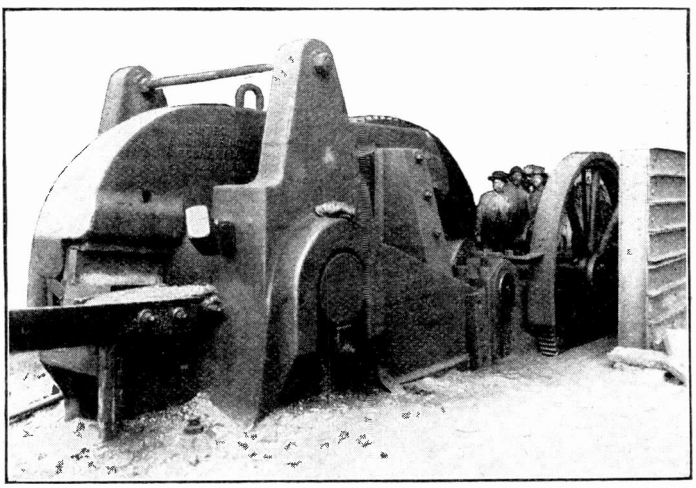
The Force of Lightning

It has been calculated that the amount of light given by a single lightning flash is sufficient to illuminate an area of two square miles.

The bolt itself would probably be visible several miles farther off, but the remotest part of the region mentioned would have as much light as would be given by a candle—quite enough by which to read.

To produce such a light it would be necessary to expend 13,000 horsepower for a second.

These figures appear amazingly large, but the time is short. The flash might be for only 1-1000 of a second, but the impression on the eye would continue for a tenth of a second at least. Reckoned down to an exact hour, this movement of force would be equivalent to only about 3½ horsepower acting continuously for an hour—briefly, 3½ horsepower hours.

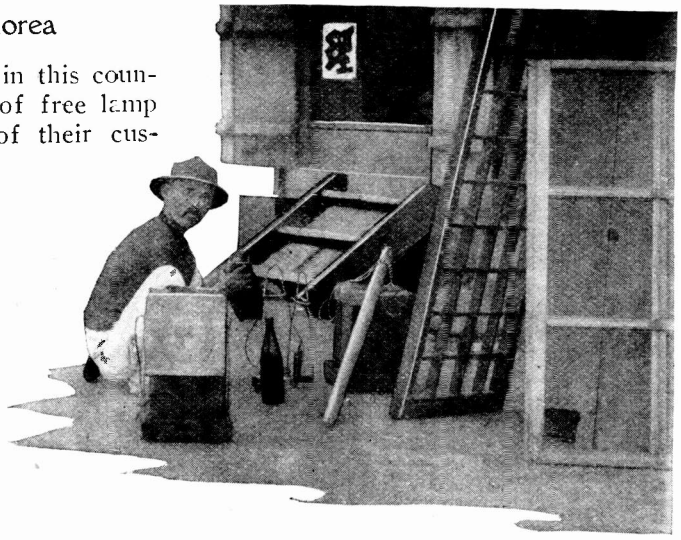


Large Shear which Snips Through Three-Inch Steel

A Pennsylvania steel mill probably has the largest shear ever made. The shear, which is shown in the accompanying illustration, weighs approximately 250,000 pounds and is capable of shearing a bar or plate three inches thick. It is operated through several gears by a 100 horsepower motor which is located just behind the large gear wheel on the right of the picture.

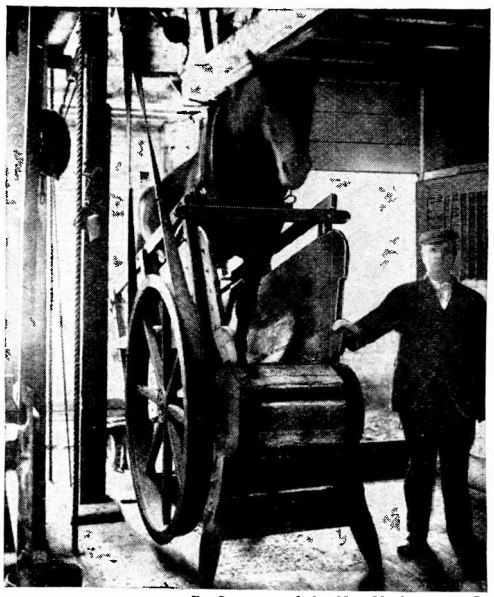
Oil Venders of Korea

Electric light companies in this country that follow the policy of free lamp renewals for the benefit of their customers, may perhaps plume themselves to a certain extent in the belief that this "service" idea is original. This is not the case, however, for the humble oil vender in far away Korea has the interests of his patrons just as much at heart as does the greatest public service corporation here. He travels about from house to house with two heavy cans of coal oil hung from a stick across his shoulders. Realizing, as does the big electric company, that a satisfied customer is his best asset, he does not stop at simply filling the lamps with oil but gives them a thorough cleaning besides.



THE OIL VENDER HAS THE "SERVICE" IDEA

Pete Loses His Job



By Courtesy of the New York Edison Co

DISPLACED BY THE ELECTRIC MOTOR

Pete, it should be understood, is a horse who has lost the treadmill job he had held for twenty-odd years in a New York livery stable. In place of the clanking machinery of years ago, there is a compact electric motor of five horsepower. This bit of modern machinery, an ever-vexing source of wonderment even to equine intelligence, raises and lowers the carriage elevator.

When Pete was the elevator operator he knew every carriage, every coach and every wagon in the establishment, and furthermore, he knew just where each belonged. A quick glance down the shaft of the elevator told him whether he was to stop at the second, third or fourth floor, and he made his stops with unerring accuracy.

It may seem strange to speak of treadmills in New York, in daily operation almost within hearing distance of the Great White Way. The machinery in Widder's stable had survived from the days when the horse was supreme. It was only discarded when, during extensive alterations, the building was wired for electric light and power. How many horses have toiled in the narrow spaces of the treadmill, or how many miles they have traveled, are facts unrecorded.

The Leasing of Blue Sky

By C. B. EDWARDS

"We will lease you a desirable piece of blue sky, corner of Broadway and 47th Street, for $30,000 a year, terms cash."

Would not such an advertisement appear odd, and would not the public think this was some new sort of real estate hoax or at least a new way of attracting attention for advertising purposes? Yet such an "ad" would say nothing that is not true to fact, for more than $500,000 of blue sky is leased every year in New York, and the business is increasing; in fact, every available site along Broadway has been taken up. Not one of even the poorest sites rents for less than $15,000, and where the sky is particularly blue and the site is most conspicuous the rents run from $30,000 to $50,000 a year. Each piece of blue sky sold is leased complete with a moving figure that will advertise the goods of the firm that signs the check—that is, a moving electric sign.

ONE OF THE FIRST SIGNS PUT UP IN NEW YORK. IT IS SIMPLE NOW AS COMPARED WITH THE MORE ELABORATE CREATIONS

Times Square, New York, is said to be the busiest street corner, for the full 24 hours, in the world. The real estate values there are enormous, and it is here that blue sky comes highest. The chariot race, the most spectacular sign in the city, earns $150,000 a year, or about $446 each night. More than a score of advertisers pay $5,000 a year apiece to have their cards "flashed," and some pay more for two or three successive "flashes."

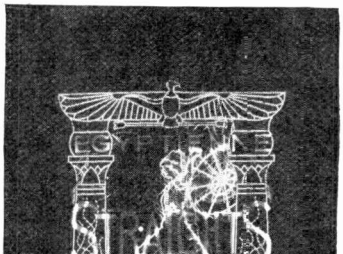
While not entirely new, the evolution of the electric sign is quite recent. Billboards, illuminated by suspended electric lights and reflectors, were once the only means of advertising after nightfall. With the invention of the rotary "flasher" came the "running rat" signs, the first type of moving sign put in general use. Since then, larger and more elaborate signs have been built, but the principle remains the same, and it is this principle that is the basis of a patent owned by a great advertising concern that owns the great majority of signs in New York, and collects royalties from those it does not own or operate.

Only four years ago, a petticoat manufacturer paid $10,000 a year to have a sign placed near Times Square. It represented a girl with an umbrella caught in a rainstorm. The flashing lights rapidly turned on and off, pictured the fluttering petticoat and rain most effectively. The sign, the first of its kind, became famous in a night, and so tremendous was the success of the "Petticoat Girl" that the manufacturers renewed the contract with the advertising agency for four years—each year for more money, until the last time it was $15,000.

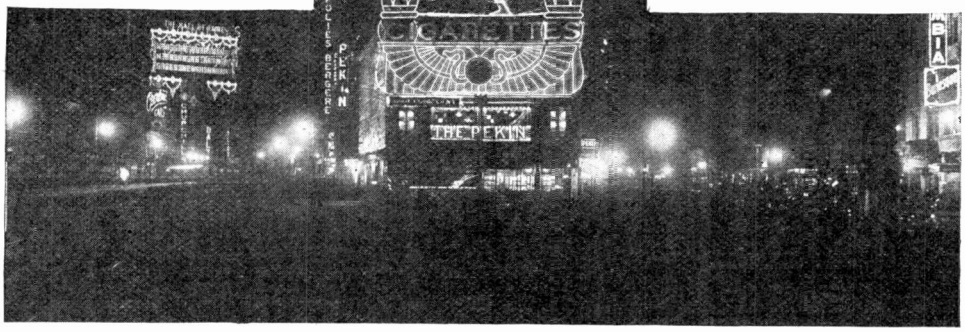
The success of the petticoat sign induced others to have signs set up. This required a regular production of new ideas, and resulted in the employment of a staff of artists by the advertising agencies who do nothing but sketch ideas for signs.

The price of sign vantage points rose with rapidity, and soon after the appearance of the petticoat sign every available site was bought. Tons of steel were

THE SPANISH DANCER

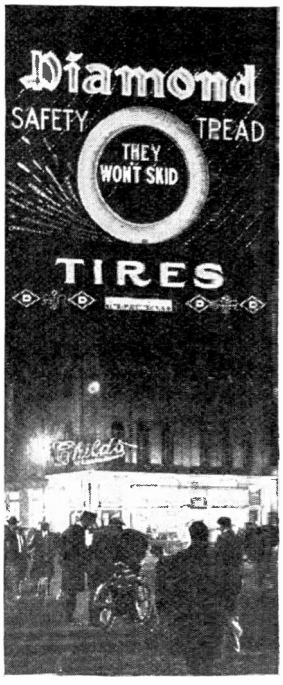


THE CIRCUS RIDER



ONE OF THE MOST ARTISTIC—THOUGH NOT THE MOST COSTLY—SIGNS IN NEW YORK. IT BRINGS IN $30,000 A YEAR

hoisted into position and erected under supervision of trained engineers to support new sign creations. To-day more than a score of these big signs are in regular operation each night. There are the playful kitten and the spool of silk, the prize fighters that serenely advertize summer underwear the year round, the toothbrush goblin, the artistic rope walker and the "weeps when he aint got um" sign—being the colloquial name for a child that cries for breakfast food. These signs are of great size and are built to stand great wind pressure and weathering. The chariot race sign has a total height of 60 feet, is 90 feet wide, and the main chariot and horses are 20 feet high by 40 feet long. There are



A DESIRABLE PIECE OF BLUE SKY

20,000 tungsten bulbs in this sign and it requires 600 electrical horse power to operate it.

Whereas in magazine advertising the advertisement is sent to the public, in electric signs the public is sent to it. The most surprising thing is that the influence of this advertising is evident in all parts of this country, and often in many foreign lands. John Wanamaker and H. J. Heinz met once at a Paris hotel. After they were introduced, Mr. Wanamaker remarked, "Oh, yes, you are the man who has that big sign on Broadway." Mr. Heinz was much amused at the incident, and said it was the best evidence he had ever had of his wisdom in spending $20,000 for a single electrical display

advertising the '57 varieties." Mr. Heinz said afterwards that he had been told of that sign in seven foreign countries and 26 states of the Union.

It takes the entire work of from six to ten skilled men for a month to arrange and put up a single big sign. Such signs cannot be turned out piecemeal, each has its own problems and idea. The artists draw up the idea in a simple wash drawing from which working drawings are made. The supporting structure requires more time in erection than the sign proper and work may not be started without first obtaining a building permit from the city.

The signs are lighted every night at sunset by two men. Each sign is turned on and off from a small box containing a switch, fastened on the outside of the building on which the sign is mounted. One man starts at 47th Street, another at 59th Street, and they run towards each other stopping at the various switch boxes, unlocking them, and turning on the current.

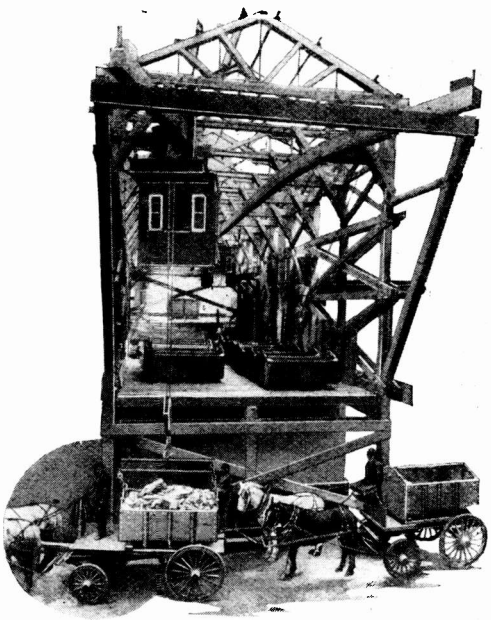
These men turn on all the signs in a remarkably short time, and when they meet, turn and patrol the "sign district" until the crowds thin out and the signs must again be shut off at one the next morning. These "sign patrolmen" keep watch of the signs and see that they operate satisfactorily at all times. Odd things have been known to happen when the flashers go on a "spree," and these men keep them oiled and working at their best.

One great authority in the electric sign business expressed, as near as words can express it, the significance of the electric sign.

"It is forceful advertising when you put an isolated distinctive bulletin before half a million people—all readers—in a single night. That is extraordinary circulation. But when the announcement is so towering, so dominating, that it burns its story into the memory of each reader, its influence is so great that even circulation is secondary."

Loading Wagons by Electric Telpherage

One of the most ingenious adaptations of electric telpherage is found in the utilization of this form of industrial trolley system for the loading of wagons in record breaking time. In some instances telphers are being utilized to dump or deposit loads of bulk material in wagons fitted with ordinary beds whereas in other cases telpher impelled tubs or receptacles are deposited on the platforms of specially constructed wagons and are returned to the telpherage terminal after the load has been discharged. At an electric lighting plant in New Orleans such a telpher not only loads wagons but can be fitted with a coal bucket and made to feed the bunkers. The buckets employed for wagon loading by telpher are usually of a capacity of one to 1½ cubic yards and this method of unloading wagons is being employed successfully in the case of commodities such as coal, coke, slag, sand, ore, phosphate, and broken stone.



AN ELECTRIC TELPHER

SEOUL, THE CAPITAL OF KOREA, HAS AN ELECTRIC STREET CAR SYSTEM

Electric Railroading in Seoul

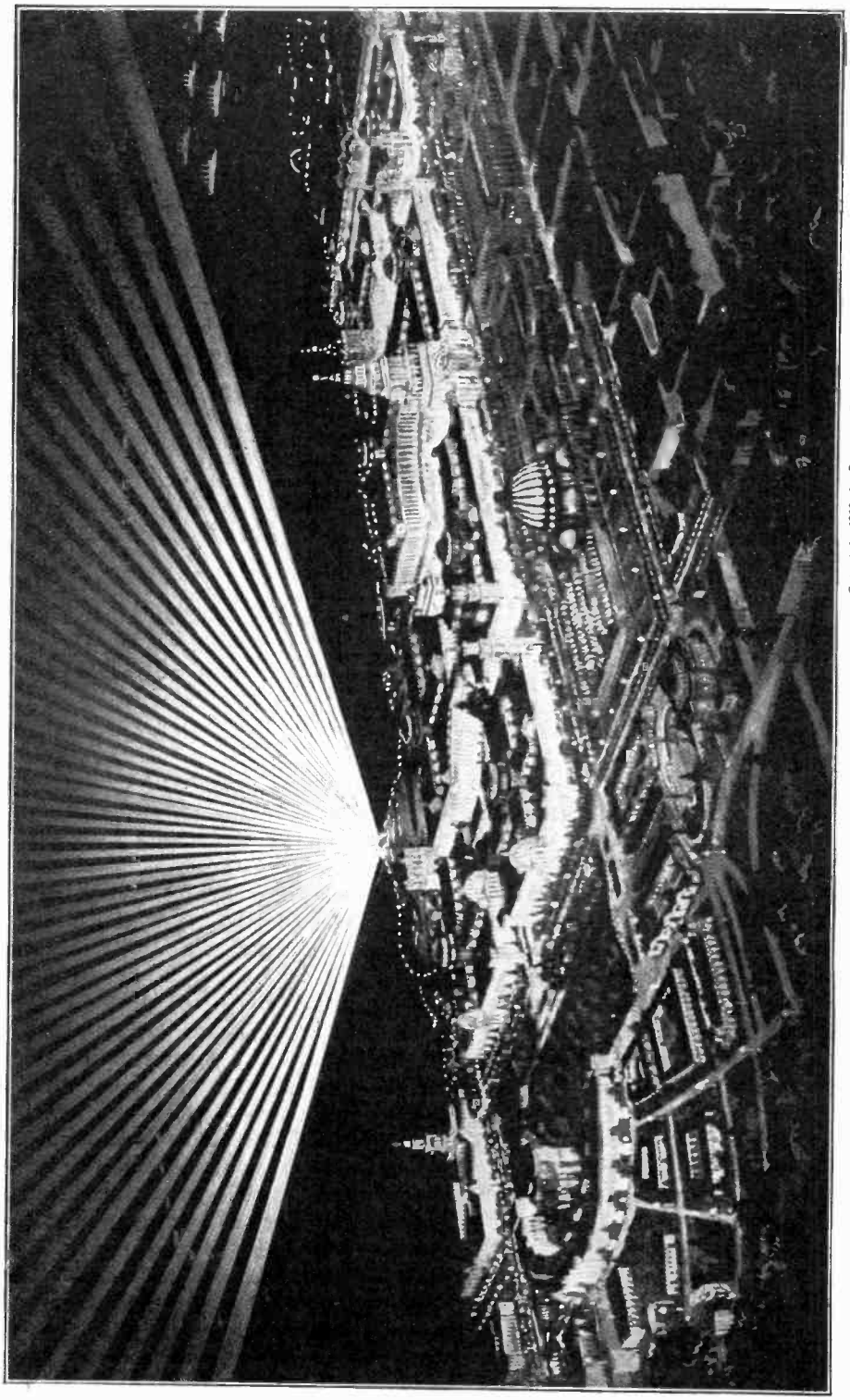
Seoul is the capital and principal city of Korea. It is picturesque, no doubt, with its squatty, queer looking buildings, though not nearly so well kept and beautiful as the cities of Japan. But it is fast becoming modernized, as the picture indicates, with its network of electric wires and what appears to be an adequate trolley car service. No coal wagons are there to obstruct traffic. Instead, diminutive horses meander along under enormous bundles of fagots and if one of them chose to walk the track could no doubt bring forth considerable bell clanging and calling upon ancestors on the part of the native motorman.

Electrical Filtration

The steam exhausted from an engine cylinder always carries considerable oil which remains in the water of condensation in the form of emulsion or fine suspension, the water being milky and cloudy and unless removed from the water, if used again in the boilers, will cause foaming and the oil left behind will settle on the tubes or plates and cause burning.

The condensed water when freed from the oil and grease is especially adaptable for feed water, being free from animal, vegetable or mineral impurities. In the past the emulsified oil has been removed by chemical action and filtration, both being very unsatisfactory and incomplete.

A new electrical process is based on the property of the current forming the oil into globules by electrolysis, much larger than the minute particles carried in emulsion and the grouping of the globules. The apparatus consists of a wooden tank containing a number of plates which act as electrodes. The oily water is passed around and between the plates and the current coagulates the oil which adheres to the plates. The water is then passed through sand or gravel to purify it thoroughly. A little hard water makes the oily water more conductive and the amount used is not enough to contaminate the filtered feed water. The filter is automatic and requires no attention except reversing the current every few days to free the plates from the oily deposit.—DANIEL M. GROSH.



THE EAST WILL MINGLE WITH THE WEST AMID A WEALTH OF COLOR BY DAY AND A MAGNIFICENCE OF BLENDING RAYS BY NIGHT, AND OVER ALL WILL BE DIRECTED THE RAYS OF A GIANT ELECTRIC SCINTILLATOR AGGREGATING OVER FOUR BILLION CANDLEPOWER

"The City of Color"

How the Challenge of the World to "Give Us Something New" Will Be Met by the Directors of the Panama-Pacific Exposition

"Imagine a gigantic Persian rug of soft melting tones, with brilliant splashes here and there, spread along the waterside for a mile or more, and you may get some idea of what the 'City of Color' will look like when viewed from the heights about the bay. This color plan alone will make the Exposition unique among the expositions of the world." These are the words of Jules Guerin, director of color of the Panama-Pacific International Exposition.

The day of the "White City" has passed. At San Francisco in 1915 the East will mingle with the West amid a wealth of color by day and a magnificence of soft blending rays by night. Practically nowhere at night will the source of light be directly visible; but everywhere will be diffused, will glow, sparkle and scintillate variegated harmonious color tones from structures studded with myriads of jewels.

Mr. W. D'Arcy Ryan, director of the illuminating laboratory of the General Electric Company, was appointed to undertake the commission of lighting the Exposition. As an illuminating engineer Mr. Ryan has already achieved national fame through his successful illumination of Niagara Falls and of the Hudson-Fulton celebration. Recently he has also devised the method for lighting the Panama Canal itself.

"The lighting of this Exposition," to quote Mr. Ryan, "will surpass anything in lighting in the world's history. The advancement since the last big exposition in the science and art of electrical engineering and the development of electric apparatus has been so great that we are now able to produce effects with economy which would have been physically impossible five or six years ago. In 1915 there will not be a single piece of lighting that has ever been used before. Everything will be new."

There will be no outlining of buildings with incandescent lamps.

