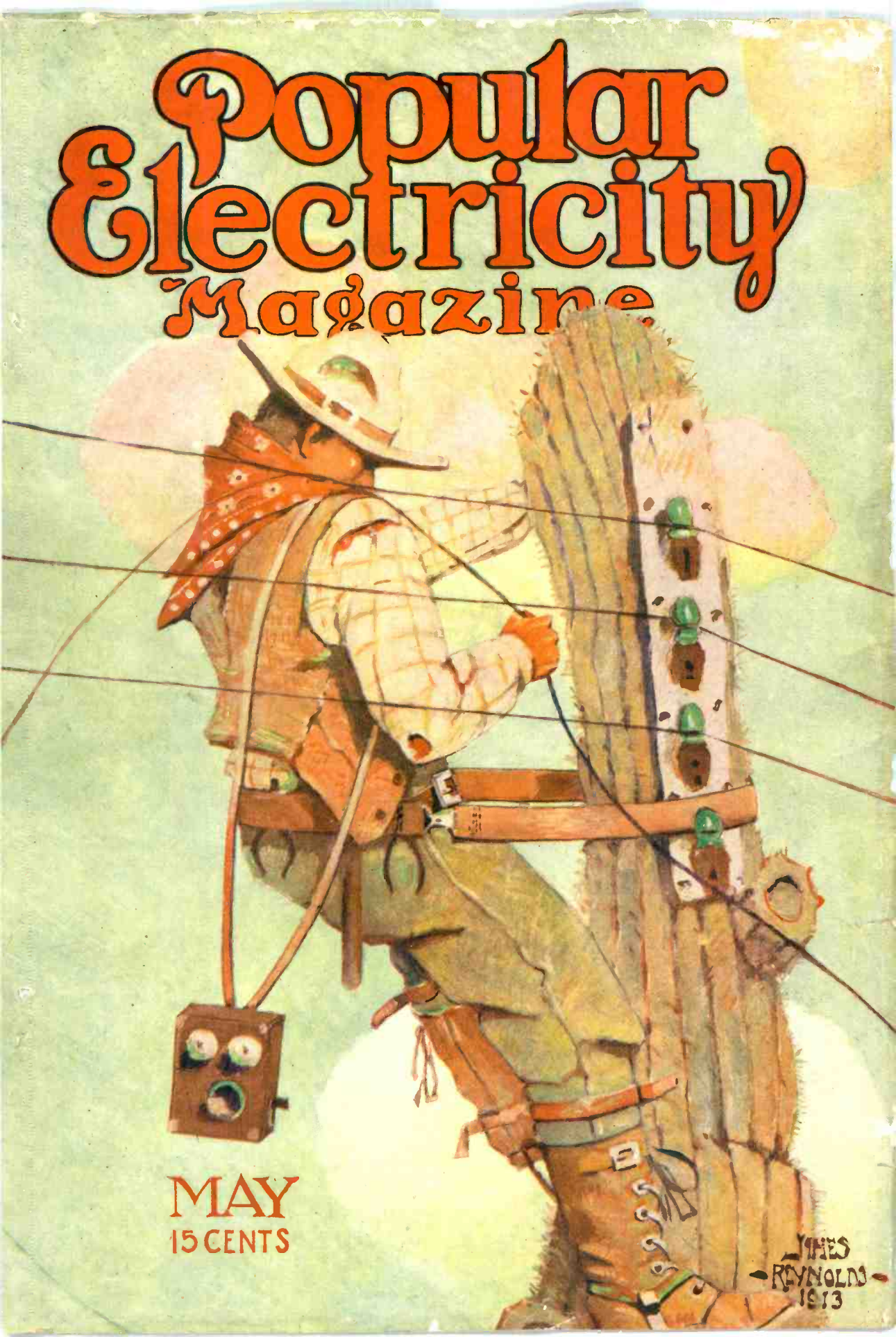
Popular Electricity Magazine



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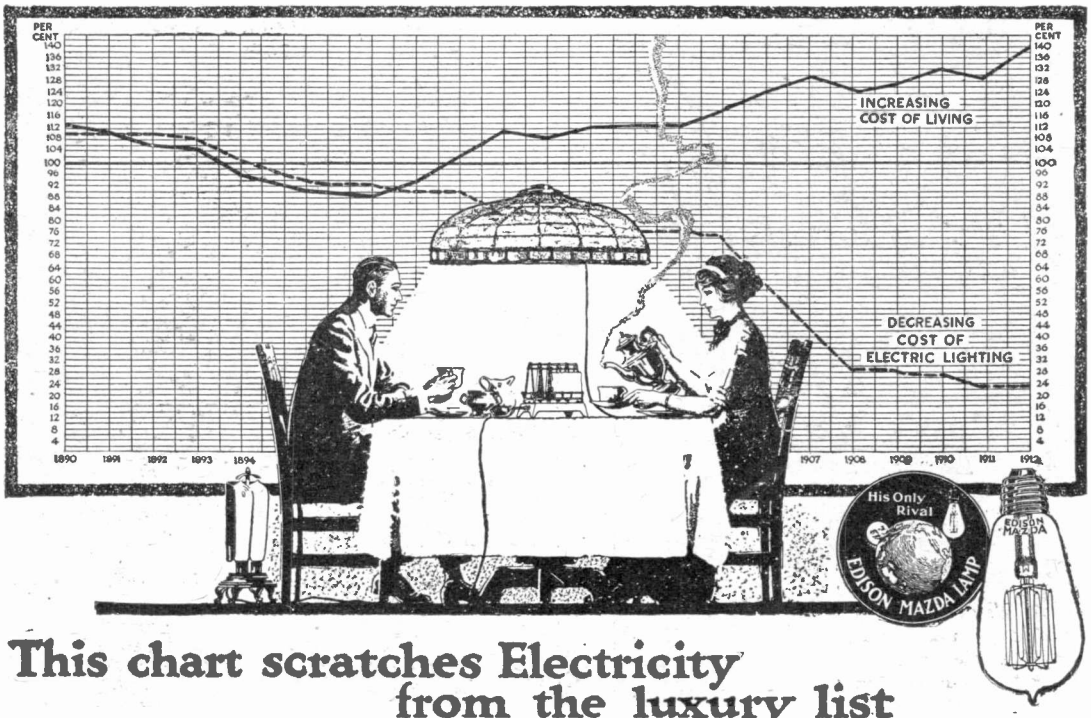

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INDEX TO VOLUME V

Popular Electricity Magazine

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POPULAR ELECTRICITY MAGAZINE
CHICAGO ILLINOIS

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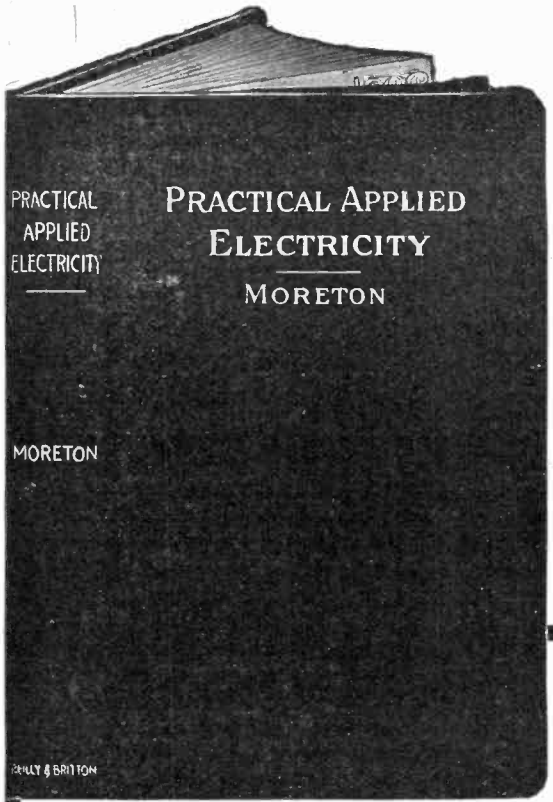

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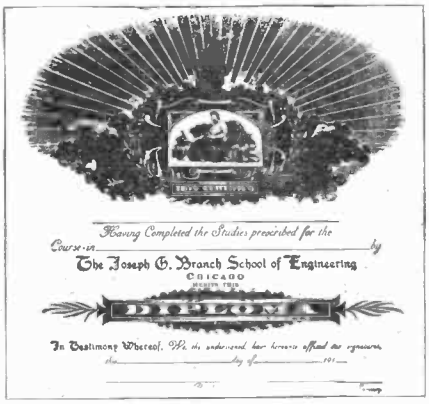

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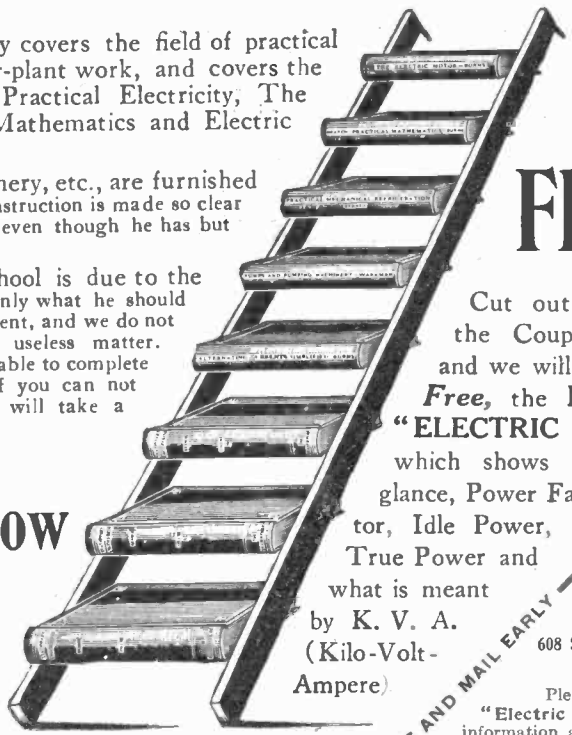

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POPULAR ELECTRICITY MAGAZINE

In Plain English

HENRY WALTER YOUNG, Editor

Vol. VI | May, 1913 | No. 1

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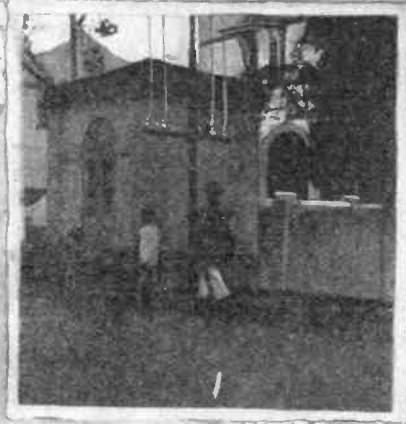
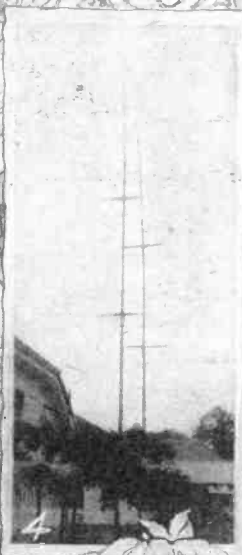
ISSUED MONTHLY BY POPULAR ELECTRICITY PUBLISHING CO., Commercial Bldg., Chicago, Ill.
YEARLY SUBSCRIPTION, $1.50; CANADIAN, $1.85; FOREIGN, $2.25; SINGLE COPY, 15 CENTS
No additional copies will be sent after expiration of subscription except upon renewal.
Entered as Second Class Matter April 14, 1908,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





(1) AND (2) SCENES IN WELTEVREDEN, JAVA, SHOWING ODD TYPES OF TRANSFORMER HOUSES IN THE STREETS. (3) INTERIOR OF THE WIRELESS STATION IN WELTEVREDEN AND (4) EXTERIOR OF SAME. (5) ELECTRIC LIGHT PLANT IN WELTEVREDEN; IN FRONT THE SHOW ROOM WITH THE POWER PLANT IN THE REAR.

Popular Electricity Magazine In Plain English

VOL. VI. MAY, 1913 No. 1

Electricity in the Island of Java

By F. G. LUDERUS

The writer of this article supposes that the readers of POPULAR ELECTRICITY MAGAZINE would like to know something about the uses of electricity in the "Far East," especially at Batavia, the capital of the Dutch East Indies, and located in the Island of Java.

Still impressed by the disaster of the Titanic, which has clearly shown the eminent usefulness of that wonderful invention of Mr. Marconi, the wireless telegraph, it is easy to understand that I first will tell how wireless telegraphy is represented here.

One of the photographs shows the wireless station of the navy department at Weltevreden, as is called the newer part of the city of Batavia. It looks peculiar on account of the odd shape of its aerial, being built in the manner of the masts of a ship. At the same time, this picture indicates the character of the buildings used here for such purposes.

Another photograph shows part of the interior of the station with its operator. Power is obtained from the 110 volt lighting current. This current is transformed in the usual way by a motor-generator. In the front of the picture is seen the large sending helix and also the enclosed spark gap on which is the word, "Levens-Gevaarlyk"—dangerous to life. At the left is clearly visible one of the great Leyden jars. The apparatus used is of the Telefunken system. When photographed the operator was just receiving a call from a warship.

There is an electric lighting plant at Weltevreden. In the days when there was not yet an electric lighting plant the people all used city gas. Now, the same company has erected an electric plant and the demand for current has increased so rapidly that enlargement is urgent. The total amount of the power is now about 2000 horsepower but will probably soon be doubled as there are also intentions to add a plant for a second electric street railway and the use of current for light and power is steadily increasing.

It is very curious to observe the natives and to hear their remarks about electricity. They do not understand at all that through such a relatively small wire flows a current that lights up hundreds of lamps and moves heavy machines. The common explanation is then: "The sètan (devil) is in that wire."

The writer remembers a case of a young native boy, who unfortunately happened to touch a broken wire of the electric light circuit. With much trouble some passers-by succeeded in saving him.

He immediately was surrounded by other fellows who asked with much interest whether the wire he had held in his hand had been "so hot," as he had yelled so loudly and had made such strange movements.

A native usually supposes of anything, in which works a power he does not understand, that the devil is in it. He has thought the same of the automobile, that other wonder of the Twentieth Century.

One must not draw the conclusion from this that the Malay is a stupid person.

On the contrary in many cases he shows much intelligence. The Malay is a good engine driver on railroads and in plants, a good motorman on electric street railways, a good chauffeur, etc. He usually understands after some weeks' practice the whole engine, and the European boss usually can leave the whole management of running the engine to him. He is also a clever blacksmith and coppersmith. He has, however, one bad fault and that is that he must be under steady control of Europeans as the natives, without hurting the exceptions, are usually very much inclined to apply to their work the *laisser aller* system.

Most of the native boys begin to work at an early age, their parents not being inclined to send them to school.

However, there is now a growing desire to profit more by the instruction offered to them by the government. The government has done much for the natives by erecting craft schools and the great number of apprentices in these schools promise that soon there will be here a good class of workmen as well in the mechanical as in the electrical line.

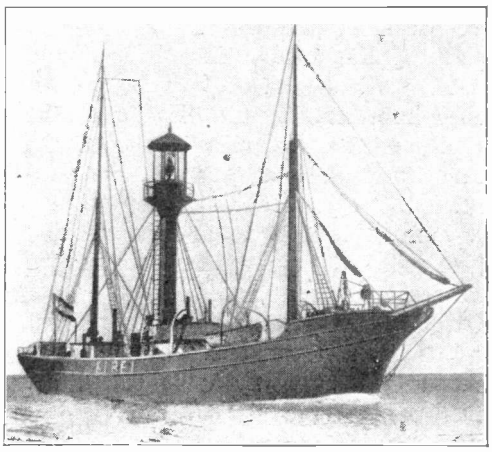
An Electric Foghorn

There is an electric foghorn, invented by a Canadian engineer, in which the noise is produced by half a dozen clappers striking a gong and actuated by electromagnets. A dynamo, supplied with power by a naphtha engine, furnishes the current. About 600 strokes per second fall upon the gong, thus producing a practically continuous sound and this is magnified and governed in direction by a megaphone. A small model of the horn is said to have made itself audible at a distance of two miles.

Lightship at the Mouth of the Elbe

The new German lightship *Burgemeister O'Swald* which was built to the order of the Hamburg state authorities is stationed at the mouth of the Elbe.

The most important feature of the vessel is, of course, the powerful light which is installed 52 feet above water level on a tower mast situated at the center of the ship. The light is maintained by a storage battery of large ca-



LIGHTSHIP WITH LOFTY TOWER MAST

pacity and not directly from the electric generating plant on board, in order that no fluctuations of power may disturb its intensity.

A powerful siren, worked by compressed air, is provided for use in fog or bad weather when the visibility of the light is interfered with. The vessel is also fitted with submarine signaling apparatus and with an installation of wireless telegraphy apparatus on the "Telefunken" system.

Signals Before the Time of the Telegraph

In our modern days we are so accustomed to the use of the telegraph and the telephone that it is hard to imagine how people in the old times could get along

THE CLAUDE CHAPPE STATUE IN PARIS

without them. Before the days of electricity there was used a method of visible signals in France which, considering the slow advance made by science at that time, was quite remarkable, as it could cover long distances. Claude Chappe was the father of the method, and he set up swinging arm signal posts upon great heights such as the Montmartre Hill in Paris, so that by using a telescope the signals could be seen at another hill post many miles off. Then the operator at this second post repeated the message to a third and so on. This is in fact an expansion of the method which was used even in old Greek days of burning a signal fire on high hills so as to announce the news of a victory. The Chappe telegraph indeed served a similar purpose, for Napoleon, used it in sending army messages across the country.

The picture shows a monument which is set up on one of the principal boulevards in Paris, and it gives an exact reproduction of the telegraph post with its pivoted main arm and the two swinging signal arms, all these being worked by cords from the ground.

Violet Rays in Zinc Mining

The violet ray has been put to a use by zinc miners. In many of the zinc mines of the country the ore occurs in the form of willamite, or silicate of zinc. This is found in a vein matter made up mostly of calcite. In order to get the ore freed from the waste calcite and in a form rich enough in mineral for practical smelting, it is first crushed and then run over Wilfley concentrating tables, which separate the mineral from the calcite. Here trouble arose, however, in the fact that the pure zinc ore and the calcite were both of a shade of gray so identical in appearance that the human eye could not distinguish which was which as they lay separated on the concentrating table.

Then some genius in New Jersey discovered that under the violet ray the zinc silicate ore turned a brilliant turquoise hue in color, while the calcite remained its original gray. This enabled even the most ignorant workman to separate the waste from the concentrates, since the line of demarcation, under the violet ray, stood out as though marked by a painter. The violet ray is now used in zinc mining, not only in the concentrating mills, but also in the underground workings, to determine just where the zinc ore is located, the miners being provided with a violet ray apparatus.

UNUSUAL USES OF TELEGRAPH WIRE

As in building the wonderful Uganda railroad the engineers suffered many hardships, continual and bitter disappointments and had to overcome almost insuperable difficulties, so with the telegraph construction engineers. As fast as they could stretch the telegraph wire on the poles cut for the purpose from the forests, just as quickly would the natives slip down from their villages and cut the line so as to obtain the wire.

MASAI WOMAN WITH WIRE FINERY

Now wire in Africa is as much a power as are dollars in America. No native beauty or warrior considers herself or himself of any account unless plentifully decorated with huge coils of heavy wire. They twist the wire tightly round their forearms, round their biceps so that it cuts into the flesh, round their calves and even on their legs above the knees. Again they will make huge necklaces of wire, platter shaped, round their necks, as well as hang bunches of it from their ears. Wire—and preferably telegraph wire — is the diamond and pearl of Africa in the natives' eyes.

MASAI FAMILY TRAVELING BY UGANDA RAILWAY—WOMAN DECKED WITH WIRE ARMLETS

It is not to be wondered at, therefore, that the natives dwelling near the telegraph line through the country looked upon the poles and wire as a perfect Godsend. The poles became a new kind of Ju-Ju, bringing them the wire their hearts craved for.

At night they stole down from their villages and cut the wire down in lengths of ten to 50 yards and made off with it into the jungles. Particularly was this the case in the Nandi territory, near the Victoria lake. It was impossible for the government to patrol and adequately protect every yard of the 584 miles of telegraph wire along the railroad track, and it cost them many thousands of dollars in replacing wire stolen by the natives for their adornment. As the years rolled on the natives were taught that the wire was sacred, but at fitful intervals the telegraph wire is still reported down. A repair gang is sent out to make good the break, and they find the natives have stolen several hundred yards of good wire. Then the telegraph inspector curses the natives in no mild terms. But as long as the Africans love wire above all things, and a beneficent government will operate telegraph lines through their country, just so long will they steal the wire.

Punishment has no effect upon them. The native police are in sympathy with the thieves. Gradually the government has learned to shrug its shoulders, replace the loss, and say with the natives—Kismet, it is fate.

Artistic Electroliers for a Park

In parks where a rustic style of landscape gardening prevails, a lighting standard in keeping with the general effect is essential, although this point is too often overlooked. It is obvious that a cast iron lamp post of ornate design is quite out of harmony in such surroundings. A good example of correct usage is found in the park in Pomona, Calif., where the cobblestone-and-cement construction of the lighting standards at the entrance harmonizes perfectly with the rustic bridge which they flank. Each is surmounted by a wrought iron, four light electrolier.

In another portion of the same park, the arrangement is more formal, and here the electroliers are of a different type, also in harmony with their surroundings. In this case a simple concrete shaft of clean-cut, graceful lines rises from a square base and is surmounted by a glass shade above a single incandescent bulb. A curved metal bracket suspends the light directly above the center of the shaft.

Although it may seem a matter of slight consequence, it is upon just such small matters that the artistic effect depends and engineers are beginning to pay far more attention than they formerly did to the details that make for beauty.

SIMPLE CONCRETE SHAFT

ENTRANCE TO GANESHA PARK, POMONA, CALIFORNIA

Cured a Toothache

"I couldn't have attended to your teeth to-day, if it had not been for the telephone," said the dentist.

We don't suppose the patient cared a rap about that part of it, so long as his suffering was relieved, but some dentists are like barbers are said to be, and talk a blue streak to their victims.

The interest of the patient was aroused in this instance, however, for the dentist went on to say: "You are the fourth case I have treated during a broken appointment. It used to be that when appointments were made ahead, the dentist would never know when one was to be broken, and many an hour was lost in waiting. Now everybody has a telephone, and if my patients do not arrive on time, I call up and ask if they are coming. Usually, they notify me; that is what happened this morning; otherwise, I could not have attended to you."
—*The Telephone Review.*

Legal Regulation of the Smoke Nuisance

By JOHN O'CONNOR, JR.

In so far as the smoke nuisance is concerned the ideal condition in any large city would be the elimination of every isolated furnace and the generation of all energy for light, heat and power at great electric stations where fuel could be burned without making smoke. Perhaps the ideal may never be wholly attained, although the tendency is constantly toward such concentration of energy production. At any rate, electricity is bound to be a large factor in the final control of this great evil and readers of this magazine will find in Mr. O'Connor's article much enlightenment on the subject. The author is economist for the commission on Smoke Investigation Department of Industrial Research, University of Pittsburgh which is attacking the problem from every angle and in a way to make the final results attained of concrete and definite value to every city in the United States.—Editorial Note.

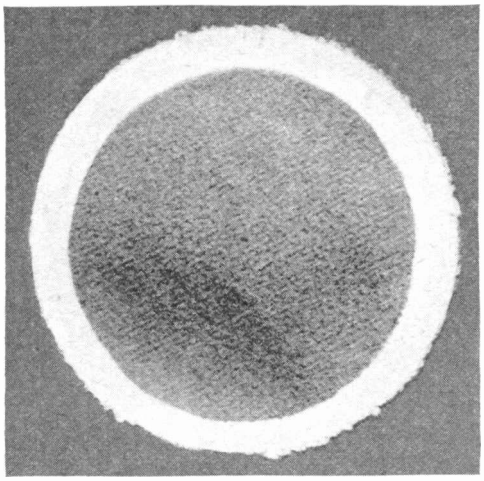
As legislation follows rather slowly the agitation for and need of certain reform measures and as the question of smoke abatement in the United States is of comparatively recent date, we need not be surprised to find that the passage of ordinances on the subject, especially of ordinances that are in any way effective, has taken place in only the last ten years. This is not true, however, of England where the law took cognizance of the smoke nuisance as early as 1273, when the use of coal was prohibited in London as prejudicial to public health. There is in existence a statement that one John Doe was in 1306, tried, condemned and executed for burning coal in the city of London. Since 1273 there have been numberless proclamations, parliamentary commissions, laws and ordinances on the smoke nuisance.

It was about 30 years ago that cities of the United States began to pass smoke ordinances. However, as early as 1856 an ordinance was introduced in the council of Cleveland to prohibit the use of soft coal in manufacturing plants and some time prior to 1869 Pittsburgh passed an ordinance which contained the provision "that no bituminous coal or wood shall be used in the engine or any locomotive employed in conducting trains upon any railroad." Chicago and Cincinnati were the first cities to pass general ordinances on the subject, the first ordinance in Chicago being passed in 1881. Pittsburgh did not have an ordinance until 1891 and then it was for only a section of the city.

At the present time all of the cities having over 200,000 population with a few exceptions—and in these cities the problem is not acute—have smoke ordinances, as have many of the smaller cities which are far sighted enough to be on their guard, lest this modern industrial plague come upon them in its full wrath.

The source of power of governmental authority to abate the smoke nuisance is the police power of the state. We are always tempted to think of this power as extending only to the protection of life and property in its narrow sense and the maintenance of public order, but more and more we are coming to know that its great sphere is public health and general welfare. This police power may be delegated by the state legislature to municipal corporations and this is the power under which municipalities declare certain acts nuisances. While a municipality may be authorized in general terms to declare what shall constitute a nuisance, it may not declare that to be a nuisance which in fact is not. At common law "dense" smoke was not a nuisance *per se* though some courts have held it to be so in a populous city.

The Pittsburgh ordinance of 1906 was held void for two reasons, one of which was "that the legislature of Pennsylvania had likely not given the city



A PIECE OF FILTER PAPER THROUGH WHICH THE VOLUME OF AIR BREATHED BY A MAN IN 24 HOURS HAS BEEN DRAWN

sufficient authority to pass an ordinance upon the subject." The city at once sought and secured the power. Thus it can be seen that in order to deal with the smoke nuisance, cities should seek specific authority from the legislature.

When a municipality is thus empowered it is then in position to pass an ordinance. It is a difficult matter to say what the essential provisions of a smoke ordinance should be and yet from out of the experience of the different cities we are able to point out certain features that are necessary if the ordinance is to accomplish any notable results.

In our day and generation we are looking to preventive rather than remedial legislation for telling achievement. This thought leads us to one of the fundamental functions of a smoke ordinance, that it should make provision for prevention as far as possible of the installation of improperly designed furnace equipment. For this purpose the ordinance should provide that plans and specifications for all construction work on furnaces be submitted to the smoke inspector and be approved by him before the work is started.

This feature leads us to the point that since it is so important a provision the ordinance should state the qualifications of the man whose duty it is to pass on these plans and specifications. Surely it should provide that he be an engineer, "qualified by technical training and experience in the theory and practice of the construction and operation of steam boilers and furnaces."

An ordinance, of course, should state the density of smoke that is to be permitted and provide a standard of measurement. On the first point care should be taken lest the provision be somewhat vague, for this has been the rock upon which many ordinances have been wrecked in courts. In speaking of this feature—the fixing the density—Mr. S. B. Flagg of the United States Bureau of Mines says, "The requirements should represent the best practice; the standard set should not be an impossible nor an impracticable one; neither should it represent ordinary or poor practice." In some ordinances a stack well within the

MODEL SHOWING THE ANNUAL SOOT FALL OF LONDON

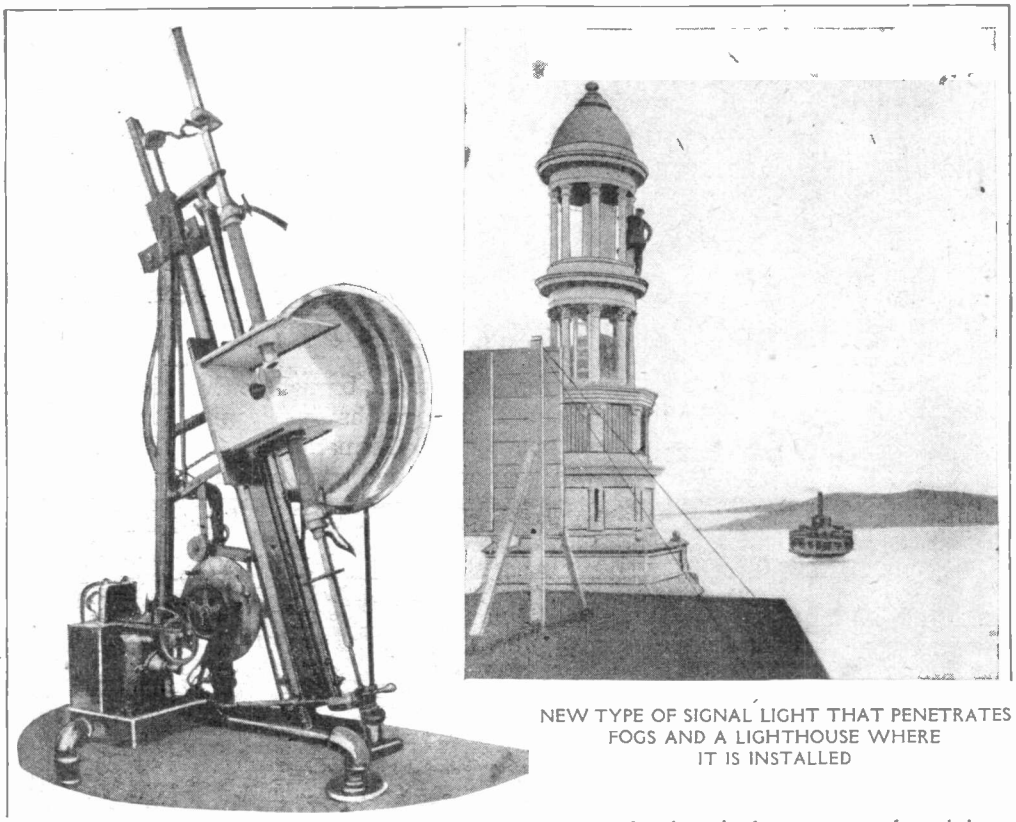
limits as set by the ordinance may be responsible for the discharge into the atmosphere of many times as much soot as another stack which violates the ordinance.

The mere enactment of a reasonable, efficient and enforcible smoke ordinance is not enough. The ordinance must be enforced. At this point most of the cities have fallen short. Sometimes the wrong methods are used in the enforcement of the ordinance; most of the time the methods employed are altogether too lax and feeble to secure even mediocre results. To remedy this situation there is one great weapon—public opinion. However, in order to educate, concentrate and focus public opinion, a league or union of civic and commercial organizations should be formed in each city. Such organizations seem imperative in American cities until better results are secured by way of enforcing smoke ordinances. Eternal vigilance on the part of the public is the price of a smokeless atmosphere, but to those who enjoy such a blessing the price is not a whit too high.

The smoke investigation that is now being conducted by the Industrial Research Department of the University of Pittsburgh claims for itself comprehensiveness of plan if no other merit. It is leaving no phase of the smoke problem untouched. It is the hope of those who planned the investigation that because of its thoroughness, the work will serve as a basis for all future work on smoke abatement in the United States. To be sure, the investigation is being made with particular reference to Pittsburgh, and for this purpose Pittsburgh lends itself as a huge and wonderful laboratory, but the results will have a nation-wide application, especially in view of the awakening that is taking place in this problem throughout the country.

TRACKLESS TROLLEY IN CALIFORNIA

The electric trackless trolley, which has been used for a considerable period with marked success in Germany, France and other countries of Europe, has also proved its worth in the mountainous regions of California. This road, specially built for auto and "trackless" traffic, is about twenty-five feet in width. The road has some sharp curves, and the trackless trolley is able to negotiate them with ease. Also it has no difficulty in turning aside to permit it to pass some other vehicle which it meets.



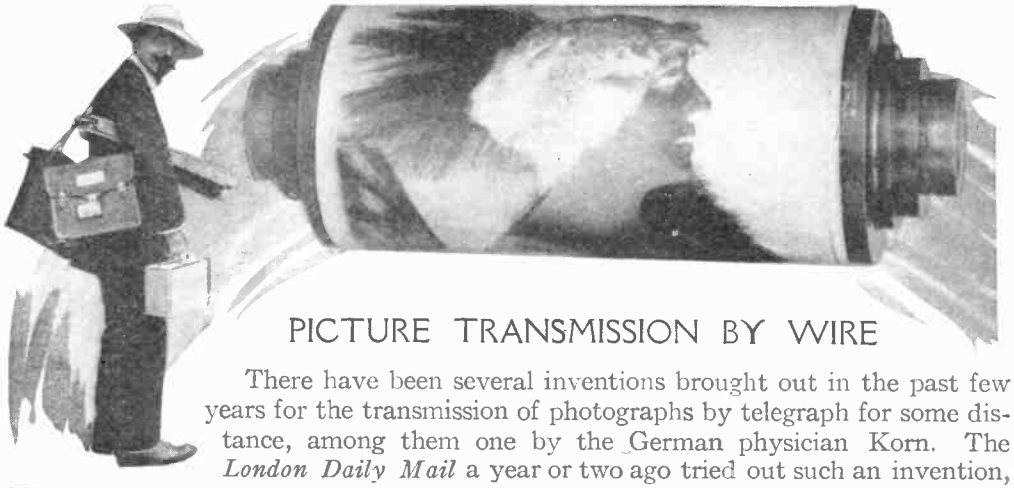
NEW TYPE OF SIGNAL LIGHT THAT PENETRATES FOGS AND A LIGHTHOUSE WHERE IT IS INSTALLED

Signal Light that Penetrates Fogs

An alert inventor lately surprised the navigators and ferry passengers on San Francisco Bay with a new electric flash-light which he installed on pierheads and elevations on shore and put into operation, both day and night, during foggy weather. The blue and violet colored flare could be distinguished through the dense mist several hundred feet farther than the customary signal lights and put joy into the hearts of captains and passengers upon its appearance.