Outline lighting has been done about as well as it can be done. The streets of every large city to-day are ablaze with it, displayed in almost innumerable applications. While undeniably beautiful from a distance, outline lighting often produces contrasting glare and dark spaces; and when it comes to getting effects from mirror surfaces, such as lagoons and moats, it is sometimes impossible to secure completely the desired results.

The plan of the buildings is as unique as is the harmonious decorative and lighting scheme. There will be no assemblage of individual palaces separated by huge intervening areas which operate to dwarf façades, however imposing. Eight of the main exhibit palaces will form parts of a correlated group surrounding the three principal courts. They will represent in conception a stupendous Oriental bazaar, similar in form to the bazaars of the East, at Constantinople, Damascus or Cairo.

The official colors of the Exposition are vermilion, burnt orange and a very rich oriental blue. Thousands of flags will flutter on the buildings in the breeze from the Pacific. To make the flags, bunting and decorations of this kind altogether different from any other exposition, the colors have been placed in the design in alternate squares. At night, the play of the illumination will be directed so that colors will hold their absolute values.

The Court of the Sun and Stars will stand out among the most brilliant architectural expressions of the world's great expositions. It will be distinguished not alone by the majestic scale of its architecture, but by the splendor of its conception and the warmth of its color effects. The tower at the southern entrance will be

studded with 50,000 jewels, diamonds, topazes, rubies and sapphires, which will sparkle at night in powerful rays from batteries of searchlights. The beauty of the changing color effects of his immense jeweled mass can scarcely be imagined.

These jewels are not colored bulbs; they are actual jewels of the first Exposition water. Great quantities are now being made from glass, of a special cutting, cut for different distances and effects, some cut in this country and others cut necessarily abroad. Strangely, glass-cutters and jewelers had never cut anything in these sizes before, and it was so entirely new to them that the illuminating engineers were obliged to figure and measure the index of refraction of the glass. Some of these jewels will be suspended upon delicate springs so that the least vibration from the wind or machinery or even the tramping of feet may keep them in constant motion and set them flashing.

Two great fountains embracing groups of statuary, one signifying the spirit of the East and the other the spirit of the West, brought together through the Panama Canal, will also lie on the main axis within the Court. At night the Court will be illuminated from these fountains. They will be constructed of dense white glass and in the daytime will in no wise suggest light sources. Within each fountain will be concealed 72 luminous arc lamps, making a total of 144 lamps for the Court.

All the noble façades of the magnificent palaces, the massive pieces of sculpture, softly colored, the stately pillars standing against the rich red of their Pompeiian background, the great mural paintings spread across the walls of the *patios*, even the blossoming reaches of the tropical gardens,—all will be made visible by light scientifically chosen that will reveal their true colors in full splendor. In the courts the mural paintings will be lighted by concealed lamps set into the fluted pillars fronting them, a special tubular lamp being designed.

There will be electric fountains, but no water will flash in them. Instead, smoke and steam, much superior media for such effects, will be sent into the air and glow with tints from the rays of the mighty scintillator. A huge locomotive, which can develop enough power to drive it along at 80 miles an hour, will be mounted on a steel turntable and will belch forth against the sky great columns of smoke and steam through which the rays of the scintillator will play. Contrasting delicately with these geysers of color, provided experiments now being made prove successful, thousands of gigantic soap-bubbles will be released from a large blower and float into the air. On these the powerful rays of the scintillator will glisten with the iridescence of an insect's wings.

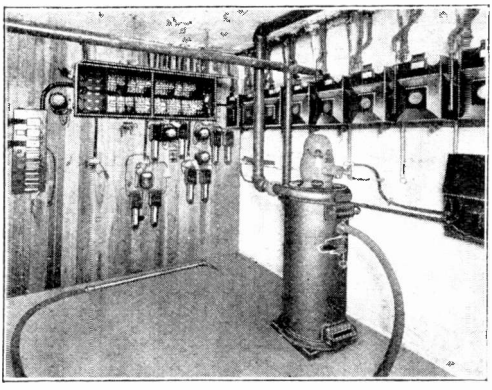
At the western end of the massed assemblage of exhibit palaces will be seen the classic outlines of the Palace of Fine Arts, a beautiful example of Italian architecture fronted with a great spacious semicircular court resembling St. Peter's at Rome. At night its ivory colonnades, drenched in silver radiance apparently from the moon, will be reflected on the surface of the dreamy lagoon in the intervening space between the palace and the main block of buildings. But perhaps the most gorgeous effects of glittering reflection will be realized in the Horticultural Palace at the left when entering through the southern gardens. Composed almost entirely of glass, it will be a veritable crystal palace, and at night will rise like a gigantic shimmering bubble of light 165 feet above a fairyland of illuminated blossoms and shining fountains.

The mammoth electric scintillator, which will be anchored on barges in the bay 500 to 600 yards from the shore, will project out over the entire grounds great beams of colored light variations aggregating over 4,000,000,000 candlepower. This will consist of a battery of 48 searchlights having 36 inch parabolic mirrors and representing the 48 States.

Sixty men will be required to operate the lights and will be trained to direct them through many evolutions of color, throwing brilliant auroras into the sky. On clear nights the spread of these colors will be visible in all the bay cities to a distance of 50 or 60 miles. But mists often roll in from the bay at night, which will greatly heighten the wonderful lighting effects, furnishing a background upon which to play the constantly changing color scheme, and to soften and intensify the lights at will.

Modern Apartment Building Basement

The illustration shows a corner of a basement such as are now found in modern apartment buildings. At the right is a stationary vacuum cleaner with



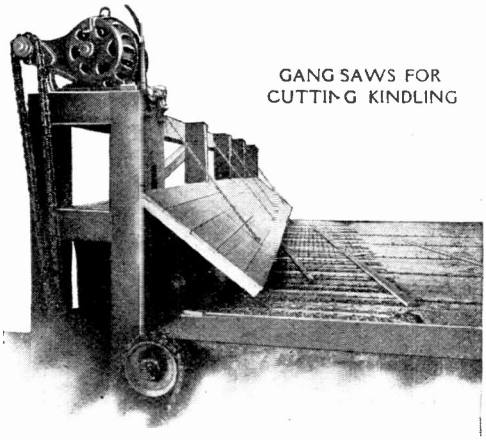
VACUUM CLEANING SYSTEM

pipes and connections reaching each apartment.

For the individual control of the various laundry devices, a series of plug outlets are located as shown at the left of the picture with a connector hanging at one side. Hinged covers are provided over the outlets so that each tenant unlocks his cover and uses current through his own meter on motor driven washing machines, irons, etc. A large hose and tool also connects to the vacuum cleaner for the janitor's use in cleaning large rugs and carpets.

Kindling Wood Saw

The outer slabs that are ripped from the logs at the mill as they are first prepared to be sawed into lumber, form a by-product, so to speak, which is cut up



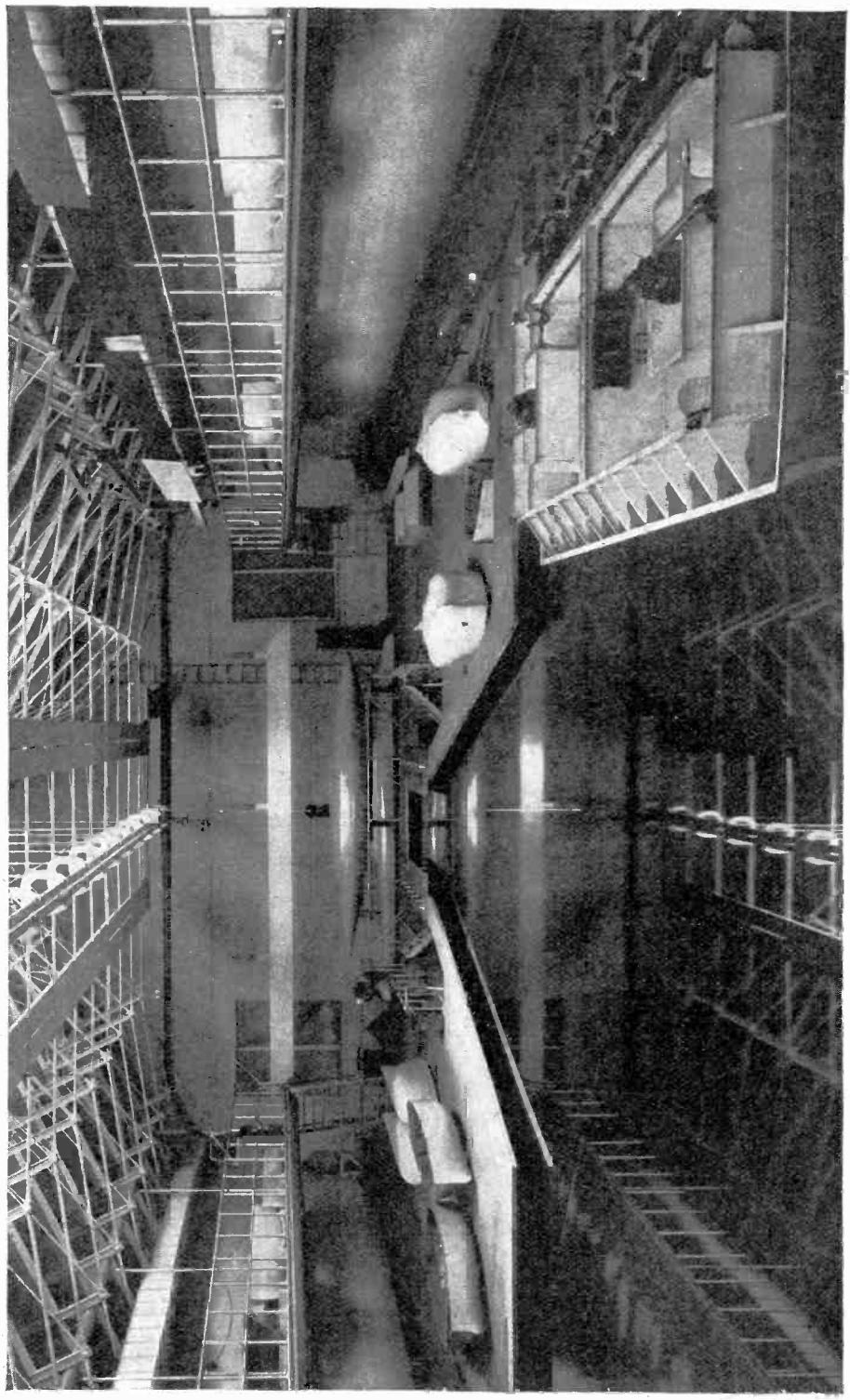
GANG SAWS FOR CUTTING KINDLING

into kindling wood by the machine shown in the picture. These slabs and other short pieces are conveyed by the continuous chain hooks shown in the platform to a set of gang saws. These saws set four inches apart on the same shaft and cut the pieces into suitable lengths.

Green Gutta-Percha

This substance is now obtained from the leaves of the caoutchouc tree, and is said to be more durable than that procured by cutting into the stem of the tree. Unlike the ordinary product, it does not require an expensive process of purification, so that its cost is cheapened. In France and elsewhere green gutta-percha has been employed in the construction of submarine cables.

The notoriously poor street lighting in most of the cities in Turkey compels the citizens to carry lanterns. Recently electric pocket lamps equipped with dry cells have become very popular with all classes except the very poor, and their use is increasing rapidly.



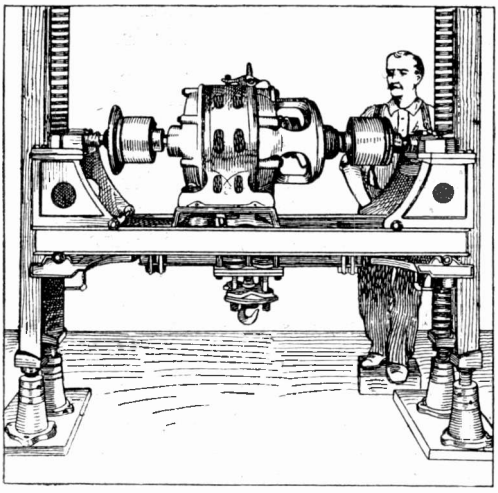
EXPERIMENTAL BASIN OF THE UNITED STATES NAVY DEPARTMENT WHERE MODEL BATTLESHIPS ARE TESTED

Miniature Battleships in Tank Tests

Electricity affords the power for the various operations of the experimental model basin of the United States Navy Department, located at Washington—an institution without counterpart on this side of the Atlantic. Its purpose is to disclose the virtues and defects of the hull design for any given vessel by means of experiments with models built on the lines of the prospective ship. Uncle Sam's model testing tank which cost $100,000 is 500 feet in length and 50 feet in width. The basin, the largest of the kind in the world, holds one million gallons of water. Up and down the length of this artificial waterway the models or miniature vessels are towed by electrical power. The speed is controlled in minutest detail by means of four motors and is further regulated by controlling the output of the generator in the power station located 100 feet from the tank. Electricity also operates the brakes.

An Elevator Without a Cable

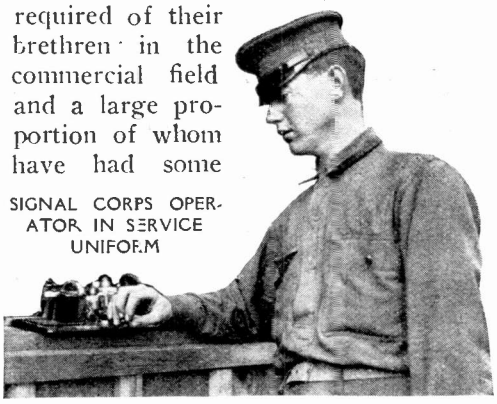
A tendency is often observed in the development of a machine or mechanical system to revert to original types. Years after a certain way of doing a thing had been discarded as impracticable the idea has been revived and perfected. For instance, the very earliest types of elevators moved ponderously up and down between upright pillars under the impulse of cog wheels meshing with a vertical, toothed rack. A western inventor has now perfected a similar idea in which an electric motor, with a shaft extended in each direction, drives a series of pinions and worm gears, the latter meshing with a rack and drawing the elevator upward or downward.



ELEVATOR WITHOUT A CABLE

United States Army Telegraphers

The United States Army now enrolls not less than 1,200 telegraphers who are capable of performing any of the work required of their brethren in the commercial field and a large proportion of whom have had some experience in wireless work as well as in regulation key pounding. There are several hundred telegraphers in the coast and field artillery service but the majority are to be found in the United States Signal Corps, which is charged with military communicative work and which now musters 700 qualified telegraphers and at least 200 additional who are fairly proficient.



SIGNAL CORPS OPERATOR IN SERVICE UNIFORM

The Signal Corps maintains a school for telegraphers at Fort Omaha where instruction is given to enlisted men who wish to specialize in this branch. There is no stated period of instruction, this having been found impracticable because many men enter the army from civil life with more or less knowledge of telegraphy.

Talking Machine Helps to Sell Real Estate

By the use of an electrically operated talking machine the sale of Los Angeles real estate is expedited by a firm that handles large tracts. In opening these subdivisions it is necessary to instruct many salesmen regarding the commercial features involved; not only prices, terms, etc., must be correctly stated but all the advantages of each particular tract must be clearly set forth. Sometimes as many as 200 salesmen are engaged for a single tract opening, and the training of these men was formerly by oral instruction on the part of the sales manager and by a quantity of printed literature, which was too frequently not read.

AFTER THE SALES MANAGER HAS ONCE GIVEN HIS DISCOURSE INTO THE PHONOGRAPH HIS WORDS ARE REPEATED AS OFTEN AS DESIRED TO THE SALESMEN

At last the manager, Mr. Robert Armstrong, hit upon the idea of delivering his instructions at length to the talking machine, such as is used in correspondence, and the rolls are then repeated for the benefit of the classes of prospective salesmen. By this method the selling points can be covered thoroughly, once, by the manager, and after that repeated again and again to the assistants with no further strain upon the manager himself, who is left free for more important duties. One of the photographs shows the sales manager dictating, with a map of a new tract in his hands. He carefully prepares his discourse, and, as the other photograph shows, his salesmen gather in a group and listen to his instructions until they are memorized.

Chicago Central Station Institute

The installation of the large turbo-generator stations, together with the present methods of high tension transmission, coupled with the local sub-station distribution systems, has opened up fields for the use of energy which only a few years ago were not considered profitable. This new territory demands well trained, experienced men.

This demand for trained men for the sales and contract departments of the large Middle West electric companies led

to the organization of the Chicago Central Station Institute.

The companies interested in this institute and which expect to receive the trained men from the institute, are the Commonwealth Edison Company, Illinois Northern Utilities Company, Federal Sign System (Electric), Middle West Utilities Company and Public Service Company of Northern Illinois.

The underlying idea of the institute is to obtain the best possible material capable of being trained, to fill the higher positions in these companies later on. At present the school has enrolled students whose qualifications vary from the four years' engineering course to a technical high school education coupled with sufficient practical experience.

The course given occupies a period of eleven months, leaving out the month of July, subdivided in such a manner that each month is devoted to one general branch of the business. This is to enable the student to enter the course practically the first of any month for the reason that the demand for the men is continuous throughout the year, and, therefore, it is the intention to graduate these men at different periods during the year.

The forenoon work consists of classroom instruction and demonstrators' lectures by experts in various lines from the companies interested, as well as special lectures by men from the large manufacturing companies on the commercial application of their apparatus.

At one o'clock the students report to the different departments of the companies, where their time is put in at practical work. The departments are those more or less directly connected with the public, largely the contract and sales departments. The students are moved from time to time, thereby getting varied experience in the actual working of different departments.

The students' records are kept, both for classroom and for afternoon work and students are graded according to ability shown.

Arrangements are made with the companies interested to pay each student $40 a month for the half day's service in the various departments. A tuition fee of $100 for the entire course is charged. It is the intention to give students a general, all-around commercial training—in a way, commercializing their engineering training—covering every phase of central station practice, enabling them to intelligently handle any of the general problems brought up to the salesman of today, without having recourse to the office in order to obtain information and advice.

Artistic Lamp Stand

The accompanying artistic design for a table or stand lamp is the idea of Julius Ivans, San Francisco, Cal. The weight needed to make the lamp stable assumes

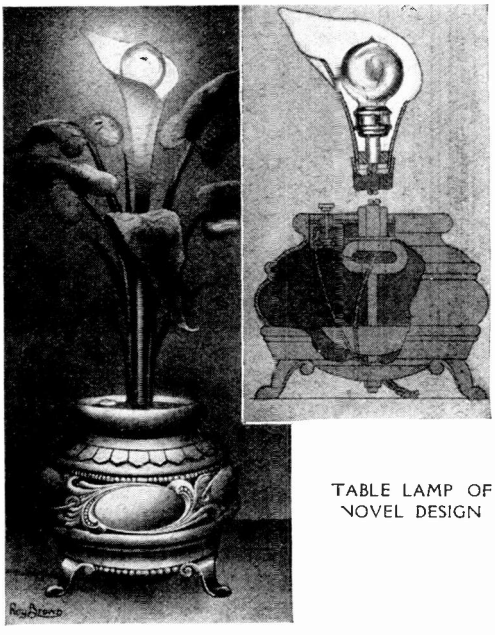
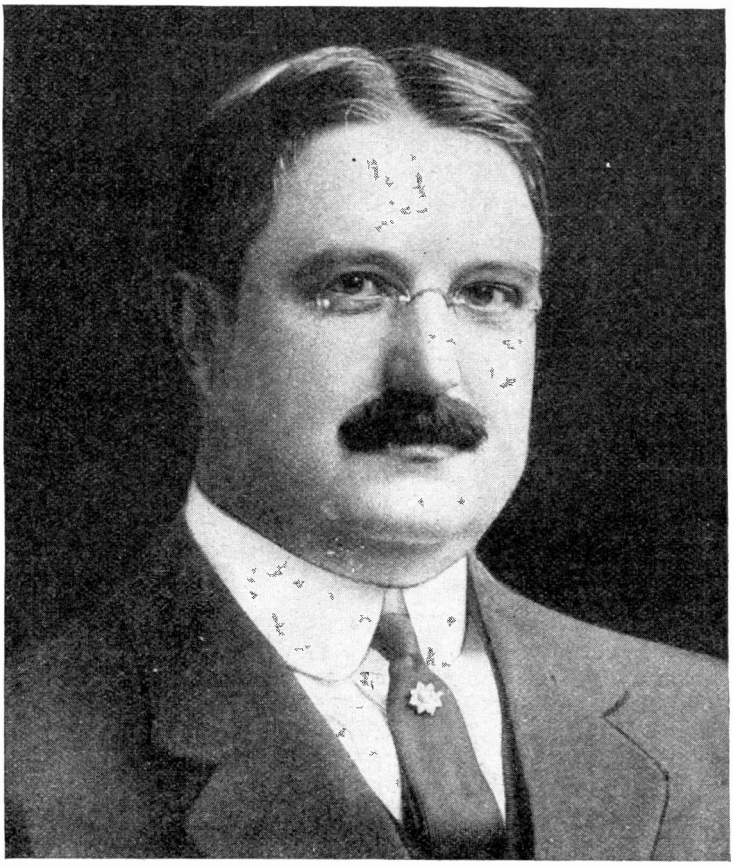


TABLE LAMP OF NOVEL DESIGN

the shape of a flower pot and the switch and attachment cord are well concealed. The lamp takes the form of an artificial flower supporting and partially enclosing the lamp globe.

Electrical Men of the Times

LAWRENCE J. SHAY



Lawrence J. Shay of Worchester, Mass., has been made manager of the newly created telegraph department of the New England Telephone and Telegraph Company, attached to the staff of the general manager. Mr. Shay has held the position of manager of the leased wire and circuit department since this department was created. This department has to do with all telegraph leases and the testing of the telephone toll circuits. Since the beginning of the joint arrangements between the New England Telephone Company and the Western Union Telegraph Company two years ago, Mr. Shay has directed the work as the representative of the New England Company. The importance of this new service resulted in the creation of the new department and Mr. Shay was chosen to continue the successful work. He is one of the best known telephone men in the East and already has the reputation of being "Johnny on the spot," when it comes to settling up Morse broker leases or furnishing emergency

facilities for the handling of newspaper matter, without a single fall down recorded against his department.