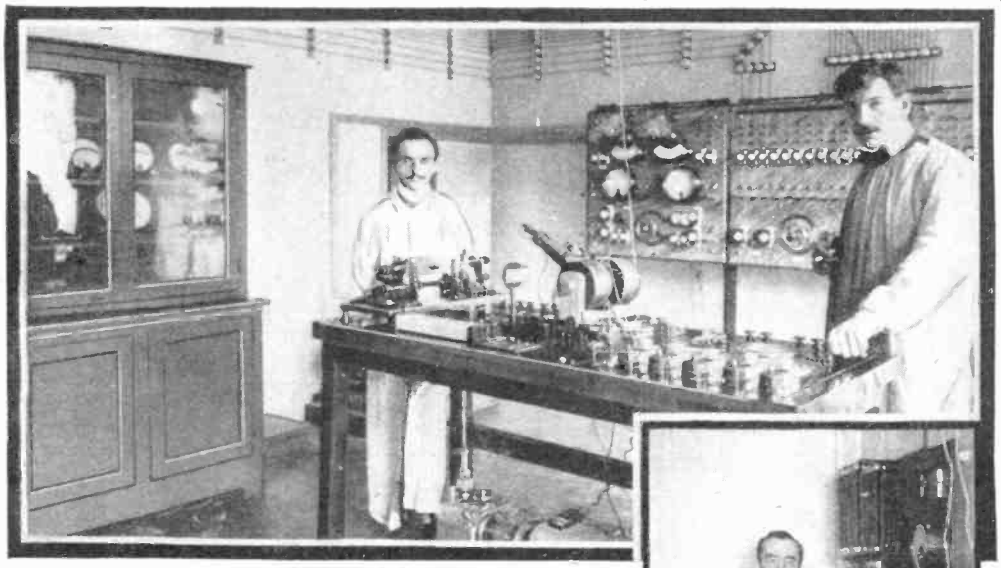
In principle and construction it is not unlike the common electric arc lamp. Two carbon rods conveying electric current are periodically touched and separated, but in separating they draw out or stretch the arc, when it becomes momentarily more highly illuminative. When the maximum point is reached the arc is automatically extinguished by means of what is known to electricians as a magnetic blow-out, thus producing a periodic signal which may be varied to designate different localities.

The U. S. Supervising Board of Steamboat Inspectors has placed its approval upon the light and has permitted its use on ships. It is doubtful if a more powerful practical light exists and the simplicity of its principle and mechanism is remarkable. One conspicuous item of interest connected with it is the fact that its principle is not new to the electrical world yet how it came about that inventors have failed to put it to practical use before now is a mystery. The producer of this interesting device caught the idea from a flashing trolley-pole scraping along the wire. The penetrative light emitted by the arcing current impressed him, with the result that an electric flash lamp utilizing the idea was constructed, and, fortunately, protected by a basic patent.



PICTURE TRANSMISSION BY WIRE

There have been several inventions brought out in the past few years for the transmission of photographs by telegraph for some distance, among them one by the German physician Korn. The *London Daily Mail* a year or two ago tried out such an invention, sending photos from Paris to London. This invention was also tried by a New York newspaper. These inventions were adapted to "telegraphing" the photographs over telephone wires.



AT THE TOP OF THE PAGE IS SHOWN A RECEIVING CYLINDER BEARING A PICTURE SENT BY WIRE FROM BORDEAUX TO PARIS IN FOUR MINUTES; IN THE CENTER, COMPLETE SENDING APPARATUS IN DR. BELIN'S LABORATORY

These inventions were based upon the use of selenium, which has the curious property of becoming a better conductor of electricity in the presence of light than in darkness. But the inventions have never been brought to a perfect state, owing to various adverse conditions, so they have been heretofore more or less scientific curiosities, rather than possessing commercial practicability.

DR. BELIN IN HIS LABORATORY

A French physician, M. Edouard Belin, who has studied for a long time ways and means of solving this interesting problem, has brought out a new apparatus for

sending photos by telegraphy, which proceeds along new lines. A brief description of this system appeared in the April issue of this magazine. Some further facts are now available, together with photographs of the apparatus and a picture actually transmitted in this way, which are here presented.

A French writer, Salagnac, describes some interesting experiments at Dr. Belin's laboratory in which he assisted the inventor in the exchange of sketches and photographs by telephony. The experiments were made in the laboratory of Dr. Belin, in the Rue de la Lancette. By actual test the transmissions of the subjects were made in four minutes, and, notwithstanding some imperfections of detail in sending, the results obtained were remarkable.

Dr. Belin's process excludes entirely the use of selenium. He uses, on the contrary, a system of hollows or depressions and reliefs or raised points, and so the passage of a stylus over the various parts of the picture determines the intensity of the current (proportionate to the whites, blacks and half-tones of the picture) which is sent over the wire.

Further, he obtains a regularity and a rapidity of transmission hitherto unknown, by substituting for the direct current an alternating current of high frequency.

Again, and here is the most interesting fact about the invention, he has perfected an apparatus for transmission that can be readily packed up and transported, one that weighs only eight kilos and can be instantly adapted to any telephone system and cut in on any telephone line.

An operator with this portable apparatus could go to Marseilles, Nice or Bordeaux and telephone to Paris, or go to Philadelphia and telephone (telegraph would be a better word, since telephone means to speak over a wire) to New York a portrait, a sketch or plan or a photograph the same night the picture is made.

In the experiments by Belin and Salagnac, in transmission from Bordeaux of pictures 13 by 18 centimeters, one hour was required for the preparation of the pictures in relief and four minutes for the transmission.

In other inventions of this sort, the receiving apparatus had to be perfectly synchronized with the sending apparatus, and the sending mirror oscillating its rays over the selenium contacts had to be regulated strictly according to the intensity of the current being received. The impressions thus received by the sensitized paper in the dark chamber where it revolved over a cylinder correspond exactly with the intensity of the current being transmitted, reproducing, in order, the shadows, the half tones and the high lights of the picture to be shown. Then the sheet of sensitized paper had to be developed as was the original. This process presented various inconveniences. It was difficult to regulate the selenium cells to constant conductibility of the current. Further it was found that the selenium was more or less slow in transmitting the luminous rays and consequently the electric current. Finally, there were troubles with the well known irregularities of the current used on the telephone lines. Hence the invention was cast aside as impracticable for any extended commercial use.

Judging by the results obtained by Dr. Belin's invention, however, there is yet a chance of this problem being worked out to a practical commercial solution.

Keeping the

WAGON TRIMMER AT WORK

READY TO SWING ON THE OUTER GLOBE

TRIMMER HIS OWN PACK HORSE

HE LOWERS IT FOR TRIMMING AND

The lamp was out and that accounted for it—an ugly fall as you swung around the corner in the snowstorm and unexpectedly onto a rough, icy pavement. The snow up your sleeve and the wind in your face only helped to clarify a fitting expression to apply to the lighting company, for of course they should have had that light burning.

One object of this story is to introduce you to the three men responsible for the lamp being out—the operator at the station, the trouble shooter and the trimmer—but more especially to the lamp trimmer and some of the difficulties he must overcome. And when you have finished you will doubtless have concluded that the trimmer and his two coworkers are not such bad fellows after all, but as a rule, hard and careful workers, as anxious to have that light on as yourself.

A modern arc lamp is a device which produces light by means of an electric arc between the ends of two electrodes. The intense heat of the arc consumes these electrodes. The length of the arc and hence the candlepower of the lamp is kept constant by means of automatic devices contained within the lamp itself which feed the electrodes together as fast as they are burned away. The

Lamps Burning

By C.H. Sheperd

principal parts of a lamp mechanism are the clutch and the controlling electro-magnets known as the "shunt" and "series" coils. The action of these coils is transmitted to the electrodes by means of various levers, yokes and other mechanical members and is checked and controlled by means of counterweights and dashpots within the metal housing.

The arc if exposed directly to the atmosphere would consume the electrodes rapidly. In the more modern arc lamp the air is excluded from the arc by means of an inner glass globe which seats tightly upon the "gas cap" and by keeping the arc surrounded by inert gases greatly delays combustion of the carbons or electrodes and increases the life of the lamp.

HE MAY BE ABLE TO THROW HIS LEG AROUND THE POLE AND HANG ON

RELYING UPON HIS SAFETY BELT

BIRDS BUILD THEIR NESTS IN THE HOOD OF THE LAMP

PULLS IT UP AGAIN WHEN HE IS THROUGH

Series street arc lamps are usually run in circuits covering many miles of streets. The average series alternating current circuit is usually composed of from 50 to 75 lamps, each lamp consuming from 50 to 90 volts of circuit pressure depending on the make and type of lamp. It is obvious that the total circuit pressure, being the sum of the individual lamp voltages, sometimes runs very high, often to 6,000 or 8,000 volts. Therefore a series arc circuit is not a thing to be lightly

trifled with, or to handled while alive.

Primarily the duty of a trimmer is to replace burnt out carbons with new ones. This, however, is only the beginning of his work. He must be an all-around electrician as well.

The trimmer may go about his work in any one of three ways determined by means that must be used to get to the lamps.

The "wagon trim" trimmer uses either a horse drawn or motor driven wagon upon which a high platform is built, the height of this platform being such as to bring the trimmer within convenient reach of his lamps. Sometimes the trimmer is alone upon the wagon and may drive it from the platform above or from the driver's seat below. He may have a helper and sometimes even a helper and a driver. At any rate he has no walking to do and can handle his work in a very convenient position, all things considered. However, the sudden starting of a tower wagon, a scared horse, a collision with another vehicle or a breakdown makes a wagon trim man keep his eyes open. A fifteen foot drop onto a hard and unsympathetic pavement is not greatly to be desired and by the same token, if a trimmer happens to be holding tightly to a lamp or pole and the wagon goes away and leaves him, so to speak, all up in the air, the spectacle may be highly edifying to the innocent bystander, but the humor of the situation is seldom appreciated by the trimmer.

The "ladder trim" trimmer is his own pack horse. A ladder, a bag of carbons and his tools constitute his traveling outfit and he hoofs it from lamp to lamp. While this method is slower than wagon trim there are conditions under which trimming can be done in no other way and which make this method necessary. This applies where lamps are so situated that a wagon cannot be driven up to them and where they cannot be lowered for trimming.

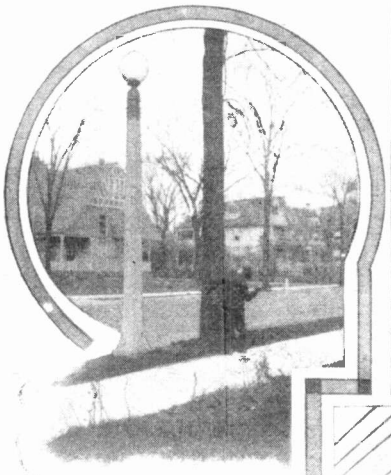
The "windlass" trim man stands on the ground to do his work. As in ladder trim he must carry his equipment. He lowers each lamp which in some cases is thus made dead, while in others the lamp leads are long and flexible and descend with the lamp which is always in circuit.

No matter what method the trimmer uses, there are certain dangers to which he is always subject. One of the most common is that the circuit on which he is working may become crossed with some "live" circuit, thus making his circuit alive and at the least, giving him a shock more or less severe and occasionally burning or killing him. Again the circuit on which he is working may be accidentally "cut in" (switched on) at the station with the same results as a "foreign cross." Induction from nearby live circuits is also occasionally an annoying and sometimes a dangerous factor to be reckoned with.

In one particular instance a trimmer on a small system was sent to trim a lamp which was reported out while the circuit was alive. This particular lamp was grounded upon (leaking current to) the suspension cable and the trimmer knew it. The circuit pressure was about 8,600 volts and the ground was wet from a recent heavy rain so the trimmer stood upon an insulating stool and lowered the lamp, trimmed it and started to wind it up to its normal operating position. In order to better reach the windlass he placed his insulating stool upon the curbstone. In winding up the cable the motion jarred the stool off the curb and dropped the trimmer's feet onto the ground, thus putting him in as a link in a complete ground. He retained his hold on the windlass for several seconds and then released it, dropping in a limp heap to the ground, dead.

No other trimmer perhaps, gets into so many precarious positions as he who trims from a ladder. Some poles are built with steps upon which the trimmer may climb, but he must get on his ladder in order to reach the first step. Other poles have no steps at all and the trimmer

must have a ladder long enough so that he can reach the lamp from the top rung. To get the best results while trimming it is necessary for the trimmer to have both hands free to work with. He may be able to throw one leg around the pole and hang on but in many cases he must use his lineman's safety belt and strap which he usually wears. In winter this kind of work

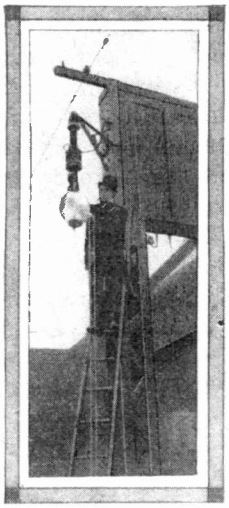


SMALL BOY WITH A STONE

ceases to be a joke. Let anyone who doubts this try hanging on to a slippery, icy pole in a cutting wind, putting carbons in a swinging, swaying arc lamp in just the right way.

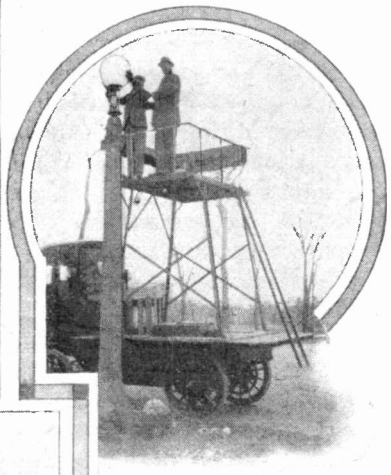
Our versatile little friends, the English sparrows, seem to regard as their very own, any lamps of such construction as enables them to build nests therein. They seem to suffer no harm nor inconvenience from the close proximity of high tension current or from the constant light near by, but calmly proceed to build homes and raise families in the hoods of the lamps without the slightest regard for the feelings of the trimmer. They dirty up his globes, fill his eyes with dust from their nests and occasionally startle him by flying out into his face. Bats, squirrels and an occasional owl are sometimes found under lamp hoods, to the annoyance of the trimmer.

TRIMMING IN PLACES WHERE WAGONS CANNOT GO



THE TROLLEY WIRES AND LINES MAY BECOME CROSSED

The globes of arc lamps cause the trimmer many hours of hard and tiresome labor. These must be well cleaned and polished at each trim, both for the sake of appearance and for efficiency. A cracked or broken inner globe on an inclosed arc lamp will admit oxygen to the arc, allowing the electrodes to burn rapidly away causing what is called a "short life." The inner globe has a ground rim which seats on a turned flange above the arc. This flange is called the "gas cap" and must also be well cleaned at each trim in order to allow the inner globe which is usually held up to it by a spring, to seat properly. Brushing gas caps is at best a dirty job, but when a trimmer gets through with a circuit of flaming arc lamps he looks as if he had rolled in a bed of very fine coal screenings.



TAKING OFF THE OUTER GLOBE

Broken globes are caused by many things, chief of which is the small boy with a stone. Others not quite so common but quite as annoying to the trimmer may be mentioned. For instance, if an arc circuit is suddenly cut out and in a few minutes cut in again, the gases of combustion may have become mixed with air in just the right proportions to form an explosive mixture approximating the firing charge in a gas engine cylinder. Consequently, if the circuit is started again at just the right time, the arcs will ignite this gas, cause an explosion and the whole series of globes may go off like a string of miniature Nihilistic bombs. The time necessary to allow such a mixture to form may be easily determined by test and the operators at the station cautioned never to cut in a circuit within several minutes of its critical time.

The mechanism of an arc lamp is usually protected from the weather by a suitable housing. However, during a hard storm, rain or snow may drift into a lamp casing through the tiniest crevices and cause rusting of iron and steel parts thus preventing them from working freely. Water sometimes finds its way to the carbon and drips down into the inner globe. The heat of the arc first evaporates the water and then disintegrates it, forming a sort of water gas, the combustion of which changes the color of the arc, causes a short life and usually ends by breaking the inner globe.

In order to prevent the sticking of electrodes, most enclosed carbon lamps are trimmed with a cored and a solid carbon. The cored carbon has a center of very soft carbon of high conductivity, which prevents crusting over of the carbon points with a non-conducting slag which may stick the carbons together or by insulating them from each other, may prevent the lamp from starting. The lamp is usually trimmed with a lower carbon of half the length of the upper and hence when the lower carbon is burned down to such a point that the automatic cutout shunts the lamp out of circuit, the upper carbon is burned down to slightly more than half its original length. The trimmer saves all of these stubs and cuts them to half the original upper carbon length for use as lower carbons on the next trim.

The old style open arc lamp will burn only one night on a trim and hence must be trimmed every day. It has, however, two advantages from the trimmer's point of view. It has no inner globe and no stubs are required. But these advantages are being embodied in the newer forms of arc lamps. The modern arc lamp will burn from 50 to 200 hours on one trim, depending on type and make. This means that the trimmer will not have to trim so often on any particular circuit with lamps of longer life. But his time of trimming will, of course, depend upon the method of operation and time of year.

This brings up the question of how the trimmer knows when a circuit needs trimming. He knows the life of his lamps on each circuit. The station operator's log book record shows the "time on" and "time off" of each and every circuit controlled from the station. From these data, the chief trimmer gets the length of run for each night. The total of the runs is kept on a trimming schedule and as the total approaches to within a certain limiting time of the life of the lamps, the chief sends a trimmer out on the circuit. Lamps must not be trimmed too early or time, labor and material will be wasted; nor too late or there is a chance of the circuit being out. On systems where the service requires that some of the circuits operate all night, others till midnight and still others to alternate from all night to midnight, the distribution of trimming is no small problem by itself. On any system where a large number of circuits are operated, the trimmer has a hard time distributing his work to the best advantage.

Occasionally he strikes some things that show how much the public knows

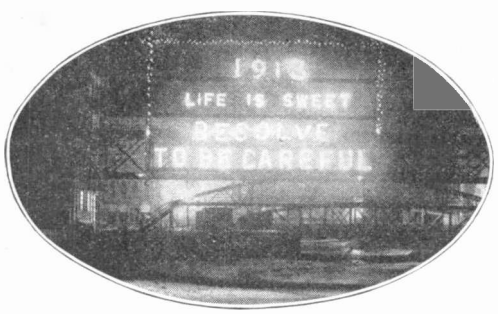
about his work. One day a trimmer, being out of matches, but having induced somebody to stake him to a pipeful of tobacco, accosted a passerby with a request for a match. The pedestrian looked up at the trimmer, then at the lamp he was working on, handed over a bunch of matches and asked, "What's the matter? Won't it burn?"

The trimmer is responsible for individual lamp outages. In case a circuit is out due to line trouble the responsibility rests with the trouble shooter. If a circuit is out due to station trouble, it is up to the operator. These two men have troubles of their own, as a class, and this is about all the consolation the trimmer has to make up for all he undergoes on his own job.

In the summer the trimmer works fewer hours and fights the heat, dust, rain, bugs and birds. In the winter he works long hours and has to contend with weather of all kinds. His job is by no means an easy one, but it is seldom that we lack light at the corners and alleys from any fault of his. It is pretty certain too that he earns the very modest salary that he draws.

A Campaign for Safety

The Chamber of Commerce of Rochester, New York, has started a crusade against accidents. An immense electric sign has been erected prominently on



UNIQUE SIGN IN ROCHESTER

the aqueduct over the Genesee River. "Life is Sweet. Resolve to be Careful," it spells out in letters of red and white.

One morning, about the time the sign was installed, all the street cars appeared, each bearing a white placard on which was a flaming red letter "S." The next morning the placard bore the announcement, "Safety first—A v o i d Accidents."

These matters have, of course, become the talk of the town and people are already becoming more careful.

Testing Wine in a Telephone Circuit

There has been discovered in Switzerland a means of testing wine by means of an electric current. The experiment is based on the conducting property of pure wine. A tube containing the wine to be tested is placed in a telephone circuit. If the wine is pure the conductivity remains good and the transmission is perfect. If it has been adulterated it is said that the transmission is so affected that the adulteration is easily detected.

Burglar Alarm for a Vault

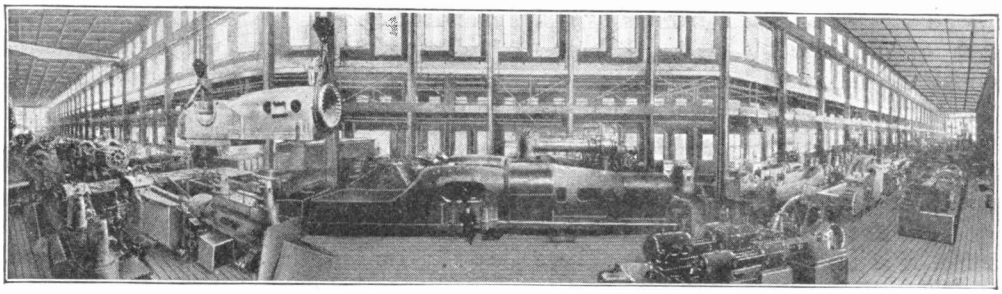
A storekeeper who took in large sums of money after banking hours was in fear that some one would enter his store and break into his vault. His living rooms were in the same building as the store. Several thick walls were between the two places, and there was the possibility that burglars entering his building might break into the vault, which was in the back of the store, before he even knew of their presence.

He therefore put in an ingenious burglar alarm as follows: First he put down two electric push buttons in the floor, one being inserted in an electric light circuit of low voltage and the other in an electric bell circuit, both going to his room.

Above the buttons he laid a thin wooden floor. If anyone then entered the vault room the thin floor would press two buttons and send a double alarm to his room. In the daytime simple switches were employed to open the circuits and keep the alarms from acting when clerks entered the vault.

The Genius of the Giant

By H. Bedford-Jones



It is a matter of nursery tale record that giants are very pleasant fellows to get along with, always jovial and fond of their little joke. True, that joke may be out of all proportion, like themselves, and may have a tendency toward a grimly ironic twist; but so has all humor, if you stop to think of it, when carried to extremes.

It is the business of the nursery tale to carry human nature to extremes, particularly in the matter of giants. Our early giant friends have an unpleasant fashion of laughing at men under cover of urbanity, just as the Jotunheim giants laughed at Thor and put him to confusion with their giantly cordiality. We do not always fall in with this broad wit, we do not always like it, we are sensible of the jest behind the beard, but we have to put up with it.

This is an attribute of human nature, that the big man quietly puts the little man to jest and gets a huge amount of satisfaction out of it. Now, just as the nursery tale enlarges only the high lights of human nature, intensifies them and distorts them to serve its own ends, so industry takes hold and does exactly the opposite—tones down and reduces the salient features of humanity, embodies them in itself as tiny scintillating points which, if we can but reach to them, will again widen out to form the *atmosphere* of a particular industry or factory. It is so with all business concerns; only a child or an outsider can center his imagination on these points and so find the human interest quality underneath the whole.

This somewhat childish but, like all childish things, extremely abstruse and deep reaching explanation is necessary to show my meaning when I say that the Allis-Chalmers plant at Milwaukee is a giant. To me, a non-technical outsider, it was given to find—rightly or wrongly—the salient points of this immense concern. I found them, to my own very great surprise, to be much the same as those of the Jotunheim giants—but I was Thor. The great human nature aspect of this plant was humor, of sorts; but let me explain.

I watched a thousand kilowatt; 600 revolution, synchronous motor-generator set under test. It was the first ever built for such high speed, 514 revolutions being the previous limit. As my guide gravely explained this, the thing laughed at me, after its own fashion.

"We are all giants here," it observed carelessly. "Make yourself at home. Just go over and build me up a 60 inch rotor, will you?"

Obediently enough, for I was yet impressed with the gravity of my guide, I located one of the immense forgings. As I looked at the great mass of steel, the rotating field for a turbo-generator in

the rough, down came giant claws that ripped through the solid metal as if it had been clay, and sent curled shreds of steel falling in a shower.

"Cutting the eight inch slots to receive the rotating field windings," explained my guide. "Some of the biggest machines in this line in the world are made out here."

I assented weakly. But I knew better. These were not machines at all; they were giants, and they were all laughing at me, for I was in Jotunheim, the home of the giants. So after that I refused to take my guide seriously, for if he did not enter into the spirit of the place, I did,—knowing my own limitations.

In the foundry we passed a gas engine bed that weighed 95 tons. Its twin brother was just being set up in the erecting shop, and one of the giant cranes hauled it about as a child hauls a toy. As I came up it gravely requested me to push it over into place—a mere trifle of an inch or so.

"Sorry," I returned hastily, "but I've got to hurry on."

"What's that?" asked my guide. I did not explain, for he could hardly understand.

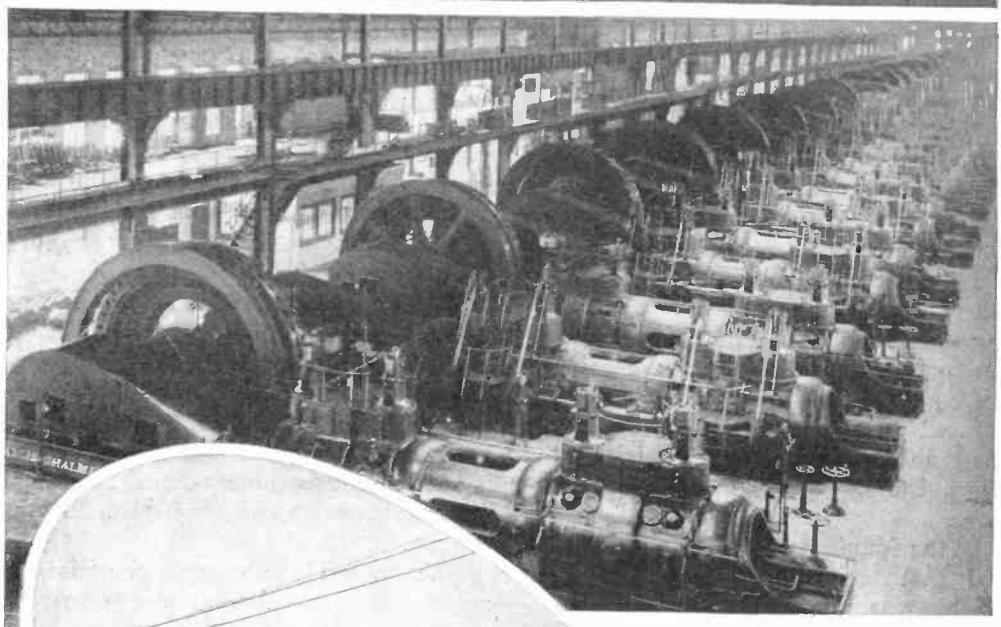
The rotors for these great steam turbine driven generators are vastly interesting affairs. The smaller ones are forged in one piece, then planed and slotted and cut to suit. The larger ones, however, are built up from thin sheet metal punchings made to exact size and then stacked on a steel shaft. Perfect mechanical balance, of course, is very essential, on account of the terrific speed of this type of generator, some making 3,600 revolutions per minute; so every ounce of the material is weighed before the rotor is assembled. The rotor core is now moved to the winding room, where the copper and mica turns are wound into place, and a hydraulic press inserts the retaining wedges.

When the thing is finally done it is set revolving and experts determine where it still needs balancing by whitewashing the ends and setting a pencil to mark the whitewash as the rotor revolves. Numbers of empty screw sockets are left, and into these screws are inserted until the pencil makes an even, regular line. It is a simple enough test, reminding one of the childish qualities of the giants; but it is extremely thorough.

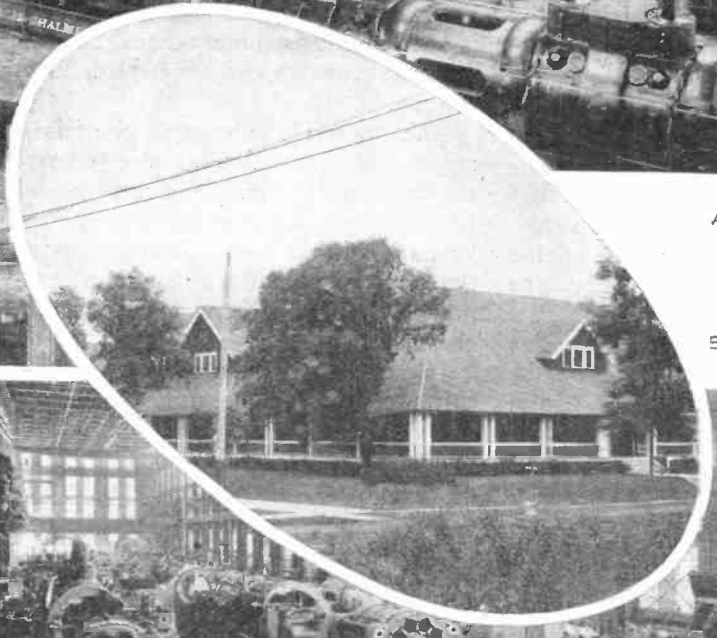
Nothing small is made here. Everything is produced on a giant scale, from motors to pumping engines that are so immense they cannot be set up inside the shops, and a glance at the illustrations will show what that means. Here is not electric machinery alone, but every other kind which can claim place among the giants.

The ground area of this plant is 110 acres and the buildings are nearly a third of a mile long. To convey any idea of their immensity is hard; they are in keeping with the whole gigantic aspect of the place. The pattern shop is a lumber mill in itself—but I must keep to things electrical.

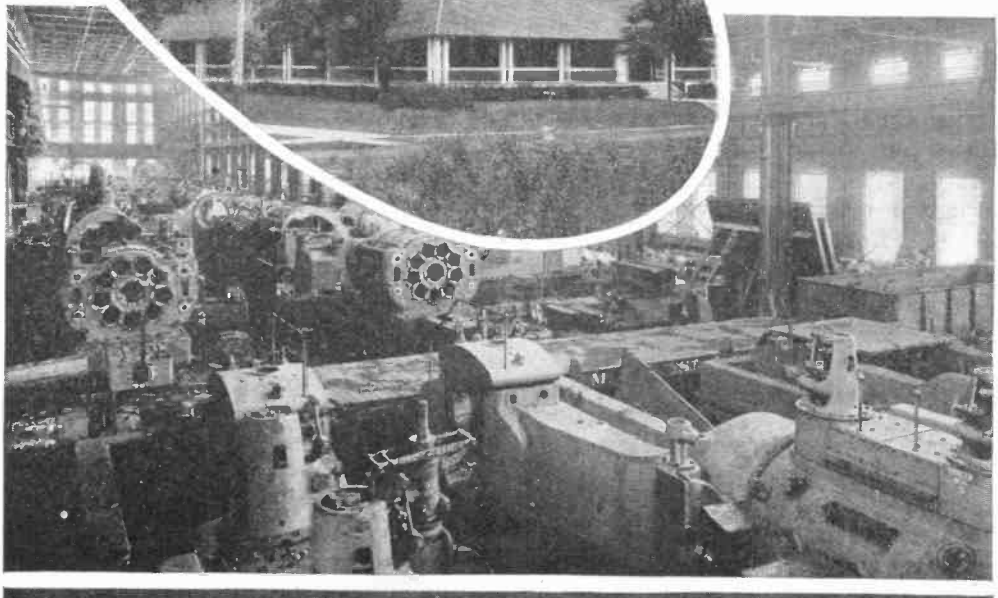
In one corner was a tremendous steam turbine driven generator, destined to find its place in the copper country up north. Its capacity was 10,000 kilowatts or over 13,000 horsepower and its speed 1,500 revolutions per minute. Not far away was a 10,000 ampere, 125 volt armature, with double commutator, also destined for use in electrolytic work. So, as we passed down the long lines of giants, they grinned cheerfully at the pygmy visitors, and grim jests flew thick and fast in welcoming. Out in the planing room were heaped the rough forgings of field poles for a number of the largest gas engine driven generators ever built. A few feet away were a dozen of these on the long bed of a planer, hot steel shavings dropping down steadily, steel giant shaping steel giant amid a rumble of quiet humor. My guide, however, took it all quite as a matter of course—being something of a giant himself, through long association.



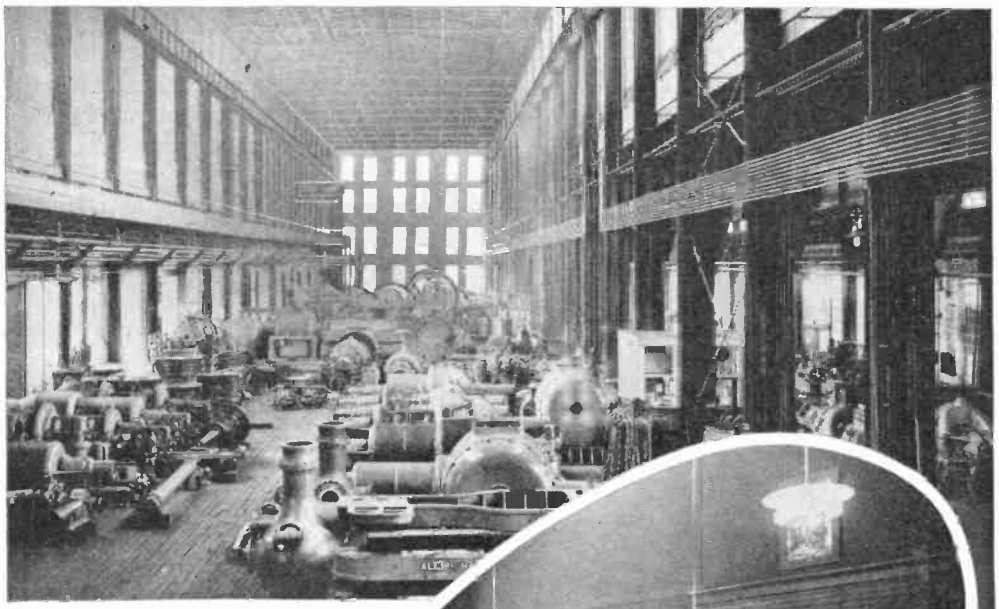
A ROW OF ALLIS-CHALMERS GAS ENGINE UNITS AT THE PLANT OF THE INDIANA STEEL COMPANY AT GARY



EXTERIOR OF CLUB HOUSE



SOUTH END OF THE ERECTING SHOP



STEAM TURBINE SECTION
OF THE ERECTING SHOP

INTERIOR OF CLUB HOUSE

NORTH END OF THE ERECTING SHOP

"I suppose you have the Asgard snake somewhere about?" I asked him, but he only shook his head, having never heard of Jotunheim. None the less, though he might not enter into the spirit of the place, it had most assuredly entered into him, for he gravely discoursed of things far and far beyond my ken, while the giants smiled quietly.

It is easy to talk of a 35 foot borer, but one cannot realize the power involved until the great steel table is seen in place, carrying a 35 foot casting, with the chips flying and the cutting tool grunting through. And all the while the giant cranes—there are 135 of them here—sweep high overhead, controlled by the touch of a finger.

There is a particular method used here of winding the field of a turbo-generator with flat strap copper in the radial slots. To effect this, a special forming machine bends the copper edgewise, thus affording a decreasing spread to each successive turn of the coil. To guard against any future trouble by reason of expansion or contraction of turbine and gas engine cylinders, they are lowered into a steam pit and subjected to a very thorough "seasoning" of alternate heating and cooling, which is another simple and very effective sample of the tests in use here.

One effect of the creation of such gigantic machinery is that in the electrical shops only one very small corps of girls is employed, mainly in the winding of coils. There is a goodly office force, however, and the commodious and pleasant club—a building apart from the rest, and a fine one—never lacks patronage. A feature of this club is the lecture course, partly popular, partly technical, the latter forming a valuable asset to the graduate engineering students. As the works are situated at some distance from the city proper, this club is of great convenience both for social purposes and for use as a restaurant.

The foundry, by the way, is said to be one of the largest in the world under a single roof, and that is easily believed. All the buildings are exceptionally well lighted, roof and walls being largely of wire glass—three and a half solid acres of it in all—which means that the workmen use little or no auxiliary lights. In fact, the whole place is absolutely up to date and equipped with the best, from sectional steel flooring to cranes.

Centrifugal pumps, driven by induction motors, form an interesting product. The motors for these pumps—which are largely used in fire service—are of the wound rotor design and give 740 revolutions per minute, attaining full speed 30 seconds after starting. The high pressure system of which these form a part has done wonderful things, notably in New York City, where it is in use by the fire department.

Shortly after its installation in this city, three large fires broke out almost at once, which could hardly have been controlled by the engines under old conditions. But this system handled them all with fourteen million gallons of water—more than a hundred steam engines could have produced! The immediate effect was a reduction in insurance rates, which saved half a million in premiums annually. The fires were under control within an hour, and the worth of the high pressure system was demonstrated for all time.

One of the features of this works is the design of reducing gear employed in all machinery where speed reduction is required, and obtained by virtue of "herring-bone" reduction gear. In the January issue of POPULAR ELECTRICITY MAGAZINE I described that in use at the Westinghouse works, but this one differs slightly in that the teeth are cut on a single forging. The result obtained, of course, is practically the same. Here was a 1250 kilowatt, 450 revolution, direct current generator, geared to a 3600 revolution steam turbine, being tested out—a mammoth affair, too much engaged in watching its own test results to pay much attention to visitors.

Naturally, I did not attempt to cover the 20 miles of aisles. My ambition ended considerably short of that. All these machines are so huge that one feels depressed on coming out; it is all very well to admire giants, but when it comes to spending a week-end with them, second thought is best. There are no shops of "little things" to relieve the tension. Even in the rooms devoted to smaller parts, such as turbine blades, great brass circles were being slotted out, long copper-nickel rods were being sliced and swaged into blades, and the same feeling of insignificance was present, the sense that the outsider comes from a pygmy world. And so it is, indeed; the average layman knows nothing of the tremendous forces that produce his comfort, nor does he give them a thought unless he chances to visit such a plant as this, where giants are brought forth daily. Despite the many descriptions and articles published every year, the vast majority of people have, and can have, no conception of the great electrical and mechanical engines which are effecting such wonderful things in the world today.

After watching the coils being wound and varnished and pressed into exact shape and size under steam pressure, I was taken on to the impregnation works —a separate building in itself, where perhaps the most interesting process of all is gone through with.

Here are three large, deep tanks and three smaller ones. The coils or other material to be impregnated go into the large tanks, which are clamped shut to the exclusion of all air. A partial vacuum of 25 inches is created; that is to say, the pressure is reduced to such an extent that atmospheric pressure would be able to maintain a column of mercury 25 inches high against it. This is held for two hours, with the result that all moisture and air is drawn from the coils. Steam is then turned into the row of pipes inside the tanks and the contents is thoroughly heated and dried. The three smaller tanks contain a specially prepared insulating varnish which is now pumped into the larger tanks.

A pressure of 60 pounds per square inch is maintained for two hours, which forces the fluid compound into every joint and crevice of the coils. The compound is then pumped back to the smaller tanks and the impregnated material is allowed to drain for an hour, after which comes another hour of the vacuum. This whole operation is repeated four times, after which the treated coils are a solid, impregnable mass.

Owing to the extreme inflammability of the materials this building is jealously guarded against every possibility of fire. It is highly interesting from top to bottom and is about the only place in the works where a mere man is not overawed by his surroundings—but this is simply because he is able to look down at the tanks instead of up at them!

Mr. Edison might feel inclined to take issue with the A-C company on the score of offices; but despite the excellent reasons set forth in favor of the extremely plain yet business like offices of the former, one must confess to an instant liking for these in Milwaukee. While not over elaborate, they are quiet, roomy, well lighted, and pleasant in the extreme. If the visitor could spend more time in the office building and less time in the works, his own self-importance would be retained to a considerable extent. You can't keep your self-importance while you are being laughed at by giants, however!

In the company yards may be seen one evidence of the enormous machines which are sent forth, in the shape of the largest cars ever put into service on our railroads. They are specially built cars, and when you consider that 125 ton castings are by no means unusual, the necessity for such special cars may be easily understood. The bedplate for a 5000 horsepower engine is not a little thing, yet in the immense foundry, such single castings are made without the

least disturbance of other work, which speaks extremely well for the organization of the place. In fact, the melting capacity of the foundry is 520 tons daily, a pouring of 400 tons being no unusual thing. That may convey some idea of the scale on which the whole place is established.

Nor is this the only plant of the company. There are six others, producing every kind of machinery from air brakes to hydraulic turbines. It is the boast of this company that complete power equipments of every description, with auxiliary electrical apparatus, can be built in one set of shops and under one management.

The twelve miles of railroad track in the yards are highly necessary, owing to the great weight of all the material and products. This track gives quick and convenient access to every point, and it is worth the visit to the plant to see one gas engine shipment, requiring a whole train to handle the great segments of engines. It is hardly possible, naturally, to test one of the immense machines, setting it up on the spot, before shipment; but so thorough are the tests of individual parts that the record of the shipments is most enviable.

Giants are sent out to all parts of the world from this Milwaukee plant, and a great share of both electrical and general power producers of the world is stamped with the stamp of Allis-Chalmers. This is a giant task, and the genius of the giant which performs it is tremendous. Men are able to do little things with powerful effort; but giants are able to do powerful things with little effort, being giants.

Springfield Company's Handsome Building

The accompanying photograph of the front of the new office building of the United Electric Light Company, of Springfield, Mass., hints that this branch of the electrical industry is reaching toward new standards of civic pride and challenges any banking house in the community to show a more attractive and a more dignified home.

It is a far cry, to say the least, from the days when the only office of the lighting company was in a corner of the local power house to the present quarters of the executive, business and meter departments. Therefore, the company's public spirit in erecting a structure of such architectural beauty has been generally commended, since the establishment is in the immediate neighborhood of a new group of municipal buildings which are setting new examples of city planning to visitors and residents alike. In all its appointments, the new building of the United company measures up to the most advanced practice and deserves the inspection of every visitor to the city interested in the broadest prosperity of this field of the electrical industry.

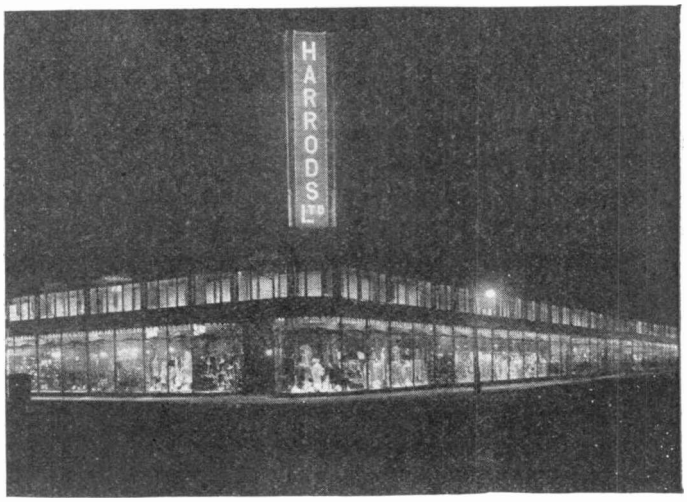
AN ELECTRIC BUILDING FRONT THAT IS A CHALLENGE TO ANY BANKING HOUSE

Window Lighting of a Famous London Store

The interesting illustration reproduced with this note shows the frontage of Harrod's Stores, which occupies about 400 feet. This is one of the largest establishments of this kind in London. The method has been adopted here, as in American cities, of keeping the windows dressed and brightly illuminated until eleven o'clock at night.

Londoners have become very much interested in the method of utilizing concealed window lamps to brightly illuminate the contents of the window without the bright filaments of the lamps being visible to the eye. This method leads to very successful results, and may be likened to the effect on the stage, where the audience is in comparative darkness.

A word or two may be said about the photograph, which, it is stated, was taken entirely by the actual light in the windows during the evening. It is no easy matter to obtain good photographs of this kind when vehicles carrying bright lamps are constantly passing to and fro in front of the camera.



HARROD S STORES IN LONDON

Opening San Francisco's Municipal Railway

Three days before the end of the year 1912, San Francisco celebrated the opening of its Municipal Electric Street Railway. This being a public ownership enterprise, the city officials took an active part in the celebration. Mayor James Ralph, Jr., was the first passenger to board the first car over the line, and he deposited as the first fare the first nickel minted in the United States Mint of the city. After delivering a brief address from the rear platform, the Mayor pulled the bell cord and amid a throng of citizens, the car started on its journey followed by others.

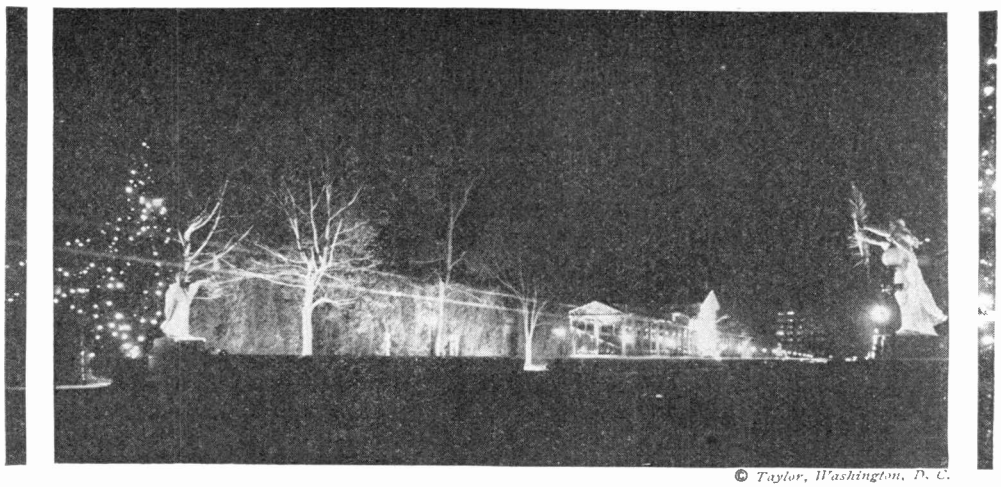
The entire track construction is typical of the latest practice. The total length of tracks is 5.45 miles. Forty-three cars are to be placed in service. They are of semi-steel construction and of the prepayment type, equipped with modern sanitary straps.

The control system is located beneath the car floor, even the circuit breaker usually placed above the motorman's head being stowed away where its loud reports will not frighten timid patrons.

A particularly amusing incident occurred during the celebration. An officer of the police discovered an over-enthusiastic citizen attempting to gain entrance into one of the well-packed cars by climbing through an open window. Just as he was fast disappearing, the officer grabbed the end of the fellow's coat, and dragged him forth.

"You can't get in that way," shouted the officer.

"Let me alone," replied the citizen, "who owns these cars, anyway?"



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ILLUMINATION OF THE COURT OF HONOR

Electricity at the Presidential Inauguration

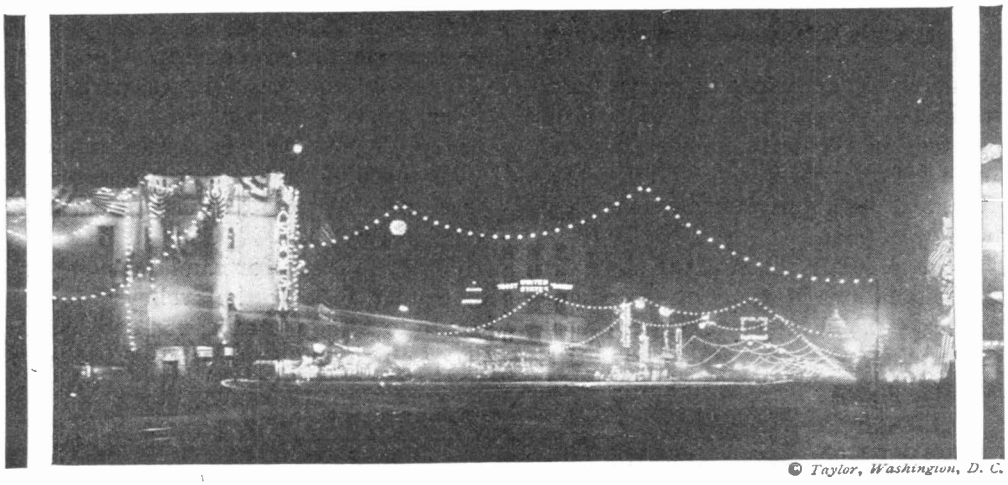
The presidental inauguration, in all respects save the electrical, seems to have reached the limit of possibilities as a one-day free show. Thus there were critics who declared that in case of the inauguration of 1913 the street decorations of flags and bunting, the "Court of Honor" in its setting of evergreens and other aspects of the spectacle as viewed in daylight, were no whit in advance of the corresponding embellishment at certain previous inaugurations. But on the contrary, it was the unanimous opinion that the electrical illumination far surpassed not only that at every previous inauguration but at any other ceremonial event at the seat of government.

The electrical illumination at the inauguration was, in effect, threefold enterprise. The national government illuminated its public buildings; private firms adorned their places of business, and a committee of citizens, organized especially for the purpose of carrying out the project, expended some thousands of dollars raised by popular subscription on an electrical illumination of Pennsylvania Avenue, the famous thoroughfare from the Capitol to the White House which is by all tradition the chosen promenade of the inauguration throng and the route of the inaugural pageant.

Spanning the wide street were 40 "streamers" or festoons of incandescent bulbs accurately spaced and forming in each instance four loops suspended at three points from a heavy wire strung across the avenue between two lofty iron poles. There were 4,800 bulbs embraced in this feature.

Even more elaborate was the illumination of the Court of Honor, which occupied the two squares of Pennsylvania Avenue directly in front of the White House and through which passed the Inaugural parade in review before the new president and other notables. This space was lined with substantial covered stands for the use of spectators, flanking and facing a special reviewing stand provided for the official party. At night all of these stands were outlined in light. On the stand for spectators opposite the presidental mansion there were used 1000 incandescent lamps. On the presidential stand there were utilized 180 of the 40 watt and 40 of the 60 watt Mazda lamps.

An especially ingenious feature was the illumination of the background of the Court of Honor. As a background there were employed, in lieu of the usual



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INAUGURAL ILLUMINATION OF PENNSYLVANIA AVENUE

columns and arches, great hedges of towering fir trees and artistically arranged banks of evergreen. This barrier of verdure, which completely screened the White House from the view of passers-by on Pennsylvania Avenue, might have appeared decidedly somber at night but instead it was transformed into an object of beauty through the focusing upon it of the tinted rays from a total of 24 "spot lights" of the type employed in theatres and opera houses. These spot lights were so concealed behind evergreen screens rising only a few feet above the sidewalk at the line of the curb that they were wholly unobtrusive and the source of the light was not apparent to the casual observer. As a final touch to this phase of the illumination, the statues at the entrance of the Court of Honor were bathed in light from concealed globes that afforded an illumination that simulated moonlight.

The graceful dome of the United States Capitol was lifted out of the darkness by means of the beams from three or four searchlights, so placed on special platforms erected on the Capitol grounds that their concentrated rays illuminated the dome from various angles. In a similar manner the slender shaft of the Washington National Monument was rendered as visible at night as in daylight.

X-Rays Wanted

In this day, when almost anything seems possible, it is not so very strange that a man like Edison should be called upon to work miracles.

The great inventor received not long ago the eyepieces of a pair of opera glasses, with a request that he would "fit them with the X-rays, and return them to the sender" in New England.

Another correspondent, writing from a town in Pennsylvania, sent the following matter-of-fact epistle:

"Thomas A. Edison. Dear Sir:—Will you please send me one pound of X-rays and bill as soon as possible."

Electric Iron in Factory Workers' Homes

In a quarter of Detroit (Mich.), populated almost entirely by factory workers, many of whom are of Polish nationality, the electric iron has become one of the most popular of household helps. The women in this section have shown a wonderful preference for the iron, which they know is a time and labor saver.

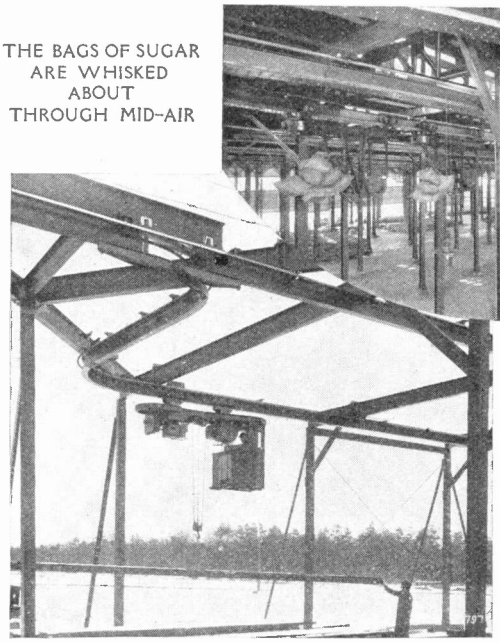
During the year 1912 an average of more than one electric iron a day was bought in this part of the city. The irons sell for from $3.50 to $5. The $5 iron holds the record for winning its way into the households.

Electric Monorail Systems

Unlike ordinary traveling cranes which are limited to one straight run a crane operated upon a single or monorail track can go from building to building, around curves and upon numerous branch tracks, inside or outside.

The two lower illustrations show two such installations in operation—one handling heavy metal in severe winter weather, the other operating an electric lifting magnet.

THE BAGS OF SUGAR ARE WHISKED ABOUT THROUGH MID-AIR



FLEXIBLE METHOD OF SWITCHING IN MONORAIL SYSTEM

MONORAIL WITH LIFTING MAGNET ATTACHMENT

from the weather but no other part of the equipment needs housing.

In some instances the system is controlled from a distant point, as in the case of the five electric double monorail hoists installed in the storehouse of the American Sugar Refining Company, New Orleans, La.

These machines for handling sugar are interesting in that the trolleys are arranged to run on T-rails, one of which is placed on either flange of a built-up section having the form of an I-beam and the electric hoists are thus enabled

Another advantage of this system is the manner in which the operator takes any desired track. He pulls the steering lever which is located on the trolley near the controllers. This raises a horizontal roller to a position in which it engages a curved rib on the under side of the switch tongue thus diverting the leading truck or set of wheels to the track desired.

The operator's cage contains a seat for him and all appliances requisite for control. If the trolley works out of doors the cage is usually housed for protection

to run at very high speeds with safety, and it is also maintained that for the operation of monorail systems, direct current is preferable to alternating, owing to the superior speeds with light loads obtainable with the former.

These electric machines are of the single whip type and the hoisting motors and the gearing are arranged to give a very high lifting speed, so that bags of sugar can be unloaded and transferred to the storage piles very quickly and the trolleys are arranged to swivel freely so that the machines operate around curves.

Testing Rock for Road Building

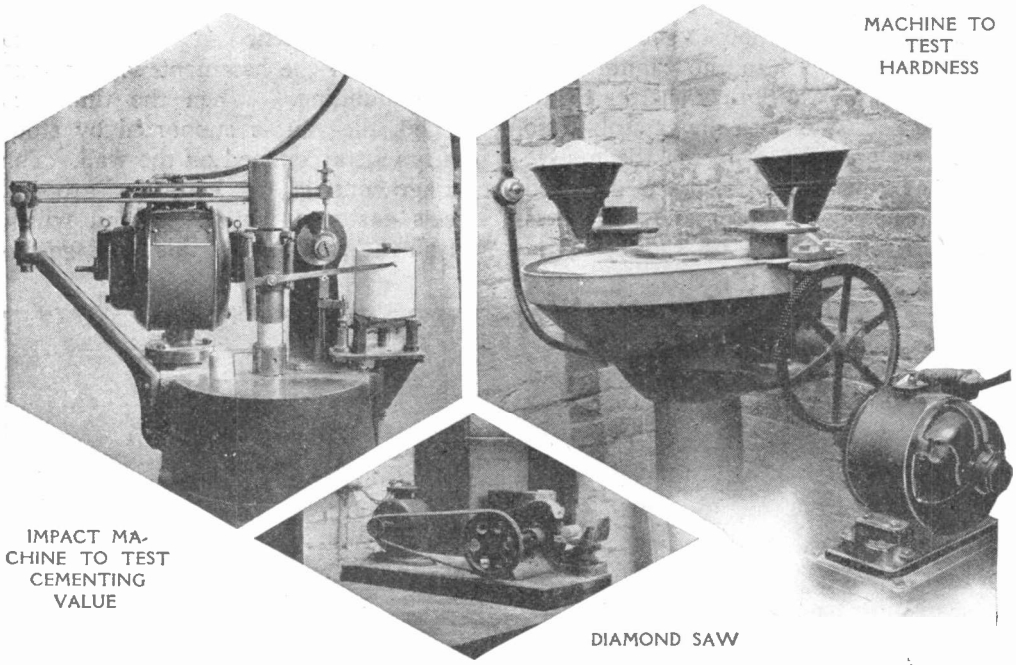
In road building the material is tested for hardness, toughness, resistance to wear, etc. and electrically driven rock testing machines are employed by the Public Roads Division of the United States Department of Agriculture.

The Dorry machine, a device first used in France, is employed to test rock for its hardness. Upon the vertical shaft of the machine is a circular steel disk revolved horizontally by bevel gears from the motor. A cylindrical piece of the rock specimen is placed in the small cylinder which holds it perpendicularly against the revolving cast steel disk with a certain pressure while quartz sand seen in the funnels is fed on the disk to act as an abrasive agent. The machine as can be seen is arranged to hold two pieces so that two tests can be run simultaneously. At the end of 1,000 revolutions the loss in weight is determined and the test repeated with the specimen reversed. The average loss in weight computed from the two runs is used in determining the hardness of the rock.

The Page electric impact machine for testing the cementing value of rocks consists of an electric motor driving a cam at the rate of 60 revolutions per minute by means of a worm gear. A hammer is raised by an adjustable pin which slides over a cam. With the plunger resting on the briquette the end of the pin is brought in contact with the cam and the binding nut is tightened to hold the pin.

The reaction of the briquette after each blow of the hammer produces a vertical movement in the end of the lever and this motion is recorded on a sheet of silicated paper, wrapped around a recording drum, by means of a brass point at the end of the lever. Each revolution of the cam produces a slight motion of the drum so that the drum makes a complete revolution in 100 revolutions of the cam. The number of blows necessary to destroy the rebounding power of the briquette so that no reaction is recorded on the drum is taken to be the cementing value of the material.

An electrically driven diamond saw is utilized for sawing the cores in the preparation of specimens.



MACHINE TO TEST HARDNESS

IMPACT MACHINE TO TEST CEMENTING VALUE

DIAMOND SAW

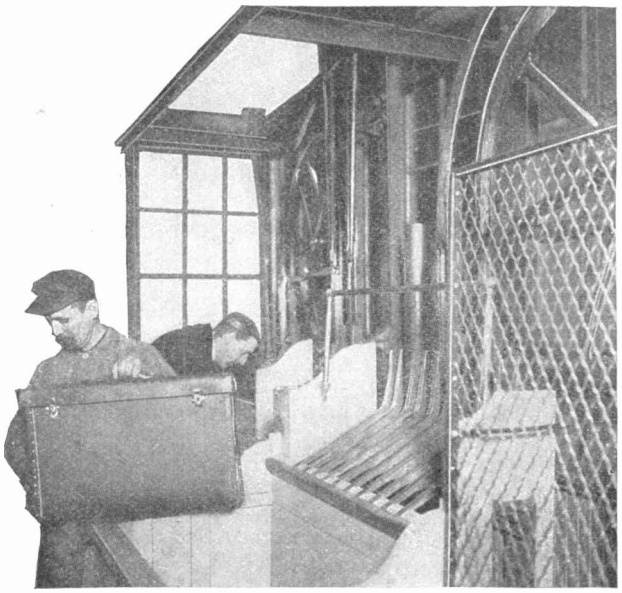
Book Railway of the Congressional Library

There is one railroad in the country owned by Uncle Sam and devoted exclusively to carrying freight for the benefit of that gentleman's congress and supreme court. It is the underground road, operated by electricity, or rather an up-to-date combination of railroad, cable road and electric line, whereby books in the Congressional Library, wanted for immediate use by senators, representatives and judges, are swiftly whisked a quarter of a mile in all kinds of weather through an underground tunnel to the capitol building.

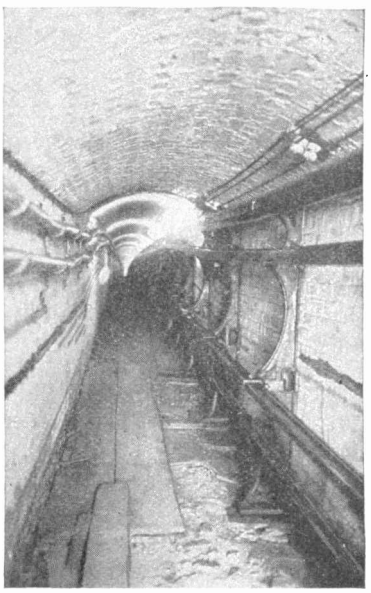
When the present library, 1,200 feet east of the capitol, was being constructed, the problem was how to get the books wanted by officials in the capitol from their places on the library shelves to the desks of the officials in the capitol. Also there was another problem: the motive power of whatever carrier was designed must be absolutely clean and smokeless —for of all enemies of the beautiful frescoes of the library, smoke is the deadliest.

Both these problems were solved by Mr. Bernard Green, now superintendent of the library building and grounds. The first part of the system devised by him consists of a network of little pulley-roads, much like the cash carriers in the department stores. These bring the books from the most distant part of the library to the central desk of the reading room. There is telephone communication throughout all parts of the building and with the capitol.

The second part of the system consists of the underground electric road. This has its terminal in the floor immediately below the central desk. The transportation carriage runs on an iron rail which is fastened to yokes bolted to the ceiling of the basement while in the library building. When the tunnel is reached, the rail is supported by stout iron brackets fastened on the wall. The carriage consists of a couple of grooved wheels fastened bicycle fashion which run on the rail. From this carriage de-



BOOK CARRIER READY TO BE SLIPPED INTO THE FINGERS OF THE CARRYING CRADLE



TUNNEL OF THE BOOK RAILWAY FROM THE LIBRARY TO THE CAPITOL

pends a cradle made of a dozen brass fingers. In this is set the book carrier, made of sheet iron and identical in form with a dress suit case. The carriage is fastened to an endless wire cable, half an inch in diameter, driven by an electric motor located at the library terminal. There is a return rail parallel to the sending rail which brings back from the capitol, by means of a carriage and book carrier, all volumes to be returned.

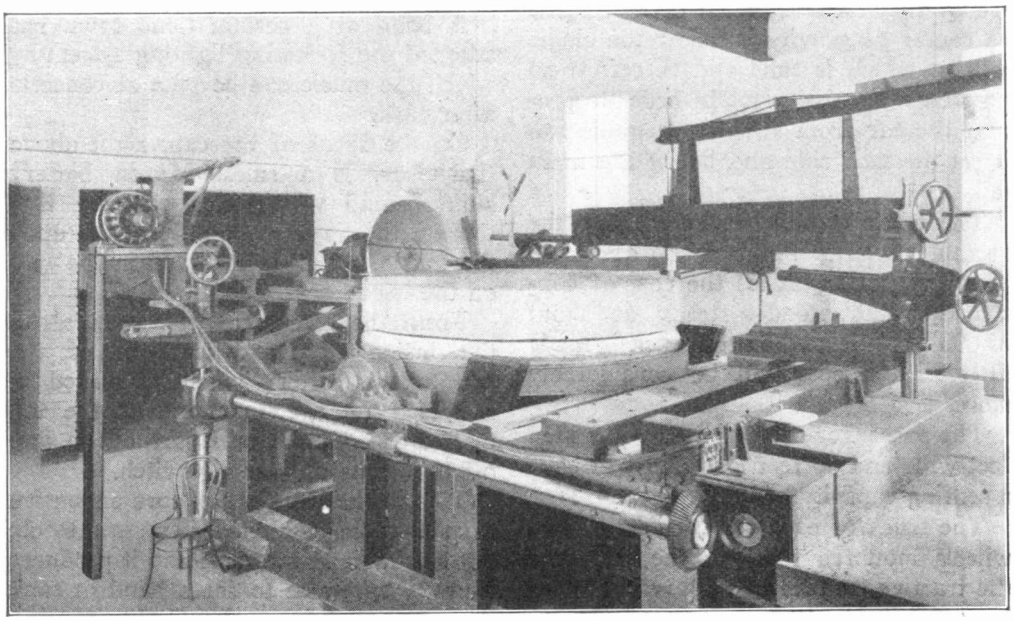
The tunnel is 6½ by 4½ feet and is lined with white vitrified brick. It is lighted with electricity throughout its quarter-mile length.

Grinding a Telescope Mirror

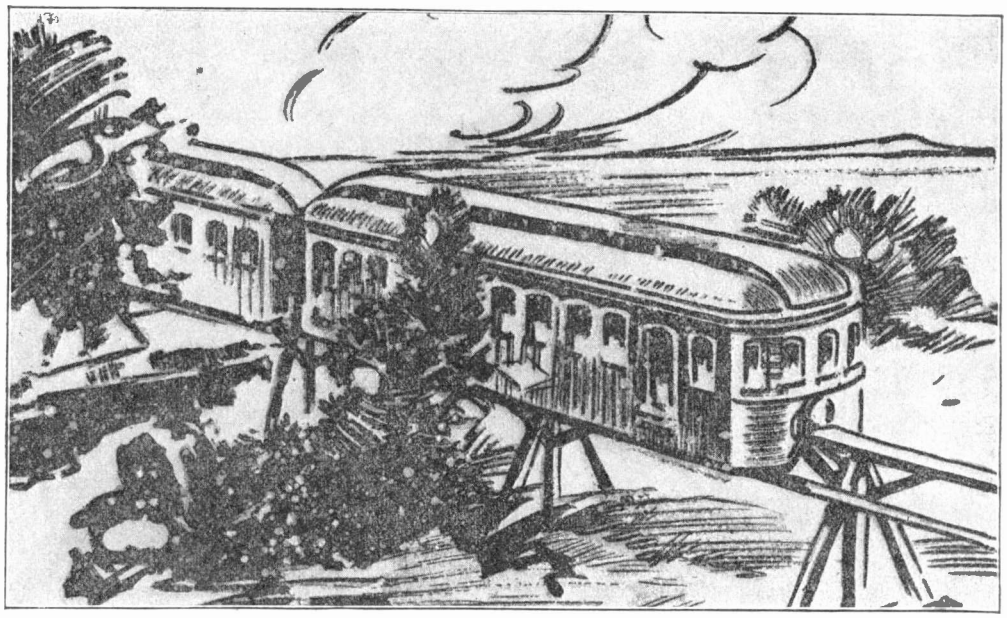
The accompanying photograph, taken at the astronomical laboratory of the Mt. Wilson Solar Observatory in Pasadena, California, illustrates the method of grinding a 100 inch telescope mirror by electric power, prior to the final finishing of the great glass for mounting. The mirror was imported from France at heavy expense and has recently been found to contain a flaw which will render it useless for the elaborate observational work for which it had been planned. Announcement has been made that an effort will again be attempted to successfully cast a flawless disc.

Two motors are used in operating the grinding equipment, one being a five horsepower outfit which turns the table upon which the mirror is carried and the other a ¼ horsepower motor which is used in moving the arm which carries the grinding tool.

The grinding of the mirrors for the large telescopes for Mt. Wilson Observatory has been done at the laboratory under the personal direction of the engineering staff of the institution and is a work of the utmost delicacy. On account of the importance of avoiding dust in this task, electric motors supply an ideal power for the running of the specialized tool needed to remove surplus material from the surface of the disk. Up to date the largest telescope mirrors cast are two 60 inch glasses, one of which is located at the Harvard College Observatory and the other at Mt. Wilson.



GRINDING THE MIRROR OF A 100 INCH TELESCOPE



SHEPARD MONORAIL INSTALLED AT SEATTLE

The Shepard Monorail

A wooden track is now being constructed across the tideflats of Seattle for the purpose of exhibiting a new type of monorail car designed by W. H. Shepard of that city. It is so designed that its center of gravity is below the single rail on which it runs and therefore no gyroscope is necessary. In order to prevent the car from swaying, a guide rail is set on each side and below the main rail.

The track is built entirely above the ground on stilts and is made of wood. The inventor estimates the cost of constructing the wooden track at about $3,000 per mile; when the track is made of steel the cost will be considerably more.

The passenger car designed will be ten feet wide and 30 feet long and will have a seating capacity of 40 people.

The truck of each car consists of two wheels mounted tandem; the width of the tractive surface of each wheel is ten inches. The motive power will be an electric motor, the current being derived from two wire or ribbon conductors, one being placed on each side of the rail, the collectors being small trolley wheels.

Band Lamps

A band of a certain Ohio town has adopted the following lighting system by which the music can be seen at concerts after dark.

On the front of the cap, right above the visor, is a small Mazda battery lamp behind which is a reflector that throws the rays of light directly upon the music, which is fastened in the lyre on the instrument.

From the receptacle wires run along the inside of the sweatband of the cap to the battery which is placed in a pocket on the underside of the top of the cap. The light is turned on and off by means of a small switch.

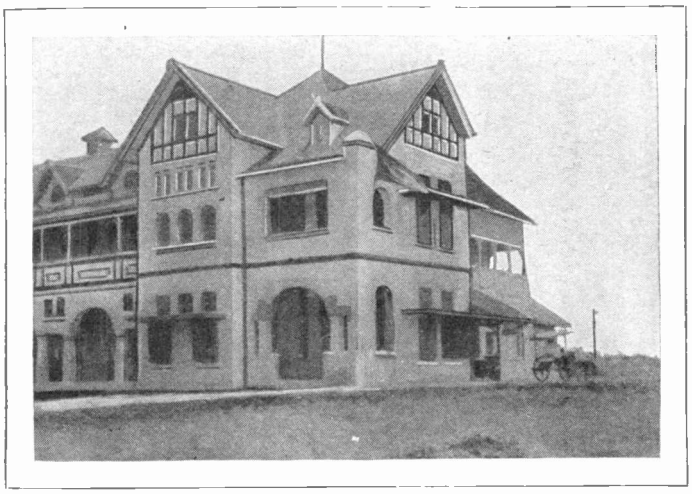
This method is a trifle more expensive than the old-fashioned kerosene torch, but it is more convenient and it produces a pretty spectacle to see a band in rank with these miniature headlights glaring out upon the darkness of the night.

Sleeping Cars on Interurban Lines

A natural sequence of events in the extension of interurban lines to distances up to as high as 300 miles is the addition to the rolling stock of parlor, dining and sleeping cars.