Among some of his various "stunts" for newspaper men were the wires set up at Groton during the illness of President Roosevelt's son; at the trial and execution of Mary Rogers at Windsor, Vt.; the famous Raymond trial at Augusta, Me., and several similar instances of the handling of emergency facilities under adverse conditions. His motto has always been:

"Don't wait for something to break, but be ready for it when it does break."

On election nights in 1906 and 1912 he reduced the time by 2½ hours in which practically full returns were gathered throughout the territory of the New England Company by establishing telegraphic centers into which returns were telephoned from smaller places and immediately wired to the Boston center. As a result, on election night, returns were bulletined up on the St. John River in northern Aroostook County, Me., within two or three minutes of the time they were published on the boards in front of the Boston newspaper offices, the wire system being worked both ways.

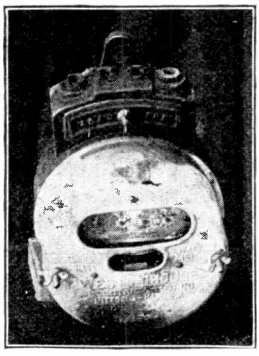
At the time of the Titanic disaster, when the flash came that the vessel and passengers were being taken to Halifax, Mr. Shay immediately got his force to work to set up a Morse circuit, available for the newspapers. After the circuit was completed, the story was denied and the circuit was not used. This was an expensive bit of work, but when the connecting companies asked about the expense, Mr. Shay's reply was that it was for humanity, and that the anxious thousands awaiting news of the awful disaster were entitled to every opportunity to get the facts without expense.

The first multiple relay telephone switchboard was established at Worcester in 1896, over which Mr. Shay had supervision. A few years ago he devised a combination telegraph-telephone test board to meet the requirements of the New England company, and this board was afterwards adopted as the standard testboard of the American Telephone and Telegraph Company, being known as "number four."

Mr. Shay is 46 years of age, a native of Northampton, Mass., and was working as a telegraph operator before he was fifteen at Mt. Carmel, Conn. He had seven years in practical railroad work. He saw the possibilities of the telephone, however, and took up that work as night operator at the Worcester office in 1889, and has since mastered the details of every branch of the service.

He is a modest man, and disclaims the credit for his test board invention, giving the credit to his test men, than whom there are no more expert wire men in their line in the United States. If ever there was an exponent of the square deal, that man is Shay, and he is beloved by his subordinates.

The Toughness of Watt Meters



AND IT STILL REGISTERED

An electric watt meter is a scientifically accurate instrument applied to the practical, everyday purpose of measuring the current used in your home. As such its mechanism is necessarily delicate but at the same time so protected as to stand a great deal of hard usage before it can be put out of commission.

The watt meter shown went through a fire and although badly battered and buried under the *débris* for several days it still registered just as accurately as ever. A falling rafter knocked it from its place on the wall and punched a hole in the top of the casing, which can be seen in the picture.

Electrical Interests of Women

EDITED BY GRACE T. HADLEY

A Profitable Club

"My! How tired I get of this continual pedaling!" exclaimed Mrs. Mills, who had a large amount of sewing to do for her daughter who was going away to school in the fall. "I don't know what I would do without my sewing machine. It is a thousand times better than having to sew everything by hand, but sometimes I think I know what it means to be a slave in a treadmill!"

"Indeed it is tiresome," remarked Mrs. Ames, a neighbor who was sitting near by doing some hand embroidery. "Really I don't know what I would do if I had three girls to sew for, as you have. I am kept busy mending clothes for just one boy."

"Well, I have a machine," remarked Mrs. Penn, "but I confess I am not fond of running it, and if I had to do so much sewing as Mrs. Mills I would never get it done."

The machine whirred and the three women sewed, embroidered and knitted in silence for some little time, then suddenly there was an explosion.

"I have an idea," cried Mrs. Ames, breathlessly.

"Do tell!" exclaimed the other two women. The sewing machine came to a dead stop.

"Recently," ran on Mrs. Ames, "in looking over my son's magazine, of which he is very fond, I came across a little story about a household fairy and what do you think the fairy was?"

"What was it?"

"An electric sewing machine motor, and it did such piles of work—"

"But I could never afford it," interrupted Mrs. Mills, "because it is all I can do to send Elsie away to school. I know that electricity can do the pedaling for I have seen a sewing machine running smoothly and noiselessly with no attendant, but I also know that I cannot afford to have one. I have priced them and they cost something like $25, I think."

"Maybe there's more to my idea," suggested Mrs. Ames.

"Do be more explicit," urged Mrs. Penn.

"Why couldn't we club together and buy an electric sewing machine motor?"

"Fine idea," interrupted Mrs. Mills.

"We would consider your home the

THE DRUDGERY OF PEDALING BECAME A THING OF THE PAST

'club headquarters' and keep the motor here because you need it most, but whenever either one of us needs to do some sewing quickly we will run here and do it. We run in most every day anyway, to sit with you."

"The idea is excellent, but suppose I pay $10 and you each pay $7.50—that makes the $25, and with that amount we can purchase the household fairy and it will always be here to work for us."

In this way the Neighborhood Sewing Machine Club was organized among three women who were congenial and fond of each other and the plan worked well. The electric sewing machine motor was purchased and kept in the busy woman's home. It proved to be a labor saver and a profitable investment. The drudgery of pedaling became a thing of the past and the unanimous verdict of all three was this:

"We could not do without our household fairy!"

Girls Study Electricity

The pretty girls of the Hollywood High School in the suburbs of Los Angeles are being given a course in electricity this year that is in advance of anything offered heretofore in the curriculum of the public schools. This course is intended to be a part of the practical preparation of housewives in the art of taking care of their homes, and the girls are being taught the mechanism and use of electrical apparatus and how to increase household comforts and reduce expense by having a practical knowledge of the newest electrical devices.

Prof. Claud Sandifur, the instructor in this course, has worked out an interesting series of lessons for the girls, taking the theoretical and making it practical and the study of electrical problems has become very popular with the girls. It is interesting to see these students dressed in their pretty middy suits, with perky bows in their hair, absorbed in their study of electricity.

A few days ago I called at the home

IT IS INTERESTING TO SEE THESE STUDENTS ABSORBED IN THE STUDY OF ELECTRICITY

of one of the cleverest of the girl students to ascertain just what practical effect the course is having. I was met by the girl's mother.

"Yes, indeed, Gertrude is bringing in new ideas constantly for the operation of the home in a more desirable way," she declared. "Gertrude is in school now but I will show you how many electrical aids we have now as a result of Prof. Sandifur's suggestions to the girls." She pointed to a pretty heater that was

very ornamental, in a corner of the drawing room.

"That is all the heat we need at any time in Hollywood," she said. "You see how pretty and clean the heater is and it is always so. We carry it to any room which it heats most efficiently and economically.

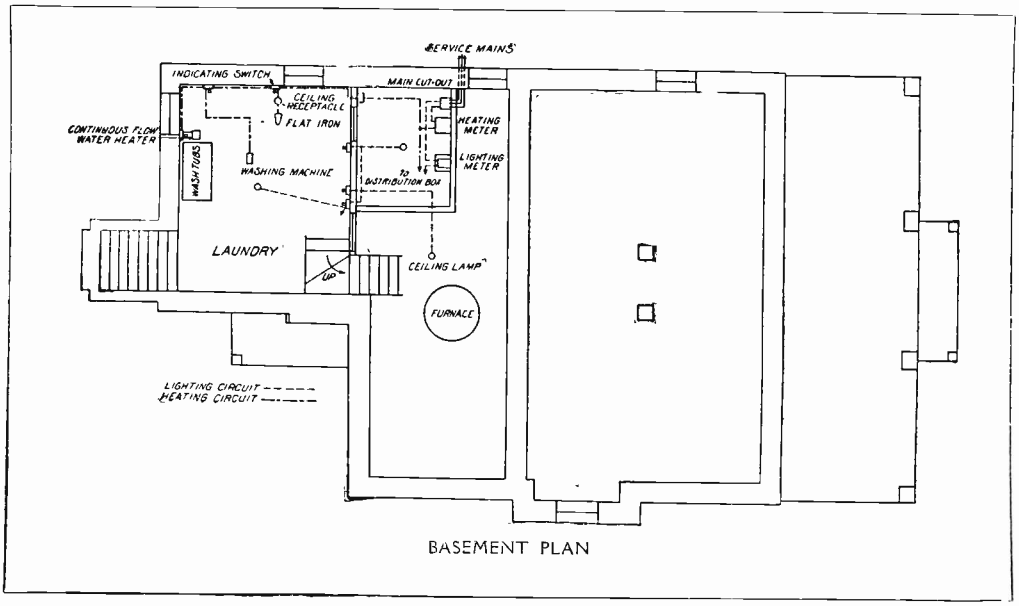
"We are gradually depending almost entirely upon the electric chafing dish for our cooking as the girls at school are obtaining new ideas every day for its practical use. Gertrude has been speaking lately of an electric oven which we may have in the kitchen when we require more elaborate cooking. These electrical devices are proving so serviceable and so convenient that I am just as enthusiastic about them as my daughter is."

I found that the lights in this bungalow home are arranged to give the greatest service at the least cost, for Miss Gertrude's scientific touch was apparent in every plan and fixture. Then there were other devices such as irons and toilet aids. It was a pleasure to visit this home into which a clever school girl had introduced so many electrical comforts in a scientific way. It made an added proof that electricity is destined to play a very much greater part by far than many of us imagine in making this world a comfortable place to live in and a joy for human beings.—STEPHEN INNES.

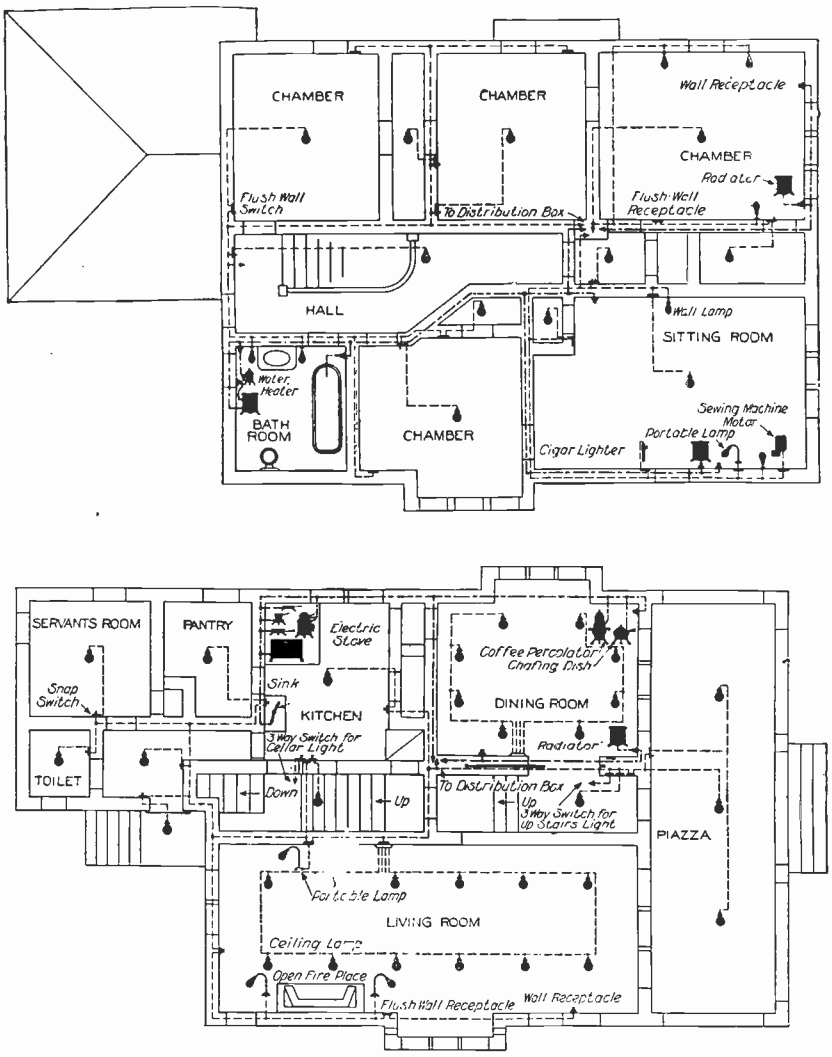
WIRING FOR A $5,000 TO $10,000 HOUSE

This house uses a single electric heating circuit with a restricted use of the lighting circuits for heating purposes. As can be seen in the basement plan, the main supply circuit enters the basement and from this the heating circuit and lighting circuits branch off as indicated by the arrows. The heating circuit runs direct to the basement laundry, a branch going to the flatiron. Connections are made with the kitchen on the first floor and with the dining-room by branch circuits running through the partitions to the respective rooms.

The heating circuit at the dining-room is provided with flush wall receptacles,



BASEMENT PLAN



FIRST AND SECOND FLOOR PLANS

Plans by courtesy General Electric Co.

to which connection is made for the chafing dish and percolator. In the kitchen the electric baking outfit is arranged as shown. This electric outfit is used for auxiliary cooking and the oven, placed by itself on the opposite side of the coal range is controlled from the main table.

Upstairs the heating circuit upon which the dining-room appliances are operated is extended to supply current to the electric luminous radiator, either in the chamber or bathroom. The arrangements for lighting circuits are shown in the plans. Landing and basement lights are controlled by three-way switches to make them most convenient. In the living room a flush floor receptacle is installed so that the reading lamp, chafing dish or coffee percolator can be operated without using a long cord.

Portable Breezes

It is a great comfort to have any kind of a fan in the home, but to have a fan that you can easily carry around as you need it is a convenience multiplied many times. What is more delightful on a hot summer's day than a cool breeze to drive away cares and worries and rest your tired body? When the heat is oppressive outside you can sit in your own home and by merely turning a switch, you can command a breeze at will and this breeze is not confined to any one room, for you can have it in the dining room, sewing room, the library, bedroom, kitchen, upstairs, downstairs, at work or at leisure, with only one portable electric fan.

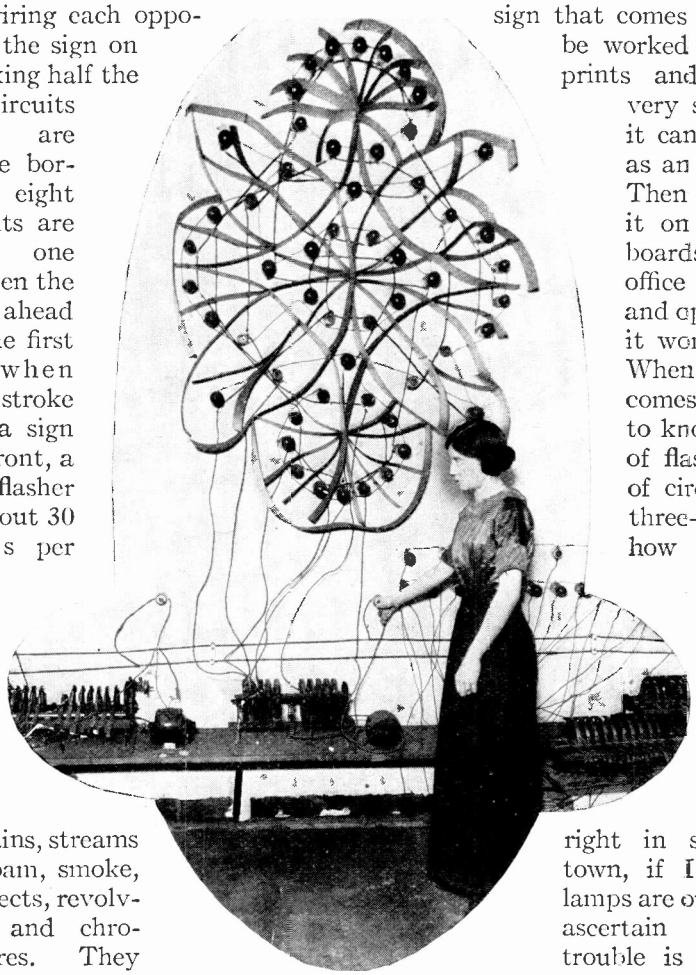
IN THOUSANDS OF HOMES THE ELECTRIC FAN IS MADE A PART OF THE SUMMER EQUIPMENT THE SAME AS SCREEN DOORS AND AWNINGS

These portable breezes keep you cool while performing the everyday household duties; they permit you to dine in comfort, unpestered by the troublesome fly, and best of all they prevent the hot weather from sapping the strength. Thousands of homes to-day are being cooled by breezes from electric fans. Many homes have made them part of their summer equipment the same as screen doors and awnings. These electric fans cost little to operate. Ten cents will run a portable eight-inch home fan seven hours a day for a whole week. Think of it—cool comfort for less than a quarter of a cent an hour! The twelve-inch fan which gives a stronger breeze uses no more current than a single electric light. It isn't a question of whether you can afford one of these summer comforts; they cost so little to run that they are within reach of every purse.

The Girl Behind the Electric Sign

Electric advertising has increased to such an extent that every city now has its "Great White Way," a cheerfully illuminated thoroughfare with electric signs that flash or spell out words, or chromatic color signs attracting the eye through color and motion. There are waving flags, crawling snakes, jumping rabbits or streaks of lightning; how many women have stopped to inquire how the flags wave, or the rabbits jump or the lightning flies across the display?

Some place out of sight is a busy little flasher that operates electric signs whether they are crawling chasers or script breakers; in a type of flasher wherein one apparently animated object chases another around the border of a sign, this illusion is accomplished by wiring each opposite lamp in the sign on one wire making half the number of circuits that there are lamps in the border. About eight or ten circuits are lighted at one time, and when the ninth circuit ahead comes on, the first drops off; when a lightning stroke goes across a sign or building front, a very small flasher is making about 30 revolutions per minute. A high speed type of flasher produces spectacular effects, such as the falling effect of fountains, streams of liquids, foam, smoke, fire, cloud effects, revolving wheels and chromatic squares. They generally operate at a speed of about 200 breaks per minute.



A GIRL WHO WORKS OUT ELECTRIC SIGN DESIGNS

All electric signs are first built up on a dummy board in the office of the company making them and in the office of one such company is a young woman who has practically grown up with the flashers. She is Miss Nettie Liepe and she is a good illustration of what a girl can do who is thrifty and industrious.

"I began to work here in the flasher company's office," she says, "when I was a little kid and I began as a telephone girl. Then I took a night school course in stenography and book-keeping and kept on working. Now I am happy to say I am office manager. Each sign that comes to us must be worked out on blue prints and we decide very soon whether it can be operated as an electric sign. Then we construct it on the dummy boards back of the office and wire it and operate it until it works perfectly. When an order comes in we have to know the brand of flasher, number of circuits, two or three-wire system, how flashed, and how to ship. I like the work and if word comes in that a sign is not working right in some distant town, if I know what lamps are out, I can soon ascertain where the trouble is by studying the blue print where all the wiring is traced down to the flasher. Then I write the electrician how to fix it."

Probably more small towns and hamlets in Norway use electricity than in any other country, owing to the abundance of water power. In the country districts also there are often plants for each collection of five or six houses.

How I "Re-Illuminated" My Home

By NELLIE ARCHER ALEY

The problem of satisfactory lighting for the living rooms of a house recently confronted me. The manner in which I

EMPIRE LAMP AND SHADE

solved it may be of help to others confronted with similar difficulties. In common with many houses this one into which we moved was over-lighted. Glare is probably the greatest crime against good taste in the average American home; this house was a flagrant example of unsubdued glare; sprawling chandeliers of poor design hung from the center of each ceiling, each chandelier being equipped with four to six lights, and when all were turned on, the living room presented an appearance of glaring distinctness reminiscent of the parlors of country hotels; rugs seemed to jump at one from the floor while the furniture stood out in a most displeasing way and yet to get the light where it was needed we had to suffer this eye tiring glare throughout each room.

My problem was to retain the electric lighting but to produce with it the soft glow of candle or lamp light. I set about to find just where the light was needed in each room and my idea was to localize the lighting; that is, to bring it directly to the places where it was needed instead of flooding the rooms with unnecessary illumination. The living room is not large, about 18 by 18 feet. Here the light needed to be localized at the reading table and at the desk, each of which stood against the walls but on opposite sides of the room. I had plugs put in the baseboard—the wiring coming from the basement—near each of these pieces of furniture. On the reading table I used a large portable electric lamp which I already had; the base of this lamp is verde green and the plain shade is of four shaped sections of green glass leaded together. For the desk a small drop light seemed to be the most satisfactory but when I came to look about I found that the really desirable ones were very expensive. I took a plain brass candlestick and had it wired and fitted with a Tiffany shade. The total cost was about four dollars but the little lamp is very handsome and quite the equal of the ten dollar ones I saw in the shops.

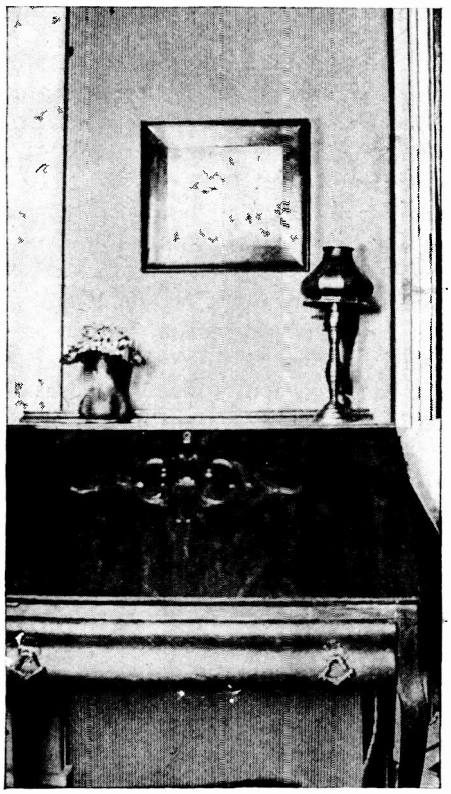
With these two portable electric lamps the living room is now satisfactorily lighted and everyone who enters it remarks upon the pleasing effect. A soft, restful glow is diffused throughout the room, in which not only the furnishings but myself and my guests look infinitely better than we did in the glaring light of an overhead chandelier.

On the newel post in the stair hall was

a lighting fixture that I can only compare to an explosion; a slender brass rod supported six contorted arms, each of which had an etched glass shade of cheap appearance. The fixture was decidedly in the way, for the arms stuck out awkwardly. Some one was always bumping into the thing and I fully expected to hear it crash every time we had company in the house. For these six lights I substituted a single wall bracket of simple design with a Tiffany shade and the improvement is wonderful.