The parlor and dining cars compare favorably with the usual equipment in use on steam roads, but the sleepers are several steps ahead in matters of convenience to the traveling public. They are built throughout of steel and are designed only for use as trailers so that motor noises are eliminated entirely. Easily operated windows in the upper berths make these just as desirable as the lowers; adjustable roof ventilators allow excellent ventilation. In summer the cars are generously equipped with electric fans and better illumination is provided for each berth by the use of larger lighting units.

The berths are made six inches longer than in the standard Pullman and are fitted with six inch spring mattresses, the use of which is possible because the cars are used for sleeping purposes only. Numerous hooks conveniently placed serve for the disposal of wearing apparel. A plush lined safety deposit vault is another novelty which is built in the side of the car, one for each berth. Two keys, one in possession of the passenger and the other in the possession of the porter, are necessary to unlock them once the valuables have been placed therein.



TELEPHONE BUILDING IN WELTEVREDEN, JAVA

Far East Telephones

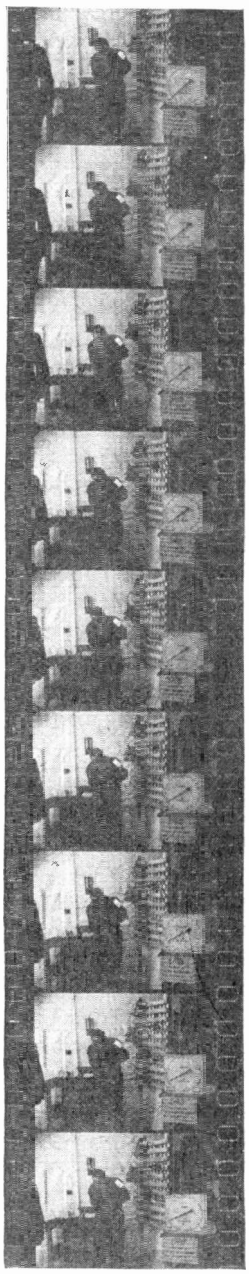
Weltevreden is a city on the Island of Java. Among its electrical advantages it possesses an up-to-date telephone system, the central office being housed in a commodious and handsome building having the appearance of the residence of some wealthy citizen. So progressive are the officials of the company that the city lines are fast being put underground, although there are some of the overhead lines left, with their odd latticed poles and one-sided cross-arms.

One of the subscribers of this magazine in sending the pictures writes as follows:

"The central at Weltevreden is equipped with the most up-to-date apparatus that in these days is to be procured, though it is not yet so modern as the centrals of a few cities in the United States, as for instance at Huron, South Dakota, where one enters a telephone central hall with not a single girl in sight. Such an automatic system has not yet been introduced here.

"Alas! the modern technic demands inexorably that instead of being agreeably surprised at the aspect of a number of pretty telephone girls when entering a telephone central, one now has before him an enpty hall where senseless and mathematically accurate machines take those places where formerly many charming representatives of the fair sex hurrying themselves to serve the public."

Moving Pictures in Efficiency Studies

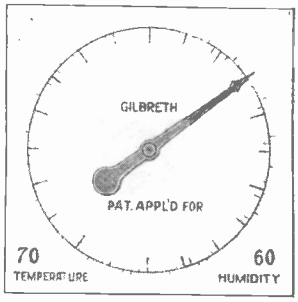


SECTION OF MOVING PICTURE FILM—NOTE THE CLOCK IN EACH PICTURE BY WHICH EVERY MOVEMENT IS TIMED

Efficiency engineer makes remarkable discoveries of lost motion by photographing men under actual working conditions

By FRANK C. PERKINS

In efficiency engineering micro-motion study is most important and the photographs show how the number of motions made by a workingman or a tool and the time occupied in performing these motions are accurately determined.

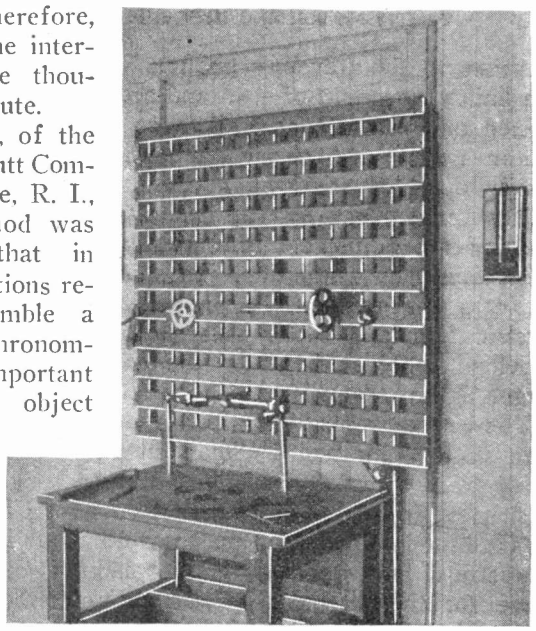


SPECIAL CHRONOMETER WITH LONG HAND MOUNTED BESIDE THE WORKMAN AND APPEARING IN EACH PICTURE OF THE FILM

Until this method of motion study was utilized the time element was determined by means of a stop watch in the hands of a trained observer. This is no easy task when it is considered that very often hundreds and even thousands of motions and operations must be studied and timed.

The chronometer noted in the pictures was designed by Frank B. Gilbreth, a very well known efficiency engineer, to eliminate the possibility of error. This new method consists in using a moving picture machine in connection with a special chronometer or "clock," with a single long hand which makes ten revolutions per minute over a dial having 100 divisions. Each division, therefore, represents a time interval of one one thousandth of a minute.

J. G. Aldrich, of the New England Butt Company, Providence, R. I., where the method was tried, stated that in studying the motions required to assemble a machine, the chronometer plays as important a part as the object studied and it appears prominently in every one of the hundreds of pictures taken by the moving picture machine. Beside the chronometer is located an ordinary twelve



VERTICAL PACKET FOR PARTS WHICH WAS EVOLVED AS A RESULT OF THE EFFICIENCY STUDIES

hour clock, which fixes the time of day, so that in the moving picture film complete information regarding the time study is obtained. The successive positions of a workman in performing each minute operation of the task intrusted to him are indicated in the film and the position of the chronometer pointer in successive films indicates the length of time between successive operations.

It is stated that each of these films is studied under a microscope and a careful analysis of each operation is made to develop the standard time for each. The interval between the successive films in one study was a little under three one thousandths of a minute. Obviously such accurate time studies of minute and detailed operations can hardly be made by means of a stop watch. Fine as that study was, it can be made much finer.

It is pointed out that chronometers can be used which make one revolution in one thirtieth of a minute, and the dials being divided into hundredths, it is possible to obtain time studies of greater refinement than at present appears necessary.

The film is far more than a record of time, as it may be enlarged and passed from workman to workman to teach the best methods of doing work. It shows a workman not only what to do, but how to do it, to the last detail and therefore teaches him what printed instructions and books can never impart adequately.

The time which the most skilled workman requires for a given piece of work is shown and the film records faithfully every movement made and subsequent analysis and study reveals exactly how many of these movements were necessary and how many were purposely slow or useless. By the elimination of the useless movements a most economical method of performing a given piece of work can be attained.

The experiments in the micro-motion study in the Providence works involved the assembling of braiding machines. The parts were assembled by bringing them to the job in boxes, from which they were taken by the worker as he required them and assembled at an ordinary work bench. In transferring the individual pieces to the growing machine many motions were unnecessarily made, all of which were disclosed by the moving picture machine.

In this micro-motion study of assembling braiding machines a bench was provided which brought the top of the completed machine to a convenient level for the workman and the arrangement of the parts in an orderly manner in bins behind him as a result of the consideration of these pictures. Although the number of motions was thus considerably reduced, there were still more than were absolutely necessary.

It is said that it is often desirable to group units composing a single assembly on a "packet" and to arrange them in the order in which they are needed and such a packet scheme was adopted for the parts of the braider.

A horizontal packet was made up first and the motion picture machine disclosed an irregularity and lack of rhythm in the movements of assembling which seriously cut down the efficiency of the workmen. A vertical packet was then tried and a standard type of portable assembly bench was thereby indicated and after a few experiments a highly efficient arrangement was devised.

It may be stated that the various parts were hung on pegs in the exact position that micro-motion study had revealed as the most economical of motions both as regards time and length of travel. This micro-motion study made it possible to greatly reduce the time required, by developing the proper form of packet to use in the work.

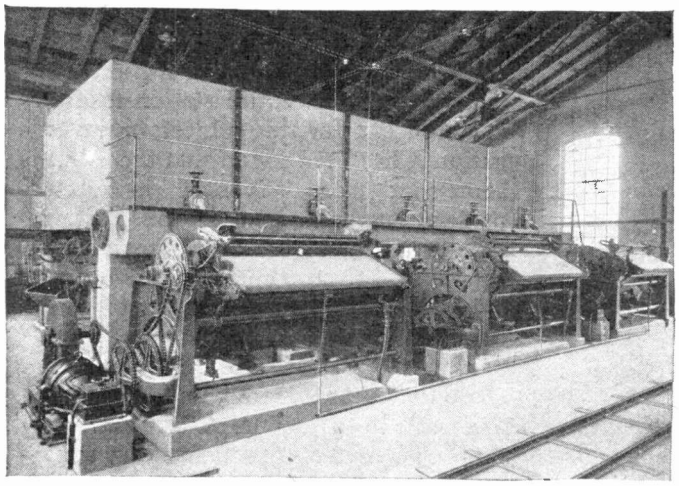
Purifying Clay by Electricity

Electricity, in the form of continuous currents, has been found, in the presence of a liquid medium, to exert a peculiar action on colloids and other finely divided substances. Viscous clay pulps and colloidal pastes, such as moist clay, when exposed to continuous currents under proper conditions, will thus lose their water to a much higher degree than ordinary apparatus. The clay mud thus produced, which may be highly concentrated, flows out into a continually working electric separator, where any clay particles are separated from impurities.

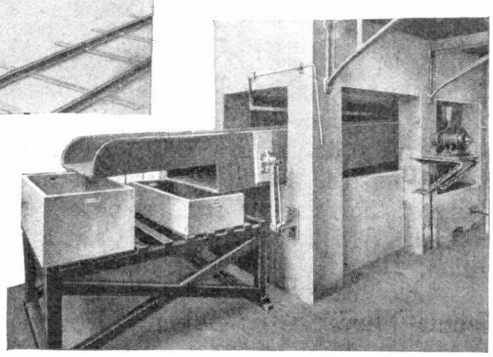
The impurities precipitated by electric means are readily discharged while the purified clay particles congregate around the anodes in a compact mass of a dryness differing in accordance with the mode of manufacture and the quality of the clay itself.

The purified clay is removed continually from the rotating anode, and the liquid residue leaving the separator is used for the washing of further clay masses so as to constitute a complete cycle.

This process is attended by the precipitation of all impurities, sand, lignites, lime,



SEPARATOR WITH DISTRIBUTING TANKS BEHIND



CHUTE AND TANKS FOR SEPARATED PARTICLES

under the action of mechanical pressures.

When mixtures of several substances of this kind are in suspension in water, this process is attended by another phenomenon, the various components, on account of their different rates of migration when subjected to an electrical potential difference (or of a migration in opposite directions), being separated from one another and partly precipitated in a solid condition on the electrodes.

On these two phenomena is based the new process for the purifying and drying of clay which is brought out (on patents by Count Botho von Schwerin) by the Gesellschaft für Elektro-Osmose, of Frankfort-on-the-Maine. According to this process, the clay is at first reduced into suspension, as usual, in the

pyrite, etc., which are separated more completely than by any other process so far in use. In fact, not only gross impurities but even the tiniest particles of the same specific weight as the clay with which they are found in suspension will be separated on account of their lower rate of migration.

The chemical composition proper of the clay is not altered by this process, except that its contents of alkaline material decreases, while its melting point rises and the percentage of alumina

undergoes a marked increase. The plasticity of the material likewise is found to increase. In fact, the new process not only purifies but refines the clay material. The purified clay leaving the electric separator as a perfectly homogeneous mass obviously requires no further treatment, which constitutes a considerable saving.

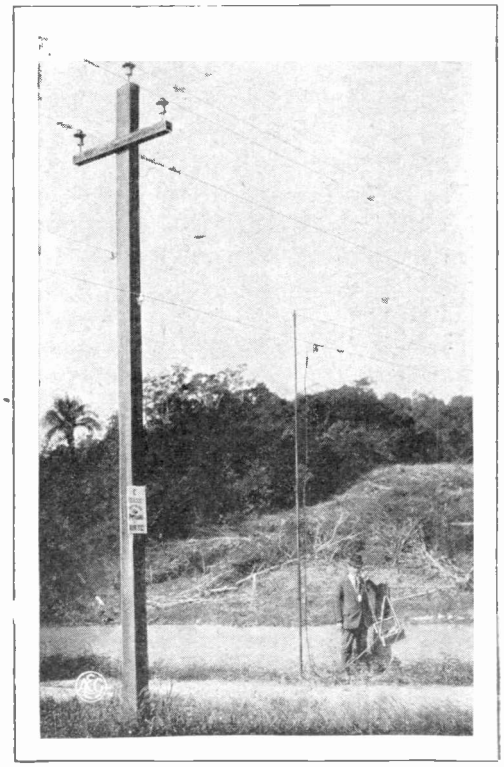
At the works recently installed for Messrs. Saalton-Werke, Leipzig, a very fatty and pasty quality of clay is treated which contains an extremely high percentage of sand and pyrite. These materials having been crushed into small fragments, are by an elevator introduced into a stirring device where the fatty clay, after addition of a convenient electrolyte (as ascertained by experiment), is reduced into perfect suspension. Any gross impurities are separated by a shaking sieve and fall down into a chute, while the clay mud flows out into settling tanks installed below ground where any minor impurities are partly separated. The mud is then thrown by pumps into distribution tanks arranged behind the electrolytic separators proper, in order thence to flow out into the separators at the required density and at a speed to be determined for each given clay.

The electrically treated clay goes over the cathode to the cylindrical anode and is conveyed automatically by a scraper onto a band conveyor arranged in front of the electrolytic separator, whence it falls of its own accord into cases arranged underneath, in order finally to be taken to the drying shed.

The clay treated at these works contains only an average of 24.4 per cent of moisture and is free from sand and—what is even more important—pyrite. Such a clay is therefore particularly well adapted for the manufacture of pencils, crayons, dyes, etc., and for use in ceramic works which of course require an especially plastic and refractory sort of clay. It is also used to advantage for increasing the plasticity of clay for earthenware.

Transmission Line in Brazil

The accompanying picture shows a transmission line in Brazil with the fronded palm and other typical Brazilian vegetation in the background. This line supplies Joinville with electric current, Joinville being the capital of the Dona-Francisca Colony. Concrete poles and crossarms carry the three wires of the three phase transmission line, the two wires below being those of a telephone line connecting the plant and substations. The patrolman when out on this line carries a portable telephone and makes



TRANSMISSION LINE IN BRAZIL

connections with the telephone wires by the aid of a long bamboo pole. He first uses the pole to hook the flexible conductor from one side of his telephone over the lower wire. The wire from the other side of the telephone is fastened along the pole and is hooked over the upper wire of the telephone line.

Production of Energy from Sunlight

Hitherto the production of electrical energy by chemical action has been so costly that this method has been out of the question for industrial purposes. If, however, it were found to be possible to reverse the chemical action by some inexpensive process, so that the cost of the production of the energy would be simply the cost of this reversal, and if by this means a current strong enough for industrial purposes could be produced, then probably this would become the ideal method for the generation of electrical energy. This, in fact, is just what a Danish inventor, M. Ch. Winther, claims to be able to do with his instrument called the photopile, which he describes in the German publication, *Zeitschrift fur Electrothermie.*

The method consists in subjecting certain chemicals to the action of the ultraviolet rays, which are the chemical rays to be found beyond the violet of the solar spectrum. The action of these rays produces a change in the chemical such that when two electrodes are placed in it an electric current is generated which continues until the chemical has resumed its original form. The second form is stable, that is, not liable to change under a temperature of 40°C. or 104°F. Now by subjecting the original form again to the action of the sunlight, the second form is produced and a current may be again generated, the process going on indefinitely.

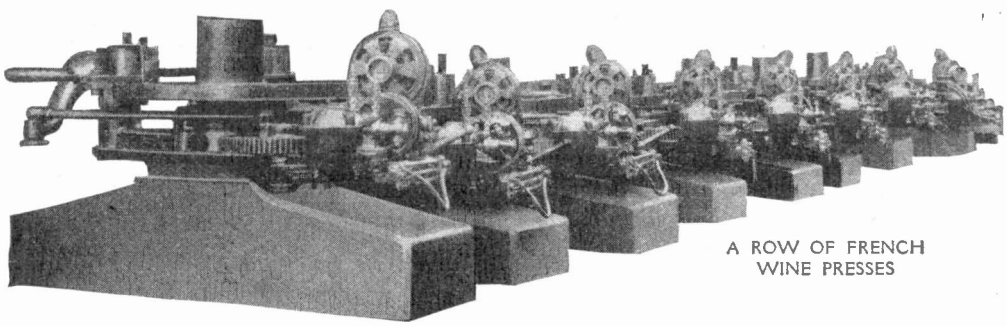
Details and figures are not yet at hand, so that at the present moment it is impossible to foretell the value of the invention, but the inventor claims to be able to produce stronger currents than have ever been generated by chemical action before.

Unfortunately, sunlight is not very rich in these rays which produce the chemical transformation, but it is thought that other means as cheap and more effective may be found; also it is possible that some other combination of chemicals may be used which will produce a current in quantity suitable for industrial purposes.

Wine Presses of France

There is now quite a move in different countries of Europe for promoting the use of electrical devices on the farm, now that power lines pass along over such extensive districts that even remote places can be well supplied with current. In France there are constantly being organized county exhibitions on model farms which are intended to bring the good points of electrical devices before the rural public.

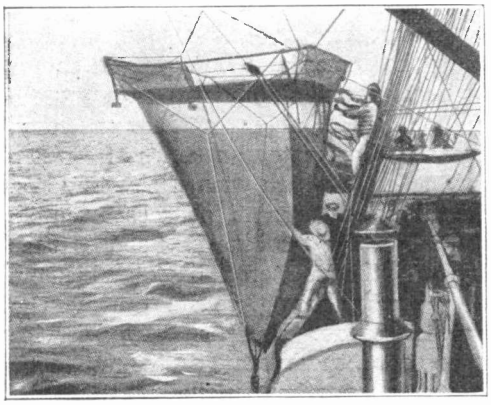
Since in this country cider and wine form a leading feature of agricultural industry, it is natural that electric presses should be among the noteworthy apparatus to be brought out. The picture shows a fleet of the new Simon electric presses; that is, the motor and the principal driving parts. All that is needed is to install it in connection with the usual cider or wine press so that the electric motor gives all the power that is needed for carrying on the operation.



A ROW OF FRENCH WINE PRESSES

Discoveries Resulting from the Breaking of a Cable

Until 1861 it was believed that the sea was inhabited only to the depth to which light penetrates, which is about 650 feet. The breaking of the telegraph



A DEEP SEA NET

cable which connects Sardinia and Algeria obliged scientists to change their ideas on the subject. The broken end was brought up from a depth of 6,500 feet, and was found to be covered to a thickness greater than its own with coral and live fish of different kinds. This discovery gave an impetus to deep sea exploration and since then great additions have been made to science by the work done by English vessels such as the Challenger (1873-1876) and the American, Hassler and Blake (1873). Other nations have also contributed, but the man who has done most to extend our knowledge of submarine life is undoubtedly Prince Albert of Monaco, who since 1885 has been continuously engaged in oceanographic research.

When Darwin made his voyage on the Beagle (1831-1835) and later Huxley on the Rattlesnake (1847-1850) naturalists felt as sure of the sterility of the deeper parts of the ocean as now they are of its inhabitation to a depth of at least 20,000 feet, which is the greatest depth which has yet been explored.

The capture of animals on the bottom is relatively easy, and is accomplished by the use of dredges of various kinds; animals living higher up are not so easily caught, and this difficulty has given rise to the invention of various appliances for this purpose. These are nets with automatic opening and closing devices; nearly all descend closed and are opened at the required depth by sliding a weight down the cable. The larger nets are about ten feet square at the top and are made of a stout sail cloth. At the bottom is a bucket which is supported by ropes from the corners of the top frame, which is of iron.

It is found that the net cannot be drawn up faster than about 6,000 feet per hour, so that a net which has descended to 20,000 feet will require more than three hours steady hauling to bring it to the surface.

One of the most striking discoveries which has been made is that many fishes, especially those with luminous organs, make a nocturnal emigration from great depths to a zone comparatively near the surface. This has been proved repeatedly by the fact that a net dropped into the sea after dark will bring up animals which if found at all at other times are found only at great depths.

Traveling Telephones in India

The British military authorities are reported to have accepted for use in India a form of movable telephone, which can be employed with great facility in the field. The cable weighs only seven pounds per mile, but is so well insulated that it can be stretched across a stream of water without loss of current. It withstands a strain of 120 pounds. An apparatus for placing and removing the cable, working automatically and capable of being attached to a saddle is employed. On one occasion a horseman in the Punjab, proceeding at a gallop, placed the cable over a distance of two miles in seven minutes. To remove it, eighteen minutes were required.

Preparing the Oyster Catch for Market

WITH THEIR NOSES AGAINST A LONG, COVERED WHARF EXTENDS A SERIES OF STRANGE LOOKING CRAFT

At the foot of Pike Street on the East River, New York, a busy slip crowded with small steam and sailing ships affords a conspicuous instance of the adaptability of electric drive. It is here that the oystermen bring their catches from points along the Jersey and Long Island shores for packing and shipment.

With their noses against a long, covered wharf extend a series of strange looking craft which with their windows, chimneys and quaint porches resemble somewhat the familiar houseboats that frequent the sheltered bays and inlets of the neighboring coasts during the summer season. Designed for sea service in no sense, these boats are found to be tied permanently at the pier in the capacity of clearing houses. Each is owned by a separate company and each furthermore has its own particular fleet which makes regular trips in from the oyster beds.

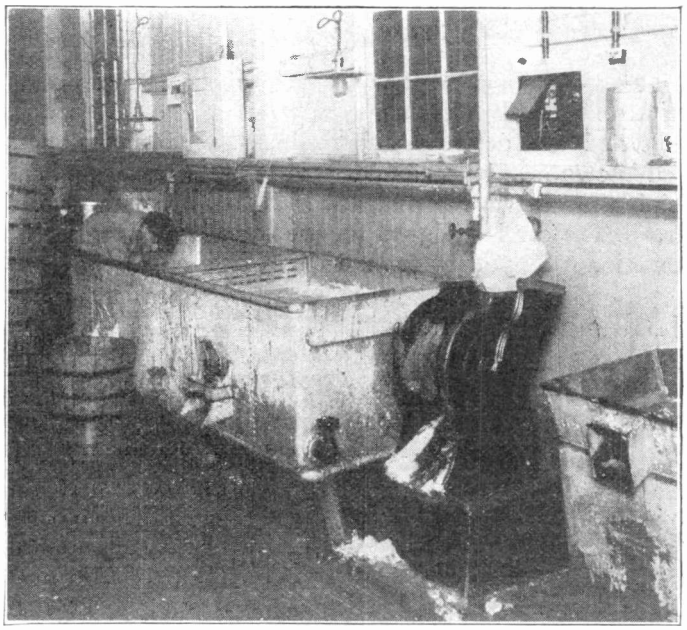
These venturesome little vessels of the fleet, which go out in all weathers, are incidentally far from lacking in modern

Photographs by the New York Edison Company

SHELLING OYSTERS

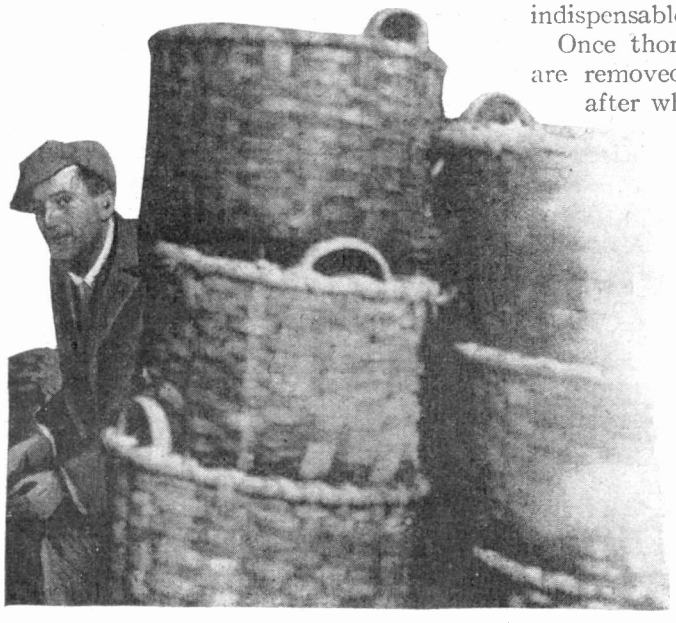
conveniences. In the case of the steam craft particularly the fishermen enjoy the luxury of electric lights, and even the sailing boats carry in most instances auxiliary dynamos which are called upon to furnish lighting service.

The stationary boats, however, possess an equipment of still more interest. Not only are they electrically lighted, connection being made with the Edison mains, but each boasts in addition a unique power installation.



THE OYSTERS ARE SOUSED UP AND DOWN AND WASHED EFFECTIVELY IN TUBS FITTED WITH COARSE, HEAVY SIEVES

With the exception of the blue points which are invariably shipped in the shell, the oysters after being opened have first to be washed entirely free from bits of shell or other foreign matter. The work consists in dumping them in large stationary tubs of fresh water. In these tubs are fitted coarse, heavy sieves which, surprising to observe, proceed to rise and fall rhythmically. The oysters in this manner are soused up and down time and again and washed far more effectively than under the old hand stirring method. The electric power required, which is supplied by motors, while not large is coming to be regarded by the trade as indispensable.

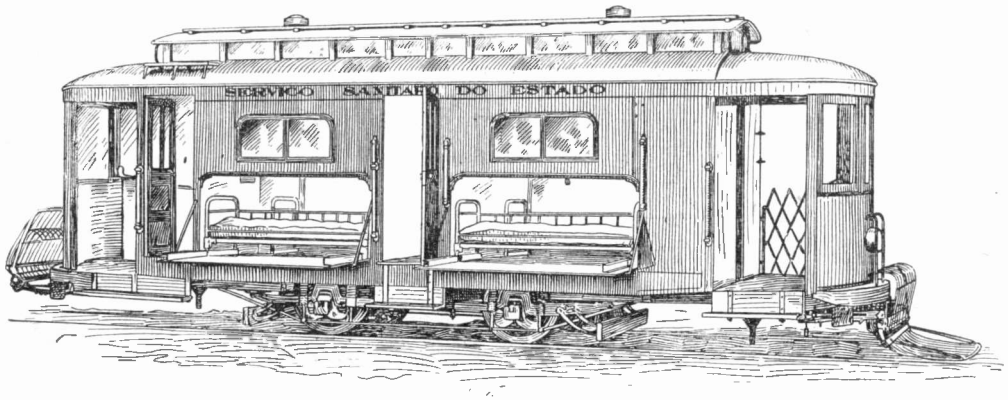


Once thoroughly washed, the oysters are removed to other sieves to drain, after which they are packed in five gallon cans which in turn are packed in ice in stout wooden tubs. In this way satisfactory shipments are made as far west as Denver.

One million pounds of copper has been spun into wire for the extension and development of the telephone system in Texas during 1913. Between 300 and 500 acres of forest is being stripped of its straightest trees to make the 30,000 poles of this special order.

A Trolley Ambulance

The trolley ambulance shown in the illustration is the first of its kind ever built and was designed and made by a well known firm of car builders in Philadelphia for a tramway company in Bahia, Brazil. The car is designed for the transportation of patients to and from the outlying hospitals about this city that cannot be easily reached by other means.



TROLLEY AMBULANCE WITH SEPARATE HOSPITAL COMPARTMENTS

There are five divisions, including first the nurses' rooms, adjoining which may be seen the two compartments for the patients. In the center of the car a small area has been converted into a fumigation room. This room is two feet 11⅝ inches long and extends the full width of the car, i. e. eight feet, as do the other compartments. The disinfecting room is hermetically sealed from other portions of the car with the exception of a small hole in each transverse wall, through which the fumigation process takes place.

The hospital compartments accommodate two iron beds each, which are equipped with rubber tired rollers, springs and the regular mattresses. These beds can be pulled out upon an extension of the car floor formed by the lowering of one side of the car. When the compartments are closed light is secured through two double paneled wire glass windows, one over each bed. Air is admitted through a small ventilating hole placed underneath each bed.

The nurses' rooms, one of which adjoins each hospital compartment, are furnished with metal medicine chests and revolving chairs and have a small door opening into the room holding the beds.

Every precaution has been taken to prevent infection on the part of the crew, a steel bulkhead with no openings of any kind separating their compartment from other portions of the car and even the ordinary signal bells with cords have been dispensed with, electric bells with push buttons taking their place.

Telephone Sand Glass

This small instrument is in use in the telephone booths of Paris, where the time limit for conversation is usually three minutes, but where a higher rate is charged for six and nine minute conversations. The three sand glasses, designed and run out in nine, six and three minutes, respectively, are a convenient means of avoiding arguments between operator and subscriber as to the flight of time, which always seems extra rapid when time is money.

TELEPHONE TIME INDICATOR

Locating Buried Water Pipes

In connecting underground water pipes to supply a house or place of business it is necessary, of course, to locate the street main, and unless maps are at hand this means that the pipes must be located by the expensive method of digging.

The water department of the District of Columbia avoids this expense by using a water pipe detector invented by one of its employees, Mr. E. H. Grove.

A copper wire 500 feet long carried on a reel is attached to a faucet or the plumbing in a house receiving water from the lost pipe. The other end of the wire is connected to a faucet in an adjoining house. A battery is placed in the circuit, also an induction coil with interrupter, and current then flows from one house to the other through the wire and from the second house back to the first through the pipe. This circuit is rapidly closed and opened by the action of the interrupter, and consequently the current through the water pipe is intermittent.

The explorer now puts on a head telephone which is connected to the detecting device carried in a box close to the ground by a strap loop. When the detector box in being carried about is brought over the pipe sought a buzzing caused by the inductive effect of the interrupted current flowing in the pipe is heard in the head phone. The course of the pipe can thus be traced and mapped.

EXPLORING FOR A BURIED WATER PIPE

Dental and Surgical Lamp

The lamp here shown is designed for the use of surgeons and dentists. The light is concentrated by a system of lenses mounted in a tube and the whole is supported upon adjustable arms so that it may be placed in any position with relation to the patient. A hood prevents the rays from being thrown out into the eyes of the operator and a telescopic arrangement of the tube permits the focusing of the rays over a distance of from six to eighteen inches. A patent upon the device has been issued to Clarence F. Rodgers, Conneaut, Ohio.

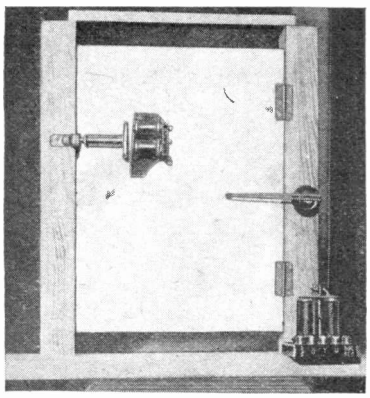
DENTAL AND SURGICAL LAMP

WHISTLING THE DOOR OPEN

Thorne Baker, of London, the indefatigable electrical miracle worker, has conceived the idea that tunes should replace latch keys. So he has devised a lock which will open when a "master tune" is whistled or sung near it.

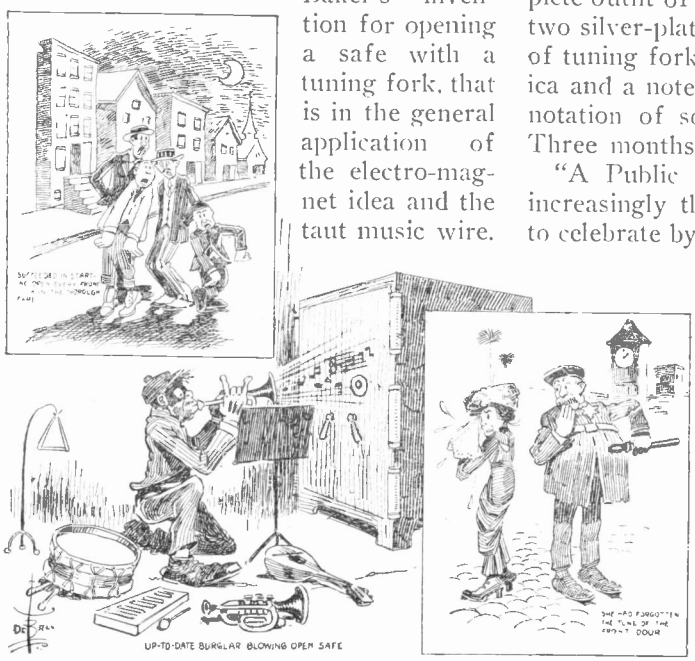
Mr. Baker, peeved at the trouble of getting out of bed to unbolt his bedroom door, wished to goodness that he could whistle it open.

No sooner thought of than done. He has now completed an invention by which it is possible for the timid to bolt their doors at night and yet admit the maid with early morning tea and grapefruit or marmalade by simply whistling or even speaking into a little mouthpiece by their bedsides. It is not necessary to use the magic word "Sesame." Open is enough, but it must be "Its Master's Voice."



THORNE BAKER'S DOOR OPENER THAT RESPONDS TO A MUSICAL NOTE

This is all made possible by a simple electro-magnet, which draws the bolt when a current passes through the magnet. The current is supplied by completing a circuit in which normally there is a gap between a platinum point and a piano wire, tuned to a certain note. This arrangement is something like Mr. Baker's invention for opening a safe with a tuning fork, that is in the general application of the electro-magnet idea and the taut music wire. By sounding the note to which the wire is tuned, or one of its octaves, the wire itself vibrates in response, as does the same wire within a piano when a tuning fork or a harp wire is struck near it.



UP-TO-DATE BURGLAR BLOWING OPEN SAFE

Commenting facetiously on Mr. Baker's invention and its possibilities, a writer in a London paper says that ere many years have passed, we may read such reports as the following:

"A Scientific Burglar—William Sykes, 27, no occupation, charged with loitering with intent. On him was found a complete outfit of burglar's tools, comprising two silver-plated pitch pipes, a full range of tuning forks, a Jew's harp, a harmonica and a note book containing the sol-la notation of some 150 well known airs. Three months."

"A Public Nuisance—It is becoming increasingly the habit for young bloods to celebrate by parading the streets in the residential sections, singing choruses. A group of medical students perpetrated this outrage in Gower Street last night and succeeded in starting open every front door in the thoroughfare. Fined ten shillings each and costs for singing in a public place, contrary to the Act."