The drawing room had a cluster of six lights at the ceiling that resembled a spider in shape and sprawl; when not lighted the fixture was not so conspicuous, so I left it, but it is no longer used for the room is now lighted by four drop lights. For the piano I bought one of the plain brass fixtures especially designed for upright pianos and this throws the light exactly where needed. The large amount of light for the room comes from a large Empire lamp with a shade of green silk; a French gilt base of good design supports the plain Empire shade. Nothing could be more appropriate for a semi-formal room and this lamp provides a pleasing illumination. The base of this lamp was purchased at a department store for eight dollars and the wire frame for the shade was bought uncovered and I got the green silk and put it on myself. The total cost of the lamp was twelve dollars against $25 for the same style when bought complete. The other lights for the room are two wired candlesticks with shades of green silk; both of these, exclusive of the holders cost but three dollars. One use on a small cabinet and the other on a side table. The effect of these green shaded lights is very pleasing.

As I look about me at the way houses are lighted I can not but marvel at the lack of discrimination and taste shown by most women in this matter. I have seen beautiful rooms ruined by some monstrosity of a fixture which had no relation to the room itself. Remember your living room is not a store and that the light of eight or ten unshaded bulbs is hardly suitable for a room where one is supposed to rest and relax after the day's work is done. As a rule, side lights of simple design with shades of ground or Tiffany glass and portable lamps of convenient size with silken or glass shades



SMALL DESK LAMP WITH SHADE OF TIFFANY GLASS

will be found more satisfactory for home lighting than unshaded chandeliers. Don't judge illumination by the brightness of the lamps. Judge the light you are getting by the way it helps you to see. Do not think that because a lamp looks glaring and brilliant it is giving you good light. It may be merely giving you too much light in the wrong place. On the other hand, a well shaded table lamp may look dim because it is well shaded, and still be giving first-class light for working purposes.

Holland's Canals Awaiting Electricity

Of all the undeveloped opportunities likely to impress the electrical engineer who travels over Europe none will prove more conspicuous than the canals of the Netherlands, which may be said to be not merely waiting upon but silently pleading for the transforming influence of electricity. Canals are, of coure, the principal highways of Holland and yet, with the exception of a comparatively limited number of storage battery boats, little has been done toward the introduction of the magic current in this promising sphere. The fact that the canals afford long, straight stretches with few locks would seem to render these waterways peculiarly well adapted to the introduction of electrically propelled canal boats of the overhead trolley type which have been tried out so successfully in other places. Holland is to hold this year some notable international expositions and there will be opportunities for outside manufacturers to do "missionary work" on behalf of electric propulsion for canal boats.

Tasting Electricity

You can feel electricity, the sense of hearing can detect it, ozone made by the electric spark affects the sense of smell, but not everyone is aware that it can be tasted. If you have not tasted the effect of current try this experiment:

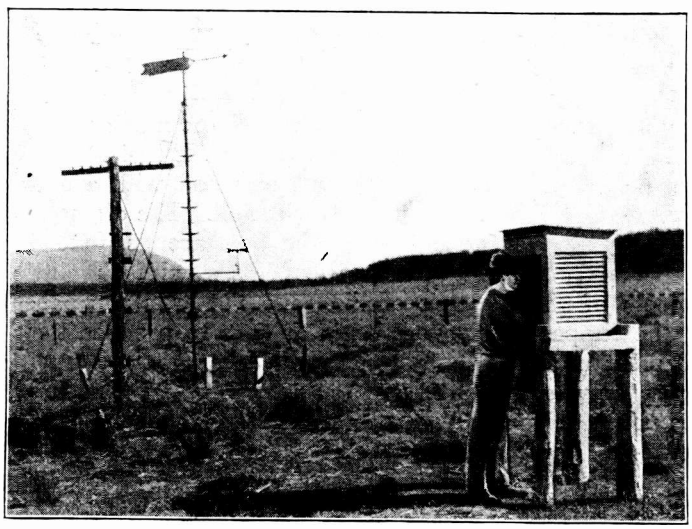
Take a piece of bright, clean tin about the size of a silver dollar and place it above the tongue or beneath it with a silver dollar on the opposite side. Keep the outer edges of the silver and tin apart for

TYPICAL SCENCE IN HOLLAND, SHOWING ONE OF THE LONG, STRAIGHT CANALS SO ADAPTABLE TO ELECTRIFICATION

a moment to see if you can detect any taste. Now bring the outer edges of the metals together with one above and the other beneath the tongue. Immediately there is a sour taste in the mouth. A small wet battery with the metals as plates and the saliva as the electrolyte is formed and the contact made at the outer edges of the metals completes the circuit while the current causes the sour taste.

Lord Kelvin's Question

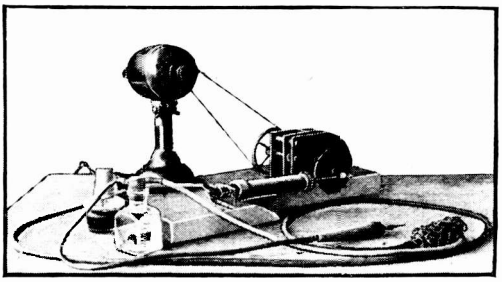
I was told some years ago at Niagara, says Isham Randolph in the *Journal of the Franklin Institute,* that when Lord Kelvin was there a short time previously he visited one of the power plants then in the process of construction. A young engineer—ignorant of the great personality he then encountered—was very kind in showing him over the work and telling him all that he knew about it. When they were about to part, Lord Kelvin said: "You have told me many instructive things. Let me ask you, "What is electricity?" The young man answered, "I do not know, sir." The great man said: "Then at last we stand upon the same plane."



FOREST OFFICER READING THE THERMOMETER

Pyrography Pump from Odds and Ends

The owner of this odd but effective outfit, having a great deal of pyrography work to do, rigged an air pump to take the place of the bulb usually furnished. The cylinder was made from the pump of an old blow torch. The works of an old phonograph was used for a reducing gear and a 20 watt fan motor furnished the power.



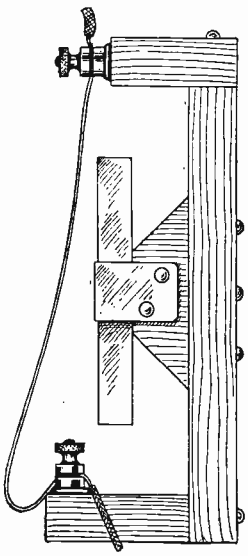
HOMEMADE PYROGRAPHY PUMP

Weather Forecasts Reported by Telephone

The Mountain State Telephone and Telegraph Company of Arizona is now co-operating with the United States Weather Bureau in reporting the weather conditions in the different sections of the state. Even some of the important towns in this section have either been without any forecasts at all or the reports have been very incomplete.

Thirty-one towns will soon be equipped by this combined action of the weather bureau and the telephone company and every morning the complete forecast will be telephoned to the chief operator of each town and will be accessible to telephone subscribers.

Mysterious Writhing Snake



MYSTERIOUS WRITHING SNAKE

An amusing piece of experimental apparatus may be made using a bar magnet and some braided strands of tinsel. Fasten the bar magnet to a wooden stand as shown and between the binding posts connect a very slack braid of tinsel. Connect the binding posts to a switch and three or four dry cells. By arranging a double pole, double throw switch not shown and throwing it over first to one side and then to the other, the tinsel will wrap itself in one direction around the magnet and then uncoil and coil itself about the bar in the opposite direction, depending upon the direction of the current through the tinsel.

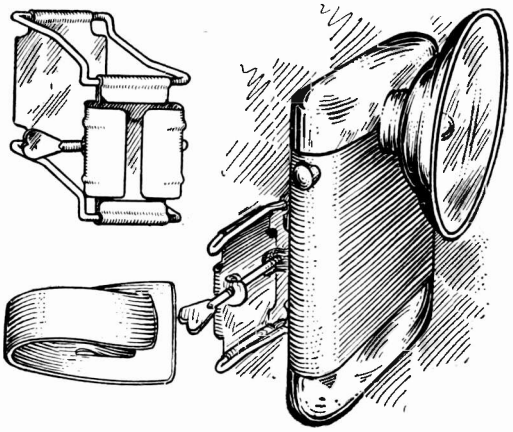
To prevent the bar from short circuiting the tinsel, the bar may be wrapped with a layer of paper or linen tape.

A Hot Fiber

According to the experiments of the French investigator Weber, the temperature of the incandescent filament in an ordinary electric lamp varies between 2849° and 2890° F. This is perceptibly lower than the melting point of iron, which is about 1500° C. or 2912° F. But with carbon fibers a little thicker than ordinary, giving a little brighter light, Monsieur Weber finds that the temperature may rise to 2962° F., or, in other words, 50 degrees above the melting point of iron.

Boy Scout Lamp

The accompanying cut is of a new type of flash lamp to be used for a bicycle lamp, camping and general service. It has a bicycle clamp; also a clamp to hold it in the pocket or to hang it on a rope.

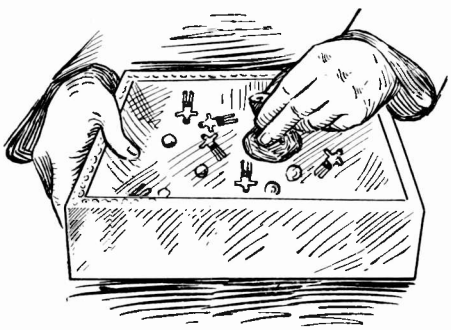


BOY SCOUT LAMP

On the side is a steady light switch and a flash button. The battery will operate a 3½ volt tungsten lamp for five hours. A large and efficient reflector is employed on the lamp.

Magic Box

A novelty which affords much amusement is the magic box. It is 4 x 6 x 2 inches, made out of wood with a glass cover and lined with foil. The directions for operating the box are as follows: Rub the pane of glass with the little leather cushion and the balls and paper men will begin at once to produce their



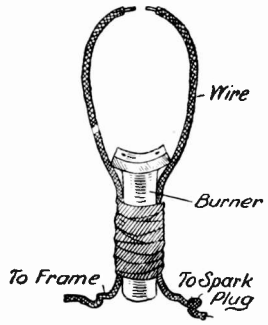
MAGIC BOX

performance, jumping about in the most fantastic manner. The only thing necessary is to keep the box and leather cushion clean and dry, which is done best by cleaning the pane of glass before using, with a piece of dry cloth. Static electricity is the secret of the odd movements.

Lighter for Motorcycle Lamps

In cold, windy weather it is not an agreeable task to light a motor cycle lamp, and it was this experience that led to the following:

To the burner of the lamp bind with tape two insulated wires each about three feet long. Leave about six inches projecting above the burner and bend in the



LIGHTER FOR MOTORCYCLE LAMP

shape illustrated, leaving the points about 1/10 of an inch apart. Connect one of these wires to the spark-plug of the motor and the other to one pole of a push button suitably situated. Then connect the other pole of the push button to the front of the motor and the outfit is completed.

In order to light the lamp simply start the motor, turn on the gas and press the electric button.

Open Circuit Telegraph Connections

Referring to page 983 of the January issue of POPULAR ELECTRICITY MAGAZINE I think the accompanying arrangement an improvement upon the open circuit telegraph diagram there shown.

With switches (A) and (B) on points (2) and (3) respectively this station can be called using its own battery. When both switches are on points (2) this station can be called using the battery at the other end of the line. With the switches on points (1) the line is clear. Whenever the station is called switch (B) is placed on point (3). The single point switch is to open and close a local circuit for private practice.—J. D. VAN BRAKLE.

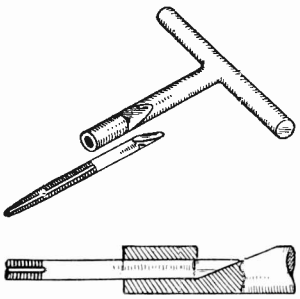
Light from Sugar

A phenomenon, the cause of which has not yet been satisfactorily explained, was described at a meeting of the British Association. Disks of loaf sugar were mounted on a lathe and rapidly rotated while at the same time a hammer played lightly upon them.

An almost continuous radiation of light was thus produced upon the sugar. It was shown that the light did not arise from beating of the sugar, and it is believed by some to be caused by changes taking place in the sugar crystals, held by some experts to be of the nature of electrical phenomena.

Experimenters' Tap Wrench

In building electrical apparatus of the small kind, amateurs will find the tap wrench here shown a handy tool to in-



EXPERIMENTERS' TAP WRENCH

clude in their kit. As shown it is so made that a tap can be quickly put in or taken out, and the beveled end, when thrust home, effectually prevents the tap from turning in the handle.—B. E. WILDER.

Experimental 200 Meter Wave Sets

By PHILIP E. EDELMAN

PART 5

ROTARY GAP

The rotary gap is more desirable for a 200 meter set operated by a transformer because it combines the cooling feature in the gap itself and may be used continually without objectionable heating. When properly adjusted this form of gap presents the additional advantage of a musical tone. This gap is well known and there are many forms of it, including those using studs on the periphery or face of a revolving wheel, stationary or revolving electrodes, solid revolving wheels without studs, plural electrodes and other types. One suitable form which may be constructed without special tools and machinery other than a lathe is shown in Fig. 9. The design is taken from "Experimental Wireless Stations" and a flat plate is utilized instead of a ring with studs, by boring holes in the plate at uniform distances.

The rotary electrode is preferably made out of sheet aluminum ¼ inch thick, and while other sizes may be constructed in a similar manner, an eight inch rotary electrode capable of discharging up to one kilowatt is here described.

Find the center of a square sheet of aluminum and describe a circle with a four inch radius. Describe another circle with a three inch radius, and a third circle with a radius corresponding to the size of the shaft used. (See Plate Layout.) Now divide the circle on the three inch radius into eight equal parts and prick-punch the points accurately. Eight holes, each 1½ inch in diameter, are to be drilled at these points, either before or after the plate is turned down to the outside diameter. The shaft hole should also be drilled out. In drilling care should be taken to get all of the holes true and the aluminum should be worked slowly. Use kerosene oil as a lubricant. The outer diameter is best trued up after the plate has been placed on a mandril. A machinist will be glad to do this.

The simple bearings and mountings

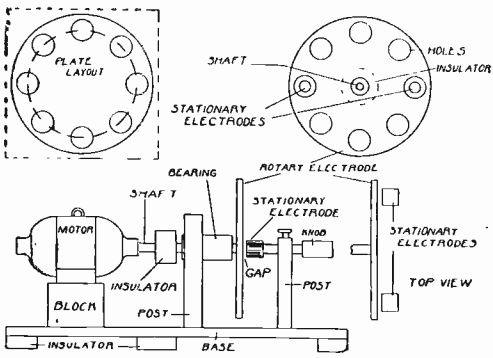


FIG. 9. THE ROTARY ELECTRODE

require no comment, but it is necessary to have the electrode revolve without vibration and so that the face does not wabble. The stationary electrodes should have a diameter of 5/8 inch and are mounted so that they are at the center of two opposite holes when the latter are in that position. These electrodes can be mounted on a rocker like dynamo brushes, if desired, to allow for adjustments. The rotating electrode should be revolved at a high rate of speed, that

resulting from direct connection with a synchronous motor being suitable. The revolving and stationary electrodes should be well insulated from each other and foreign bodies and the rotating electrode should be insulated from the drive shaft of the motor. An insulating coupling with a ⅜ inch opening at each end, such as is used in electric light fixtures, may be used with a ⅜ inch shaft or the insulator used may be made from a block of hard rubber. The light aluminum electrodes do not offer much resistance and a small fan motor may be utilized to drive it. The stationary electrodes may be perforated as described for the series gap and the length of the gap should be the same at both electrodes. The gap need only be rotated when in use and may be stopped when the station is not used for sending purposes. If a rotary gap is to be used with a spark coil, it is not necessary to bore the holes, as a solid electrode will do.

It should be noted that there is no chance for the spark to pass when the stationary electrodes are concentric with the holes. The condenser may charge at this point, and will readily discharge through the short gap as soon as the metallic surface comes into place opposite the stationary electrodes. Small aerials can be charged with larger quantities of energy by means of the rotary gap, for this reason. The gap will give the best results when it is adjusted to correspond to the other apparatus used. By again referring to Fig. 7 (Part 4, June) it will be evident that it is an advantage to have the electrode in line for sparking at regular intervals along the charging voltage curve, out of line while the condenser is charging and out of line when the charging voltage, as it approaches zero, falls below a desired charging voltage.

Charging Voltage

When spark coils are used no special design is required for a 200 meter circuit. From the foregoing discussion it should be obvious that a transformer capable of supplying a voltage at least twice that of the charging voltage is required for use with the particular type of apparatus described if the condenser capacity is to be kept to the small value specified. A ¼ kilowatt transformer, then, should be wound for at least 13,500-15,000 volts, a ½ kilowatt transformer for at least 19,000-20,000 and a one kilowatt transformer for at least 26,000-30,000 volts, the first value in each case corresponding to the lower value given in Part 2 (April) and the other value corresponding to the higher value given in Part 2 for the charging voltage. It may be stated that not many of the old transformers are wound with a ratio of the turns which will give this voltage for the power specified. The voltage in any case can be found by finding the number of turns used on both the primary and secondary of the transformer, and since the primary voltage is known, the

$$\text{Secondary voltage} = \frac{(\text{Primary voltage}) \times (\text{No of Secondary turns})}{\text{Number of primary turns}}$$

In making a transformer for the present purpose, then, it is only necessary to alter the design to make the scondary voltage at least twice that of the charging voltage desired, or if a transformer is purchased the purchaser should see that the transformer is wound so that a condenser of substantially .01 microfarad will produce resonance, as has already been set forth. Many old transformers can doubtless be remodeled to meet this particular requirement and those having taps can in some cases be operated with fewer primary turns in circuit in order to raise the secondary voltage. This last case however may mean an overload on the transformer and is not desirable. The same result may be obtained in some cases by adding to the secondary turns, but this method is not always practicable.

Connections

It will be remembered that the condenser circuit using .01 or .011 micro-

farad can only have 1.1257 or 1.025 microhenry for the total inductance. In order to keep most of this inductance in the helix or primary of an oscillation transformer where it is needed, it is necessary to make all connecting conductors in the primary circuit as short as is possible. Every inch of wire or ribbon used should be noted carefully with the object of shifting the apparatus to make the leads still shorter. The leads are preferably made by using two to four strips of eighteen or 20 gauge brass 00 copper ribbon at least ½ inch wide. This method gives a thick conductor which will be somewhat flexible, and if thinner ribbon is used in a greater number, the flexibility will be increased. The cable mentiond in Part 3 may also be used where a more flexible conductor is necessary, that is, for the inductance leads.

The author finds that it is practical to make the total length of the leads between the inductance, gap, and condenser less than sixteen inches. Wave meter readings indicate very clearly that even an inch in the length of the leads in the condenser circuit make a difference and that if long leads (total two to three feet) are used, it is not possible to operate efficiently at 200 meters. The importance of short good conductors for the leads, then, cannot be overemphasized. There are several methods of arranging the apparatus so that the leads will be a minimum. Thus, the condenser may be mounted on the helix and the gap may be placed on top of it, in which case the transformer can be mounted on a shelf higher up so that the secondary terminals can run down to the gap. (I, Fig. 10.) Or when either a helix or oscillation transformer is used with either a rotary or stationary gap, the three parts, the gap, the condenser, and the inductance, can be arranged so that the terminals form a triangle, the sides of which are formed by the apparatus. This method will give the shortest possible length for the leads in most cases. As has already been noted, the ground and antenna leads should be made as direct and short as is possible.

The plural layers of ribbon form a conductor which is readily soldered to the terminals of apparatus, or which is suitable for use with ordinary binding posts provided that a hole or slot is drilled through the ribbons at one end (see Fig. 10.)

Operation

The connections for the apparatus described are shown in the diagrams of

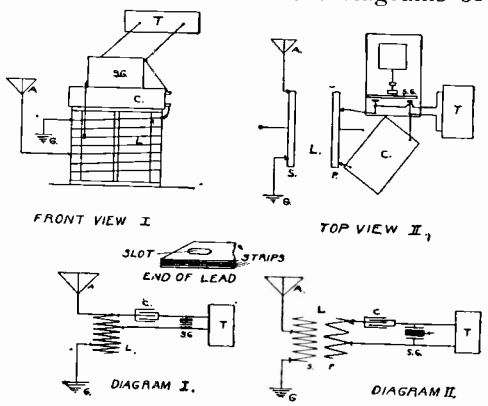


FIG. 10. A, AERIAL; G, GROUND; L, INDUCTANCE; S. G. SPARK GAP; T, TRANSFORMER; C, CONDENSER; S, SECONDARY; P, PRIMARY

Fig. 10. There are also other variations of these circuits which are suitable. Some form of antenna switch (not shown) should be used. The primary circuit of the transformer has also been omitted. If the cylindrical inductances are of the standard type previously described the primary inductance for any turn or number of turns may be readily found. The inductance of one complete turn is approximately .29 microhenry, that of two turns 1.16 microhenrys, that of three turns 2.61 microhenrys, that of four turns 4.64 microhenrys, and so on, multiplying .29 by the square of the number of turns to find the inductance for the desired number of turns. Allowing for the inductance of the lead conductors, the primary circuit will include between one and two turns with the .01 or .011 mf. condenser, and much can

be done with even one turn to secure a good coupling between the circuits. The leads, however, are an unknown quantity, and if made too long they may easily have an inductance equivalent to from .3 to .6 microhenry. It may be noted that the smaller sizes of spark coils may be operated at less than 200 meters without difficulty on account of the small capacity used.

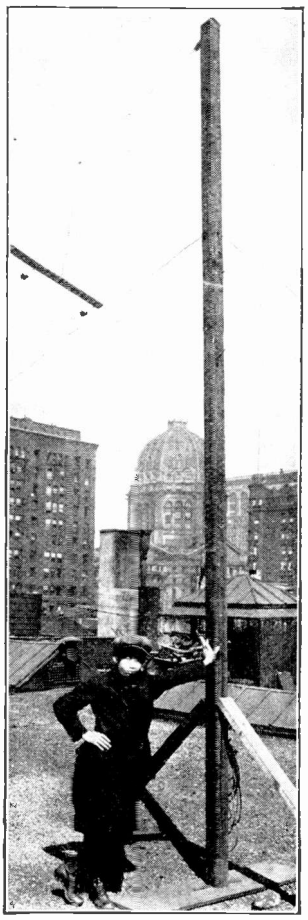
The method of tuning for 200 meters has already been explained. In conclusion, it may be said that the object of this article has been to clear up a few points by giving specific cases. Parts such as keys, switches, and even the receiving apparatus, which involve no conditions peculiar to a 200 meter circuit have been omitted, as they have all been treated elsewhere. Most of the items represent recent practice and in any case the reader should now understand the chief requirements and limitations, as well as the advantages of a 200 meter wave circuit for experimental purposes.

(To be concluded.)

Harry Hong Sling

Harry Hong Sling, a bright, energetic Chinese boy, is probably the only wireless amateur having a station within the "loop" or business district of Chicago. Harry is fifteen years old, was born on South Clark Street and is in the eighth grade at the Jones school.

In one of the pictures he is shown seated in his room which is located upon the fourth floor of the building in which he lives. This room serves both as a workshop and as a good location for wireless equipment. The lad's mechanical ability is demonstrated by the number of instruments upon the table which were constructed at the workbench shown on the left. Among them are a helix, a rotary spark gap, a condenser and a telegraph key. His former



HARRY HONG SLING AND HIS WIRELESS STATION AMIDST THE SKYSCRAPERS OF CHICAGO

aerial was small and low but recently he erected a higher one of four wires and is seen standing by one of the masts which is on the roof of a six story building. The aerial height is 80 feet. In the distance is the dome of the Chicago post office building.

Within a few months Harry will go over to China to study the Chinese language and customs, for China is as strange to him as to an American boy except as his father and mother have told him about the country by stories and pictures. While Chinese is spoken in his home Harry writes and speaks most excellent English.

Filtering Out Wireless Without Confusion

Professor Michael I. Pupin, chief of the electro-mechanical Department at Columbia University, New York, and discoverer of the Pupin cable that permits quick and perfect messages to be sent under the sea, has just announced an even more wonderful invention. He calls his recent triumph the Pupin inductor, and it has already startled and received the unqualified approval of the American Philosophical Society, as well as no less a physicist than Professor Elihu Thomson.

Professor Pupin modestly refuses to predict the great possibilities of his important discovery. Professor Thomson, however, speaks boldly and enthusiastically about the discovery. It is a rotating armature which means around the world wireless even for amateur ratio stations.

"The big trouble with wireless communication," said Professor Thomson, "has been that the electric waves weaken very quickly. This makes it impossible to send messages many thousands of miles even with such gigantic stations as Arlington, Washington, or the Eiffel tower in France.

Atmospheric and other changing conditions have limited wireless communications to the relatively narrow limits of 3,000 miles. Even with airships Marconi was not able to extend the radius of the messages beyond 3,000 miles. Even 2,000 miles is a long distance for land stations to cover.

Professor Pupin's device is one by which the received electric waves are put in inductive relation with a rotating armature of a motor. When a signal is received it acts at once automatically on the rotating armature. This rotating feature, although the technicalities of its action cannot be explained here, serves to increase vastly the strength of the current as well as the magnetic power. Thus a greatly extended area of inter-communication is assured.

The rotator answers several other purposes but none more important than the filtering out of preferential or desired signals.

In other words, all confusion is abolished, all interfering messages are suppressed and no amateurish or criss-crossing flashes can perplex the operator or derange the codes.

A cruiser, for example, in Hampton Roads or Long Island Sound where there is so much perplexity and rioting of radio-telegraphic signals, because of the large amount of business, the immense number of vessels, and the numerous near-by land stations, by the installation of one of Professor Pupin's rotators can not only pick out just the antennæ it desires, but can send a correct reply across all of the interfering and intervening stations.

Save Odds and Ends for the Shop

Don't pass up any good "raw materials." You will be able to make use of most everything, sheet iron, copper, zinc, and brass, wire, glass jars, tumblers and bottles; all these things should be carefully hunted up and neatly arranged on shelves around your shop. Edison is said to have thousands of boxes in his laboratory filled with every manner of things. He even has a box of feathers!

An Air Insulated Tesla Coil

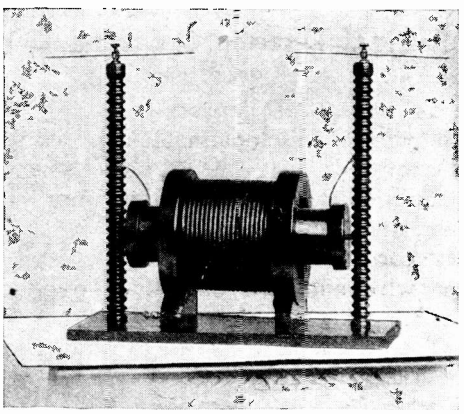
Experimenters who have wireless sending stations have all the apparatus necessary for the operation of an air insulated Tesla coil.

The coil here described is suitable for use with spark coils giving from a two to six inch spark or with a ¼ k. w. transformer. It is not advisable to make a larger coil unless oil is used for insulating. The coil shown in the photograph will give a seven inch spark when used in connection with a ¼ k. w. closed core transformer (magnetic leakage type), glass plate condenser and a rotary spark gap. When a stationary gap is used the sparking distance is about five inches.

The drawing gives the necessary dimensions. Part of the primary and secondary tubes are cut away in the drawing in order to make the construction clearer. The post in the end view is also cut away for the same reason. The primary consists of 20 turns of No. 14 B. & S. gauge rubber insulated wire wound on a paper or fiber tube six inches outside diameter. The length of the tube is not shown in the drawing because there is a great variation in the thickness of the insulation of different kinds of wire. There should be just space enough between the end pieces to accommodate 20 turns of the wire used. If stranded wire can be obtained it is preferable.

The secondary coil consists of one layer of No. 32 B. & S. gauge enameled wire wound on a tube three inches outside diameter. The winding should be eleven inches long. The other dimensions may be changed somewhat to suit the builder. The posts, however, must not be lower or the spark will jump into the primary winding.

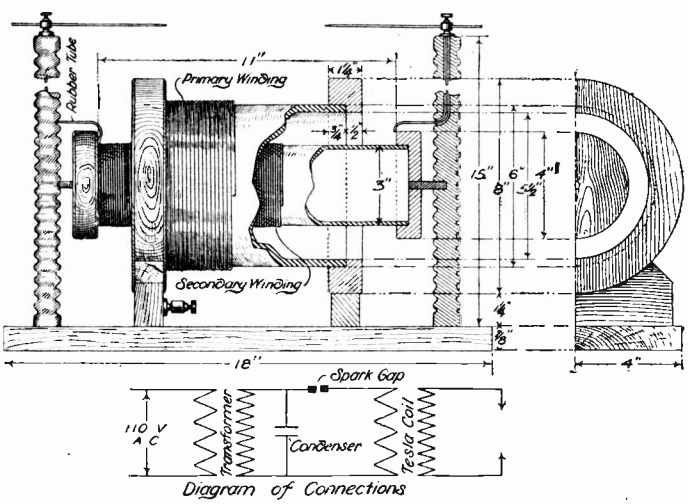
The framework may be made of any hard wood. It should be put together entirely with dowels, for if nails or screws are used the spark will jump into them. The tubes may be fastened to the end pieces with glue. The wood-



AN AIR INSULATED TESLA COIL

work may be finished with any substance which is a good insulator. A good imitation of hard rubber can be made by using maple and finishing with black shellac.

Very beautiful experiments may be performed with this coil in a dark room. The spark may be allowed to jump to



DETAILS AND CONNECTIONS OF TESLA COIL

a piece of metal held in the hand but no sensation of pain will be experienced. If the spark jumps directly into the body only a slight burning sensation will be felt. Lubricating oil may be placed on the end of the finger and lighted by means of the spark without burning the finger.—L. S. UPHOFF.

Making a Detector Out of a Cartridge Fuse

To make this improved detector the following readily obtainable material will be required:

One 50 ampere cartridge fuse and base, one small piece of galena or other detector mineral, four inches No. 30 copper wire and two ounces of ordinary sealing wax.

The fuse is first opened by pulling out the pins (one at each end) and the fuse wire broken off near one cup. Now wrap the fuse wire fastened to the other cup tightly around a small piece of the mineral and pour a little melted wax over the points where the mineral and wire come into contact and let cool and harden.

Fasten this cup and the piece of No. 30 wire to the receiving set as you would any detector and adjust the end of the wire on the mineral till the signals come in strongest. Then pour a little of the sealing wax around the point of contact and when it sets you will be surprised to find it in the same sensitive spot as when first adjusted.

Following this, line the inside of the fiber tube of the fuse plug with cotton and insert the detector proper, putting the wire through first so that a connection can be made to the cup at other end of the tube. This can be done with the remainder of the sealing wax and when the cups are replaced on the tube and fastened you will have a detector that can stand a surprising amount of hard usage and can even be dropped on the floor without affecting its adjustment in the least.—N. E. HOLT.

Convergence of Wireless Waves

In discussing the possibility of wireless communications for distances exceeding those now traversed, attention has been called to a very interesting theoretical point, namely, that when the equator is passed, the waves may begin to converge, following the outline of the globe, and thus it may happen that at the antipodes messages can be received much more easily than halfway to the antipodes.

WIRELESS CLUB DIRECTORY

This directory of amateur wireless clubs and associations will be published quarterly. When a new club is formed the names of the officers, also the street address of the secretary, should be forwarded to us at once. Any changes that should be made in the directory, when designated by an official of a club, will be made in the next issue in which the directory appears, after receipt of such advice.

Aerogram Club.—Walter B. Clarke, 17 May St., Newport, R. I., Corresponding Secretary.

Aerograph Club of Richmond, Ind.—James Pardieck, 320 South 8th St., Richmond, Ind., Secretary.

Aero Wireless Club.—D. Beard, Napa, Calif., Secretary and Treasurer.

Allegheny County (Pa.) Wireless Association.—James Seaman, Leetsdale, Pa., Secretary and Treasurer.

Alpha Wireless Association.—G. F. Girton, Box 57, Valparaiso, Ind., Secretary and Treasurer.

Amateur Wireless Association of Schenectady, N. Y.—A. R. Toft, R. F. D. 49, Schenectady, N. Y., Secretary.

Amateur Wireless Club of Geneva (N. Y.).—Benj. Merry, 148 William St., Geneva, N. Y., Secretary.

Arkansas Wireless Association. — Edward Vaughn, 2622 State St., Little Rock, Ark., Secretary and Treasurer.

B. W. T. A. Wireless Club.—C. H. Smith, Scarsdale, Pa., Secretary.

Back-Bay Wireless Club of Boston.—John F. A. Davis, Readville P. O., Mass., Secretary.

Berkshire Wireless Club.—Jas. H. Ferguson, 18 Dean St., Adams, Mass., Secretary.

Calgary Radio Telegraphy Club.—C. Selby Rickards, 3237 Seventh St., W. Calgary, Alberta, Canada, Secretary and Treasurer.

Canadian Central Wireless Club.—Harold E. Mott, 9 Central Ave., Armstrong's Point, Winnipeg, Manitoba, Can., Secretary.

Cardinal Wireless Club.—Harry Schwebke, South Division High School, Milwaukee, Wis., Secretary.

Chester Hill Radio Association.—Richard D. Zucker, 46 Clinton Place, Mt. Vernon, N. Y., Secretary and Treasurer.

Chicago Wireless Association.—F. D. Northland, 24 Scott St., Chicago, Ill., Corresponding Secretary.

Coatesville Radio Telegraphy Association.—Geo. H. Newlin, 326 Charles St., Coatesville, Pa., Secretary.

Colorado Wireless Association.—W. F. Lapham, 1545 Milwaukee St., Denver, Colo., Secretary and Treasurer.

Custer Wireless Club.—Walter Maynes, 438 Custer Ave., Los Angeles, Cal., Secretary.

De Kalb Radio-Transmission Association.—Bayard Clark, 205 Augusta Ave., De Kalb, Ill., Secretary.

Electrical and Wireless Club.—Clyde Stillwell, 108 Kappell Ave., Council Bluffs, Ia., Secretary.

Electro Mechanical Association of Columbus, Ohio.—John Dolby, 512 W. State St., Columbus, Ohio, Secretary.

Fargo Wireless Association.—Earl C. Reineke, 518, 9th St., Fargo, N. D., Secretary.

Forest Park School Wireless Club.—William Crawford, R. F. D. No. 1, Springfield, Mass., Secretary.

Frontier Wireless Club.—George S. Franklin, 1034 Elmwood Ave., Buffalo, N. Y., Secretary and Treasurer.

Geneva Amateur Wireless Association.—George Esser, Geneva, Ill., Secretary.

Geneva Wireless Club.—Henry B. Graves, Jr., 448 Castle St., Geneva, N. Y., Secretary.

Germantown Wireless Association.—George C. Blackwood, 5346 Germantown, Philadelphia, Pa., President.

Gramercy Wireless Club.—John F. Diehl, 207 E. 25th St., New York, N. Y., Corresponding Secretary.

Granby High School Electricity Club.—Eastman Smith, Granby, Mass., Secretary and Treasurer.

Greater Huntington Wireless Club.—Frank L. Murphy, 201-203 Main St., Guyandotte, W. Va., Secretary and Treasurer.

Greenfield Wireless Association.—Burrell C. Morris, 2201 Harrison Blvd., Oakland, Cal., Corresponding Secretary.

Hamilton Wireless Association.—H. N. Swain, 405 Franklin St., Hamilton, O., Secretary.

Hannibal (Mo.) Amateur Wireless Club.—G. G. Owens, 1306 Hill St., Hannibal, Mo. Secretary.

Harriman Wireless Association.—Everett R. Parish, 801 Clinton St., Harriman, Tenn. Secretary.

Haverhill (Mass.) Wireless Association.—Leon R. Westbrook, Haverhill, Mass., Secretary and Treasurer.

Hobart Wireless Association.—Charles Clifford, Hobart, Ind., Secretary.

Independence Wireless Association. — Joseph Mahan, 214 South Sixth St., Independence, Kan., Vice President.

Independent Wireless Transmission Co.—Harlan A. Eveleth, 72 Gray St., Arlington, Mass., Secretary.

Jonesville Wireless Association. — Merritt Green, Lock Box 82, Jonesville, Mich., Secretary.

Killington Radio Club of Rutland, Vermont.—W. R. Canty, Rutland, Vt., Secretary.

Lake View Wireless Club.—R. F. Becker, 1439 Winona Ave., Chicago, Ill., Secretary.

Lane Radio Association.—R. R. Traub, 2147 Lincoln Place, Chicago, Ill., Corresponding Secretary.

Lexington Aerogram Company. — Charles Young, 5 Warren St., Lexington, Mass., Secretary.

Long Beach Radio Research Club.—Bernard Williams, 555 E. Seaside Blvd., Long Beach, Calif., Secretary.

Manchester, (N. H.) Radio Club.—Earle Freeman, 759 Pine St., Manchester, N. H., Secretary.

Minneapolis Wireless Club.—John L. Ewart, Minneapolis, Kans., Secretary.

New Haven Wireless Association.—Russell O'Connor, 27 Vernon St., New Haven, Conn., Secretary and Treasurer.

New Thomson Wireless Club.—Edward M. Fleming, care the New Thomson, Kane, Pa., Secretary.

Niagara Falls Wireless Association.—J. J. Dobbie, Jr., 7 Buffalo Ave., Niagara Falls, N. Y., Vice President and Secretary.

Non-interference Wireless Association of America.—Gerald E. Travis, 1062 Saratoga St., East Boston, Secretary.

Northwestern Wireless Association.—L. J. Healy, 3349 Lincoln Ave., Chicago, Ill., Corresponding Secretary.

Oakland Wireless Club.—W. R. Sibbett, 916 Chester St., Oakland, Calif., Secretary.

Oklahoma State Wireless Association.—Ralph Jones, Box 1448, Muskogee, Okla., Secretary and Treasurer.

Oregon State Wireless Association.—Clarence Bischoff, Lents, Ore., Treasurer and Corresponding Secretary.

Panama-Pacific Wireless Club.—F. A. T. Browne, 1553 Muth St., Oakland, Cal., Secretary.

Peterboro Wireless Club.—E. W. Oke, 263 Engleburn Ave., Peterboro, Ontario, Can., Secretary and Treasurer.

Plaza Wireless Club.—Myron Hanover, 156 E. 66th St., New York, N. Y., Secretary and Treasurer.

Pueblo Wireless Club.—K. G. Hermann, 100 Board of Trade, Pueblo, Colo., Secretary.

Radio Club.—D. S. Brown, East Side Y. M. C. A., 153 East 86th St., New York City, Secretary and Treasurer.

Radio Experimental Club.—T. Reboul, 2106 Chartres St., New Orleans, La., Secretary.

Radio-Signal Club of Chicago.—F. H. McCarthy, 2113 Washington Blvd., Chicago, Ill., Secretary and Treasurer.

Radio Wireless Club of America.—George Burghard, 1 East 93d St., New York, N. Y., Secretary.

Rockland County Radio Wireless Association.—P. Haeselbarth, Nyak, N. Y., Secretary.

Roslindale (Mass.) Wireless Association.—Fred C. Fruth, 962 South St., Roslindale, Mass., Secretary.

Sacramento Wireless Signal Club.—W. E. Totten, 1524 "M" St., Sacramento, Calif., Secretary.

Santa Cruz Wireless Association.—Harold E. Sentor, 184 Walnut Ave., Santa Cruz, Calif., Secretary and Treasurer.

Seneca Electrical Club.—Howard Donnelly, R. F. D. 1, Geneva, N. Y., Secretary.

Southeastern Indiana Wireless Association.—H. Hitz, Fairmont, Madison, Ind., Corresponding Secretary.

Southern Wireless Association.—P. Gernsbacher, 1435 Henry Clay Ave., New Orleans, La., Secretary and Treasurer.

Springfield (Mass.) Wireless Association.—D. W. Martenson, Secretary; Club Rooms, 323 King St., Springfield, Mass.

Spring Hill Amateur Wireless Association.—H. P. Hood, 2nd, 2 Benton Road, Somerville, Mass., Secretary and Treasurer.

St. Paul Wireless Club.—L. R. Moore, 1911 Ashland Ave., St. Paul, Minn., Secretary.

Stoneham Radio Association.—Wendell Smith, 33 Warren St., Stoneham, Mass., Secretary and Treasurer.

Sullivan Amateur Radio Association.—Cecil L. Pigg, Sullivan, Ind., Secretary.

Tri-State Wireless Association.—C. J. Cowan, Room 1001 Falls Building, Memphis, Tenn., Recording Secretary.

Waterbury Wireless Association. — H. M. Rogers, Jr., 65 Elizabeth St., Waterbury, Conn., Secretary.

Wireless Association of Atlantic City.—Room 314 Bartlett Building, Atlantic City, N. J.

Wireless Association of British Columbia.—H. J. Bothel, 300 Fourteenth Ave. E., Vancouver, B. C., Corresponding Secretary.

Wireless Association of Canada.—W. C. Schuer, 189 Harvard Ave., Quebec, Can.

Wireless Association of Fort Wayne.—Adolph Rose, 1326 E. Wayne St., Fort Wayne, Ind., President and Secretary.

Wireless Association of Montana.—Harold Satter, 309 South Ohio St., Butte, Mont., Secretary.

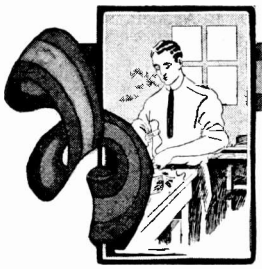
Wireless Association of Savannah.—L. H. Cole, Cor. Liberty and Price Sts, Savannah, Ga., Secretary.

Wireless Club of Baltimore.—Winters Jones, 728 Monroe St., Baltimore, Md., Secretary.

Wireless Club of the Shortridge High School.—Robert C. Schimmel, 2220 N. Penn St., Indianapolis, Ind., President.

Y. M. C. A. Wireless Club of Williamsport, Pa.—Lester Lighton, 241 W. 4th St., Williamsport, Pa., Secretary.

Zanesville Wireless Association.—Rudolph C. Kamphausen, 105 South Seventh St., Zanesville, Ohio, Secretary and Treasurer.



For Practical Electrical Workers

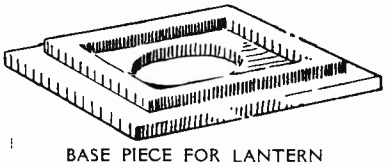
Homemade Artcraft Fixtures of Wood

By JOHN D. ADAMS

PART I

LANTERN

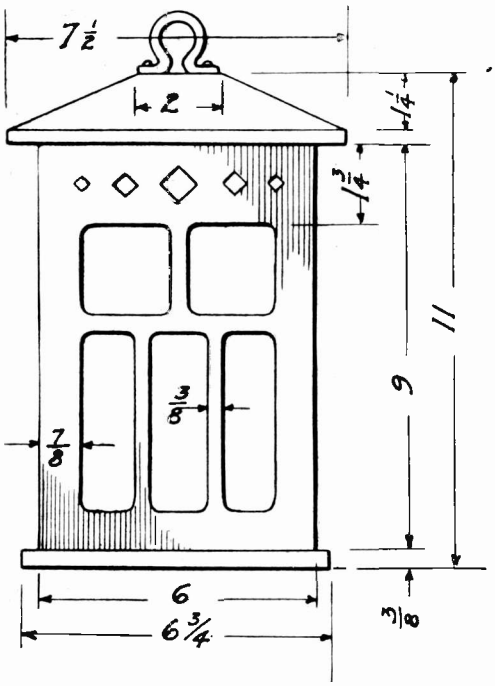
In planning a lantern we must remember that there are two distinct effects to be considered—the result when it is illuminated and its general appearance during the daytime. The effect that obtains during the one period seems to bear no relation to the other, as many lanterns show up fairly well at night but are anything but pleasing in broad daylight. The subject of the accompanying illustrations is a simple affair of rather attractive lines that will add to the homelike appearance of the porch, and when



BASE PIECE FOR LANTERN

illuminated will give ample light for all practical purposes without being offensive to the neighbors.