"Strange Occurrence—A respectable elderly

woman was found wandering along X street in great distress last night. She explained that she had just moved into a new house and having gone out for her evening's shopping, had been unable to get in again, as she had forgotten the tune of the front door."

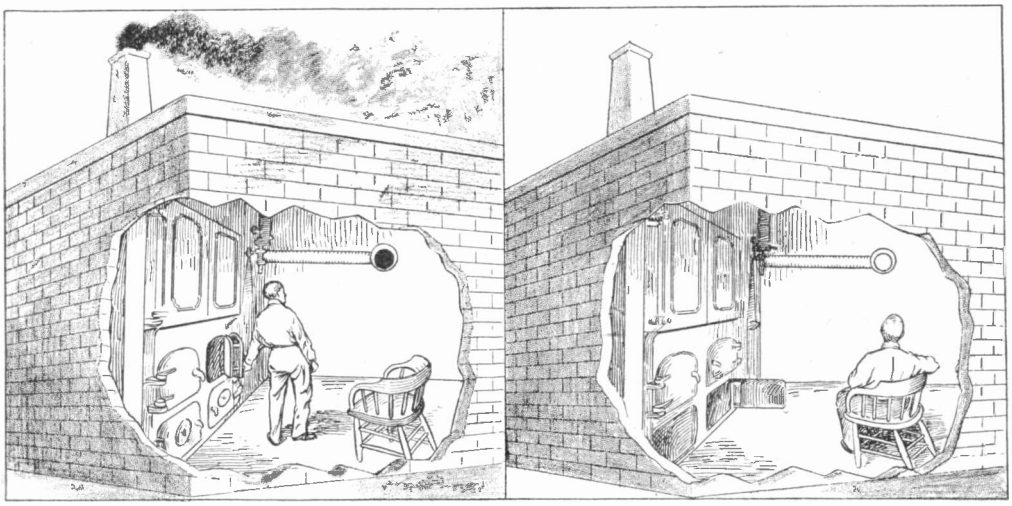
All the above do not take into account the folk with a non-musical ear, who can never remember a tune nor whistle it in pitch or, as the saying is, "carry a tune." These would have to carry a pocket music box, and have a professional lock tuner set the combination for them, as they would never know whether they had the right tune or not.

Mr. Baker's experiments are always interesting, and some of the results he has obtained are not only of scientific value, but practical as well.

Smoke Indicator

The light reflected from an incandescent lamp is employed in the Eclipse smoke indicator to tell the fireman when the stack is smoking.

The lamp is placed at the breeching of the boiler so that the smoke in passing up the stack cuts offs much or little of the light. Reflectors are arranged to take what light comes from the lamp across the breeching and reflect it to a ground glass screen in a convenient location for the fireman to have it always under observation. When the stack is clear the glass screen is bright. When the stack is smoking badly little or no light gets through the smoke and the glass is dark. Thus at all times the ground glass indicates the amount of smoke going up the stack and enables the fireman to stand at his boilers and find out how to fire with the least amount of smoke and greatest efficency.



A GLANCE AT THE GROUND GLASS INDICATOR SHOWS WHETHER STACK IS SMOKING OR NOT

Breaking of Ocean Cables

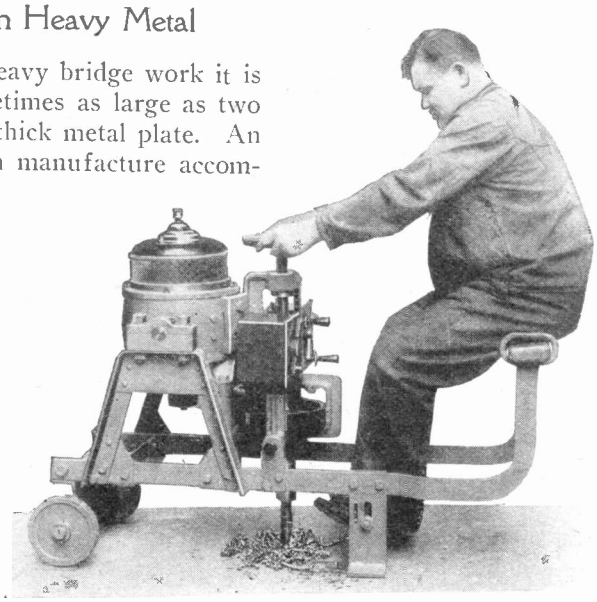
The researches of Professor Milne on the cause of the breaking of telegraphic cables have revealed the fact that there are parts of the ocean bed, particularly on steep slopes on the edges of continents, where great changes frequently occur. The importance of properly selecting the location of a cable is shown by the fact, cited by Professor Milne, that the military and naval reserves were called out in Austria in 1888, when the simultaneous interruption of two cables cut off communication with the rest of the world for nineteen days.

Drilling Large Holes in Heavy Metal

In ship construction and heavy bridge work it is necessary to drill holes sometimes as large as two inches in diameter through thick metal plate. An electrical drill of German manufacture accomplishes this work with comparative ease, leaving the efforts of the operator to be directed in placing the drill and arranging the speed. Mechanical adjustment makes it possible to drill upward, downward and even in an oblique direction.

In addition to the regular gearing between the drill and motor, a connection is provided for a flexible shaft to which may be attached a polishing or grinding wheel.

The manner of moving the drill about is indicated in the illustration but while in use the operator furnishes stability to the equipment by sitting on a cross plank passing through the handles of the frame.



A HEAVY ELECTRIC DRILL

Concrete Telephone Houses

When the Erie Railroad installed a new block signal system on its branch road, the New Jersey & New York Railroad, concrete houses were brought into service as telephone booths. These houses were cast at a convenient point on the line and then loaded on flat cars and transported to the points desired on the 42 miles of the branch road.

The telephone is used in connection with the system to provide a means of instant communication in case of trouble on the line. The stations being equipped with telephones, the station agent can set the block against a train some distance away and communicate with the engineer giving him such orders as the situation may call for. Being non-inflammable, the concrete houses are safe, and the wires being underground there is little danger of the telephone system ever being thrown out of order by weather condition causes which play havoc with overhead lines.

CAST CONCRETE TELEPHONE HOUSE USED IN A RAILROAD BLOCK SIGNAL SYSTEM

Another Use for the Cactus

Arizona is one of the western states bound to be heard from, and there, as in other sections of the country, the United States government through its Forestry Bureau is assisting the state to develop and use all its natural resources. One of these is the Giant Cactus, a sturdy, non-edible fruit bearing plant which sometimes attains a height of 40 feet.

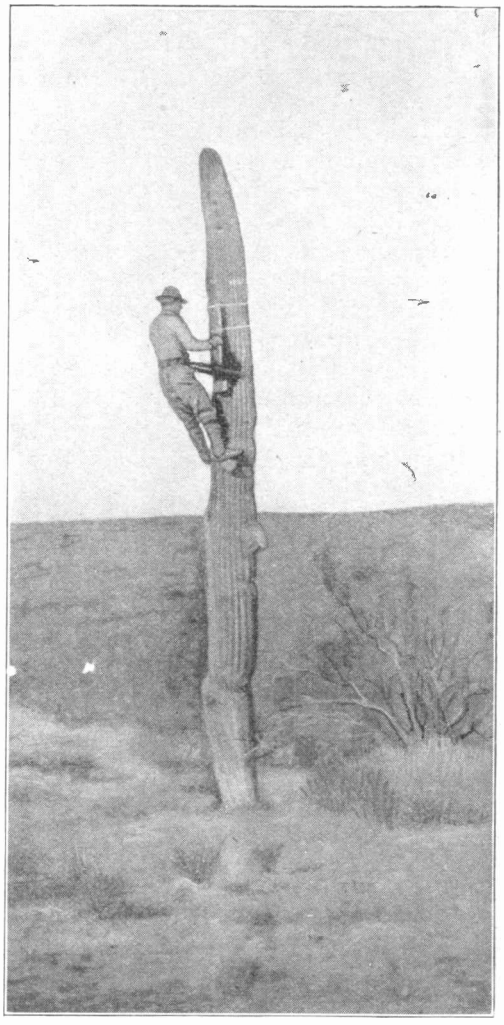
The sahuara, or cactus, is strong and tough, and when it became necessary to build a telephone line from the office of the Supervisor of Forests to the Soldier's Camp Ranger Station, a distance of some 30 miles, economy dictated that some use should be made of the many sahuaras growing along the proposed route.

The idea was not wholly new, as some telephone lines in Arizona had already been successfully constructed in this way, but the plan had never before been adopted by the government.

From Tucson to the Magnetic Observatory, about eleven miles, the wires were strung on the poles of the Arizona Telephone and Telegraph Company; to Lowell Ranger Station, redwood poles alternated with cactuses, in the proportion of one cactus to two poles; to the Great Western Power damsite, second hand boiler tubes alternated with sahuaras in the same proportion, and from there to Soldier's Camp the wires were strung on trees.

It was believed that the cactus poles would prove far more durable than those of ordinary wood, and brackets for holding wires were attached to the living plants, upright pieces being fastened to them to produce the desired height.

The result has been less satisfactory than was anticipated, owing to the fact that the sahuaras are especially susceptible to be struck by lightning, and it has been found necessary to replace a number of the cactuses with wooden poles on this account.



ON SOME GOVERNMENT TELEPHONE LINES THE GIANT CACTUSES ARE USED FOR POLES

Growing Power of Electric Lights

A comparison has recently been made of the power of the lights in French lighthouses at various periods in the past 40 years. In 1873, when only oil lights were used, the highest power was equal to 54,000 candles. In 1883, when the electric light was introduced, the power rose to a maximum of 820,000 candles. Since then frequent improvements have been made in the electric lights until, at present, the most powerful lighthouses project an illumination equal to 3,000,000 candles.

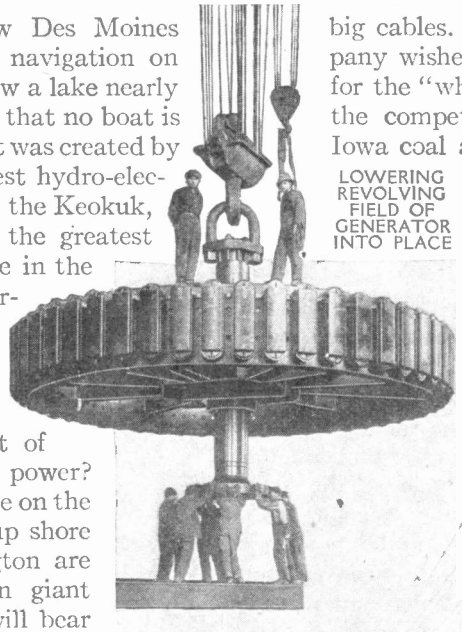
Industrial Elixir for Old Steamboat Towns

Out where the shallow Des Moines rapids formerly impeded navigation on the Mississippi there is now a lake nearly 40 miles long and so deep that no boat is in danger of grounding. It was created by the building of the greatest hydro-electric dam in the world. At the Keokuk, Ia., end of that dam is the greatest hydro-electric power house in the world. The great undertaking, now almost completed, has already been described in detail in these pages. But what is going to be the result of this great development of power?

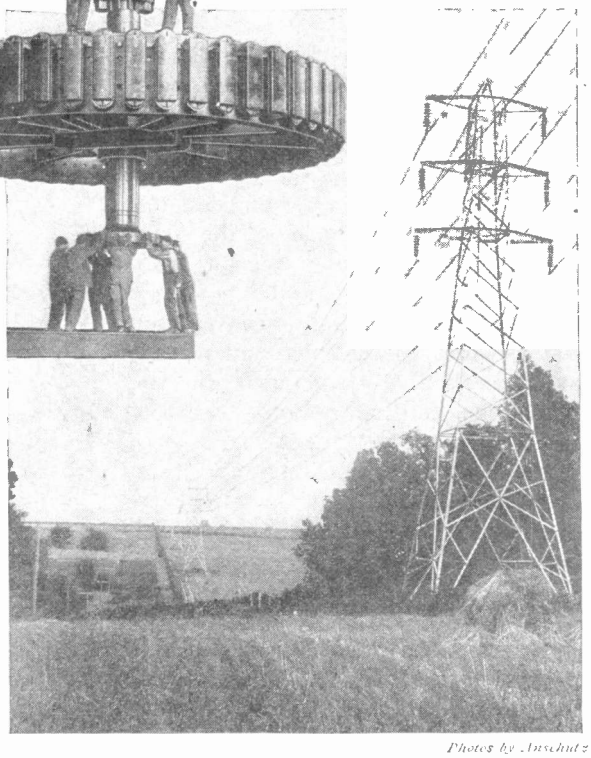
Reaching down the shore on the south to St. Louis, and up shore on the North to Burlington are mighty cables swung on giant steel towers and which will bear within their covers the electric current that has already revitalized the industries of this section of the valley.

Municipalities which have struggled ever since the old steamboat days to hold their own in trade, have now discovered a new elixir of industrial life in the combination of cheaper power and better transportation facilities. As a result Old Man Industry has trimmed off his whiskers and gone out with a new kit of tools to build more factories, more boats, more electric railways and hundreds of homes for his boys, the working men.

As far as the makers of the 200,000 horsepower of electrical energy—the Mississippi River Power Co.—are concerned they will act as wholesalers of current and distribute it in job lots at Keokuk, Burlington and Ft. Madison, Ia.; Hamilton, Warsaw and Quincy in Illinois and Hannibal and St. Louis in Missouri. Smaller places may have power by proper arrangements to tap the big cables. Whether the company wishes it or not its rates for the "white fuel" must meet the competition of the cheap Iowa coal and the transportation conditions governed by waterway freight rates.



LOWERING REVOLVING FIELD OF GENERATOR INTO PLACE



Photos by Ansehutz

KEOKUK-ST. LOUIS TRANSMISSION LINE. IT STRETCHES 143 MILES ACROSS COUNTRY ON A PRIVATE RIGHT-OF-WAY

With these conditions in mind and the knowledge of "bridge arbitraries" and car shortages to spur them, factory owners began to move into the electric zone long before the turbines were ready to turn. The mill has been taken to the raw material. For the first time in many decades, also, traffic has begun to move from the south to the north along the valley.

One of the new industries for the electric zone is the ginning of cotton and the manufacturing of cotton products of all

sorts. Ginning was formerly done solely in the cotton growing section. It will be cheaper now to haul it by boat and gin by electric motor instead of steam. Cotton has hitherto been converted into fabric chiefly in New England, where water power was the original incentive to industry. Now the Central States will see the manufacture of cotton fabrics within their own bounds.

Until the new fuel came into the horizon the people of the valley towns never dreamed of an electric livery stable. Yet one will be opened soon in a town on the south transmission line. A woman who wants a rig to make her afternoon calls or carry her to the theater will not have to bother with a skittish horse that sheds in the spring and kicks on the cold days. She can do her shopping in an electric brougham or coupe. Travelers who were formerly greeted at the station by antiquated hacks that toiled up the hills will now be whisked to their hotels in electric carry-alls.

In anticipation of the cheap power an interurban line has recently been incorporated and will run between Quincy and Springfield in a rich farming district formerly traversed principally by bad roads. This is but one of a series of traction lines that will skirt the river's edge in the electric zone.

Countless small industries are moving into the eight towns which will be distributing centers for electric current. There are some strange new industries, too, coming into being which were unheard of before the electric age. The makers of aluminum products will take electricity direct, as will the makers of air nitrates and similar articles of modern chemistry. Cereal manufacturers, millers and others are picking out sites in the river towns near the farms, on the cheap transportation line and in the region of inexpensive power.

The riverside municipalties are so certain that an industrial revival is at hand that they are spending immense sums of money to take advantage of it and compete with rival cities in building up their communities. The turning on of the electric elixir has done for them what half a century of oratory and millions of the nation's funds has failed to do; started a revival of waterway traffic. That is why Alton is planning a million dollar sea wall; Quincy is trying to convert its bayou into a harbor; Davenport is reaching out after trade with harbor facilities; Keokuk is trying to get a concrete dock in shape for the use of traveling cranes, and elsewhere they are beginning real river docks where transshipping between water carriers and railroads may go on with an economy that is likely to put the cities of the Rhine to shame.

If further proof is needed, one may drop into any boat yard on the upper Mississippi and observe the steel barges which will soon replace the romantic old steamboat.

And the farmers who formerly stayed up at night to fight the spring flood, now that the river is harnessed are converting their black corn lands into truck gardens so that they may feed the workers in the mills and reap greater profits.

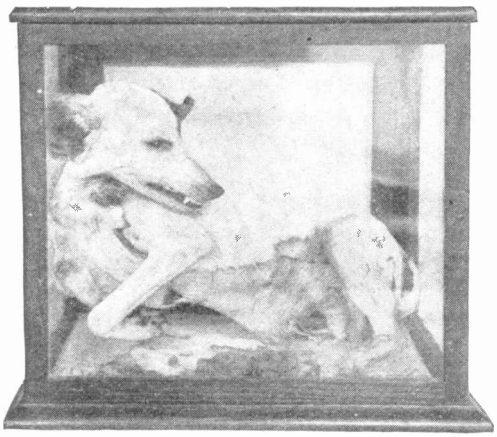
Some idea of the size of the power giant that is going to make Keokuk his home is shown in the pictures. The revolving field of the generator is but one of a battery of 30. Each generator measures more than 31 feet in diameter. If all the generators had been shipped at once it would have required 38 locomotives, 600 cars and a train nearly seven and quarter miles long to transport them.

The Keokuk-St.Louis transmission line consists of seven copper cables each containing nineteen strands about 5/8 inch in diameter and suspended on 80 foot steel towers set 800 feet apart and 143 miles long. The current carried is of 110,000 volts. The north bound transmission line is of aluminum stranded cable and carries 11,000 volts for 40 miles. Both lines are placed in a 100 foot right-of-way.

Desiccation of Bodies by Electro-Magnetism

Not since the days of the ancient Egyptians when gums, spices, bitumen and swathings of linen enabled them to keep a lifeless human body for centuries without decay has such a miracle been performed. The secret passed with them and has been lost in spite of strenuous efforts to rediscover it.

However, modern science will find a means to preserve the body after death if it has not already been accomplished by



DOG PRESERVED BY ELECTRO-MAGNETIC PROCESS

means of electricity as applied by William H. Allen of Cleveland, Ohio. He subjects the body for several days to the action of a magnetic field and presents proof of results in exhibits of bodies of animals and pieces of meat treated by the process.

The accompanying picture is of the body of a dog preserved by the electro-magnetic process. The body though losing in weight remains in a perfect state of preservation.

In support of the operativeness of his method, the inventor makes the following statement of facts: That on numerous occasions he has desiccated organic substances, both animal and vegetable. That on Saturday, January 6, 1912, a piece of fresh, raw beef was placed in a magnetic field and subjected to the same for a period of seven days; that on January 13, the meat was entirely desiccated and free from odor and in fact there was no indication of decay or putrefaction. The desiccation with the magnetic field was conducted in a small, completely closed room in which there was absence of air circulation.

At the same time a similar piece of meat was placed in the same closed room, but at a distance away from the magnetic field. At the same time and throughout the same period, a third piece of meat was placed and left in a second room, adjoining that in which the first two mentioned pieces were placed. The three pieces of meat were substantially the same in size and weight, and all three pieces were, prior to the test, in the same condition.

On the fifth day, or on January 11, the two pieces which were not in the magnetic field showed decided indications of decay and on the seventh day, or on January 13, both of the pieces gave off a bad odor and showed advanced putrefaction.

The piece of meat which was desiccated in the magnetic field between January 6 and January 13, is filed as an exhibit in the U. S. Patent Office and marked, "Exhibit A," together with sworn affidavits, the piece having been cut into two parts since the test to show the desiccated condition beneath the surface.

When applied practically, each crypt or compartment in a community mausoleum can be provided with a field producing apparatus and the bodies may be placed in the crypts and desiccated therein by the magnetic influence.

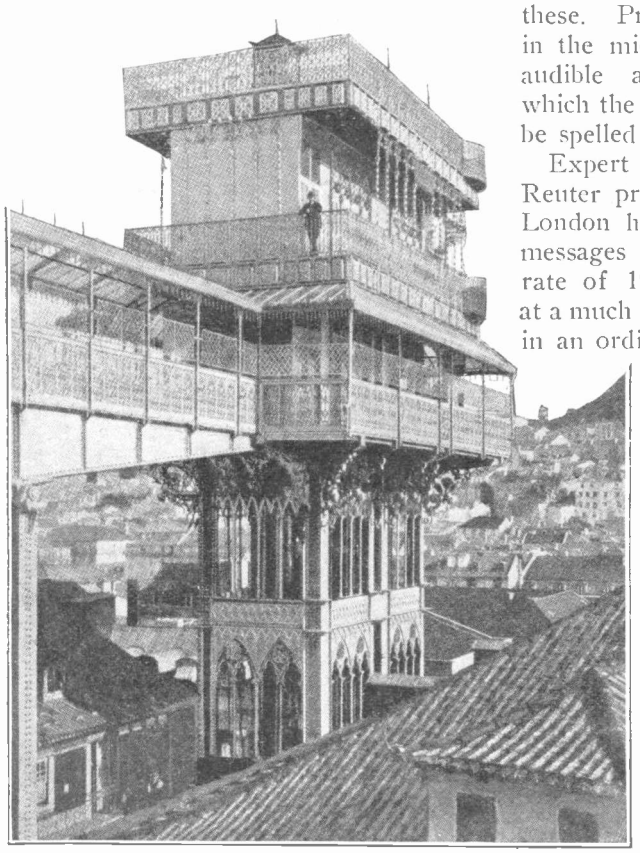
Timing a Lightning Flash

By means of a photograph made with a vibrating lens, Professor Glew, of London, has calculated the time of a lightning flash. It comes out one-nineteenth of a second. The calculation is

based upon the multiple image in the photographs and the rate of vibration of the lens. The time applies, of course, only to the particular flash that was photographed.

Railway Elevators in Lisbon

In Lisbon, Portugal, a portion of the Santa Justa railway line is on an elevated structure. And there is no climbing stairs to get to the platform, for electric elevators are provided for the patrons. These elevators are of the Waygood type, now so popular in England, and the enclosing structure is of a very artistic design, as seen in the picture. There are two cars for passengers, and in the station illustrated, where the rise is 100 feet owing to a steep hillside, the trip is made in half a minute.



ELEVATOR TO A RAILWAY IN LISBON

Words in the Telephone

Long distance telephoning has become a science on its own account and has called into existence a class of operators who are valuable by reason of the clearness and sharpness with which they can pronounce words while speaking rapidly.

It has also developed the fact that the French language is better adapted to the purposes of the telephone than the English. The ordinary business of the long distance telephone between Paris and London is carried on in the French language. It is stated that the considerable proportion of sibilant or hissing syllables in English renders it a less easy and accurate means of communication.

Certain English words are especially difficult of transmission by telephone. The word "soldier" is cited as one of these. Proper names frequently occur, in the midst of an otherwise perfectly audible and intelligible conversation, which the ear cannot catch. These must be spelled out, involving delay.

Expert telephone operators in the Reuter press service between Paris and London have succeeded in transmitting messages in the French language at the rate of 190 words a minute. This is at a much swifter rate than that employed in an ordinary conversation.

The speed at which these messages can be transmitted is limited, however, by the proficency of the stenographers, who must take them down from the receiver's mouth, and the stenographers acting in concert have limited the number of words which may be taken down in three minutes to 400. The three minute period is the one fixed upon in this case, as the telephone company makes a charge of ten francs, or two dollars, for the use of the wire for three minutes or a less time.

Cleans Your Pipe for a Penny

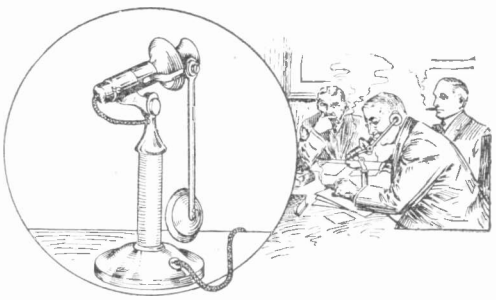
The English pipe smoker may now clean his pipe with little effort using an electrically operated cleaner recently put on the market by an English firm. A penny placed in the slot of the device starts the motor. The bowl of the pipe is inserted in a cylindrical projection on the top of the machine. After the scraper has cleaned the bowl, the pipe is placed on a second cylinder equipped with a pressing-down lever, which opens an air valve and sterilizing air is forced through the bowl and stem. The two operations take about half a minute.

AN ENGLISH CONTRIVANCE FOR CLEANING PIPES

Each operation of the machine automatically illuminates and rotates transparent advertisements which appear in a glazed aperture in the front.

Telephone Fixture

In using the telephone it is necessary to employ one hand to hold the receiver to the ear and besides the receiver must be lifted from the hook. To William C. Ude of West Haven, Conn., this is too much like work so he has patented a receiver upon an arm directly attached to

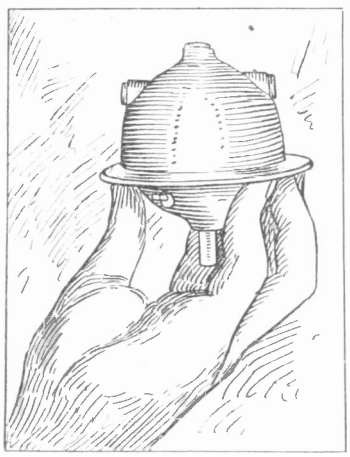


TELEPHONE FIXTURE

the transmitter and so arranged that the user simply moves his head against the receiver to close the talking circuit.

A Two Pound Motor

The drawing herewith shows in a relative way, the very small size in which some forms of commercial motors are now built. This one is a Fort Wayne motor weighing only two pounds. It was developed for an application requiring very small power, but at the same time demanding a motor of especially rugged design.

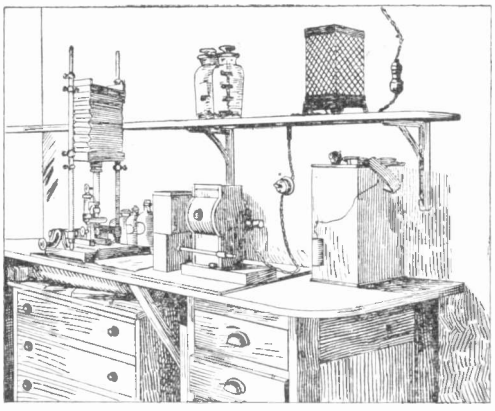


A TWO POUND MOTOR

The result is a little machine that rests nicely on the tips of the fingers and thumb.

Photomicrography

The photographing of small sections of metal through the microscope has become one of the most useful methods open to the metallurgical chemist for the study of the materials used in making automobile crank shafts, rails and bars subjected to heavy stresses in service. Pictures of this kind are often published in magazines devoted to engineering pursuits, but comparatively few readers of



OUTFIT FOR PHOTOMICROGRAPHY

such periodicals realize how easily such photographs are taken or the part which electricity plays in the work.

The accompanying illustration shows a typical equipment in the laboratory of a large drop-forging plant. It consists principally of an adjustable arc lamp whose rays are thrown upon the field of a microscope at the left of the view, the latter being utilized as the lens of a 4 by 5 inch camera mounted above it. The specimen, about as large as a pea, is held in place on the slide carrier by a small horseshoe magnet and an image three inches in diameter covering perhaps an area of the specimen as big as the head of a pin is easily obtained with a powerful glass.

By this means the changes in the fibrous structure of the metal after various treatments can be studied, and an experienced observer can tell the good or bad effects of different processes without waiting for material to fail in service.

Inhaling Radium Emanations

For the first time in America, inhalation of the emanations of radium is to be employed as a means of curing disease. Johns Hopkins University is establishing a department for the sole purpose of giving this radium treatment in the most exact and scientific form. Already there are $25,000 worth of radium compounds on the way to Johns Hopkins and very soon the new department will be working in full force.

The new methods will be availed of in cases of disease that come within the scope of the University Medical Department. Almost since the discovery of radium by Madame and the late Prof. Curie, some fifteen years ago, radium has been used in medical practice. It has been used effectively in fighting certain forms of cancer. Also, in giving what are known as radium baths. Recently, it has been found that the emanations from the mineral were of some value in the treatment of chronic rheumatism, neuralgia facial paralysis and diseases of the joints.

While the medical persons in charge of the new department at Johns Hopkins are insisting upon sending out injunctions to not expect too much of the new treatment, it can be stated as a fact that confidence of the broad value of the innovation among the university medical faculty is exceedingly sanguine and feeling is deep that a vital factor is being introduced into medicine.

The effect of the treatment will be similar to that experienced in the X-ray system.

As the employment of the radium emanation treatment means no diminution in its value or strength, what is now being used at Johns Hopkins will be as good 3,000 years hence. This endurance of radium is a ponderous fact when it is remembered that there is only a very small quantity, relatively, in the whole wide world, a microscopic particle at present commanding a fortune.

Hints for the Photographer

With proper diffusion, in the way of reflectors of cloth and transmitters of ground glass, the enclosed arc makes a good exposing light for photography and one which is constant in value. For printing, the same light may be successfully used. For amateur work an especially good printing arrangement is a 100 watt tungsten lamp with frosted bowl and white bell shade. The frosted bowl is

USE OF ELECTRIC FLATIRON IN MOUNTING PRINTS

equivalent to ground glass as a diffuser. The lamp should be hung on a cord so as to be quickly and easily adjustable in height from the printing table or shelf.

Electricity is most satisfactory for the red lamp in the darkroom, provided you choose a bulb made of red glass, not one of clear glass merely stained or painted red.

The air of the darkroom, which is often a small compartment, is not vitiated by an electric light as it is by the oxygen-consuming gas or kerosene flame.

For enlarging pictures nothing is quite so satisfactory as the electric arc, either with hand or automatic feed, when properly diffused by ground glass or by thin white cloth. The arc is also a satisfactory method for illuminating a picture for copying to make slides for the projecting lantern.

The family electric flatiron comes into service in mounting photographs upon their cards with kodak dry mounting tissue. This method of heating the iron is superior to any other, because of the easy regulation of the degree of heat, for uniformity of temperature is of prime importance in this work.

A small electric fan, about eight inches in diameter is of great service in the darkroom to dry plates or kodak films quickly. It also is convenient as a ventilator in a room which otherwise is likely to become hot and "stuffy," for the construction of the darkroom precludes the ordinary means of ventilation.

Heaviest Railway Service Handled by Electricity

The train service operated by the Grand Trunk Railway System through the St. Clair Tunnel which connects Sarnia and Port Huron beneath the St. Clair river is the heaviest railway service handled by electricity in the world. This electrification scheme operates within a zone of approximately four miles and the motive power is derived from 1,500 horsepower electric locomotives weighing 135 tons, with a nominal draw-bar pull of 50,000 pounds and a maximum speed of 35 miles an hour.

During the year 1912, the company's records show that 197,801 loaded freight cars and 86,692 empties passed through the tunnel in addition to 35,096 passenger cars. Estimating on a basis of seventeen tons to a car, this gives a total tonnage passing through of 3,500,000. No other tunnel operated by electricity is said to have more than 60 per cent as much traffic.

The New Moon of Thespis

Since the time of Shakespeare's players when a man held up a lantern with a sign, "This is the moon," there have been many that have waxed and waned over the land of Thespis. Of them all, it has remained for the moon which rises eight times a week over the desert scene in "Joseph and His Brethren," to present the best counterfeit of Nature. Benjamin Bierwald, chief electrician of the Century Theater in New York is the man who made it possible.

His moon is unimpressive when viewed in a dark corner behind the scenes. It looks like a huge pan, four feet in diameter and ten inches deep, held up on edge by wooden supports. Its face is made of linen stretched tight as a drum head and set about the inner edge of the pan are 36 tungsten lamps of 100 candlepower each. Each lamp is coated thinly with orange paint so that the moon may have the aspect of shining through leagues of atmosphere. When the lamps are turned on, the real surprise comes. Here is no flat pale spot of light that might be a jack-o'-lantern. Rather it is an actual moon with all the physical outlines of the nightlamp of the heavens.

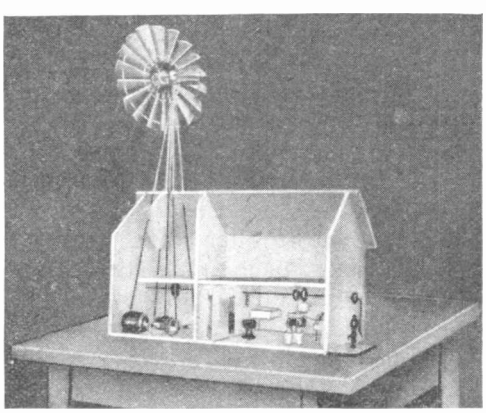
Bierwald was weary of smooth faced moons. Therefore he sought a remedy and found it. A man who snaps Luna in all her phases with the aid of a strong telescope provided him with a photographic plate of the full moon that shone on the night of September 15, 1903. Bierwald applied acid to the negative, removing everything outside of the moon itself and then had enlargements made from the plate. The result was a set of prints of varied size, each one showing the craters, valleys and pot-holes of the moon's surface. Over the print of the four-foot moon Bierwald laid a linen of Scotch manufacture, tightly woven so that a light behind is equally diffused and not "spotty." The outlines of the moon's markings were traced on the linen, then filled in with a coat of light blue paint—and the face was complete.

The rising of this moon is no less ingenious. A broad standard supports two uprights. Others fastened to the moon-pan slide up or down in grooves on the permanent uprights. From eye-bolts at the foot of the lamp uprights, heavy sash cord is led on each side through a small pulley on the top of the standard uprights and down again to an axle fitted with a handled wheel at one end. A turn of this wheel raises or lowers the moon with all due solemnity and steadiness. Bierwald wanted a natural moon. He has it.

Model of Windmill Electric Plant

The windmill will one day be utilized to generate electricity. The two difficulties to be overcome are the uncertainty of the wind and the variation of the velocity when blowing.

At the North Dakota Agricultural College electrical show the Manikowski brothers of Wahpeton exhibited a patented model of an equipment which they assert will revolutionize the production



MODEL WINDMILL PLANT

of electricity upon the farm. The accompanying picture shows a miniature model of this plant which changes the varying wind velocity into steady electric power. A large plant similarly constructed is in operation upon their 1,200 acre wheat farm near Wahpeton.

A Practical Windmill Electric Plant

By J. F. FORREST

The subject of generation of electricity by wind power is one of importance, for the energy of the winds is practically all wasted except for the comparatively small amount used in pumping water and grinding. In spite of this fact no standard apparatus for windmill generation of electricity has ever been put upon the market. Manufacturers say that certain inherent difficulties of voltage regulation cannot be overcome. In face of this, however, we find isolated farm plants that have been built by ingenious individuals which seem to be doing the work satisfactorily, notably a plant built by Mr. J. F. Forrest on his farm near Poynette, Wis. A brief note concerning this plant appeared in our November 1912 issue which resulted in so many inquiries that we asked Mr. Forrest to give a more detailed description, which follows. — Editorial Note.