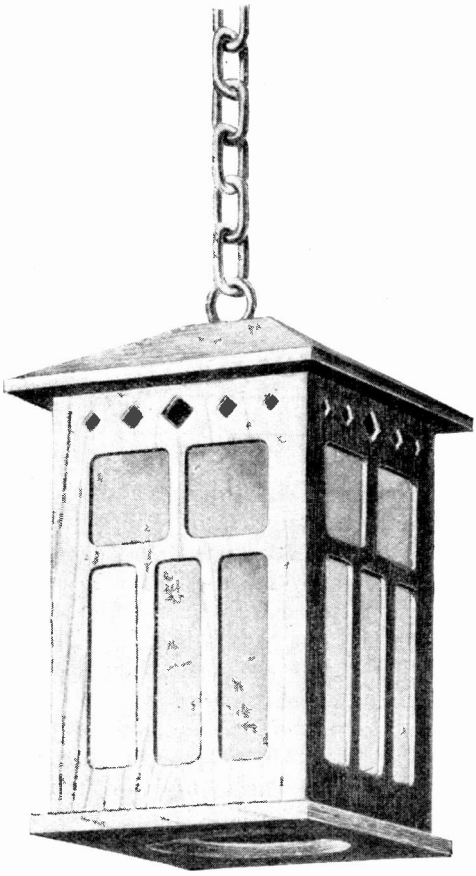
The first piece to make is the sloping top. Square it up, and mark off the necessary angles before sawing. Finish two opposite faces before commencing the remaining two. Next make the bottom board, cutting a round hole in it so that the globe may be renewed when necessary. In order that the sides may be firmly connected, nail four small strips around the upper side of the bottom as shown in the small sketch. Similar strips are also to be placed around the lower side of the top piece. The four side boards are now to be worked out with the scroll saw, which should be set with the teeth pointing inward so that splinters will not be torn off along the outside. The thin boards that trunks are made of, consisting of three thicknesses



DIMENSIONS OF LANTERN

NOTE: The suggestion in the National Electrical Code regarding the wiring of wooden fixtures is that wireways be metal lined unless approved armored conductors with suitable fittings are used. Those desiring to conform strictly to insurance requirements may use a substantial metal tubing for the wireways taking care that fins and sharp edges are rounded off.

of veneer with their grains crossed, is excellent material. Thoroughly dry hardwood, however, will answer every purpose. The corner seams may be mi tered or simply nailed up after the fashion of a box. Secure the necessary



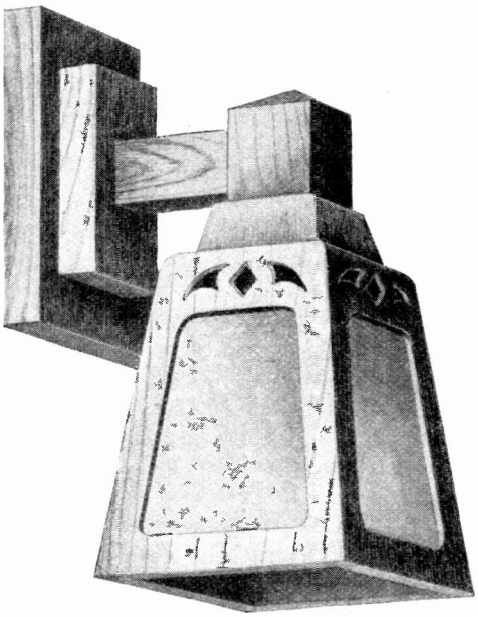
LANTERN

pieces of art, colored, or frosted glass and arrange for holding them securely against the wooden sides by means of tacks and small strips. Being assured that everything goes together properly, the assembling may commence. Nail the sides to the top and also to one another along the corner seams. Use glue and small wire brads, the heads of which must be carefully and deeply set. After drilling a hole in the top for the wire, the lantern is ready for the staining and finishing.

The chain may be connected by means of the bent piece of metal as shown, or with a large screw eye. The wires should be interwoven with the chain, or the latter may be entirely dispensed with and the lantern hung directly on the usual electric cord. The light can be controlled from a wall switch or by means of a socket with a drop pull.

HALL LAMP

There are several places besides the hall where the bracket fixture illustrated may be appropriately used. On a porch column, at either side of the fire place, or above a small desk are all places where this form of light may be worked in to advantage. The shade is of a form that may be made use of in several combinations and its adaptability to a

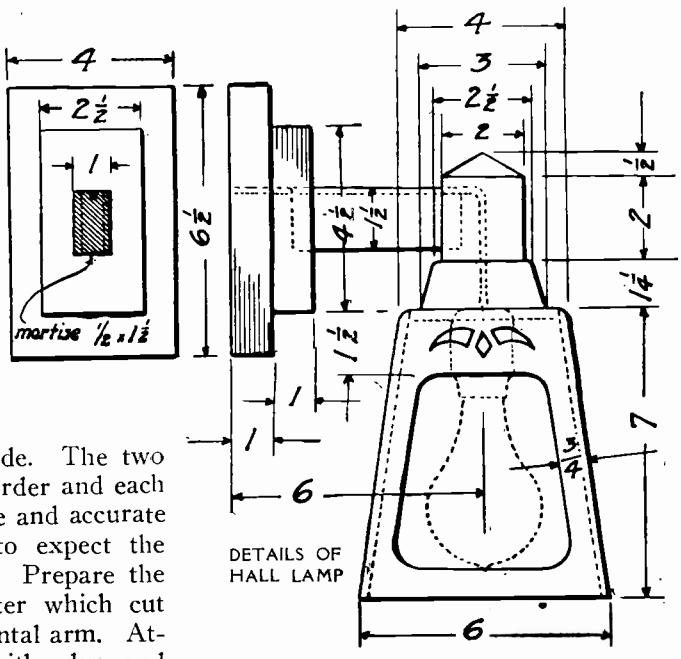


HALL LAMP

chandelier will be the subject of a later article.

The one feature that will require the greatest attention will be the fitting of the four corners seams on account of a very slight angle made necessary by the general angles of the sides. Attend to this feature first, and after having made

the four sides to form a tight fitting tapering box, proceed to cut out the panels for the glass and the small ventilating openings near the top. Use a scroll saw, and finish all edges smoothly. Securely nail and glue the four pieces together and then fit in a top. Should the sides tend to wrap along their lower edges, reinforce them with thin strips of hardwood fastened on the inside. The two blocks on top are now in order and each will require some little care and accurate marking out if we are to expect the lines to stand out clearly. Prepare the two wall blocks next, after which cut the mortises for the horizontal arm. Attach the several pieces with glue and screws, and while the glue is setting proceed to tenon the short arm to fit the mortises already made. Cut a small groove in the upper edge of this piece for the wires, and then assemble the entire lamp. Drill intersecting holes about as large as a lead pencil through the top blocks to lead the wires out to where they connect with the slot just mentioned, from whence they are to be carried back through the two wall blocks. The socket is suspended inside directly from the electric cord and is operated by the usual wall switch, otherwise a socket having a drop pull must be provided.



If the necessary art or frosted glass cannot be conveniently obtained, procure some heavy and appropriately colored paper and paste it on the inside. Those who have never used colored papers in this connection will be greatly surprised at the effects that are possible when illuminated.

For use out of doors the woodwork should be well varnished outside and in.

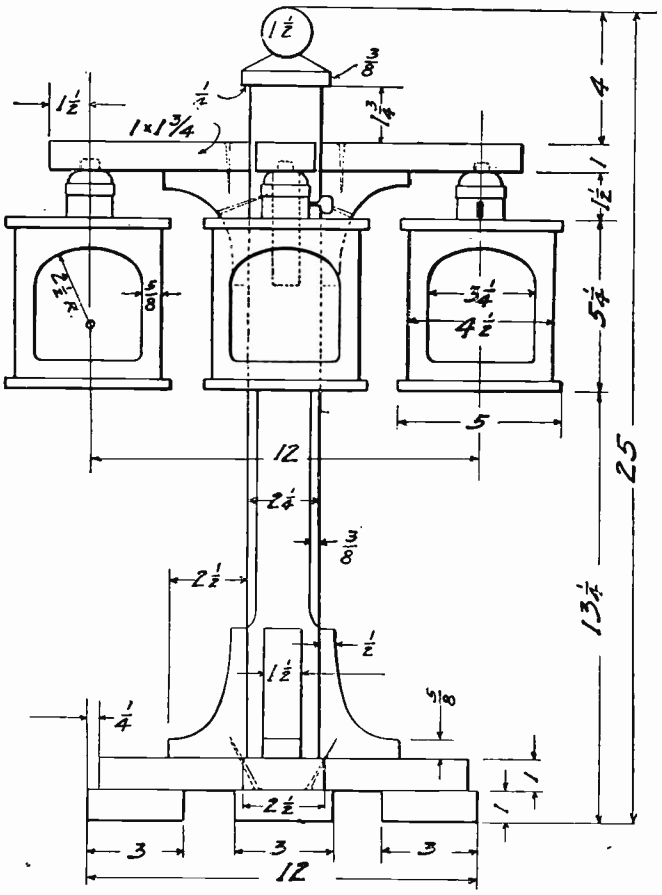
LIBRARY LAMP

The successful construction of this library lamp is much more a matter of time and patience than of skill. In other words, the structural features are more numerous than difficult. If the reader decides that he can make one shade, one bracket, and one foot, it is safe to assume that all four of each can be made, and therefore the entire lamp.

The method of making and attaching the shades is identical with that previously described in connection with the lantern fixture. The accompanying sectional view clearly shows this feature. First square up the sixteen small boards that compose the sides, mark out the openings from a carefully prepared pattern, cut them out with a scroll saw and finish all edges smoothly. Next get out the eight pieces for the tops and bottoms and after cutting the circular openings (in the former for the sockets and in the latter to give access to the interior) nail strips around on one side, as shown in the sketch of the lantern base piece. These are to facilitate the connecting of the sides, which may then be attached after having put in the glass. The shades may now be put aside until we are ready

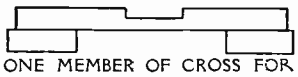
to place them on the sockets, to which they will be attached by means of four small strips of tin securely bound or soldered around each socket. These strips are spread outward when the shade is in position, as illustrated in the sectional sketch.

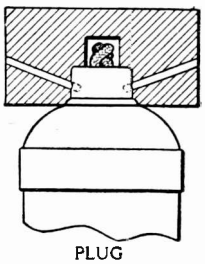
In making the cross for the base, each piece must be notched out in the center and after securing a good close fit, apply glue and set in a couple of screws from below. Cut the square mortise for the center post, and then square up and fasten on the four foot blocks. Accuracy is essential to bring out all these simple lines. The center post is now in order and after tenoning the lower end bevel off the four edges, make the top perfectly flat, and drill a large central hole for the wires.

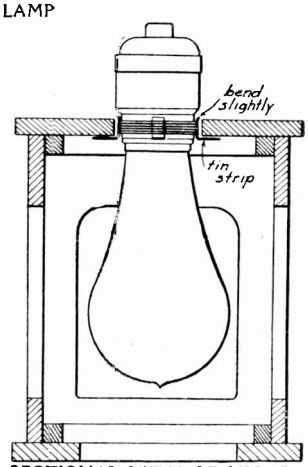


DETAILS OF LIBRARY LAMP

Next prepare the eight curved brakets and test carefully with the steel square. Place the post in the base and secure the lower set of brackets in position using glue and screws set in as indicated on the working drawing. The four plain projecting arms are now to be squared up and drilled near the ends for the sockets. These holes need only be about a half inch deep and will connect with a smaller hole running lengthwise to carry the wires to the center post, through which they will then run downward to the underside of the base.

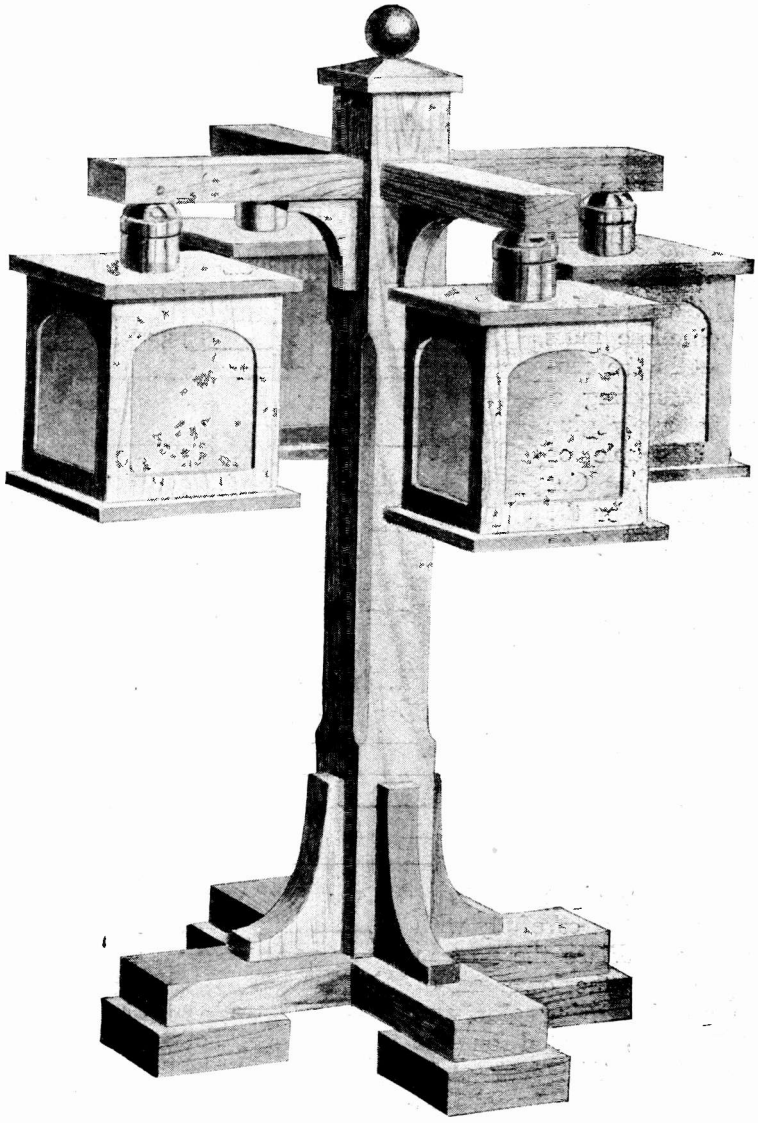

ONE MEMBER OF CROSS FOR BASE OF LIBRARY LAMP


PLUG ARRANGEMENT FOR FASTENING SOCKET TO ARM



SECTIONAL VIEW OF LIBRARY LAMP

Attach the upper set of brackets and the cap and ball on top. Stain and finish the entire lamp, shades and all. Place the sockets in position, each with a good length of wire,



LIBRARY LAMP

which must be drawn tightly through the wood so as to pull the socket up snug and secure each socket by two hardwood plugs inserted in holes in the woodwork, the plug points entering holes drilled opposite each other in the socket nipple. Draw the ends down the central hole and then attach the four arms. The various ends of wire are now to be connected to the regular twisted cord, which will lead away from the lamp from the underside of the base. If desired this feature may be turned over to any wireman.

Elementary Electricity for Practical Workers

By W. T. RYAN

CHAPTER IV—MATERIALS USED BY PRACTICAL WORKERS

In any electrical apparatus there are in general four classes of materials: conducting materials for carrying the current; insulation for electrically separating the conductors from the surrounding material; magnetic materials in which the magnetism is produced; and the additional materials required to give mechanical support to these three classes of materials.

CONDUCTING MATERIALS

The most important conducting material is copper. It is the best all around conductor of electricity with the exception of silver whose conductivity is approximately nine per cent greater, but which is so expensive that it is not considered. Copper wire may be either "hard drawn" or "soft drawn." Where tensile strength is of primary importance, as, for example, for transmission lines, trolley wires, etc., hard drawn wire is used. Where conductivity is a primary consideration and mechanical strength is not of great importance, soft drawn wire is used. The difference from the standpoint of manufacture lies in the fact that the soft drawn wire is annealed more frequently in the process of drawing. The difference in conductivity favors the soft drawn wire by about four per cent, whereas the tensile strength of the hard drawn wire is very much greater than soft drawn. For example, the breaking strength of No. 1 hard drawn wire is 3,746 pounds and of No. 1 soft drawn wire is 2,234 pounds.

Aluminum.—This is very plentiful in nature and the cost of recovering it is constantly becoming less. The use of it for electric conductors is quite frequent and is increasing. It is lighter than copper but has a lower conductivity and lower tensile strength. Copper and aluminum compare as follows:

	Specific gravity	Conductivity	Tensile Strength	Coefficient of expansion per degree F.
Copper,	8.95	98	35000 to 65000	.0000095
Aluminum,	2.69	62	25000 to 35000	.000013

The relative conductivity of copper to aluminum as shown is almost exactly the ratio between the area of any B. & S. gauge wire and one two sizes larger. For example, a No. 12 B. & S. gauge copper wire may be replaced by a No. 10 aluminum wire as far as conductivity goes. For equal conductivities aluminum has 1.56 times the cross-section of the copper conductor, therefore it presents a much greater body to the pressure of wind and the formation of ice. In some localities these factors are important considerations. Taking two wires of equal conductivity, it will be found that their diameters have the ratio 1 to 1.25, therefore, with insulation of equal depths it will require about 25 per cent more material for the protection of the aluminum wire than for the copper wire. At present equal conductivity aluminum costs about fifteen per cent less than copper. It is so plentiful that its price will probably continue to decrease whereas copper will probably increase in value.

While aluminum is undoubtedly not well suited to many situations it is well adapted to high voltage transmission distribution. Aluminum is frequently used for station bus bars. An aluminum bar presents a much larger surface to the air for radiation than a copper bar of the same conductivity. Aluminum is quickly coated by a thin layer of oxide which protects it from moisture, sulphurous fumes, etc. It is now successfully soldered by ordinary means through the use of an aluminum solder.

Iron.—Pure iron has about six and hard steel about twelve times the re-

sistance of copper. Where mechanical strength is more important than conductivity, iron wire is sometimes used. In very long spans in transmission lines steel wires in a copper shell (copper clad) are sometimes used in order to get the necessary strength. Both iron and steel wire must be galvanized in order to protect from oxidation. Iron weighs about 84 per cent as much as copper. A very serious fault of iron for use as a conductor is that it is magnetic, therefore offering a higher resistance to alternating currents than to direct currents. This, of course, depends upon the frequency, the size of conductor, etc. The effective resistance of the Ballston line of the Schenectady Railway System was increased 93 per cent when alternating current series motors were put upon the cars and supplied with 25 cycle alternating current.

Carbon.—Although carbon is not nearly as good a conductor as the metals it is often used as a conductor of electricity. The brushes which conduct current to and from direct current dynamos are almost always made of carbon. The carbon of arc lamps is another example. The filaments of carbon incandescent lamps are also made of carbon. Rheostats are sometimes made with carbon conductors.

Liquids.—Acids and salts in solution which are decomposed by the passage of electricity may all be classed as conductors. The most important of these is probably sulphuric acid, because of its use in the lead storage battery. It is often convenient to control current by means of a liquid resistance. Pure water is a non-conductor, but if small quantities of salt or acid is added almost any desired degree of conductivity may be obtained.

Alloys.—There are a large number of alloys in use as conductors, but in general they have some special application. They are manufactured each for the sake of some quality which makes it of greater value under certain circumstances. This peculiar property may be zero temperature coefficient, low melting point, high resistance, etc. The more important ones are German silver, manganin and a combination of tin, bismuth and lead which will melt at very low temperatures. It may be used for fuse wire or solder. German silver is an alloy of copper, nickel and zinc. The resistance is about 20 times that of copper. Manganin has nearly 40 times as much resistance as copper and has a zero temperature coefficient. Its resistance is the same at all temperatures.

INSULATING MATERIALS

Insulating materials are used to prevent leakage of current between conductors in electrical apparatus and transmission lines. It is not generally appreciated that the lack of proper insulation causes an unusual amount of trouble and is one of the principal hindrances to electrical progress at the present time. It is a question of insulation that limits the voltage of commercial alternating current generators to approximately 20,000 volts. It is a question of insulation that fixes the upper limit of transmission line voltages and limits the area over which such water powers as Niagara Falls can be economically utilized. Go and look at any railway motor scrap heap and you will find that at least 80 per cent of the motors are out of commission because the insulation has failed.

The primary requisite of an insulating material is that it be able to withstand puncture when submitted to the maximum electromotive force under working conditions, and that it will not deteriorate. There is a place for a number of good insulating materials. Dr. Steinmetz has given the name "electric pressure rupturing gradient" to the number of volts per inch of thickness necessary to puncture the material. This is the most important of the requisites of a good insulating material as its function is primarily to prevent leakage of electricity between conductors.

Among the important dielectrics are the following: Air, ambroin, armalac, asphalt, ebonite, enamel, glass, gutta percha, horn fiber, lava, leatheroid, marble, mica, micanite cloth and paper, paraffin, porcelain, rubber, shellac, slate and sterling varnishes.

Air.—The wires of high voltage transmission lines are as a rule, not covered. The air between the wires is what insulates 110,000 volt transmission wires from each other. Even in the case of a large per cent of the covered wires, the object of the covering is simply to separate the wires, the air being depended upon for insulation. Air has many peculiarities as an insulator. The rupturing gradient depends on the length of path between the conductors being much greater for a relatively short path than for a longer one. It is also much greater for a high pressure, than for a low one.

The spectacular "corona effect" which precedes breakdown takes place when a certain critical electromotive force is reached, depending on the spacing of the conductors, their radius and the atmospheric conditions.

Armalac.—This is an insulating varnish that has many good points. It is black paraffin in a solution of petroleum naphtha, the melting point of the paraffin having been raised by a secret process to over 300°C. It will absorb oil and be benefited thereby. It never attacks the conductor. It is applied by simply dipping the taped conductors into it. It is also used to insulate iron laminations. It is thinned with petroleum naphtha and the plates dipped into it. A very thin layer is formed which dries very quickly without baking.

Asphalt.—This is used chiefly in cable conduits. It is not affected by water and is very ductile. It is cheap and is easily repaired.

Ebonite.—This is a species of hard rubber. It has a very high dielectric strength but is attacked by oils and also by the air because of the sulphur which it contains. It is brittle but fairly strong.

Enamel.—Various kinds have been applied successfully to small wires ranging in size from the smallest up to about No. 10 B. & S. gauge. Its principal advantage lies in the saving of space and the heat resisting qualities of the insulation.

Glass.—This has very high dielectric strength, is easily molded into any form and posseses excellent electrical and fair mechanical properties.

Gutta percha.—This is used for insulating cables where it is protected from the action of light and air. It oxidizes rapidly in air, the oxidation being hastened by light.

Horn fiber.—First in rank among the fibrous materials is horn fiber, both in mechanical and dielectric strength, but it is rather expensive. When impregnated with varnish the dielectric strength is high.

Lava.—This is not, as commonly supposed, a substance of volcanic origin, but is a mineral talc which has come to be an important insulating material. While in its natural state it can be machined as easily as brass. After machining, it is baked at a temperature of over 1,000° which renders it so hard that nothing but a diamond will cut it. It is used for transformer bushings and other places where the requirements are similar.

Marble.—A high dielectric strength is characteristic of this material. It is, moreover, easily worked and is very beautiful

Mica.—One of the most valuable and important of the insulating materials is mica. It has a high dielectric strength and is suitable for very high temperatures. It is a silicate of aluminum and potassium or sodium found in nature. It crystallizes in laminated form and may be split along its axis into sheets as thin as 0.001 inches.

Paraffin.—This is used to impregnate other materials, such as cloth and paper.

Porcelain.—This is a suitable material for line insulators. At high temperatures it becomes a fairly good conductor

and, therefore, is not suitable for extremely high temperatures such as are found in furnaces.

Rubber.—In the manufacture of insulated wires and cables rubber enters very extensively. A layer of soft rubber is applied to the tinned surface of a wire, the tinning being necessary to prevent the action of the sulphur of the rubber upon the copper. Rubber will not stand very much heat, therefore it must not be raised to such temperatures as will soften it.

The rubber coating is then mechanically protected by cotton braids impregnated with some wax compound.

Shellac.—This is a quick drying varnish which is a good sticker, has a dielectric strength and is moisture and to a certain extent acid proof. It becomes brittle and disintegrates at high temperatures.

. *Slate.*—It should be free from conducting veins and be enameled so as to fill the pores and keep out moisture. It is suitable for some classes of switchboard work.

MAGNETIC MATERIALS

The only commercially important magnetic material is iron. When a piece of iron is placed in a magnetic field it becomes a magnet. The operation of magnetizing the iron is called induction. The ability of the field to induce the attractive force is called its magnetomotive force. The magnetomotive force may be produced either by a previously magnetized piece of magnetic material or by a coil of wire carrying a current as shown in Fig. 8.

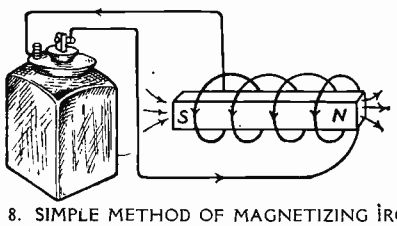
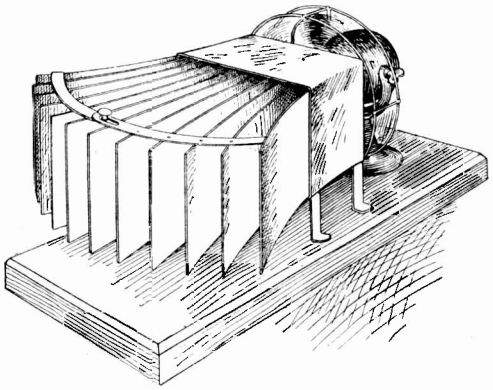


FIG. 8. SIMPLE METHOD OF MAGNETIZING IRON

(To be continued.)

Air Current Equalizer

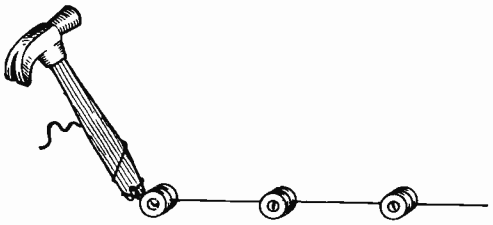
The peculiarly shaped device placed in front of an electric fan is called by its inventor, Charles Goodwin, East Moline, Ill., an air current equalizer. The adjustable, flexible blades permit the air to be distributed over a large or small area as desired.



AIR CURRENT EQUALIZER

Making a Hammer Useful at Both Ends

When fastening wires up with split knobs, the wire should be drawn up taut as each knob is put on. A handy instrument for the purpose is an ordinary hammer. Cut a notch in the end of the handle about three-fourths of an inch deep and wide enough to take the wire. When you are ready to draw up the wire and put the final tightening twist to the screw in the knob, get hold of the wire with the notched handle up close to the knob on the far side and give it a turn which will draw the wire as tight as you wish. While you have it tight, clamp it there with the knob.—MARSHALL LOKE.



HAMMER AS A WIRE STRETCHER

Electrical Securities

By "CONTANGO"

Receiverships and what they mean. Necessary and unnecessary they will occur — sometimes to the detriment and occasionally to the benefit of the properties involved. Their average effect explained by analysis and chart.

Broadly speaking, there are two main forms of receivership: the voluntary and involuntary. The former is brought about by friendly action on the part of owners; that is to say, in the case of a big corporation, of the stockholders. The latter is brought about by action on the part of creditors, usually the bondholders on whose bonds interest has been defaulted for a period.

The term receivership means the placing of the affairs of a corporation or business concern in the hands of one or more persons appointed by a court of law to receive all moneys due, pay out all moneys, and in fact conduct the business until such time as it may be ascertained as to whether the business should be continued or wound up, or sold to bidders, in which case, if the action for the receivership has been brought by bondholders, it is usually bought in by them.

A score or more disgruntled stockholders applying to a court for a receivership for a large concern is an occurrence always looked on with more or less suspicion by a judge in any court, unless fraud should be charged and substantiated. In such case an official receiver would be appointed by the court to take charge of the business and if need be wind it up. A receivership does not always mean failure. It may, and usually does in the case of a large corporation, mean that stockholders, or a body of them, bondholders and commercial creditors unite in a desire to ascertain the company's true position. There would then be probably three receivers appointed as a committee representing the different interests mentioned. In the case of default on bonds the bondholders, after the period established in their particular mortgage, have, of course, an absolute right to demand a receivership or to foreclose. There have in past years been some very serious failures in the United States involving receiverships for some very important railway companies, and in such cases the value of shares of stock may have dropped from say $80 a share to as low as $5.00. On the other hand the bonds may have been so well protected as to have suffered comparatively slightly in quoted price. This would mean that the bondholders assuming control of the property have ample security for their investment with the certainty of acquiring the property under a receivership sale, and of thus being able to have the particular company's affairs conducted on such a basis as to pay and maintain the rate of interest on their original securities. But in the final adjustment there is usually a rearrangement of the bonded indebtedness, a calling in of the old class of securities in favor of a new and more comprehensive issue by means of which more capital is raised for the proper development and further continuance of the business. A dozen cases of corporations of the largest caliber passing successfully through the trammels and difficulties of receivership might be mentioned. On the other hand, in quite a majority of cases of receiverships for commercial and industrial concerns the final result has been the wiping out of the holdings of the original owners. The point of moment to the investor is to what degree does a receivership affect his holdings of stocks or bonds.

Will he lose his principal as well as the interest, or dividends overdue, in the case of preferred stocks?

It is hard to apply a set rule. One has known cases of companies where there has

been no bonded indebtedness and where stockholders themselves have been responsible for the receivership, buying the property in at the receiver's sale, realizing enough money to pay off or compound with the creditors and then running the business anew with a subsequent loss and final failure. On the other hand large corporations have passed through one or more receiverships with little or no final loss to the security holders and even with final recoupment to the original stockholders.

The moral of this is that the mere fact of a receivership must not of necessity imply that all is lost. With the affairs of a corporation like a public utility company this is scarcely ever the case, because by the very nature of its business it is always a going concern; practically, the business must be conducted either by readjustment of stock and securities in the hands of the original investors, or the taking over of the corporation by some larger concern with consequent protection to the holdings of the original investors.

The point to be insisted on is that investors should not be in the least alarmed as to the likelihood of receiverships for public service corporations. The accompanying chart compiled by the well known operating and financing firm of Henry L. Doherty and Company of New York is decidedly worth while considering as to this point.

It appears that the risk of receivership in gas and electric utility corporations with average net earnings of $8.45 per $100 of securities outstanding, is but $0.37; in the case of industrials with average net earnings of $7.79 the average receivership risk is set at $2.07 and in the case of railways with average net earnings of $4.25 the receivership risk is set at $1.84. In each case the receivership risk is represented by the length of the solid black area. This chart very aptly and clearly shows by a few simple figures what has just been explained at some length, viz., it is in the commercial, or perhaps one should say mercantile, line of business that the receivership is most to be expected and feared.

A receiver or receivers appointed by a court conducts or conduct the business until the affairs of the corporation are refinanced or wound up, but at the same time the expert managers and men conversant with the affairs of the company are retained to look after their specific departments. It therefore often happens that in the case of the receivership of some railway company, for example, one would not know that anything untoward had occurred in so far as the personnel of the operating force of the company is concerned. It is the tightening of finances and prevailing economies that as a rule indicate the situation. But even so, the business must be conducted, and for all

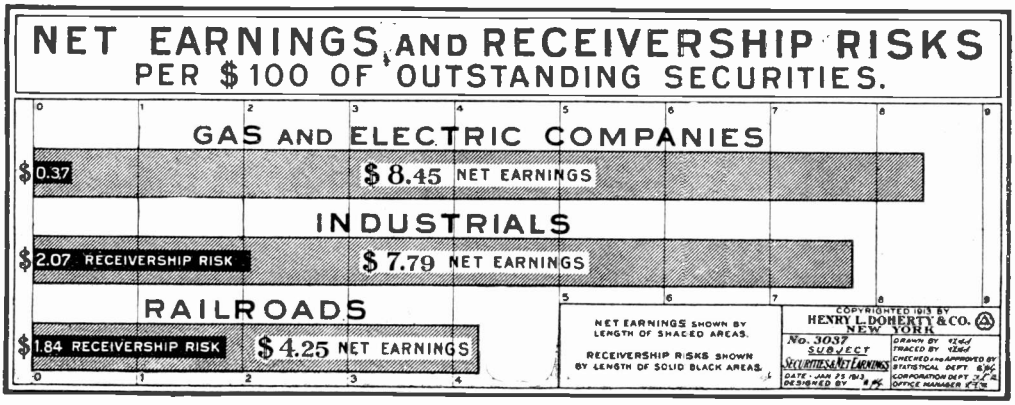


CHART OF NET EARNINGS AND RECEIVERSHIP RISKS

pressing matters receivers' certificates for payment will be issued, which, of course, have prior claim on the company's resources or money coming in and before anything else may or can be paid. These certificates sometimes include wages and salaries. When the receiver has paid off and adjusted the claims of a company or wound up its affairs then the legal court under which he has been appointed will discharge him. The cost of a receivership is always heavy; in big affairs the legal charges are enormous and there are court fees as well. Courts have usually special men they appoint as receivers in a general way, and in particular is this the case with the Federal Courts, but naturally if the receivership is brought about by the bondholders, in other words by those who seek to get an accounting without at once foreclosing their mortgage, they have much to say as to the person or persons to be named as receiver or receivers. In the case of a friendly receivership the president of the concern may be named as the receiver and often is.

It is not necessary to go into the intricacies of the legal end of a receivership; it is, however, quite important to insist once more that security holders in particular need not by any manner of means immediately assume that they have lost their investment by such proceedings.

Position of Electric Service Company Securities

During the past ten years the investing public has been called upon to pass judgment upon electric service company securities to a very large extent and the final verdict has been a most favorable one. Prior to 1900 it was difficult to market the bonds of such companies, except when the company issuing them operated in thickly populated centers and could show very large gross earnings.

This hesitation on the part of the public did not arise from doubt as to the inherent safety of such securities, for the electrical business had been profitable and was known to be one of the few classes of enterprises which had passed through panics without experiencing any serious setback in earnings, but was due rather to the fact that the technical development had been so rapid that the methods and cost of production had not been standardized and there could be no real basis upon which to judge various properties. This, coupled with the fear that new inventions might revolutionize the entire production, made the public hold off from buying this class of electrical securities.

To-day these difficulties have disappeared. Methods and costs of production are fast being brought to a fixed and practical standard and investors have been educated to a full realization of the value of this class of investment.

Lost or Mislaid Securities

Few people realize the risks run by them in not taking proper precautions to see that their bonds do not fall into the hands of strangers by reason of carelessness, theft or fraud. It is therefore well to outline the position of a bond in the hands of others than the true owner. A bond is governed by the law of negotiable instruments while the interest coupons attached have the same negotiability as the bond itself, if there appears on them some negotiable word or language from which negotiability can be inferred, thereby creating an obligation distinct and independent of the bond.

The first general principle in the law of negotiable instruments is that the holder of such has a good title which he can defend against all others if he is a bona fide "purchaser for value," having bought in the ordinary course of business without any actual notice or inference of facts which might interfere with its value as relating to prior holders.

In the case of a bond an innocent "purchaser for value" must acquire it before its maturity, as an obligation presented after maturity implies on its face a situa-

tion which should be inquired into. A purchaser who has taken a bond in the manner set forth above may recover on it, although it may have been obtained by the seller through fraud, theft, robbery or breach of trust. As to what is a "purchase for value" the law may be summarized by saying that a valuable consideration has passed if the bond has been paid for in money or something of real value or where the purchaser has changed his position to his own injury, but if the consideration given is considerably below the market price, the good faith of the purchaser may be inquired into.

It can be set down as the law that if a bond is stolen or obtained by fraud and then is bought in good faith for a good consideration by a third party, such party can defend his title even against the defrauded owner. While registration of bonds would avoid the danger of loss by theft or fraud, yet it is not advisable to put coupon bonds in registerable form, as immediately upon registration the bond loses its quick marketability due to the red tape necessary before the bonds can be transferred on the books of the registrar and the various methods used by registrars.

Few investors have a legitimate excuse for being careless in the protection of their securities, as it is nearly always possible to find a convenient safe deposit vault in which to place bonds and stocks so that possibility of theft may be precluded.

Accrued Dividends as Affecting the Price of Stock when Issued

Any firm of brokers offering an issue of "cumulative preferred stock" at par, for example, with accrued dividend is merely suggesting an arbitrary price. It remains with the public to fix that price by its belief, or lack of it, in the value of the stock and its future.

Used as a term or expression in connection with the price of an issue of stock, or quoted in an advertisement, it carries with it the meaning of dividends due or accrued and *current,* otherwise the price of the stock offered would be lower and described as ex-dividend, that is, purchasable without accrued or *current* dividends. And this is the same in regard to bonds, which, without accrued or *current* interest, would be described as ex-interest, and therefore quoted at a lower price.

To Determine Length of Wire in a Spool

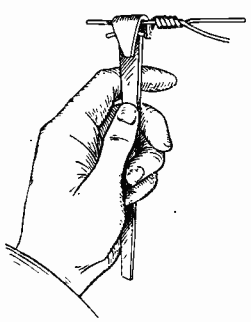
It is often necessary to find the length of wire a spool will hold in order to get the resistance or weight of wire.

To the large diameter in inches add the small diameter in inches, multiply by the number of turns of wire, then multiply by .1309 and the result will be the length in feet.

The number of turns in one layer may be found by dividing the length of the spool by the diameter of the wire (over insulation of course). The number of layers by dividing the depth of the spool by the diameter of the wire, but there will be an extra layer of wire about every six to ten layers caused by the wire dropping in the grooves between the wires of the under layer.

Wire Splicing Tool

The illustration shows a device made out of a temper drawn file, bent as shown with slit shoulders ground in the sides so that when two wires are crossed for the making of a splice, the rounded slit holds one wire and a leverage of ten inches may be obtained for twisting.



WIRE SPLICER

SCIENCE EXTRACTS FROM FOREIGN JOURNALS

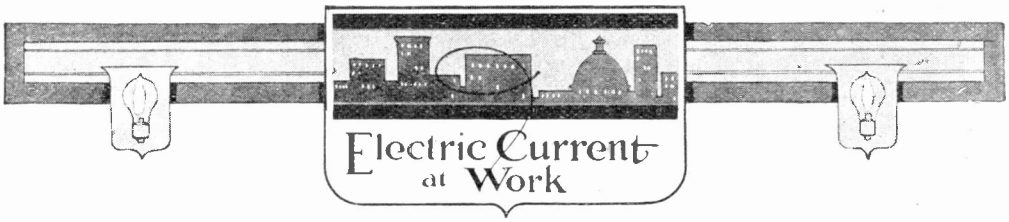
Detecting Flaws in Aluminum Joints.—Now that aluminum wire is coming extensively into use for electrical work, it will be of interest to note the new method of detecting flaws in aluminum welded joints, whether for wire or for other kinds of pieces. This applies, of course, to a direct weld of the metal, and not to a soldered joint. A German engineer, Otto Nicolai, of Bonn, finds that a joint of this kind can be very readily tested by simply dipping in water for a certain time. For instance, the joint is immersed in a vessel of water, and if air bubbles are seen to be given off after 48 hours, such bubbles being hydrogen gas, we may be sure that the joint is defective and the metal will give out sooner or later. He claims that a bad joint of this kind will last only fourteen days when under water, but in the air it may sometimes hold good for several months, but is sure to break at last. Naturally, damp air hastens the corrosive action and soon breaks down the joint.—*Revue Electrique, Paris.*

Wireless in Polar Explorations.—Wireless telegraphy will be a feature for the equipment of the "Fram," Capt. R. Amundsen's vessel to be used in his expedition to the North Pole, which is due to start in May. Capt. Amundsen also intends to carry a wireless outfit on the sledges in his final dash to the Pole. It has been queried whether a wireless set carried on the sledges would not have averted the tragedy to Capt. Scott's party. They were only eleven miles from One Ton Depot where there was food and help when disaster overtook them. No doubt in the future the stations in the Polar regions will be provided with wireless. In Polar exploration, of course, a very light weight outfit is needed, especially for the sledges. One of the lightest is the new Marconi "knapsack" type, for conveyance by hand, and the total weight of the complete station is only 86 pounds. It can be erected in six minutes by four men, and is able to reach a twelve mile range. It will be highly interesting to note from Capt. Amundsen's experience with his wireless equipped sledges what future radio-telegraphy has in Polar exploration. Among the members of the Shackelton expedition to the South Pole was a young Australian explorer, Dr. Mawson. On his return with the party, he decided to retrace his steps in order to systematically explore the land which had just been opened up by these intrepid adventurers. Accordingly he, at the head of a party of 32 scientists, has for more than a year been engaged in important researches in this virgin territory —the coast extending westward for 2,500 miles. The main exploring party was landed in Adelieland, where a base was formed preparatory to another journey to the magnetic pole. Other parties were landed to the westward by the "Aurora" and will be taken off by the vessel on her return journey. A wireless telegraphic station was established at Macquarie Island by the expedition in 1911. This is midway between Tasmania and the Antarctic Continent. Since then another wireless installation has been made in Adelie Island, and the connecting link of Macquarie Island will enable Dr. Mawson to communicate the adventures and discoveries of the three exploring parties to his agent in Hobart. With characteristic enterprise the *Daily Chronicle* has made arrangements with the agents to receive the messages as soon as they have come through to Hobart, and will then publish them. This is the first time that wireless communications will have been telegraphed direct from the Polar regions.—*Marconigraph, London.*

Electrically Produced Ferro-Silicon and Potash.—Electric production of ferro-silicon as well as potash is to be carried out by a new method in Sweden, using current from hydraulic stations which can thus be had cheaply. It is reported from Gothenburg that the Swedish engineer, Axel Lindblad, who is known by his work in electrical smelting of iron, is experimenting with a test plant in which felspar (containing eighteen per cent potash is to be electrically smelted with coal and iron. The main product resulting from the operation is ferro-silicon, while the easily soluble potash salts are in the slag and can be extracted by a dissolving process. About 100 tons of fertilizer potash are said to have been turned out already in the small plant and he is now engaged upon the plans for a large one.—*London Electrical Review.*

Use of the "Iron Arc" in Optical Work.—The Zeiss optical works of Jena, Germany, have lately produced a rather curious form of electrical apparatus for use in various kinds of optical testing work in their laboratories. The device is based upon the use of the so-called "iron arc," that is, an electric arc having its carbons impregnated with salts of iron and this causes the arc to give out a strong light which contains a large proportion of ultra-violet rays. The iron arc is much richer in such rays than the arc between ordinary carbons. A set of screens is placed in front of the arc so as to cut off all the ordinary light rays as well as the heat rays, and leave only the ultra-violet rays to pass in a strong beam. Such a beam is of a striking nature, as it is quite invisible to the eye but at the same time can produce powerful effects. In these rays many substances are seen to glow with a fluorescent light, and as is well known, this is caused by the invisible rays exciting the substance, such as a mineral crystal, for instance, so as to make it glow and give out light which is of another degree so that it can now be seen by the eye. It is also noticed that the amount of light they give out is greatly affected by the purity of the substances, so that different chemical substances can be examined in the beam in order to test their purity; that is, a pure and an impure specimen will give different hues of light.—*The Engineer, London.*

Record in Wireless Telephony.—An almost sensational feat in the way of telephoning across space by wireless has been accomplished by Professor Vanni, who succeeded in telephoning from Rome to Tripoli, a distance of over 600 miles, mainly over sea. It will be remembered that after the pioneer work of the Danish engineer Poulsen, the question was taken up by the Italian scientist Majorana, who succeeded in covering about 250 miles distance, working between the vessel "Lanciera" and the coast. Since then there appeared to be no further progress made up to the present time. Professor Vanni now covers a distance which is far ahead of anything to be reached up to date, and this marks an important step in telephoning by the aerial waves. His station is set up at the Military Institute, about eight miles from Rome, where he is professor, and he was able to talk to the engineers at the Tripoli station 600 miles off. It is of interest to note that speech is now sent over space for the first time between Europe and Africa, crossing the Mediterranean. He uses a liquid microphone, which, by the way, is the invention of an American, Chichester Bell, brother of the celebrated inventor of the telephone. Employing a microphone on this plan combined with electric apparatus of the Maretti type, his voice could be well distinguished at Tripoli. Still more difficult was the experiment made by placing the trumpet of a phonograph before the telephone, and the words of the phonograph could also be heard at the other end. Professor Vanni states that he will next try to work between Rome and Paris, 730 miles.—*La Nature, Paris.*



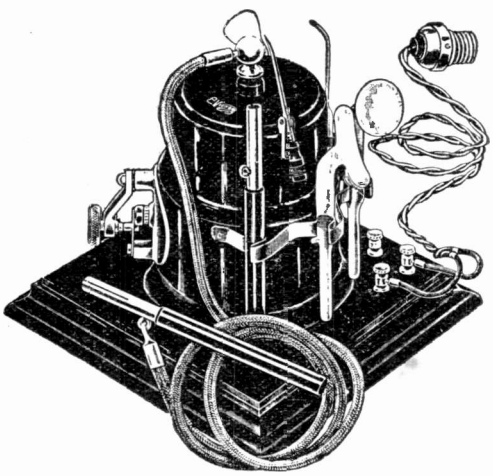
The Foen Drier

After scouring a tan shoe it must be dried thoroughly before the polish is applied. To dry it by fanning with a rag or whisk broom is a process that "gets on the nerves" of the customer and wastes the time of the shop employe. In the most progressive shoe shining establishments this fact is recognized, and almost as soon as the electric hot air blower became practicable for other purposes it was used for this one also. Some of these driers, being designed for altogether different work, are too cumbersome and clumsy to handle in the restricted quarters of the small shoe shining parlor, so a small, convenient one has been designed—the Foen drier. It weighs but two pounds and if operated continuously would require but about two cents worth of current an hour. Considering that it dries a pair of shoes in less than a minute its use means a great many additional dimes during rush hours when the shop is working to capacity and people are turning away every minute because there is no vacant chair.