Standard makes of windmills have an automatic speed governing device. The center of the wheel is set a trifle to one side of the turn table which allows any great pressure of the wind to turn the wheel edgewise to the wind. There is also a spring which connects the tail and the wheel in such a manner as to bring the wheel to the wind again when the wind pressure reduces, so that between the gyroscopic action and this speed governing device the mill is kept within certain speed limits. As wind exposure is to a windmill what boiler capacity is in a way to a steam engine it is advisable that the mill be of sufficient size and height to work easily in a light wind.

My mill is an Aermotor. Referring to Fig. 1, the belt to the dynamo runs with a quarter turn from a horizontal pulley upon the upright shaft of the mill to avoid the use of miter gears. In order to get results from low velocities of the wind a smaller pulley near-by on the floor, is substituted on the dynamo on days when the wind is light. This changes the distances between the belt bearing surfaces. To overcome this you will notice, by referring to the picture, that there is a plank upon which the dynamo sets, one end being on wheels and the other on adjustable legs. These legs are shown at an angle which serves to raise and lower the plank so that the belt may be put on a line with the center of the belt rim on the horizontal pulley of the mill shaft. A four or a six inch pulley can thus be used, the four inch for low mill velocities and the six inch for high ones. Sometimes it is not necessary to change pulleys for several weeks at a time. The pulley on the upright shafting of the mill is set to run with a clutch coupling operated by a lever and rod which is near the furling lever.

A storage battery is used in connection with the plant and between the dynamo and the battery is a patented cut-in and cut-out device. This device I will not attempt to explain except to say that it is merely an electro-magnet, the armature of which closes and opens the circuit between the dynamo and battery as current does or does not flow through its coil. With the cut-in working and with a variable speed there is no noticeable wavering of the lights when fed from the dynamo.

The dynamo delivers six amperes at 35 volts when running at a speed of 450 revolutions per minute. When the dynamo is running at 275 revolutions per minute the cut-in closes the battery circuit and two amperes flow into the battery of fourteen cells. The dynamo has run at 600 revolutions per minute, when about twelve amperes was delivered. On an overcharge, speed is somewhat lessened by partially releasing the furling lever on the mill. As the speed returns to 275 revolutions per minute the cut-in

opens the circuit to the battery. The cut-in so far as I know is not on the market and this is the only windmill plant in the state. My ammeter reads both ways from zero.

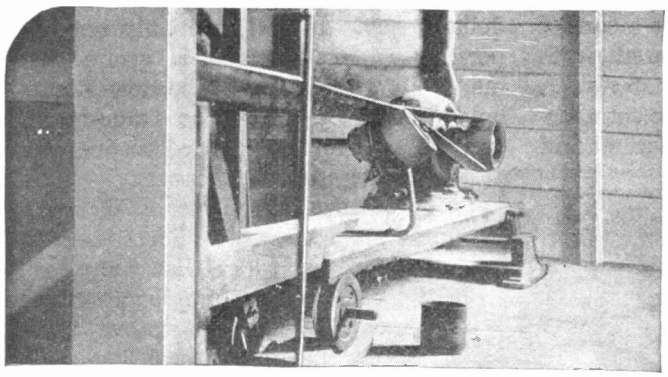
The windmill is started in charging the battery at any time the wind is favorable. A wind that is charging at a slow rate is used for the overcharge but with a high wind, as soon as the cells begin to gas, the charge is stopped, a hydrometer being also used to determine the battery condition. The mill generally runs at chore time, noon hour or in the evening. When the lights are turned on with the windmill running the speed may be sufficient to supply all the lights, also some current may pass into the batteries at the same time.

When the wind lulls, the batteries will be furnishing part or all of the current and with variable speed and the cut-in working it there is no noticeable flickering in the lights.

For operating a flat iron, a percolator, a glow heater or a vacuum cleaner I have a separate equipment consisting of speed pulleys and a 110 volt dynamo run by the mill, Fig. 3. A separate pair of wires runs to the house for this voltage.

The electric lighting plant has been in use for three years and has never been found wanting. It brings electric lights and water supply to the same basis.

The operating expense with a windmill drive amounts to the lubricating oil, which has a charm to it that would cause even the poorest of men to smile.



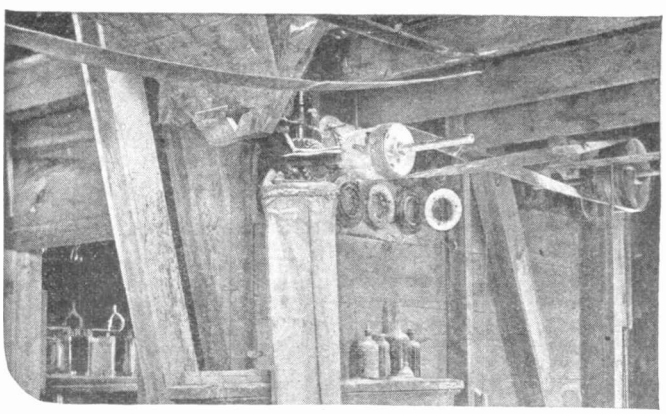


FIG. 1. THE DYNAMO IS DRIVEN FROM THE MILL SHAFT BY A QUARTER TURNED BELT

FIG. 2. FEED GRINDER COUNTERSHAFT AND A GLIMPSE INTO THE BATTERY ROOM

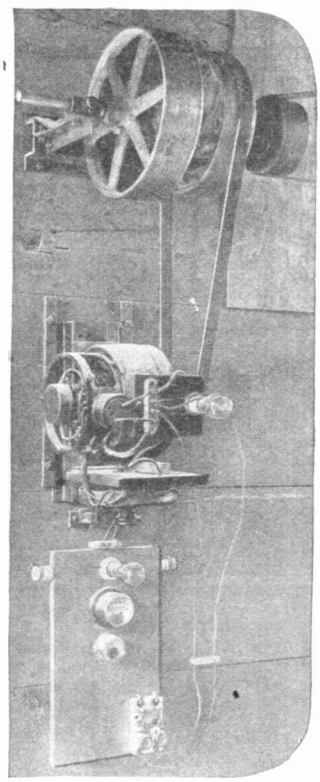
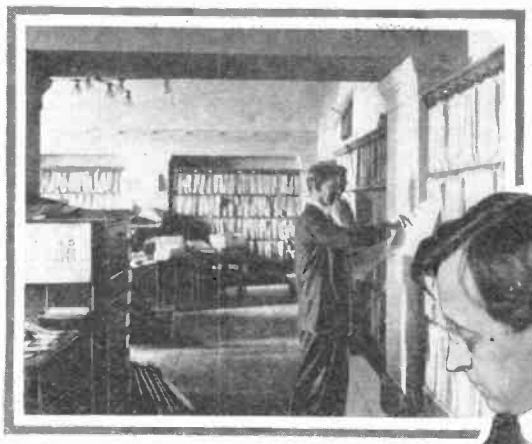


FIG. 3. SEPARATE 110 VOLT SYSTEM FOR HOUSEHOLD UTENSILS. THIS HAS NO CONNECTION WITH THE LIGHTING SYSTEM

Trade-Marks in the Electrical Field

By WALDON FAWCETT

A trade-mark may be a name, a coined word, initials or numbers, a portrait, an autograph signature, a sign, symbol or pictorial design; in fact, almost any distinctive mark that will serve as a means of identification for a manufactured product or a given class of raw material. A trade-mark has been termed the commercial signature of a firm or individual and the simile is apt because to imitate a trade-mark is, in the eyes of conscientious business men, quite as serious an offense as to forge an individual signature and the law regards it in somewhat the same light.



FLAT FILING OF RECORDS OF TRADE-MARKS. ALL PENDING APPLICATIONS ARE KEPT HERE

MANUFACTURERS MUST SUBMIT PHOTOGRAPHS TO PROVE THAT TRADE-MARKS ARE IN USE AND PROPERLY PLACED ON MACHINERY

For the purpose of forestalling unintentional duplication as well as to prevent misappropriation of property most trade-marks are "registered" and hundreds of different marks on electrical articles alone have thus been duly recorded in the archives of the U. S. Government. The Trade-Mark Bureau is a branch of the United States Patent Office and among approximately 100,000 trade-marks that have been duly entered upon Uncle Sam's books are some which are estimated by the owners to be worth all the way from one million to six million dollars each. Indeed, probably not one person in ten thousand is aware that many names that have become household words, originated as trade-marks and are to this day entitled to due protection for that significance.

To be sure, by no means all trade-marks are registered. Some users of trade-marks consider that they have in the common law ample protection and means of redress against those who would steal their trade slogans. However the majority of business men seem to incline to the opinion that it is better to expend from $10 to $75 to have a valued trade-mark duly registered so that in the event of any disputes in later years

SEARCHING THE RECORDS FOR DUPLICATION OF ELECTRICAL AND OTHER TRADE-MARKS

MR. J. C. CARNES, PRINCIPAL EXAMINER OF TRADE-MARKS AT THE U. S. PATENT OFFICE

they can count on governmental testimony as to priority of claim.

One of the odd characteristics of trade-mark practice is the prevalence of, shall we call it, fashions, in the selection of trade-marks in a given field. When it comes to picking out trade-marks the producers and manufacturers in almost any given line appear to be very much like sheep. Perhaps, in reality it is merely shrewd business policy. Whatever the incentive there is a manifest disposition to follow the example of other firms and individuals in the same field. Did the pioneers in the industry use fancy pictures as trade-marks? Then it is a pretty safe guess that most of those who come after them in this same sphere will do likewise. Or, again, we find a whole vast industry committed to such trade-mark designs as stars, diamonds and crescents.

In no domain is this tendency more marked than in that of electrical manufacture. Here the preference is for coined words, and for the satisfaction of electrical interests be it remarked that trade-mark experts all agree that there is no better form of trade-mark than a catchy coined word. To be sure, there are in the electrical field some notable exceptions to the coined word policy—for example the portrait and signature of Edison and the widely exploited initials "G. E.," but any reader has only to run over in his mind a category of the leading electrical products to realize how generally electricity's men of affairs have subscribed to this policy.

Cleverness and originality of a high order have been manifested by many firms and individuals in the electrical field in concocting unique words for use as trade-marks. As evidence there may be cited a few of those which have recently been received for registration at the U. S. Patent Office. There is "Bronskol" as a name for electric carbons; the appropriate "Adaptabox"; and "Americore" as a trade-mark for rubber covered wire. "Gumkor" is another mark selected to identify a given make of insulated wire; "Kablak" has been picked to designate an insulator; "Transpotare" for electric regulators, and "Thunderbolt" for batteries. "Dynalux" finds a rival in "Delco," the latter applied to electrical cooking utensils, and "Resistolac" as a name for insulator compound is no more pat than "Excelsite" as a trade-mark for an insulator.

The manner in which many of these unique electrical names have been evolved is a marvel and a puzzle even to the experts of the U. S. Trade-Mark Division, who, through long experience, can usually guess pretty accurately as to the mental processes which resulted in the evolution of any given trade-mark. Some of the electrical trade-marks that appear baffling at first glance, are found to have been produced by combining the initials of members of a firm or by using such initials and tacking on "co" derived from "company." Examples of this sort of trade-mark are seen in "Pepco" and in "Pefco," the latter applied to a line of electrical fixtures.

Perhaps the most common form of electrical coined word, however, is that suggestive of the product itself. Some of the trade-marks above mentioned are very obviously in this class and so likewise are "Allite," selected as a name for spark plugs; "Metite," chosen as a trade-mark for brushes for dynamos; "Tutoette," the very transparent title for an electric signal horn; and "Simcore," another one of that very numerous directory of suggestive names applied to insulated wire and similar products. Indeed, insulated wire and kindred products may be cited as one of several lines in the electrical field where there has been such a fad for names in a certain style—in this case with "core" or "kor" attached to some distinctive prefix—that the examining officials at Washington have to be ever on the alert lest these electrical christeners tread upon one another's toes in their trade-mark rights.

There is only one prohibition in the

trade-mark law and regulation to which electrical interests need to give much heed (so long as they continue to follow present fashions) and that is the ban on the registration of descriptive words as trade-marks. There are other things barred under the trade-mark law, for example the use of the American flag, the Red Cross insignia, coats-of-arms of the various States, geographical names, etc.

The Great Tata Power Plant in India

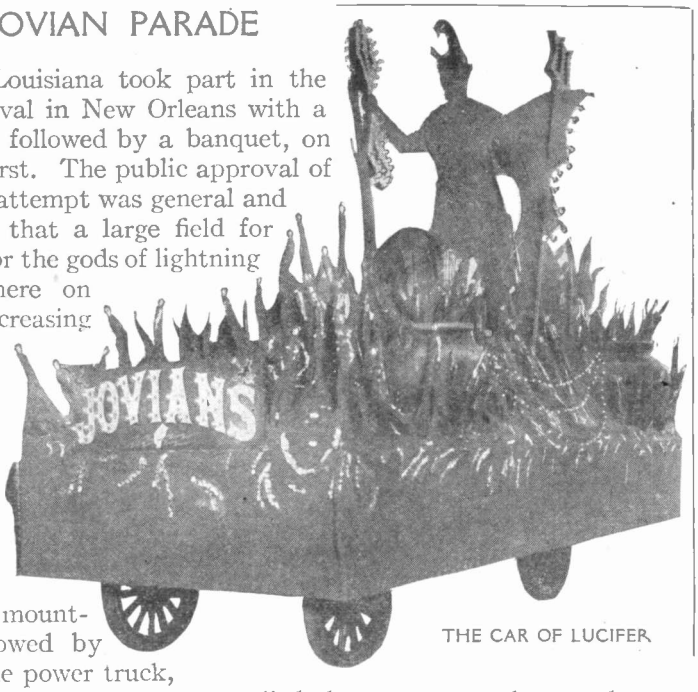
India will very soon see the completion of one of the largest hydro-electric projects ever undertaken in that country. Some 43 miles southeast of Bombay are three valleys, which during the wet season become lakes. Masonry dams designed to hold sufficient water to deliver 60,000 horsepower in electrical energy in Bombay are now being built and the two largest reservoirs created will hold 380 million and 2,800 million cubic feet of water each. The water will be led by a masonry duct to a forebay 2,040 feet above the sea level and here it will enter steel pipes leading to turbo-generators in the power house below, under a head of 1,734 feet, practically ten times as great as that of the Niagara plants. Current from the generators will be raised to 100,000 volts and brought to Bombay.

Years have been taken in bringing this work toward completion and one of the reasons for this delay may be seen in the manner in which excavating work is carried on for one of the dams (Lonavla). The earth and rock are removed in baskets borne on the heads of the workmen. In another locality is a railroad under which the steel water pipes lead to the power station being erected in the valley not far from the tracks. It is expected that by January of 1914, electrical energy will be transmitted to the factories of Bombay.

EXCAVATIONS FOR THE GREAT TATA DAM TOOK MANY YEARS, THE EARTH AND ROCK BEING REMOVED IN BASKETS BORNE ON THE HEADS OF THE NATIVE LABORERS

MARDI GRAS JOVIAN PARADE

The Sons of Jove of Louisiana took part in the annual Mardi Gras Carnival in New Orleans with a masker's electrical parade followed by a banquet, on the evening of February first. The public approval of the spectacle as an initial attempt was general and strengthened the opinion that a large field for beautiful effects is ready for the gods of lightning and light, represented here on earth by the constantly increasing number of electrical men who are entitled to be called Jovians and wear the Lucifer button.



THE CAR OF LUCIFER

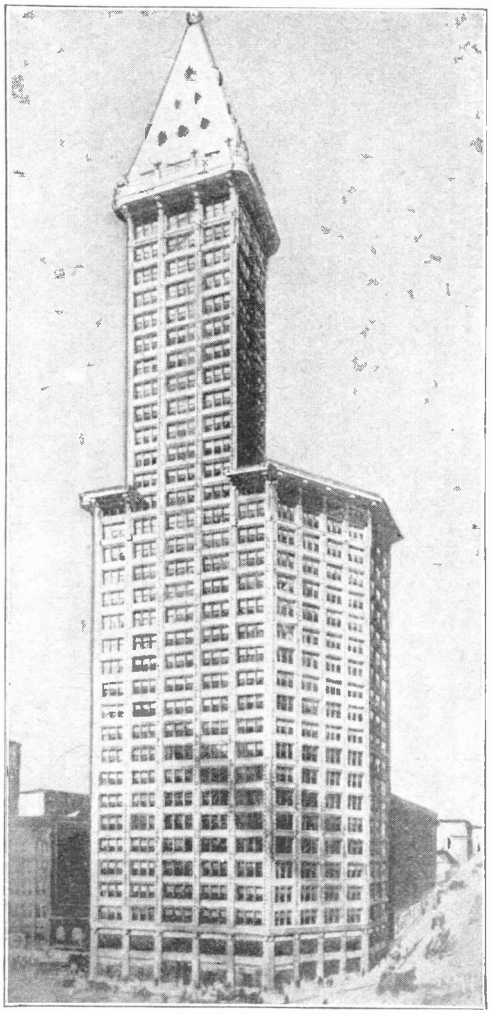
The Jovian Statesman for Louisiana in a canopied electric automobile resplendent with electric lights led the parade behind a platoon of the city's mounted police. He was followed by the power float—a gasoline power truck, upon which was an electric generator belted to a gasoline engine. The entire mechanism was screened from view by canvas and papier-mâché, painted to give the effect of a "devil's workshop." A double line of cables made up of wires with weatherproof sockets carried 110 volt current to the lines on both sides of the men, masked uniformly as Jovian devils. A large variety of individual decorations were worked out by these men with small lamps and Christmas tree outfits. They were limited to 40 watts per man. The prison car, or cave, was arranged similar to the power car, to make up a cave into which were thrust neophytes and Jovians who failed to respond promptly to calls to assemble.

The Jovian police, led by Hercules, were a squad of about fifteen men who made many of these arrests on the public streets, from the spectators. Even the busy city electrician was not spared. They gave the comic note to the parade, and wore helmets and decorative stars and lights, on the regular devil mask and domino. Small pocket batteries supplied the current to these and many other maskers.

The great feature of the procession, the car of Lucifer, showed him holding a bolt of lightning in his right hand, in his left the three tined fork. This papier-mâché figure, executed by New Orleans artists whose lifelong business is to produce effects, faithfully, historically and graphically, towered sixteen feet amongst the flames of a Hades. The red used throughout the whole color scheme was especially effective here, and the flashers used for the lightning effects, with hundreds of miniature lamps of all kinds and voltages offered the sight the crowds came to see.

This float or automobile truck required 1,800 pounds of storage battery for its operation.

Under the new rules for German telephone lines, no local telephone conversation may last longer than six minutes, and no long distance conversation longer than nine minutes. At the expiration of this time the connection is broken by the operator.



Seattle's 42-Story Skyscraper

Seattle now takes its place among the cities possessing what might be called "ultra-skyscrapers." The new L. C. Smith Building, now almost completed, will be 42 stories high—the loftiest building anywhere in the world outside of New York.

Numberless are the applications of electricity in this mammoth structure, and to convey the electric current to all parts there will be required 93,952 feet of wire passing through 46,796 feet of metal conduit.

Eleven months was required for the installation of the foundations, which are entirely different from the pillars which support the world's largest structures —caissons having been used heretofore, while 1,276 concrete friction piles driven by 60 tons pressure each to a distance of 50 feet under the surface of the ground, are to support this skyscraper. The combined carrying strength of the piles is figured to be more than 76,560 gross tons, while the building will weigh approximately 32,650 gross tons, or more than two-thirds the weight of the transatlantic liner Imperator.

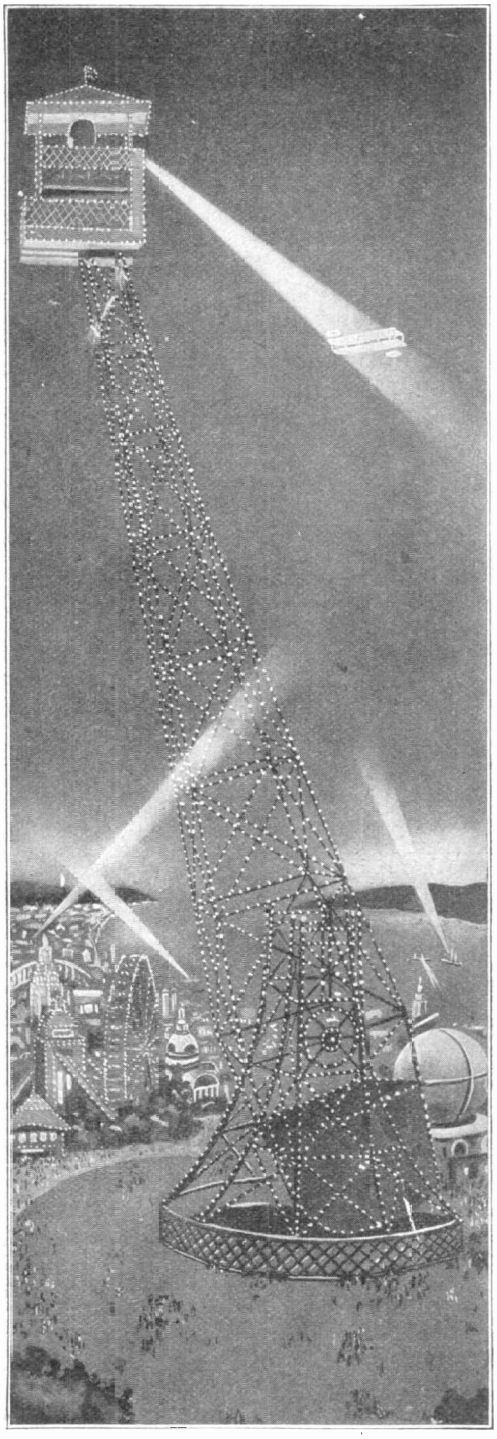
Club House for New York Edison Employees

The new club house of the Association of Employees of The New York Edison Company is located at 113 East 12th Street. It is in every respect as near the ideal of what a club house should be as will be found in any part of the country.

The building, which is a five story structure, is the property of the company, which will bear all the running expenses. The entire equipment and furnishings of the new club house were also supplied by the company. On the ground floor, besides the charming little reception room, are bowling alleys and shuffleboard. On the second floor is a large reception room, suitable for dances or entertainments; also the music room.

The athletic and bowling trophies won by the various teams of the company are exhibited in the large reception room on the second floor. On the third and fourth floors are pool and billiard rooms equipped with every modern accessory. The library is furnished in bird's-eye maple and contains more than 1,000 volumes. On one of the tables is the first electric fan modeled by Thomas A. Edison, while a life size portrait of Mr. Edison adorns the wall. Off from the library are several little nooks suitable for quiet reading.

Mr. William T. Dempsey is present president of the Association of Employees, which numbers nearly 3,000.



THE AEROSCOPE AS IT WILL APPEAR AT THE EXPOSITION. DRAWN FROM THE PLANS OF THE DESIGNER, J. B. STRAUSS

The Aeroscope

The huge and unique $100,000 amusement device shown in the picture is a novel sky ride that will be to the Panama-Pacific Exposition at San Francisco what the Ferris Wheel was to the Chicago World's Fair. It is an electrically operated mechanism consisting of a cone shaped steel tower mounted on wheels which travel upon a circular track on the ground. Upon this tower a huge steel beam (technically known as a bascule arm) is balanced but in such a manner as to create a long and a short arm and to rotate on an axle at the balancing point. A double decked cage with a capacity of 114 passengers and an operator, and always upright, hangs at the extremity of the long arm. An adjustable counterweight hangs at the extremity of the short arm. Perfect balance is thus maintained and safety assured while the beam is revolving on the axle. When operating, the cage end of the beam is elevated by air propellers as the tower is rotated upon its foundation and is thus given an upward spiral course. When the highest elevation is reached, the cage stops but the tower continues to rotate. In completing the ten minute trip, the cage swings on in the same direction as before, descending, but reaching the same point from which it started owing to the continued rotation of the tower. Thus the old fashioned well-sweep idea in a new vocation will be found doling out joy.

In spite of the unique twist passengers will experience in this joy ride they are not expected to be "all turned around" when they land again. What they will experience, however, is a novel ride combined with a wonderful view, for this device, situated in the midst of many amusement concessions (already secured) and fantastically decorated with myriads of electric lamps, will command with its altitude of 260 feet a bird's-eye view not only of the entire exposition but of the distant Golden Gate.

ACROSS THE STREET FROM THE AMERICAN CONSULATE. A TANGLED MASS OF LIGHT AND POWER CABLES IN THE FOREGROUND

Shooting Out the Lights in Mexico Gity

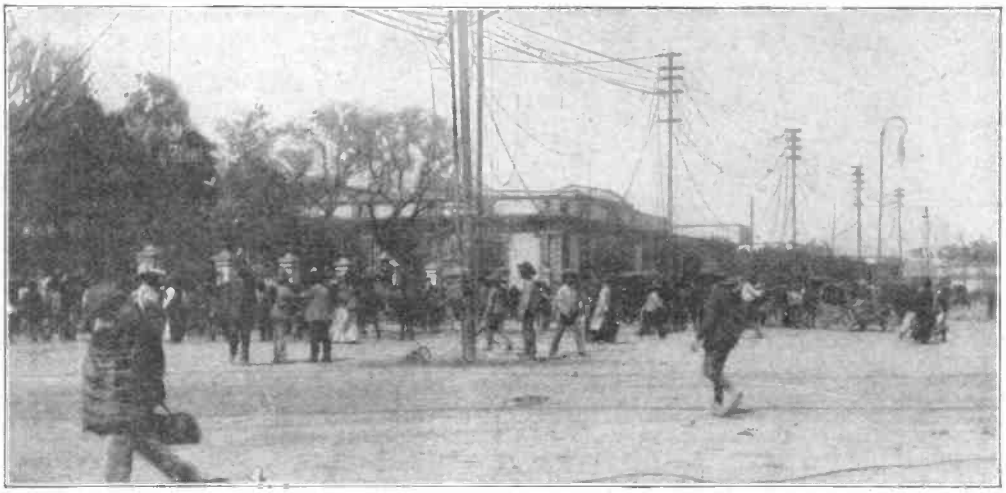
By JAMES CARSON
Contract Agent, Mexican Light and Power Company, Ltd.

"Shooting out the lights" was an expression used out West in the early days when exuberant cowboys, filled up with squirrel whiskey, emptied their six-shooters at inoffensive luminous targets.

Not even Bret Harte, in the wildest of his imaginative flights, could have pictured this same performance indulged in on a tremendous scale in the heart of one of the world's capitals.

That, however, is what happened in Mexico during the terrible ten days commencing Feb. 9 and ending Feb. 19. Modern cannon were substituted for the cowboys' six-shooters—guns designed to shoot three miles tore at each other at a

WIRES AND POLES SHOT DOWN IN FRONT OF THE Y. M. C. A. BUILDING. THIS BUILDING WAS OCCUPIED BY A MACHINE GUN CORPS AND WAS DAMAGED TO THE EXTENT OF $150,000



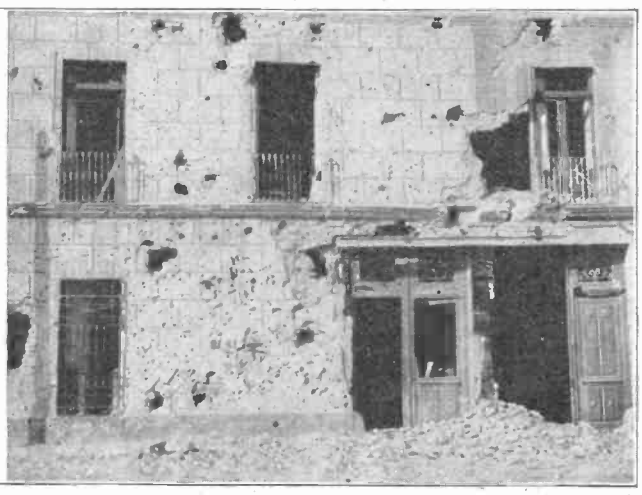
WIRES IN FRONT OF THE CITADEL ("LA CIUDADELA") WHERE GENERAL DIAZ AND HIS MEN WERE BESIEGED

blank range of three blocks. The roar of these was punctuated almost incessantly with the rattle of Mauser fire and the trip-hammer sound of the rapidfirers.

Is it any wonder then that light, telephone and power cables, and the beautiful standards upholding them, were mowed down like grass before this terrible hail of death? Can you picture such a shooting range lined on either side with stone buildings and residences and paved underfoot with asphalt? If so, you have some idea of the battle ground of the latest and most terrific struggle of the Mexican revolution.

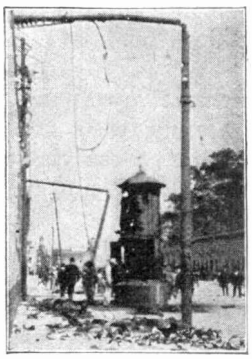
The illustrations which accompany this article picture more vividly than can words just what happened to the electrical systems in the affected districts, yet so efficient was the service of the Mexican Light and Power Company, Ltd., which has the concession for lighting the City of Mexico, that the service outside of the affected district was not

STANDARD SHOT CLEAN THROUGH. AT THE LEFT OF THE POST IS A BODY PARTIALLY BURNED



WHAT THEY DID TO "EL HERALDO," AN AFTERNOON NEWSPAPER

SHOWING A LAMP STANDARD NEAR THE AMERICAN CONSULATE, THE BUILDING AT THE EXTREME LEFT. HEAVY SHELLS SNAPPED THE POST AS IF IT WERE A REED

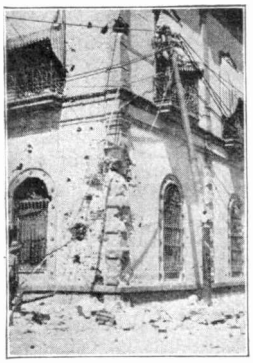


A SMALL TRANSFORMER HOUSE OR KIOSK THAT HAPPENED TO BE IN THE LINE OF FIRE

interrupted for a moment and nearly half a million incandescent lamps and some 2,000 street arcs cast their rays to the edge of the darkened district which surrounded the citadel besieged by the government forces.

This was accomplished because no officer of the company left his post, and because of the splendid system comprising a total generating scheme having a capacity of 127,560 horsepower. Over 96,000 horsepower of this energy was steadily transmitted over the company's lines from the falls of Necaxa, 9½ miles to the northeastward, while four auxiliary steam plants in the city proper stood ready to supply the demand should the rebels have attempted to trifle with fate by cutting the 85,000 volt transmission lines.

In the city's tramway system are comprised some 200 miles of trackage, and 274 regular daily service cars. When the shooting commenced in the great square in front of the National Palace on Sunday morning, February 9, many of these cars were out in service over various parts of the system. The management, realizing that both life and property would be needlessly sacrificed should an attempt be made to continue the traffic, ordered all cars into the barn and by ten o'clock that morning the rolling stock was safely housed. For ten days the roar of cannon and rattle of musketry took the place of the noise ordinarily made by the cars; nevertheless, in the intervals of no firing, the periods of weird calm affected the nerves more than the firing.



SHARPSHOOTERS ON THIS BUILDING DREW ARTILLERY FIRE WITH DISASTROUS RESULTS TO THE WIRES

Picture a city and its suburbs of nearly a million inhabitants with no street cars, no newspapers, no telephones, no cabs, and at times almost no pedestrians, and you get some of the atmosphere sur-

rounding this weird Twelfth Century battle fought amidst modern surroundings in this Twentieth Century.

The telephone girls, as always, proved themselves heroines. Not until twelve shells had dropped into the Ericcson Exchange did the plucky girls cease to plug in and make connections. The Mexican Telephone Company's exchange, owned by Bostonians and managed by most up-to-date American telephone engineers, held out longer and worked when there were wires and cables to do the bidding of the operators. Altogether electricity played a most important part in the battle, and the battle certainly played a most important part with it in certain sections.

Uses for the Post Card Projector

These ideas are all in regard to uses for the post card projector when lighted by two Mazda bulbs. It is of inestimable value in school work and I use it constantly in lecture work in the class room. Pictures in magazines or in large reference works may be thrown on a white wall or screen thus illustrating a lecture perfectly. It can be used in the grades studying geography to a great advantage. One copy of the *National Geographic Magazine* once a month can be used in this way with great benefit to the class.

It may also be used to a great advantage in enlarging small pictures, designs, cartoons, etc. The most convenient way I have found to do this is to place the picture in the machine and then hang the machine lens downward right over the table where one wishes to draw. The cardboard or cloth upon which the enlargement is to be made is fastened to the table with thumb tacks and then the picture is easily traced. With some colors and a brush a colored picture can be reproduced very nicely. Small designs for stencil work or embroidery may be cut out of papers and magazines and reproduced in the proper size on either stencil paper or cloth.

It may be used as a unique advertising scheme for a store in the following way. Place the advertisement or picture in the machine then hang the machine out of sight up high in the show window so that the picture is thrown out upon the sidewalk. Of course any wording will be reversed but this can easily be remedied by the use of carbon paper.

Another use for the projector should appeal to the wall paper dealer. Instead of having to manipulate the enormous books of samples for every prospective customer he could have miniature samples about the size of post cards, such as are seen in catalogs advertising wall paper in its colors and could project these in their natural size directly upon a white wall in the back room. The picture of course would be projected so that the border would come in the proper place. A ceiling design could easily be projected upon the ceiling by turning the lens upward. No other way will give a customer such a correct idea as to the way the paper will look.—N. E. Wood.

Feather Duster Causes Broken Filaments

In an eastern school building complaint was made about the short life of the incandescent lamps furnished, many globes being found with their filaments broken and drawn to the glass. The lamps themselves, when tested in regular life racks, showed good average performances, so that a service test was finally determined upon.

In 26 days, according to the New York Electrical Testing Laboratories, 56 lamps or 29 per cent of the total burned out. Thirteen new lamps were then put in one of the fixtures and after being dusted in the regular manner with a feather duster current was turned on and four of the lamps immediately burned out. Wiping with a slightly damp cloth was substituted for the cleaning with the feather duster and the abnormal breakage at once ceased.

Society for Electrical Development

"Electricity is in its infancy" is a saying which should be set apart among the bromides. So says Henry L. Doherty, president of the newly formed Society for Electrical Development, Inc. In other words, electricity, from the scientific and engineering standpoint, is one of the best developed of the industries, although considered from the standpoint of commercial application it is one still exceedingly young.

The growth of public interest in, and knowledge of, all things electrical has been tremendous; so great that the electrical industry has doubled in magnitude every five years. But with an immense field, in many directions only partially cultivated or not cultivated at all, why should it not double itself every two and one-half years?

This question has been so pertinent to so many men of broad gauge in electrical affairs that it has resulted in the formation of the above named society which held its first meeting in the United Engineering Societies Building, New York, on March 4th and 5th. Nearly 200 men were present, representing a diversity of electrical interests—men from the light and power companies, the manufacturing companies, jobbers and supply dealers, contractors, architects, representatives of newspapers and electrical magazines and from advertising agencies.

A great amount of work had been done by committees previously appointed and this was crystallized and put in tangible form by reports, papers and discussions at the meeting. The great central idea brought out in the discussions was, in effect, that marked increase in electrical development in all directions is bound to come in proportion to increased educative work among the people at large, who are the ultimate consumers of electric current and current operated devices. In other words, the question of "how" resolves itself into salesmanship in its very broadest sense.

The work before the society amounts, then, to more than a national advertising campaign, though this was considered essential. It embodies a great educational movement—far reaching and significant. Coupled with this, the society will work toward co-operation on the part of the different interests represented by its members and unified effort to supply most efficiently the public's electrical needs.

People generally, almost universally, are interested in electricity; even the fiction of the day contains many electrical references. There is a vast amount of news value connected with it which the public is eager to read. There is no need to resort to the old-fashioned reading notices, which are no longer acceptable to the newspapers or class and trade journals. But, as pointed out by Mr. Frank H. Gale, there is always a place for a good electrical article which will be of interest and value to the reader, and one of the functions of the society will be to gather and prepare such information in a popular form.

This again will require the training of writers who shall have a working knowledge of the subject and can handle the phraseology. Work has already been done in this direction by the Columbia University School of Journalism, where general instruction is given in physics, chemistry and electrical engineering. In speaking of this, Dr. Talcott Williams, director of the school, said: "There is no calling which suffers so much with respect to lack of knowledge of what is being done by it as that of engineering. The work of the engineer is often misrepresented in the daily press, not intentionally but owing solely to the lack of training of the ordinary reporter."

In a paper on efficiency in local advertising Mr. J. C. McQuiston pictured

electrical conditions ten years hence. Then we shall find people speaking of electrical equipment as familiarly as they now do of the ordinary household devices. The streets will be illuminated, not merely lighted. All work will be done in the home electrically. Devices in shop windows will be plainly marked with their names, prices and the amount of current required for operating. Electric vehicles will be common. Moving pictures will portray all branches of the electrical industry.

All this will come simply from increased knowledge on the part of the general public of the characteristics and possibilities of use of electric current.

A traveling electrical show—a regular three-ring affair—was even suggested; this to go all over the country with advance agents, posters and the other advertising accompaniments of a "World's Greatest Show." Indeed, something of this kind has already been done. The Boston Edison Company makes use of a traveling electrical exhibit with two circus tents. The Middle West Utilities Company has purchased a new railway car equipped with electrical devices capable of being transported from town to town in the district covered by the company's lines. A suburban company in another locality has an electric truck equipped with all the latest lighting and motor appliances for demonstration work.

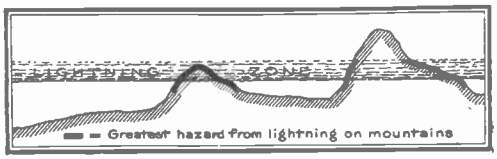
Other forms of electrical advertising as signs and window dressing came in for consideration. The electric sign, especially, is an expression—a vivid one—of a certain phase of our way of living. Such a sign might not be appropriate on a park, drive or boulevard, but in the business places where the overwhelming rush of affairs makes necessary, action and strong, quick impressions to bring home the idea, it has a legitimate place and in that place is of artistic value, since it represents the life of its surroundings. "Cities which legislate against electric signs," declared Mr. Doherty, "legislate against their own attractiveness."

In the older industries, such for instance as the drug and dry goods trades, sales and advertising campaigns are often undertaken with but a forlorn hope of exciting an already full market. This "saturation point" of the electrical merchandising field has never been approached. Mr. Frank Seaman reported on this subject replies he had received from some 673 subscribers to a woman's magazine, distributed through 26 cities in different parts of the country. Of the 673 answers received, 526, or 78 per cent, of the women reported that they already use electric light in their homes. In answer to the question: "Would you welcome the general use of all kinds of electrical appliances in your own household?" 497 replied "Yes," indicating their lively interest in electrical labor saving devices and conveniences. Seventy-five per cent of the number reported using electric irons, 31 per cent vacuum cleaners, 27 per cent toasters, 23 per cent fans, and fourteen per cent percolators. Of all the other appliances on the market none reached a greater proportion than six per cent in use by these 497 women.

These figures illustrate that despite the large number of women greatly interested in electrical devices the total number of sales accomplished to date still leaves an enormous latent market.

Many pages might be written upon the various details of this development scheme which were discussed during the two days of the meeting. Boiled down we find co-operation from start to finish; the beginning of a definite, educative movement of a great moment, not only to those connected with electrical undertakings but to all the vastly greater number whose very mode of living each day becomes more intimately dependent upon what has so long been called that "mysterious" force, but in which the element "mystery" is so fast giving place to "familiarity."

Lightning and Forest Fires



FORESTS ON MOUNTAIN SLOPES AND SUMMITS ARE PARTICULARLY EXPOSED

DISMANTLED AND IGNITED BY LIGHTNING

IDENTICAL WITH THE MOST EFFICIENT LIGHTNING ROD—SPREADING BRANCHES IN THE AIR, SPREADING ROOTS IN MOIST SOIL

"That lightning is one of the chief causes of forest fires is now an established fact" is the opening statement of a bulletin of the United States Forestry Service upon "Lightning in Relation to Forest Fires" from which the following interesting information is obtained.

Careful observations in the National Forests show that there, lightning ranks second to sparks from locomotives as a source of conflagration.

Two principal kinds of lightning are distinguished, *linear* and *ball*. The effects of the first may be peculiarly destructive. Its flashes are followed by thunder and usually accompanied by a downpour of rain. When its light is seen from a great distance, often through clouds near the horizon, it is called *diffused, heat* or *sheet lightning*. The same appearance may, however, be due to actually diffused and silent discharges at great altitudes.

A long flash of linear lightning, if visibly composed of a number of short segments in the same general direction, is called *pearl* or *beaded* lightning. If a streak splits into two or more parts the form is called *forked lightning*. Occasionally it is so branched or sprayed as to resemble the form of a naked tree.

Ball lightning is also called *fire ball* and *globular lightning*, and sometimes, loosely, *thunderbolts*. Balls may vary from a half inch to several feet in diameter. They differ in form and motion from linear lightning, but as both kinds are erratic their effects are sometimes similar. Balls of lightning may come from any direction, may move slowly or rapidly, and may be harmless or deadly. They float through open windows or doorways and up chimneys. They may play around a lightning rod without being attracted, or may strike the ground and rebound without being dissipated. It would be difficult to believe, as some maintain, that such an outlaw could not set fire to a tree. Any lightning flash may be destructive or fatal.

A tree may be scorched, it may be stripped of its leaves, it may be cleft longitudinally, or, more rarely, severed horizontally. Pieces of bark or wood may be torn off in strips. One-half of a tree's crown may be withered, the other half remaining unharmed. Sometimes the bark is stripped from only one side, occasionally without a trace of burning; at other times it may be riddled, as by worms, with a multitude of little holes. The lightning furrow on a tree is usually single; but it may be double, usually in parallel lines. Furrows may be oblique or spiral, the current in such cases following the grain of the new wood. If the tree is inflammable or is rendered very dry by the flash a fire may result. In other cases the dry duff or humus at the base of the tree is ignited by the flash.

From early times there has been a belief that certain trees more than others are likely to be struck by lightning. The elder Pliny said: "Lightning never strikes the laurel." This tree was also called bay, and wreaths of its leaves were worn by ancient rulers both as a symbol of victory and as a protection from the lightning of the gods. Seneca and Plutarch held a similar belief which may be traced down even to modern times, but the theory as now held includes a number of trees, differing in various countries. This belief was so firmly established that such trees as the beech and locust, supposed to be effective in warding off lightning, were planted near dwellings. To this day there are many who still insist that the beech is never struck, while in parts of the United States the aspen is considered immune from lightning.

The persistent popular beliefs regarding immunity of some trees and liability of others have given rise to the following theories regarding trees most likely to be struck:

1. Tall trees.—Because they reach high toward the electrically charged clouds, and therefore lessen the distance which the flash must traverse through the dielectric (air). Such trees are conceived to be a part of the earth, extending upward and inviting the stroke.

2. Trees with pointed crowns.—Because they invite, to their one apex, a single full pressure flash. Trees with rounded crowns favor the diffusion of the flash into a spray.

3. Trees with pointed leaves.—Because static electricity jumps most easily to and from pointed terminals.

4. Trees with smooth or shiny leaves.—Because a smooth surface invites flashes, while a hairy or wooly surface, presenting a multitude of fine points, favors diffusion.

5. Trees with deeply grooved bark.—Because bark deeply grooved longitudinally guides the current to the ground, and because the moist sapwood is close to the surface in the bottoms of the fissures.

6. Trees isolated.—Because they are the only marks for the flash and are conductors.

7. Trees on high ground.—Because they are nearest the storm cloud strata.

8. Trees on damp soil.—Because the moisture makes a good contact between the tree and the earth.

9. Trees deeply rooted.—Because the long roots give a better grounding and furnish a more direct path to deeper and moisture earth strata.

10. Trees with dead branches.—Because they present alluring points.

11. Trees whose wood has high electric conductivity.—Because the flash will select the path of least resistance.

12. Trees whose tissues are composed mostly of longitudinally arranged fibers and other elements.—Because this arrangement would favor the transmission of the electric current.

13. Trees rich in starch.—Because starches and sugars are better conductors than oils, resins and waxes.

In temperate climates thunderstorms, with lightning, occur most commonly during the summer, usually in the afternoon. In the United States they are four or five times as frequent east of the Rocky Mountains as west, omitting from

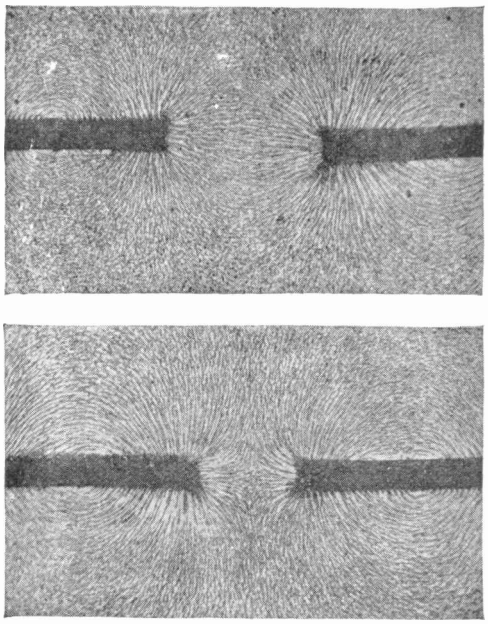
consideration parts of Arizona and New Mexico. This is due, as explained later, to the generally mountainous condition of the West. Lightning is most frequent in Florida and Illinois.

As might be expected, even though lightning is less common in the west than in the east, the proportion of fires which owe their origin to lightning is much greater in the national forests than in the thickly settled portions of the country. In the former case it is, for trees only, 17.5 per cent; in the latter, for all objects, about 2.5. This difference is largely due to the fact that risk from lightning is much greater in unsettled country than in cities, towns and their vicinity. Forests on mountain slopes and summits are particularly exposed, while houses and other structures liable to stroke are usually protected by lightning rods. Moreover, the form of all trees—spreading branches in the air, spreading roots in the soil—is practically identical with that of the most efficient type of lightning rod, which has a number of branches at both its upper end and at the end in the soil.

Methods for Recording Magnetic Fields

All are familiar with the fact that magnets, coils of wire and even single wires carrying electric current are surrounded by what is termed a magnetic field. Magnetism plays a very important part in our industries and is even so far-reaching in its influence that throughout the universe even to the distant stars it plays a part of great importance. Experimentation continually goes on in this field. The youth experiments to acquaint himself with the phenomena while the veteran seeks to add new knowledge. In all cases it is desirable to preserve records of the magnetic fields.

All substances are magnetic to some extent but iron exhibits this property to a wonderful degree. When iron filings are scattered on a paper which is held in



THE IRON FILINGS ARRANGE THEMSELVES IN LINES CORRESPONDING TO THOSE OF THE MAGNETIC FIELD

a magnetic field it is found that the filings arrange themselves in a definite manner. In this manner it is possible to see visually the effect of like or unlike poles on each other, the disturbance of the magnetic field due to another piece of iron, and many other phenomena. But it is desirable to preserve these and herein are given some simple methods.

First, iron filings are heated to redness in order to drive away the moisture and also to blacken them. Then the filings are sifted through a fine screen. A paper is placed in the magnetic field whose "picture" it is desired to preserve. The filings are sifted evenly upon the surface and perhaps a little tapping is necessary. A cork on a knitting needle serves as a little hammer. If it is desired to hold part of the paper still while the other parts are tapped a pointed glass rod will be found convenient.

After the field is well represented by the filings a spray of shellac will fix the particles in place. The spray should not be turned directly on the paper.

Another method is found in the use of

gummed paper. A paper uniformly coated with starch paste or gum arabic is turned down upon the diagram and firmly pressed with the ball of the hand so that the filings adhere firmly to the gum. A gummed glass plate can be used in this manner and it will serve as a lantern slide.

Another method is the use of shellacked sheets of glass or paper. When the shellac is dry the iron filings are spread upon it. They will properly arrange themselves, after which a coating of alcohol is poured over the surface. This softens the shellac and the filings adhere to it. On gently warming, the shellac becomes sufficiently transparent for copying photographically by transmitted light. Paraffine wax can be used in the same manner. The filings are spread on the cold coating which on being warmed will fix the filings in place.

One of the most desirable methods if the actual images of the filings are not desired is to spread the filings on a sensitized photographic plate in a dark room. After the plate has been gently tapped and the filings have arranged themselves a lighted match held above the filings at some distance will expose the unprotected portions of the plate.

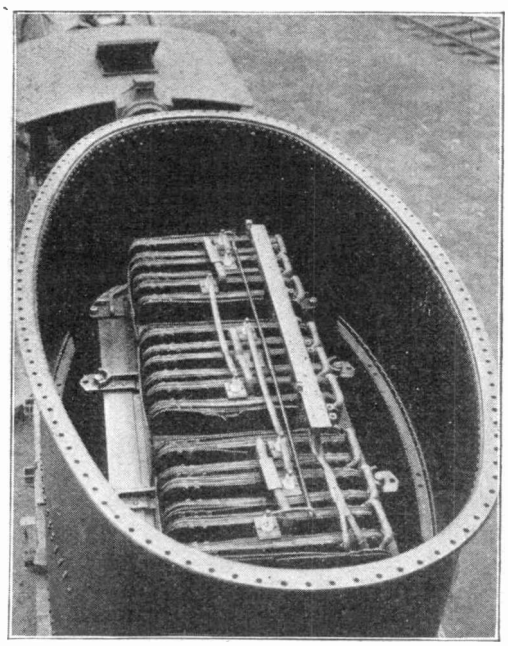
The plate is then developed and prints made from it. These methods are very useful and interesting to both the amateur and the professional and serve as convenient means of preservation of records. The accompanying photographs are found in nearly every textbook on magnetism but illustrate how easy it is to preserve a record. The upper picture shows the effective field produced when two unlike poles are brought near to each other. The lower one shows the effect of two like poles.

Electricity the Tabloid of Energy

Dr. Schuyler Skaats Wheeler, president of the Crocker-Wheeler Company, has said that the difference in the motion of the two first cousins, heat and electricity, is the difference between a panic stricken mob in a fire, and the fire drill in a public school by means of which a building is emptied of hundreds of students in less than five minutes. Dr. Wheeler is responsible, too, for the expression: "Electricity is tabloid energy." It is as easy to handle as extract of beef. Just add hot water and serve in the first case. Just turn a switch and be served in the second.

Looking Into a Large Transformer

Many persons have probably wondered what the inside of a huge transformer looks like; they can get a good idea from the accompanying picture which was taken from above while the transformer, one of the largest ever built, was being carried on a flat car a short distance to receive its charge of insulating oil before placing the top on and putting the transformer in service. The ends of the coils can be seen and also the taps by which a number of different voltages can be obtained.



INTERIOR OF A 100,000 VOLT TRANSFORMER

Electrical Men of the Times

HOMER E. NIESZ

The subject of this sketch began his career in the electrical field in a most practical way. Clad in overalls, possessed of a pair of pliers and the rest of a wireman's kit, Homer Eldredge Niesz, now president of the Cosmopolitan Electric Company, Chicago, began in 1886 at the lowest rung of the ladder.

He was born in Canton, Ohio in 1868, attending the common school there and in 1886 graduating from Mount Union College. He gave much attention to mathematics while at college. Coming to Chicago soon after graduation, he did his first electrical work as an apprentice in the arc light and testing departments of the Western Electric Company, leaving to become a wireman. After two months as a wireman with the United States Electric Lighting Company, Chicago, he accepted a similar position with Leonard and Izard, western agents for the Edison General Electrical Company, and assisted in installing a number of the first Edison lighting plants.

But electrician's pliers could not snip

off the early manifestations of Mr. Niesz's ability to handle men and to act in an executive capacity and this his employers soon discovered and transformed into a valuable asset, for in 1888 he was made assistant superintendent of construction in the Chicago Edison Company with whom he had in the meantime become connected. He served only a year in this position when he was made assistant to the general superintendent, who at that time was Louis A. Ferguson. When Mr. Ferguson assumed the office of second vice-president of the Commonwealth Edison Company, an outgrowth of the Chicago Edison Company, Mr. Niesz became his assistant, which position he held until 1909, when he resigned to become manager of the Cosmopolitan Electric Company, a Chicago central station.

A friend associated with Mr. Niesz in the early days of electricity, speaks of him thus: "He is gifted with a most remarkable memory for details and is ever of pleasing address and very tactful. He is the sort of a chap whom, I realized when I first knew him, would make good. He never watched the clock and was always ready to stick to a job until it was completed."

When the exhibition and demonstration of electrical apparatus by means of electrical shows first presented itself, Mr. Niesz formulated and put into operation plans for handling with dispatch the multitude of details that such an exhibition entails. This field seemed to offer a vent for pent-up wisdom and as an electrical engineer expressed it. "This man's application to it reminded me of the intensely hot carbon burning its way through a steel plate. The carbon accomplished the seemingly almost impossible, but in doing so was itself partially consumed." So closely did Mr. Niesz apply himself prior to and during Chicago electrical shows that his friends always insisted upon his taking a vacation immediately after to recuperate.

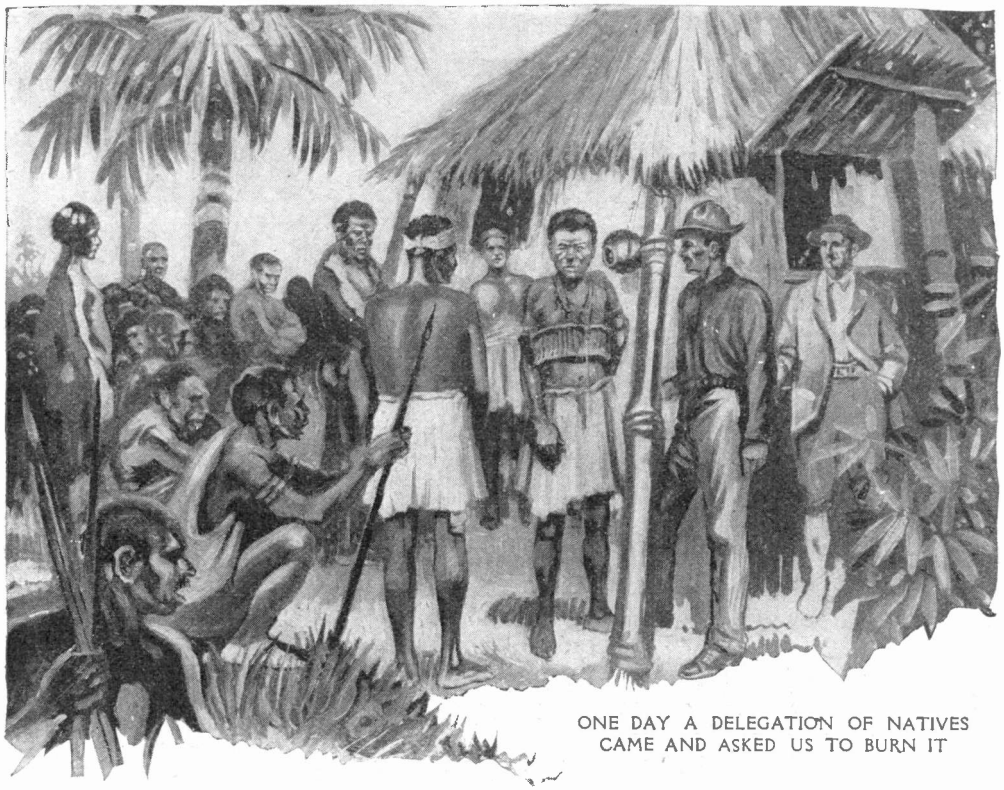
For two and one-half years he served as president of the Chicago Electric Club and had his services sought by national organizations. He was a member at this time of the Exhibition Committee of the National Electric Light Association and chairman of the Hotel Committee. He was also vice-chairman of the Committee on Arrangements for the 1912 meeting of the Chicago convention of the Illuminating Engineering Society.

In council Mr. Niesz is deliberate and cautious, approaching any question with a keen, analytical spirit. His answer to a proposition is, therefore, seldom questioned. To those who know Mr. Niesz well, a verbal answer by him to a proposition is hardly necessary, for his friends always watch a bunch of keys which it is usually his wont to manipulate as some plan is being unfolded to him. With the key ring held upon the first finger of one hand he removes one key after the other over the top of the ring and to the other side of the bunch. When these keys move slowly, the petitioner is making a favorable impression; but if the movement quickens, it is said by those who know, to indicate a negative, proportional to the keys' r. p. m.

Mr. Niesz was married to Miss Ollie Mae Wasson of Cincinnati, in 1901.

He is a member of the National Electric Light Association, Class B, and also a member of the commercial section. He has always been active in the organization and served in 1905 as editor of the "Question Box." He is also a member of the Electric Vehicle Association, of the Illuminating Engineering Society, of the Sons of Jove, associate member of the American Institute of Electrical Engineers, Member of the Engineers' Club, the Chicago Athletic Club, the South Shore Country Club and the Calumet Country Club.

THEY BURNED THE TALKING COCONUT



ONE DAY A DELEGATION OF NATIVES CAME AND ASKED US TO BURN IT

Sanford Jones, employed by the government in the Philippines, relates the following story: "I was stationed on the Island of Basilan in the Sulu Archipelago. The natives of this island were so uncivilized that they did not even know the value of money, and of course had never heard of such a thing as a telephone.

We frequently had them entertain us with their native dances and in turn would fill them with wonder and awe with a phonograph which we had in our outfit. We found it necessary to put up a telephone line between two buildings that were a little distance apart, using two Western Electric magneto sets.

One day I chanced to find a rather large sized coconut under a tree near the bamboo hut we were living in, and conceived the idea of making the coconut talk. So I emptied its contents and hung it on the outside of the house opposite the telephone and so arranged that we could put the receiver through the grass wall and drop it into the coconut. We invited some of the natives to see the wonderful coconut that we could make talk and with the aid of an interpreter at the other telephone who understood their language, we had a lot of fun.

Some of the natives were so frightened they left the village and one day a delegation of natives came and asked us to burn the coconut as they did not like to have so uncanny a thing around. So with great ceremony and much rejoicing we consigned it to the flames and to this day I suppose they are telling their children about the coconut that was able to talk.

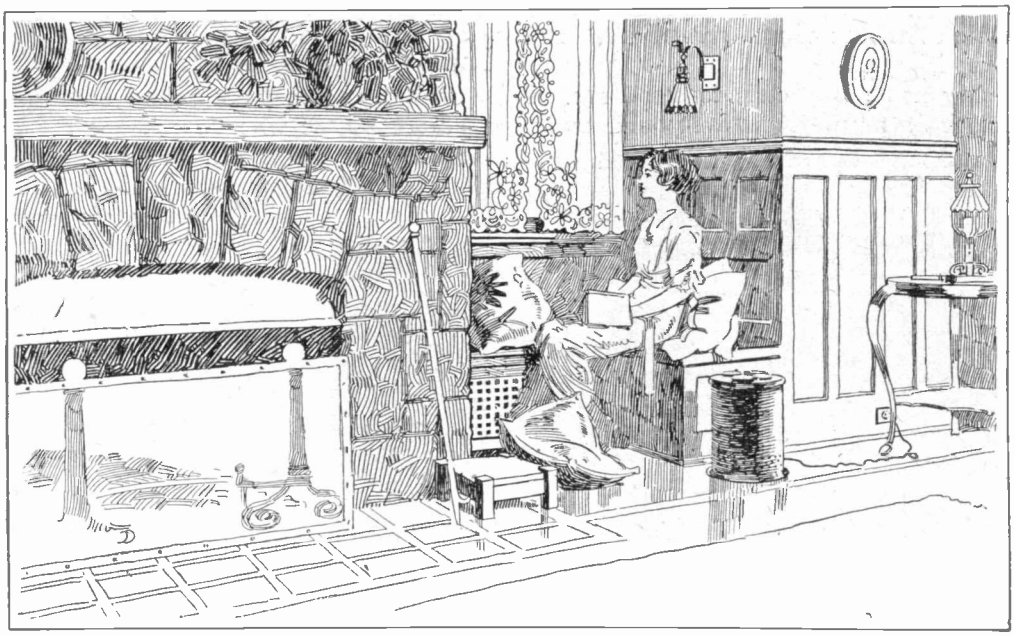
Electrical Interests of Women

EDITED BY GRACE T. HADLEY

Ozone in the Home

Ozone is a form of oxygen which is many times more active than oxygen itself. It is regarded as the strongest oxidizing agent known and is of great value as a disinfectant and an antiseptic; while ozone is continually being formed by the various processes of Nature, it is only within a very few few years that it has been produced by artificial means for commercial use.

Now there are many forms of ozonizers and a portable type of ozone generator is herewith illustrated which is especially designed for use in homes. The ozone is generated inside glass tubes lined with metal mesh, the outside of the tubes being plated by a special process with a thin coating of metal closely adhering to the glass. This form of ozonizer is very rugged and substantial; the electrically active parts are highly insulated and the apparatus so noiseless in operation that it may be left running, even in a sleeping room, without any disturbance.



THERE ARE OZONIZERS OF THE PORTABLE TYPE ESPECIALLY ADAPTED TO THE HOME

It must be understood, however, that the operation of this apparatus is not intended to take the place of ordinary ventilation. In order that the ozonizer may generate ozone, it must be supplied with air containing oxygen; introducng fresh air into a room does not destroy impurities, but it simply dilutes the impure air. The ozonizer does not add

any oxygen to the air but it renders the oxygen which is present, more active. The effect of ozone is to destroy the impurities by the process of oxidation. When air is purified and oxygenated, the health and efficiency of those living in such rooms is greatly enhanced.

The Mission of the Toaster Stove

Fresh, crisp, golden-brown toast! Does it not convey a pleasing suggestion to the palate? Is there any other form in which bread is served that will equal it? Is there anything that gives as much tone to any meal, for toast appears in so many forms and has become the necessary accompaniment of so many delicious dishes, we could hardly do without it. To make toast in the dining room on the table so that it can be served fresh and crisp is my mission.

My name is electric toaster-stove. I might be taken for a five-pound candy box, if I were not made of metal, finished in highly polished nickel and did not have four legs and a mouth. My place is right on the breakfast table close to the lady of the house. A warm friendship soon grows up between us and from the time I make my first appearance at the table my position is assured. She takes pride in having the meal served in its best form and when she discovers how well I prepare the important part for which I am responsible and how little of her attention I require, she finds me indispensable. She likes to have me on the table, because it is as great a pleasure for her to serve the good, hot toast that I make, as it is for other members of the family to eat it.

My important feature—my reason for existence—is my electric heating element. This is just a series of metal strips that give off heat when the current flows. The lady puts a cord from an electric outlet into my mouth and before she knows it, I'm hot—just hot enough to make perfect toast.

TOAST IS ONE THING WHICH GIVES TONE TO A MEAL

Lamp Candlepower and Current Bills

Strange as it may seem there are thousands of people who do not know that incandescent lamps can be obtained in almost any candlepower desired. They accept whatever is given them and pay whatever is asked without a question. More than half the time a complaint for excessive cost of electric lighting is traceable directly to lamps of too high candlepower for the light required. That cost mounts up in direct ratio with the increase of candlepower is shown by the fact that an eight candlepower Mazda lamp will burn for 100 hours for a total cost of but ten cents, where the rate is ten cents a unit. A 20 candlepower lamp on the same circuit would burn only 40 hours for ten cents and a 32 candlepower lamp but 25 hours for ten cents. It is evident that by exercising a little judgment in selection of lamps a saving may be made.

A Woman Jeweler

Business reasons often require a jeweler's bench to be behind the front display window. This position is necessary to secure good light for delicate work, to make the jeweler convenient to the show cases when customers appear and as an advertisement, because in plain view of passers-by whose watches may be in need of "doctoring." This proposition means that the working corner must be beside the doors that are opening "forty-'leven" times on wintry days.

HAMILTON'S WOMAN JEWELER

In Hamilton, Ill., a woman jeweler, Miss Bessie Gordon, a graduate of the Horological department of Bradley Polytechnic Institute, Peoria, occupies the watch repairing and engraving seat. Steam radiators do their best to warm the store but fail of their mission at the floor near the frequently swinging doors. A Simplex 400 watt foot warmer, costing about $3.00 now serves her comfort in midwinter days.

Origin of Coffee Drinking

The origin of coffee drinking is connected with various legends and superstitious ideas. The shrub on which the coffee berry grows is said to be indigenous to Abyssinia and the story runs that the virtues of the plant were discovered by accident. Fleeing from persecution towards the end of the Third Century, a party of monks from Egypt found refuge in the Abyssinian highlands where they settled and supported themselves by agriculture and by the care of flocks which were in turn entrusted to the care of the different brethren.

One of these came to the prior one night with the strange tale that the sheep and goats would not go to rest in their folds, but were frisking and lively to such a degree that he feared that they had been bewitched. This state of things continued, in spite of prayers and exorcisms for several days, till at last the prior resolved himself to herd the animals. Leading them out to pasture he observed what plants they browsed upon and thus discovered that their sleeplessness was the effect of the leaves of a certain shrub. Experimenting on himself by chewing some of the buds, he found he was easily able to keep awake during the long night services which his form of religion prescribed. Thus was coffee discovered.—*Folk Lore of the Holy Land.*

Aluminum Utensils

If you use ordinary kitchen utensils for cooking on a small electric table stove do your best to see that they are aluminum. Anything heavier or thicker, especially granite, takes too long for the process of heating through and wastes your time and current. An aluminum double cooker will give you an opportunity to cook rice, breakfast cereals, etc. Any utensil used on an electric stove must set down closely to the stove so that the heat will not radiate and be wasted.

Making Over A Flat

By AVIS GORDON VESTAL

Last fall my husband set his wits to work to help me make over our flat on "shop management" principles. He attended to the electrical and mechanical difficulties and declared it was lots of fun. I worked with him and devoted many hours to studying new methods of work and better arrangements to facilitate housekeeping. The result is that housework is no longer drudgery to me and I consider my kitchen a laboratory where I experiment in science that is worth while.

THE KITCHEN OF THE MADE OVER FLAT IS CONSIDERED A LABORATORY

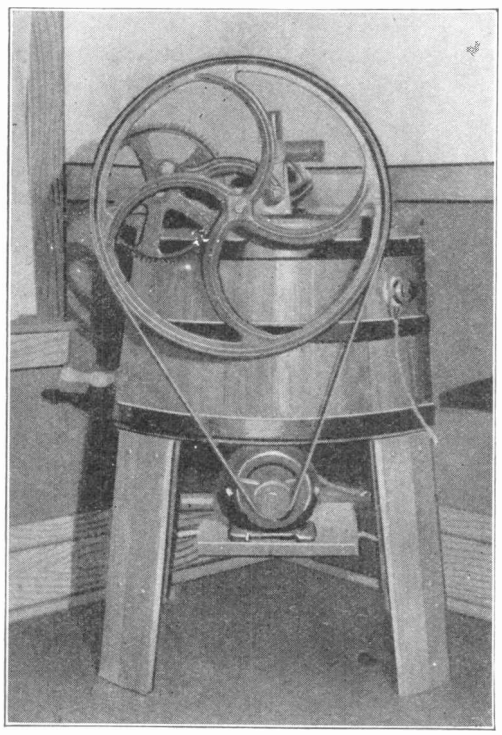
Ironing day was the first thing we tackled. One day my husband brought me an electric iron with a three heat switch. At the Chicago rate my new iron costs but five cents an hour at high heat and less than that at medium and low heat. I can iron for a while after the current is entirely off. I find the high heat most satisfactory for heavy table linen, starched clothing and for pressing suits and skirts; medium does well for plain, unstarched articles, while low heat is suitable for waists, ribbons and neckties. With my iron I press my husband's trousers and have already saved a part of its cost in tailor's bills. Every woman who uses an electric iron knows its cleanliness, the ease with which it is handled and the absence of delay while waiting for cool irons to heat. Electric irons are always hot.

"What is your hardest work?" enquired my husband after we had solved the problem of ironing day.

"Washing," I replied without hesitation.

"We'll see what can be done. I think I can make you an electric washer that will help you as much as an extra pair of hands."

He began a search for a hand power washer with possibilities. Finally he



A HAND POWER WASHER WITH POSSIBILITIES

sent home a wooden tank washer of the dolly type with a big fly wheel and a lever for operating it. The cost was $7.95. I used it one week by hand and believe me, it was a sentence to hard labor. I do not regret the experience, however, for it affords me a basis for comparison and appreciation of the new electric method. When we went down town the following Saturday, my husband bought the accessories for the new machine; these included fourteen feet of lamp cord, 28 cents; a double connector 20 cents; two larger plug fuses to be placed in the basement, 10 cents; a snap switch for starting the motor, 20 cents; a leather belt to run over machine's fly wheel and motor's pulley and a Benjamin cluster, 50 cents.

The motor arrived in due time—one of 1/6 horsepower which cost $18.00. It took John a little over an hour, all supplies being on hand, to make a wooden platform under the tank and install the motor and its accessories. Wash day has lost its terrors for one appreciative wife. The new machine does all the work with the exception of wringing and the total cost was less than $30. The current for operation is about a cent an hour. The most important advantage I cannot express in dollars and cents. When I washed with a board or with the hand operated washer, I was so tired in a few hours I was ready to go to bed and stay there all the afternoon for I had consumed a full day's energy. Now I have my wash on the line in a much shorter time and am fresh to do other work the balance of the day or even to go calling.

The photograph of the ironing equipment shows in the background how illy lighted my kitchen sink was. Our flat had the usual central ceiling fixture with one open gas jet and one sixteen candlepower lamp. My husband volunteered to be efficiency engineer again. Our Benjamin cluster was a part of the solution of better lighting. John bought more lamp cord and carried it from one socket of the cluster to a point over the sink and stove where he suspended it by a porcelain ceiling button. At this point he placed a 60 watt tungsten lamp which gave me more and better illumination in a more serviceable place.