Barbers' High Frequency Apparatus

The Electro Prismatic Wave generator is a new high frequency device for use in barber shops, the current being conducted directly into the customer's face or scalp through a vacuum electrode of glass. The current used is high frequency. The ordinary 110 volt lighting current is stepped up to several thousand volts and its frequency or alternations raised to several million per second, making the current harmless and pleasant to receive.

First, a thin towel is placed over the customer's face and a very mild current is then turned onto the machine. As the treatment progresses, the strength of the current is increased little by little. This treatment is continued for approximately four to five minutes, at the end of which time the current is turned off and the towel removed. Hot towels are then applied to the customer's face, after which the regular massage cream is put on. The machine is then turned on and the electrode held by the customer in his hand. The barber then gives approximately a three minute hand massage—the current going into the customer's body through his hand during the entire period. As the barber massages the face, sparks are drawn through the face to his fingers.



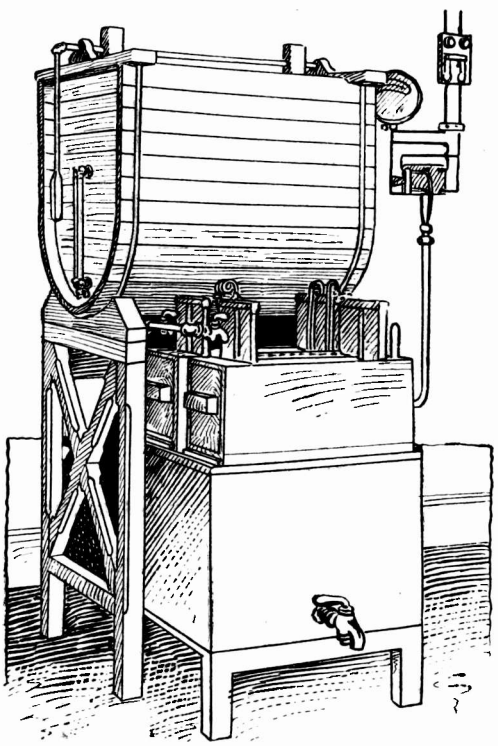
BARBERS' HIGH FREQUENCY APPARATUS

This gives a slight tingling sensation to the face. It is not, however, in any way painful or disagreeable, but on the contrary, quite pleasant.

After the completion of the massage the balance of the operation is similar to the finish of an ordinary massage. Experience seems to have demonstrated that the customer feels that he has received nearer the worth of a dollar than fifty cents.

Electrolytic Bleaching

In the days before modern chemical and manufacturing methods had been discovered, the bleaching of cloth was done by exposing the material for a length of time to the action of the sun and the air. This process was called "crofting" and the persons engaged in the business were "crofters." In the early part of the last century the bleaching properties of chlorine were discovered, and since then this has been used almost exclusively, in the form of chloride of lime or *eau de Javelle,* which is a solution of potassium hypochlorite. The use of chloride of lime, however, necessitates the employment of a precipitating agent, such as soda ash, to remove the lime, which if not removed makes the water extremely hard and forms soap curds which if deposited on the cloth cannot be removed. This method, however, gives a liquid which although soft is strongly alkaline.



ELECTROLYTIC BLEACHING MACHINE

In recent years manufacturers have been experimenting with electricity to see if it would be possible to discover a method of producing a solution of chlorine which will have none of the disadvantages of the old methods. Now it happens that one of the most prolific sources of chlorine is ordinary common salt, which is a chemical combination of sodium and chlorine. By submitting a solution of salt in soft water to electrolytic action there is liberated at the positive electrode, chlorine and at the negative, caustic soda. The chlorine gas, being soluble in water, combines with the caustic soda and produces a solution which is perfectly soft and perfectly neutral.

The manufacturers of the electrolytic bleaching apparatus shown in the accompanying illustration state that if electric power costs one cent per kilowatt hour, and salt five dollars per ton, then the cost of producing electrolytically a bleach which would be the equivalent of 100 pounds of chloride of lime, will be 83 cents—the power costing 45 cents and the salt 38 cents.

An analysis of these figures will enable a comparison of the two methods of producing a bleach to be made if the cost of power, salt and chloride of lime is known. It was found that taking an average of a number of mills using the electrolyzers, 300 gallons of the electrolytic bleach was equal to 100 pounds of bleaching powder; this 300 gallons being produced by 150 pounds of salt and 45 kilowatt hours of power.

NEW BOOKS

PRACTICAL MATHEMATICS. By C. I. Palmer. New York: McGraw-Hill Book Company. 148 pages with 68 illustrations. Price, 75 cents.

This book is Part IV of a series and completes the set which is designed to meet the requirements of the practical man who finally realizes the need of a knowledge of elementary mathematics. Part IV treats the subjects of trigonometry and logarithms.

THE ELECTRIC MOTOR. By Elmer E. Burns. Chicago: Joseph G. Branch Publishing Company. 1912. 182 pages with 78 illustrations. Price, $1.50.

The aim of this work is to give to the men in engine rooms and shops a first hand understanding of the principles of motor operation in everyday English.

PRACTICAL MATHEMATICS FOR THE ENGINEER AND ELECTRICIAN. By Elmer E. Burns and Joseph G. Branch. Chicago: Joseph G. Branch Publishing Company. 1912. 139 pages with 21 illustrations. Price, $1.50.

A book intended chiefly for the operating engineer and electrician. It treats only of such subjects as the authors believe will be of value to such men.

STEEL. By E. R. Markham. New York: Norman W. Henley Publishing Company. 367 pages with 168 illustrations. Price, $2.50.

This work was formerly known as "The American Steel Worker." It is written by a man who has been selecting, annealing, hardening, tempering, and studying steel for nearly 30 years and is a practical book for the machinist, tool maker, blacksmith, tool hardener and superintendent.

WIRING DIAGRAMS OF ELECTRICAL APPARATUS AND INSTALLATIONS. New York: McGraw-Hill Book Company. 253 pages with 439 illustrations. Price, $2.00.

This volume contains a collection of circuit diagrams pertaining to all branches of electrical engineering with the exception of telephony and telegraphy.

AMERICAN TELEGRAPH PRACTICE. By Donald McNicol. New York: McGraw-Hill Book Company. 497 pages with 421 illustrations. Price, $4.00.

In this work the aim has been to give a detailed exposition of the various systems of telegraphy in use in America at the present time, together with a complete description of modern methods of operation and an extensive compilation of the formulæ used in practice telegraphy.

ELECTRICAL INSTRUMENTS AND TESTING. By Norman H. Schneider and Jesse Hargrave. New York: Spon and Chamberlain. 245 pages with 133 illustrations. Price $1.15.

The apparatus described in this book is modern and universally used. The tests are such as are made frequently in the engine room, power house or technical school. Two chapters are given to testing telegraph wires and cables.

A HANDBOOK ON INCANDESCENT LAMP ILLUMINATION. Schenectady: General Electric Company, 1913. 148 pages with 59 illustrations, Price, 50 cents.

A convenient reference book to all interested in the sale or use of lamps, containing valuable data of a general nature, tables, diagrams, etc., concerning lamps, reflectors, cost of light, distribution, fixtures, wiring and a great number of kindred subjects.

EXAMPLES IN APPLIED ELECTRICITY. By C. G Lamb. New York: G. P. Putnam's Sons. 61 pages with five illustrations. Price, 70 cents.

A collection of questions compiled principally from test papers handed in by students of the Cambridge Engineering Laboratory.

THE MODERN WARSHIP. By E. L. Attwood. New York: G. P. Putnam's Sons. 142 pages with seventeen illustrations. Price 40 cents.

A brief account of the modern warship written from the naval architect's point of view but in such a manner as to be interesting to the general reader.

On Polyphase Subjects

The Pressure of Light

The idea that the waves of light produce a mechanical push or pressure was advanced by Clerk Maxwell, who could, however, offer only a theoretical proof.

Lebedew of Moscow, made an experimental demonstration of the pressure of light. He employed a radiometer resembling the familiar Crookes radiometers with revolving vanes, but used a larger and more completely exhausted bulb, from which the heating effect that is the principal agent in moving the Crookes vanes was excluded.

When the light falls upon the vanes they are driven before it, and the intensity of the pressure thus revealed comes within ten per cent. of that calculated by Maxwell. The effect is independent of the color of the light, and was also found to be directly proportional to its energy.

Electric Furnace Diamonds

The fact that M. de Boismenu has succeeded, as he claims, in producing small diamonds in the electric furnace by a new method, has awakened much attention in Paris. It will be remembered that the late Prof. Moissan produced microscopic diamonds, also by the electric furnace, but the experiments were very difficult to carry out, so that since then no one has been willing to take up the matter, especially owing to the very small size of the diamonds. M. de Boismenu states that his method is not a difficult one to work, and he already secures diamonds of 1/20 inch size, but expects to produce larger ones, as the process is only in the first stages of development. He was led to his discovery somewhat by accident, as while superintendent of a carbide works he found that the use of direct current on the carbide caused it to be decomposed in the furnace so as to produce carbon, part of which took the crystalline state as real but minute diamonds.

Then he set up an experimental furnace in Paris and after a few trials he succeeded in obtaining quite a number of the minute crystals. What is encouraging is that the size of the diamonds appears to depend upon the length of the operation, so that in his coming work he hopes to be able to produce much larger specimens.

Wireless in Surveying

Wireless telegraphy is being successfully employed in the survey of such countries as the Belgian Congo, the Sudan and similar inaccessible regions. It is well known that a very exact result can thus be obtained for the difference in longitude between any two points as shown by the difference in their respective times. Previous experiments show that this latter is readily ascertained by sending wireless signals between the two points. The method is likely to prove a valuable one in colonial regions, where there are no telegraph lines, as portable wireless posts can be set up with little trouble. In Belgium it is thought that a map of the Congo which would require a period of ten years to draw up can now be made in two years or possibly less time.

"I understand you went over to Crimson Gulch and lynched the wrong man?"

"No," replied Three-fingered Sam. "You can't lynch the wrong man in Crimson Gulch. We jest got Piute Pete a little bit ahead of his turn."

* * *

'Arf a hinch, 'arf a hinch,
'Arf a hinch honward,
'Ampered by 'obble skirts,
'Opped the "400."

* * *

Mr. Rinkpate (to barber) — Part my hair in the middle, please.

Barber —Yes, sir! Shall I split the odd one, sir?

* * *

One of the central Illinois county papers was devoting considerable space each week to a sensational divorce case then being fought in the local court. A reporter on the paper walking through the city park one afternoon noticed a young lady lay aside a copy of the paper, take off her shoes and stockings, turn the latter wrong side out and then put them on again. This aroused the curiosity of the reporter and he went to her and asked the reason for her peculiar actions. She replied, "I was just reading the account of the divorce case in this paper and it was such hot stuff I had to turn the hose on myself."

* * *

Automobile Owner (after mishap in which puppy has been run over) — "Madam, I will replace the animal."

Indignant Owner — "Sir, you flatter yourself."

* * *

He prided himself on his knowledge of baseball. At the end of the first inning he turned to the girl and very condescendingly said to her:

"If there is anything about the game you don't understand, ask me and I'll be glad to explain it to you."

"Just one thing," she replied. "I wish you would explain how that rheumatic bush league relic in the box ever gets the ball over the plate without the aid of an express wagon."

* * *

The whale that bolted Jonah down
Was kept awake o' nights.
By hearing Jonah's frantic cry,
"Turn on the 'lectric lights!"

Minister — So you are going to school now, are you, Bobby?

Bobby (aged six) — Yes, sir.

Minister — Spell kitten for me.

Bobby — Oh, I'm further advanced than that. Try me on cat.

* * *

Henry was very proud of the kittens, and brought them to show to the visitor. His mother heard them coming along the hall and, alarmed at the procession, called out:

"Don't hurt the kittens, Henry."

"No, mother," came the reassuring answer, "I'm carrying them by the stems."

* * *

"Freddy, you shouldn't laugh out loud in the school-room," exclaimed teacher.

"I didn't mean to do it," apologized Freddy. "I was smiling, when all of a sudden the smile bu'sted."

* * *

Caller — So the doctor brought you a little baby sister the other night, eh?

Tommy — Yeh; I guess it was the doctor done it. Anyway, I heard him tellin' pa sometime ago, 'at if pa didn't pay his old bill he'd make trouble for him.

* * *

"I got a funny one myself to-day," said the treasurer of the theater. "A kind of a fidgety girl frisked up, pushed a five-dollar bill across the shelf and said, 'I want a seat.'

"'Where do you want it, madam?' I asked her.

"She shoved her whole arm through the window, waved her glove under my nose, and hollered, 'I want it right here in my hand! Where did you think I wanted it?' "

* * *

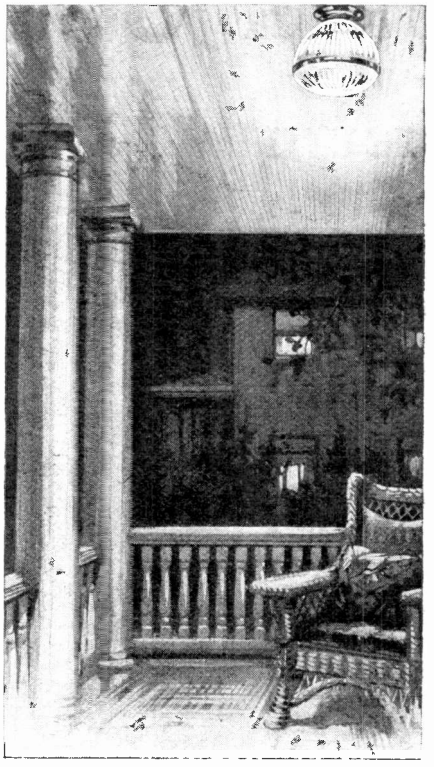
A physician visited a certain school building to examine the eyes of the children. The teacher next day sent a note to the mother of one pupil saying that he was "not perfect optically." The following day Johnny brought back a reply from his mother which read: "The old man whaled Johnny last night and I took a hand at him this morning and we think he'll be all right from now on."

* * *

The smallest boy in the class read haltingly: "I see—a man—flyin'." "Don't forget the 'g,' Danny," reminded the teacher; so Danny read again: "Gee, I see a man flyin'."


"Captain, if we don't pay that gas bill to-day we lose the discount."
HISTORY AS IT MIGHT HAVE BEEN
CAPTAIN KIDD DIGGING UP HIS TREASURE
ACHILLES DRAGGING HECTOR AROUND THE WALLS OF TROY
NERO TORTURING CHRISTIAN MARTYRS
BIFF!
BING!
CLANG!
BANG!
LOAD OF STEEL GIRDERS
DICTOGRAPH
DICTION-ARY
THOMAS JEFFERSON AT WORK ON THE DECLARATION OF INDEPENDENCE
LUCREZIA BORGIA MAKING SOME POISON
ALL NIGHT LONG HE CALLS HER SNOOKY OOKUMS
CLEOPATRA COMMITTING SUICIDE

The Hospitality of Ample Light



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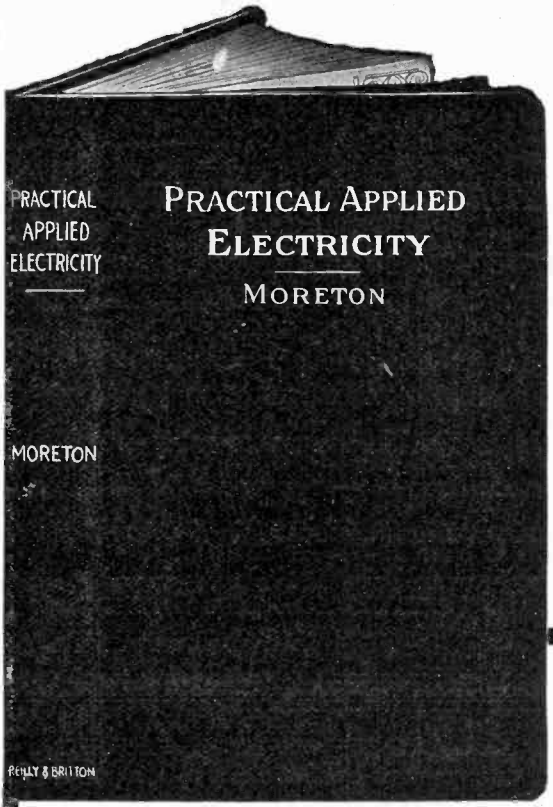

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The language is so plain, and the mathematics so simple that no one can fail to understand. Questions and answers given at the end of each chapter, impress upon the mind of the reader the more important points to be remembered.

Subjects Covered:

The Electrical Circuit and Electrical Terms Explained by Means of the Water Analogy; Ohm's Law; Series and Divided Circuits; Calculation of the Resistance of Various Circuits and Conductors; Primary Batteries; Dry and Wet Cells; Voltage; Internal Resistance and Polarization; How to Renew; Series and Parallel Connections; Tables of Data of Commercial Types of Cells; Magnetism; Permanent Magnets; Electromagnets; The Magnetic Circuit and Quantities Involved; Magnetic Properties of Various Materials; Magnetic Calculations; Instruments; Construction of Various Types of Ammeters, Voltmeters, Wattmeters, Galvonometers, etc.; Calibration of Instruments; The Dynamo; Fundamental Principle; The Magnetic Field: Commutation; Armature Reaction; Characteristics of the Series, Shunt and Compound Types of Generators; Motors; Fundamental Principle; Various Types and Their Application to Different Kinds of Work; Motor Speed Control; Variable Speed Motors; Railway Motors; Elevator Motors, etc.; Storage Battery; Fundamental Principle; Commercial Types; Application; Care of; Systems of Power Distribution; Two and Three Wires; Balancers; Motor Generator Sets, etc., Practical Operation of Electrical Machinery; Connections in Series and Parallel; Motor and Generator Troubles; How to Locate and Remedy Them; Electrical Lighting; Various Types of Incandescent and Arc Lamps; Application of Various Types; Photometry of Lamps; The Nernst Lamp; Moore Tube; Mercury Vapor Lamp; Electrical Wiring; Calculation of Conductors; How to do Exposed Moulding and Conduit Work; How to Install and Connect Heaters, Motors, Generators, Fixtures, Arc Lamps, etc., Wiring Tables for Different Classes of Work; Alternating Current Circuit; Comparison of the Direct and Alternating Current Circuits; Quantities Involved: Series and Divided Circuits; Measurements of Power; Alternating Current Generators and Motors; Resuscitation; Numerous Miscellaneous Reference Tables.

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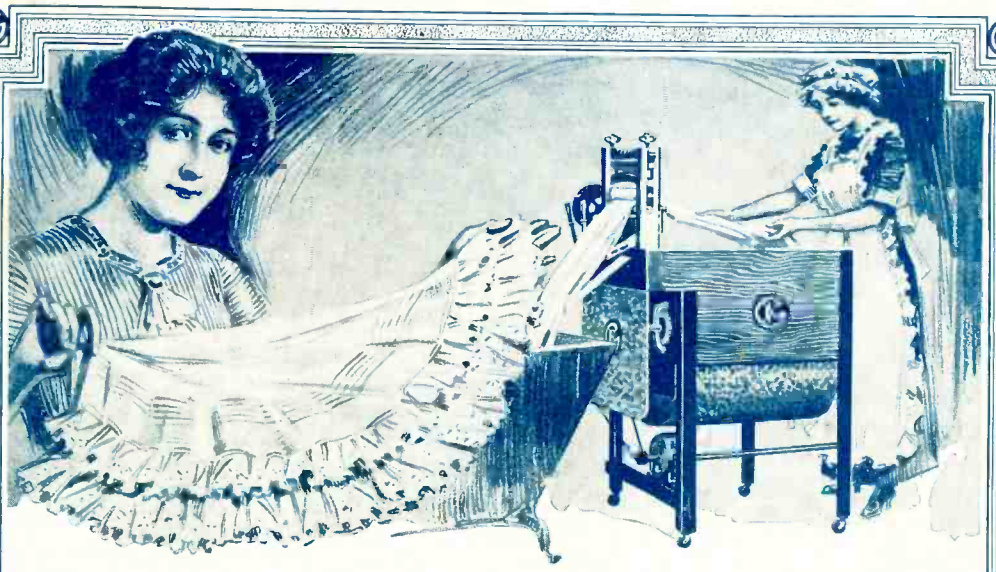

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