As in many flats I had to pass the bathroom and go through a long dark passage to get to the dining room from the kitchen. This meant that when I carried food to the dinner table I then had to walk back to the kitchen to turn off the light there. The only alternative was to leave the lamp wastefully burn-

ing during the meal or turn it off before starting tableward with my loaded tray in dangerous darkness. This was now remedied for when John bought the kitchen lamp he wired for it in neat moulding around the passageway and placed a new snap switch by the dining room door, three steps only from the buffet.

"You should always be able to turn on the light ahead of you," remarked my electrician when he worked out the above plan.

They say that a wife likes to do anything commanded by her mate that she has already decided she will do anyway. Now the meaning of all the improvements in our made-over flat is this: We spend our evenings reading together owing to the increased leisure which I have achieved through electrical and mechanical efficiency and this contributes not a little to the higher mental and spiritual growth of a couple who believe in community of interests.

THE HOUSEHOLD FAIRY

"What a pretty little house dress you are wearing!"

"Do you like it?"

"Indeed I do."

"I made it myself."

"No!"

"Yes, really."

"I wish I could sew half as well." Mrs. Minton was openly envious.

"But that isn't all I've done." Mrs. Winsome was openly enthusiastic. "You know Cousin May is to be married in June and I'm helping her with her household outfit."

"What a busy little bee you are, to be sure!"

"Last week I sewed 30,000 stitches or 100 yards of cloth for one cent!"

"You must have a little fairy of some kind hidden somewhere in this house," insisted Mrs. Minton.

"I have," smiled Mrs. Winsome. "Would you like to see it?"

"Of course; where do you keep it?" For answer Mrs. Winsome led the way upstairs into the bright little sewing room and behold, upon her machine was an electric sewing machine outfit; diminutive in size, light in weight, compact, well finished, complete in every detail was the household fairy.

"You see," explained the housewife proudly, "the power is supplied by electricity brought to the motor through a cord and a plug screwed into an ordinary electric light socket. A turn of the switch starts the motor. Foot pressure on the treadle gives instantly any desired sewing machine speed."

"Perfectly fine," said Mrs. Minton. "Sewing has always been to me a dreaded burden rather than a pleasant task."

"Yes," agreed Mrs. Winsome, "the art to plan, the deftness to fashion and the ambition to make raiment, go for naught when the strength is lacking to bring the work to completion. I always had the ambition to sew but the necessary strength was lacking, but now with this electric sewing machine outfit I can sew for hours without fatigue. It is the happy solution of the sewing problem in the home."

"And think of the total relief from drudgery!"

"Just so," said Mrs. Winsome seating herself at the machine. "I turn the switch and with a light pressure of my foot on the treadle, the power is applied; the work has then only to be guided—there is no physical or mental fatigue. There is nothing to do but to guide the work. And only think of 30,000 stitches sewed for one cent."

"Surely this is spending pennies profitably," said Mrs. Minton.

Transforms Kitchen Range into Electric

Take off the lids of your kitchen range and in their places put electric heating units made to fit the holes. Connect the necessary wires to switches and a source of supply and lo! you have an electric range.

Such is the direction in which the inventive genius of Leon F. Parkhurst,

ELECTRIC ATTACHMENTS FOR ORDINARY RANGE

Binghamton, New York, has turned and upon this method of making a modern electric range out of any stove he has received a patent.

The small cut shows the manner of supporting the heater in the stove hole, an air space being provided to prevent the heat from being dissipated by the stove top.

Buzzer for the Cellar Light Circuit

Nearly every one has trouble to remember to turn on and off the cellar lamps. It is quite a common thing for the best and most thoughtful of us to forget to turn them off and often they burn for days without being noticed. This can be easily remedied by installing a buzzer on the circuit. A pilot lamp, usually red, placed near the switch, will help, but this, too, is easily overlooked and forgotten, but a buzzer in series with the pilot lamp is by all means better as it continues to buzz as long as the cellar lamps are lighted and only ceases its raucous clamoring when you turn out the lights. There is no danger that even the most absent minded will forget the little wall buzzer. They cost but a few cents and are easily installed.

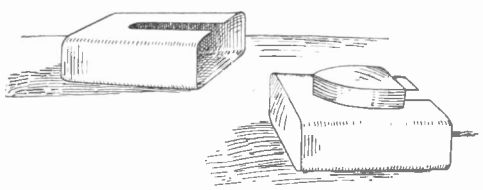
Cost of Operating Cooking Devices

The following table compiled by the National Electric Light Association serves to show how inexpensive the operation of domestic heating and cooking devices, which are now widely used, really is. It must be understood that the cost will vary in different localities according to the rate charged for electric current. The liberal rate of ten cents per kilowatt-hour was used in computing this table:

Device	Cents per hour.
Chafing dishes	2 to 5
Cigar lighters	0.75
Coffee percolators	1 to 4.4
Flatiron (3 lb.)	2.75
Flatiron (4 lb.)	3.5
Heating pads	0.5
Nursery milk warmers	4.5
Radiators	7 to 60
Shaving mugs	1.5
Stoves (4½ to 12 inches)	0.5 to 13
Toasters (9 in. by 12 in.)	3.2 to 8.8
Toasters (12 in. by 18 in.)	5 to 15
Waffle irons (2 waffles)	7.5

Electric Flatiron as a Stove

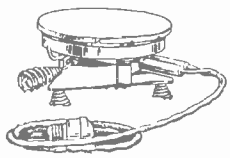
Here is a simple arrangement I made for holding our electric flatiron so as to use the latter for heating the coffee pot, etc. I cut the top end off of a gallon



FLATIRON HOLDER

syrup can and then cut a strip out of one side just large enough to slide in the handle of the electric iron. In this way the iron made a very convenient stove.—M. S. Loke.

A New Disk Stove



DISK STOVE WITH THREE HEATS

Anyone who has had experience with the old style disk stove will readily appreciate the advantages and improvements in this new disk stove which has been christened "The Stove of a Hundred Uses." With a stove that has but one heat that must be regulated by jumping up and turning off the current, perhaps at the chandelier or electric light socket which is not conveniently near, some of us have had a varied experience. This new disk stove is made in three sizes and the largest size permits of a regulation of temperature by a three-heat switch, which is convenient to the hand. In addition to the conveniently attached three-heat switch the stove is equipped with a handle which makes it easy to carry or lift from place to place, even while hot.

It is the little things that count, but small things are not small if they yield good and satisfactory results. These portable disk stoves yield great results in serviceability and satisfaction to the housewife who wants a quick, clean heat in the sick room, in the nursery or on the dining room table.

Must the Broom Go?

In the interest of public health the broom and the house cat must go the way of the common drinking cup and the roller towel. Hereafter no house should be cleaned except by a vacuum cleaner, and the family cat must go too, even though the house is overrun with mice. As for beating rugs or shaking dust cloths from open windows, this is a reckless practice fraught with gravest danger to one's innocent neighbors. These are some of the progressive views aired at a meeting of the public health committee of the New York County Medical Society. The vacuum process is without doubt the most scientific, sanitary and thorough method of cleaning ever devised.

It remains only for the public at large to realize that the same advancement has been made in the method of cleaning a house as in the method of lighting it or the method of obtaining water. It will soon be as old-fashioned to wield the broom and dust cloth to scatter dust and germs into the air we breathe as it is to carry our drinking water from an open well.

A Good Dinner

"A good dinner means first, a well balanced menu in which are assembled the dishes which associate well together; second, cooking that is above the ordinary, superlative in its perfection, and third, flawless service. The idea of simplicity should be carried out even in the decorations. The guide should be common sense, which teaches that above all things, ease and comfort, pleasure for the eye and for the palate should be associated.

"The idea is to provide just enough for each meal, to associate just the right dishes and to have everything cooked at the last possible moment before serving so that nothing may be spoiled. There should be the grand conscience in cooking."—*Antoine Dupraz.*

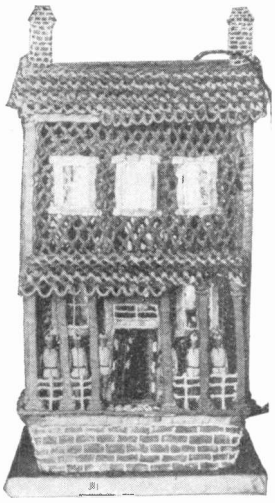
Editorial Note. Antoine Dupraz is chef of the Colony Club of New York, a distinguished organization whose membership is composed of women of fame and fortune.

A Cook Book for Children

Mrs. Charles Marshall of London has prepared a charming little cook book for little cooks by means of which children are initiated into the preparation of simple soups, meat dishes, salads, sauces, savories and breakfast dishes. Among the fascinating sweet things which children may learn to prepare are a currant pig, orange jelly, almond toffee, rosy-cheeked tartlets, French pancakes, Naples sandwiches and bath buns.

Electrically Lighted House of Sugar

Not all houses are lighted by electric batteries; also there are few structures in existence made wholly of sugar and lighted by the incandescent. It is believed the only building in the country conforming to these specifications is that manufactured by a Chinese cook employed by a field officer in the army. John Chinaman decided to tickle his boss by reproducing his master's headquarters building in solid sugar. It took lots of patience and many hours of toil—to say nothing of the sugar—to build the miniature. Powdered sugar was used, and the rooms inside, as well as the hallways, were illuminated with tiny electric bulbs lighted by a dry battery.



HOUSE OF SUGAR

An Apple as a Rheostat

While in my laboratory experimenting, I became in need of a rheostat and not having one around that was not in use, I took an apple and inserted one wire in one side of the apple and the other wire in the other side.

The voltage can be regulated by merely making the distance greater or less between the ends of the wires. The one apple can be used only about an hour, as the heat of the electricity tends to cook it.—R. C. FORCE.

Magnetic Shadow Pictures

By means of the magnet it is said to be possible to produce shadow photographs resembling those made by the action of the X-ray. Either an electro-magnet or a permanent magnet will, it is claimed, suffice for the purpose. The procedure is as follows:

A key or other iron or steel object is placed upon the sensitive film of an ordinary photographic plate and the poles of the magnet are then brought near the other side of the plate and kept there for a period of five minutes or more. When the plate is developed a shadow picture of the key or other object, quite as sharp and well defined as any of the X-ray pictures, will be found.

It appears that only iron or steel or other paramagnetic substances may be photographed by this method; but if the sensitive side of the plate is turned toward the magnetic poles, and a disk of iron nearly as large as the plate is placed on the other side, then shadow pictures of any non-magnetic object placed on the sensitive film facing the magnet may be obtained. The operations are, of course, conducted in a dark room.

With an electro-magnet capable of lifting a weight of 100 pounds, one experimenter, it is reported, has succeeded in making such pictures through two inches of interposed wood. He has also obtained shadow pictures with a compound steel magnet weighing little more than a pound.

Humbling the Savage Spirit

By W. ROBERT FORAN

OLD CHIEF OWACHI, SEATED, AND A GROUP OF TUK-A-TUK NATIVE FOLLOWERS

Owachi, subchief of the Tuk-a-tuk in the Lado Enclave of the Congo, had been so long without the guiding hand of the white man that he was suffering from the worst form of Africanitis—no more and no less than a case of swollen head. To all my messages, ordering him to come to my tent and bring in food supplies for sale to my native caravan porters, he sent back insulting messages. And when an African subchief chooses to be insulting, he is a past master at the art. Owachi was a super-past master.

I was determined to humble his spirit in the dust before I left his territory, and to show him that the white man was a greater personage than a mere African potentate. But how to do this was a puzzle. I had cracked many hard nuts in my career as an official of the British governent during six years' residence in East Africa, generally by means of bluff, sometimes by the most simple expedients and on rare occasions by armed force.

The two former courses were open to me on this occasion, but the last was not. I was camped as a mere newspaper correspondent upon the trail of ex-president Roosevelt at Wadelai on the banks of the Nile and I was accompanied by no armed men. Therefore, it was obviously out of the question for me to try a hand with a mailed fist. My camp was an isolated one, far from the nearest government station. Bluff must therefore by my long suit.

I sent off a messenger to Owachi to inform him that if he would call at my camp on the next afternoon, I would present him with a fine collection of beads for his wives. No doubt the wives fell for this bait, even if Owachi himself did not. The African ladies love finery, especially colored beads. Owachi graciously signified that he would come to my camp as requested.

All the intervening time was devoted to the cudgeling of my brains to find a means of bluffing this native into a correct estimate of the power of the white

man. But it was not until noon of the day appointed for the meeting that a light broke in upon me. It so happened that I had with me in camp the government inspector of telegraphs. He had been loaned to me by the Uganda government so that I could tap the wires at any time or place and send back to the Associated Press in New York my news of the doings of Colonel Roosevelt.

I explained my plan to the inspector, which was nothing more than to run a wire from his battery and an induction coil into a bowl of water. Then, by means of a simple contact on which the chief would be obliged to stand, connected to the other side of the circuit, it would be possible to give him a shock after the manner of the experiment familiar to all. Into the bowl I would throw a silver coin and tell Owachi he could have it if he cared to fish it out of the water.

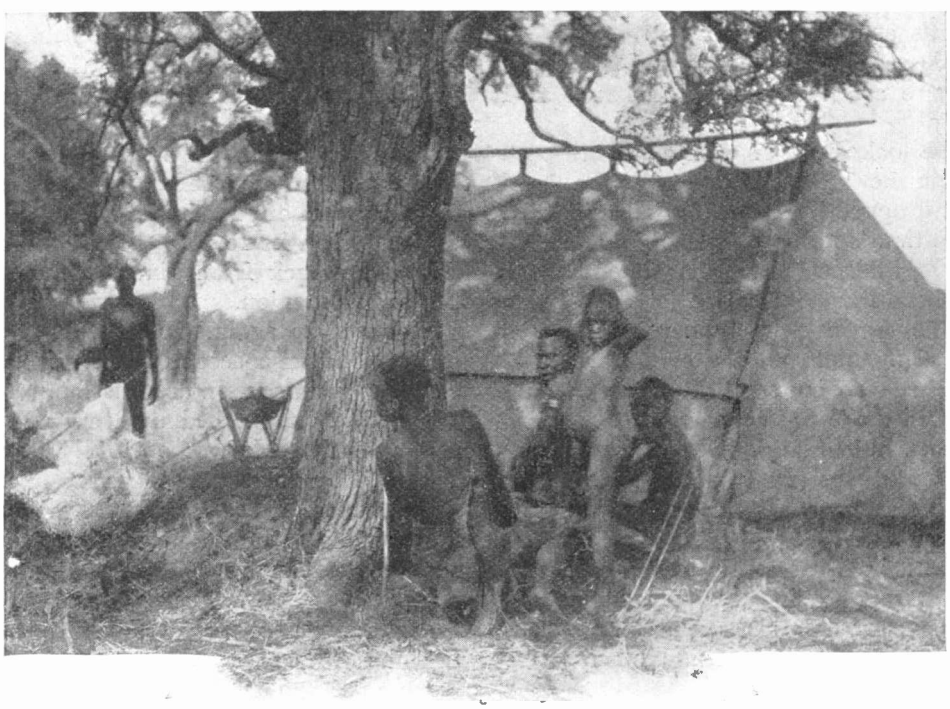
The old chief reached my camp at the appointed time, being accompanied by his courtiers—an unsavory looking collection of naked savages—and some 50 warriors armed with spears. His whole attitude was offensive and I was sorely tempted to give him the sound thrashing he deserved. But my time was not yet come. I forbore to act then, gloating over the fun I was presently to enjoy.

The beads were handed over to Owachi, who received them with an air of indifference. He was obviously unsatisfied as yet and expected more in the way of presents.

"Oh! white man," he said, in his deep gutteral tones, talking in Tuk-a-tuk which I knew, "these beads are small things to offer a great chief."

His beady eyes searched my tent for other possible spoil, and there was ill-concealed cupidity in the gaze.

"There are other things, yet," I an-



CAMP AT WADELAI ON THE NILE

swered curtly. "I would give you silver coins as a token of my good-will. See, in yonder bowl," I pointed to the bowl of water, "there is silver. Take it!"

Owachi rose eagerly from his heels, on which he was squatting in front of my tent, and walked in dignified strides toward the bowl. My companion and I watched him, with broad grins.

The chief peered into the bowl, and at sight of the silver coin, plunged his hand in. His face changed quickly from cupidity to pain, and he let forth a terrified yell. Quickly withdrawing his hand, he turned to look at us. We had hard work in composing our faces.

"What troubles you, chief?" I asked suavely.

"There's a devil in the water," he answered angrily.

"Nonsense!"

I rose abruptly to my feet, and at my nod my companion quietly disconnected the wires. I plunged my hand into the water and held up the coin before the chief's astonished gaze.

"See, chief," I argued serenely. "There are no devils. It is even as I said."

He looked at me with a new respect. Again he advanced towards the bowl and dropped his hand into it cautiously. This time nothing happened. He sheepishly withdrew his hand again and shook his head in astonishment.

"Throw in more money," I ordered my companion, with a significant look. He threw six coins into the bowl and unnoticed made the connection.

Owachi let out a howl that would have awakened the dead as he plunged his hand once more into the bowl. But the coins remained.

He looked cautiously at the bowl and could see nothing unusual about the water. Then he looked at me. I was watching his face and pretended not to see his fear.

He summoned all his dignity to his aid. "What is this thing that bites, and yet again does not bite?" he asked.

"Nothing bites, unless an evil conscience," I answered crushingly.

Once more Owachi essayed to grab those alluring coins, but the shock was too much for his nerves and he turned and fled outside my tent. We hastened after him, ready to follow up the advantage.

"What is this thing that cannot be seen, yet bites like a thousand scorpions?" he inquired tremulously.

"It's the god of the white man," I warned him. "You see to me he does no harm, but to you he shows the hand of his wrath. Look at yonder small box. Within is the god. When I call him he acts."

I held up the box containing the outfit which my companion had employed in his work. The chief eyed it warily and retreated some paces, while his followers copied his example.

"Disconnect the battery," I whispered quickly to my companion.

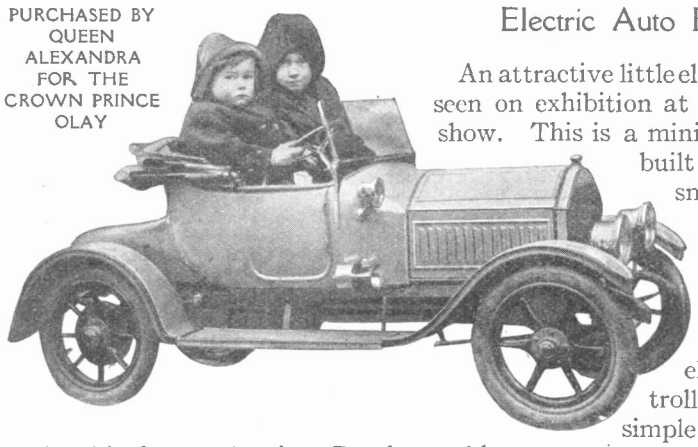
And as I turned to the chief again, the battery was without power. I held out the box in my hands and let the chief hold it. He was plainly frightened, but at my urging seized the box with a "do or die" expression. It would never do for him to show fear before his warriors. An expression of great relief spread over his face when he felt no shock. I took the battery back from him and handed it to my companion.

"Connect up again, quickly," I whispered. And in a second more the battery was once more in commission.

The old chief watched my every movement intently. He was obviously much impressed by the power of my god-box.

"See, chief," I began quietly, "the god of the white man will protect me from my enemies. Take hold of these two strings."

The natives were crowding close, watching the proceedings with awe-struck faces. The old chief picked up the two wires, and as he did so my companion turned the battery on to full strength. Owachi writhed and twisted,



PURCHASED BY QUEEN ALEXANDRA FOR THE CROWN PRINCE OLAY

Electric Auto Built for a Prince

An attractive little electric automobile was to be seen on exhibition at the last Paris automobile show. This is a miniature Cadillac car and is built as a reproduction on a small scale of the 1913 two-seated roadster car. The car is driven on an improved electric system by the use of a storage battery of a few cells and an electric motor and the controlling device is made very simple so that a child can handle it without any trouble. An hour's run can be given in this way without needing to re-charge the battery, and the top speed is sixteen miles an hour.

This little car was purchased by Queen Alexandra of England for the Crown Prince Olay.

yelling his fear and pain. But he could not release his hold, try as he would.

Seeing he had had enough, I motioned to the telegraph inspector to turn off the current. Owachi dropped the two wires like red hot coals. He looked with a new respect into my face.

"Great is the god of the white man, master," he said, "and all powerful is the white man. I will go and bring him food in plenty for his porters. Say what you want and the orders shall be obeyed."

I had won, and was not slow to take advantage of my victory. I gave him orders for the necessary loads of foodstuff for my men and he started off with his followers to bring it to me. But he had not gone far before he turned back and again stood respectfully before me.

"What is it?" I asked.

"Oh! Master," he began solemnly, and there was earnest entreaty in his tones, "my subchief Owinga is insolent. I would have you show him the power of this god that makes children of men."

He pushed the erring and frightened Owinga toward me. And with a self-satisfied grin on his face watched his dusky lieutenant suffer as he had done. Not content with this, he insisted on each one of his followers having a taste of the electricity before he would leave my camp. And as each one came forward to take his medicine the old man rolled on the ground in paroxysms of laughter.

Taming Lions with Electricity

The "live" wire is said to be used with great success by lion tamers in impressing upon their savage pupils the utter hopelessness of an attack on the master. When a lion is in the early stages of education it sometimes starts for its tamer when the latter's back is turned. Formerly the only security for the man was in keeping a sharp outlook over his shoulder. Now he can have a charged wire stretched across the cage in front of the beast, and if the latter touches the wire he gets a lesson which makes a deeper impression than the cut of a whip.

Thermal Flasher Leads Orchestra

The high school orchestra of Attica, Ohio, has adopted a new means by which it is led. A sixteen candlepower lamp is placed on a standard which is within sight of all the musicians. This lamp is in series with a thermal flasher so that the lamp lights up on the first beat of every measure. The flasher is so constructed that it can be regulated to beat the time to music of any movement.

Experimental 200 Meter Wave Sets

By PHILIP E. EDELMAN

PART 3

INDUCTANCE

Either a helix or an oscillation transformer may be used in a 200 meter circuit provided a few essential points are considered. The direct coupling is an advantage in that it allows a greater percentage of the energy to be transferred to the aerial circuit and radiated. The same set will often radiate from five to ten per cent more energy through a direct than through a loose coupling. On the other hand an oscillation transformer, particularly an adjustable one, allows the operator to tune to a more defined wave length. This sharp tuning is carried out at a decrease in the energy radiated, but the other advantages compensate for this loss. At the receiving station it is much easier to tune to a weaker sharply tuned signal than to a stronger less defined signal, for the advantage of the latter is often lost on account of the interference of other stations. In any case it is desirable to consider these points when the object is to cover the greatest distance possible.

In case a straight helix is to be used, it should have a diameter of ten inches. The wire should preferably be No. 4 B. & S., and the turns should be evenly spaced, preferably at a distance of three-fourths of an inch apart. Copper or brass ribbon of equivalent capacity may of course be used, and often more conveniently. It is not necessary to have more than seven turns if these dimensions are used. The distance between the turns may be less when ribbon is used, but the dimensions specified are best carried out as shown at (A) Fig. 6. Readers are not advised to use a straight helix for a set which is to be operated in a locality in which there is much interference between the stations. Although no details will be given for this well known piece of apparatus, it should be noted that the supports for the turns should be good insulators, such as rubber, and *not* unseasoned wood.

If an oscillation transformer is to be used there may be some doubt as to the relative merits of the pancake, the fixed adjustment and the adjustable types. There is only a slight difference between the pancake and coil types, but the former are more portable. The latter are, on the other hand, easier to construct, and have a uniform inductance for the successive turns. The use of two cylindrical coils for an oscillation transformer has one other disadvantage, in that the outermost turns of the primary and secondary coils have a very weak coupling. In some designs, a compromise is made, one of the coils, the primary, being made flat and the other cylindrical. Either of these arrangements can be used provided the turns are spaced according to a working standard. If the primary coil is made from wire it is desirable to use just four turns of No. 4 B. & S. wire spaced three-fourths of an inch apart on a form which will give a diameter of ten inches. Or if copper ribbon one-half inch wide is used for a flat coil, the turns should be spaced one-half inch apart. The turns in this case should come even divisions, as 3 inches, 3½ inches, 4

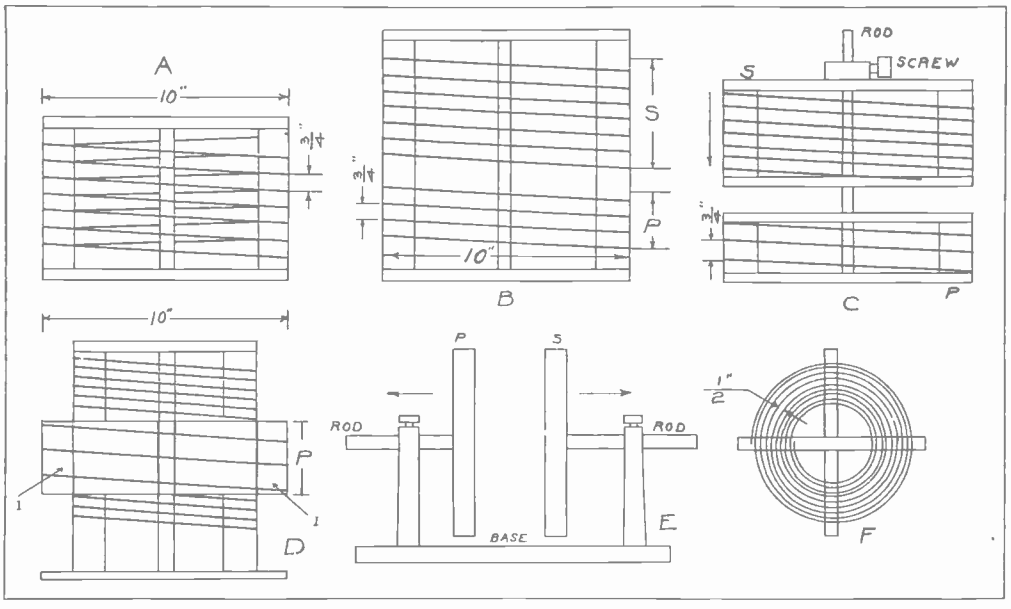


FIG. 6. TYPES OF OSCILLATION TRANSFORMERS

inches, etc., from the center. The dimensions of the secondary coil in any case are not necessarily limited, as in the primary coil. A secondary coil of the pancake type is generally made with more turns than are used in the primary coil and sometimes these turns are spaced closer together than the primary turns. The turns of a secondary coil of the cylindrical type are greater in number than the primary turns of the transformer and are generally wound with a smaller conductor; also the turns are spaced closer together. The cylindrical type of secondary coil may be made the same diameter as the primary cylindrical coil or slightly smaller. We see, then, that the dimensions of an oscillation transformer as well as the design can be varied without greatly affecting the results, provided that the primary coil is made to a working standard suitable for a 200 meter circuit, and the secondary apportioned so that there will be an efficient transfer of energy between the two circuits. It is well to note, too, that a small diameter is particularly suitable because of the small amount of inductance which the 200 meter circuit allows. With a coil having a diameter of more than ten inches, for instance, it may not be possible to use more then two-thirds of a turn in the primary or condenser circuit, and this means a poor transfer of energy between the primary and secondary circuits.

These points are best understood by reference to the four cases shown in Fig. 6—(B), (C), (D) and (E). The type of transformer shown at (B) is very nearly like an ordinary helix except that the turns are broken into the parts (S) and (P) or secondary and primary respectively. This fixed type of transformer when used with three or four contact clips gives an operator a good instrument for tuning purposes. By separating the two coils, as at (C), and placing the secondary coil on a rod so that it may be moved up or down, we have a simple example of the adjustable type. By pulling up the secondary coil from the primary the coupling may be reduced. As an example of the use of this feature, the secondary would be clamped at the greatest distance from the primary in case a message was to be transmitted a short distance through interference. The distance between the

two coils determines the sharpness of the emitted waves and has, of course, no effect upon the resonance adjustment of the two coils. The form shown at (D) is substantially the same as the foregoing ones, except that the secondary is placed within the primary coil. The coil (P) may be mounted so that it can be moved up and down or out of its plane, if desired. This arrangement can be made from an old helix in some cases, and when this is done the helix is used as the secondary of the remodeled instrument. The primary wires are conveniently supported on insulating strips (I) resting on the helix conductor supports. It should be noted that the primary coil is shown with the standard dimensions in each case.

Pancake coils are generally mounted adjustably, one arrangement being shown in the figure at (E). The primary and secondary are mounted on adjustable rods so that their distance apart may be varied. Sometimes one of the coils is also turned out of its plane to secure a very weak coupling for sharp tuning. The wave band from such a feebly coupled circuit is confined within a very narrow limit, so that the receiving station may tune to either the long or short wave with precision. In making such an instrument it is well to have the coils rest on the base in order to take up the strain, and oblong rods with the narrow side up are better than round ones for the adjustable supports. When the two coils are separated the maximum distance, the coupling will be the weakest and the two resulting waves from the set will be as distinct as a spark system is capable of emitting. The arrangement of the ribbon winding in this type of coil is shown at (F). Such a coil can be mounted at one end of an old helix and will give good results in some cases when used in this manner. Some coils are wound with edgewise coiled strip but the design is essentially the same as for the cases described.

Regardless of the type of inductance coils used, the connecting clips and their leads should have a good clean surface, a capacity equal to that of the coil conductors, and the leads are preferably made flexible. If nothing better can be had for the leads a cable may be twisted together from short lengths of No. 20 B. & S. bare copper wire and then pressed flat into the shape of a ribbon.

Whenever wireless apparatus is purchased it is well to ask for the electrical dimensions. Thus, in buying a helix one would ask for the inductance per turn and the total inductance, information that is essential for the use of apparatus at a 200 meter wave length.

(To be continued.)

An Apparatus for Signaling Thunderstorms

The first attempt to investigate atmospheric discharges by a method resembling radio-telegraphy, viz., by means of a Branly tube or coherer, was made as far back as in 1895-96 by the Russian physicist, Professor Popoff. An insulated aerial wire directly connected to one pole of the coherer was used in this connection, the other pole (in accordance with a practice later adopted by Marconi) being joined to the ground. Professor Popoff thus was able to ascertain that atmospheric discharges, on account of their oscillatory character, will excite the coherer, thus enabling any thunderstorms to be recorded by means of a Morse apparatus or bell signal.

On the same principle is based the storm indicator designed by the Telefunken Company, Fig. 1, but in the arrangement of connections differing considerably from the primitive plan.

As seen from Fig. 2, a spark gap (F) and a coil (S), connected up to the earth conductor (E), are inserted in the aerial wire (L). The coherer (Fr) and a blocking condenser (C) are arranged in parallel to the coil, the relay circuit, which comprises the cell (E) and the relay coils (Sr), being branched off as

usual from the condenser. The secondary circuit of the relay contains a galvanic battery (B), which, on the relay contact being completed, actuates a tapper (K) and a recording apparatus, in the present case a single stroke bell (G).

The spark gap having been adjusted to a spark distance of a few tenths of a millimeter, a series of sparks will pass, thus exciting the coherer and sounding the bell as soon as there are any charging phenomena in the atmosphere. Feeble atmospheric accumulations, that is to say, far distant thunderstorms, will result in a slow charging of the aerial wire and accordingly in the passage of sparks at considerable intervals. Since the signal bell is sounded in the very rhythm of spark discharges, the sequence of sounds

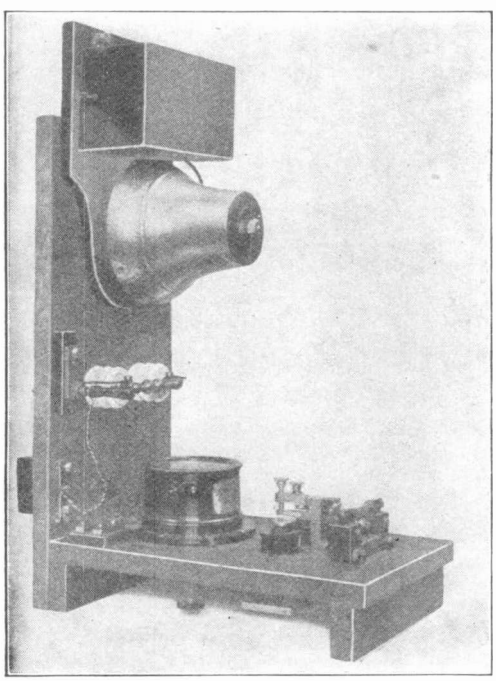


FIG. 1. NEW TELEFUNKEN APPARATUS FOR DETECTING THUNDERSTORMS

allows the distance of the thunderstorm from the recording apparatus to be gauged.

In the place of the single-stroke bell, a Morse recorder with self disengaging paper tape can be connected up to the apparatus, thus marking each passage of a spark by a point on the tape. If the speed at which the paper is unwound be

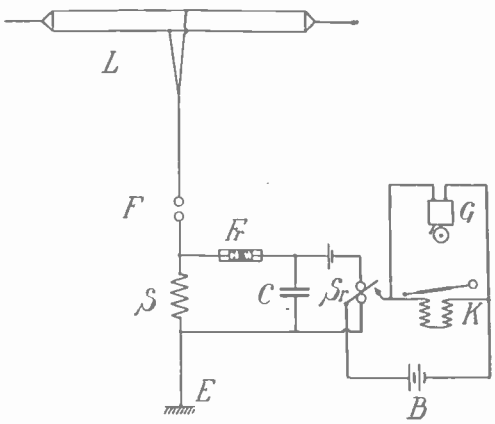


FIG. 2. CONNECTIONS OF STORM INDICATING SYSTEM

known, the distance of the thunderstorm can be gauged by measuring up the paper tape and counting the number of points recorded thereon.

Daylight and the Wireless

An important factor in long distance radio-telegraphy is the very marked and detrimental effect of daylight on the propagation of electric waves at great distances, the range by night being usually greater than that attainable during the day.

For comparatively short waves, such as are used for ship communication, clear sunlight and blue skies, though transparent to light, act as a kind of fog. It often occurs that a ship fails to communicate with a nearby station, but can correspond with a distant station.

It would almost appear as if electric waves when passing from a dark space to an illuminated space were reflected in such a manner as to be deviated from their normal path. It is thought probable that illuminated or ionized air absorbs some of the energy of the electric waves and that that portion of the earth's atmosphere which faces the sun contains more ions than that which is in darkness.

Wireless During the Swedish Manœuvres

In compliance with a wish expressed by the Swedish Minister of War, the Telefunken Company, during the last army manœuvres, placed at his disposal three transportable military stations.

Preliminary tests were commenced on September 6th last, between Kärda and Falköping, over 90 miles distant, and from Kärda a smooth telegraph service could be established with Göteborg, over 100 miles, and with Karlskrona, over 110 miles distant. At night there could even be obtained a connection with Stockholm, 360 miles away.

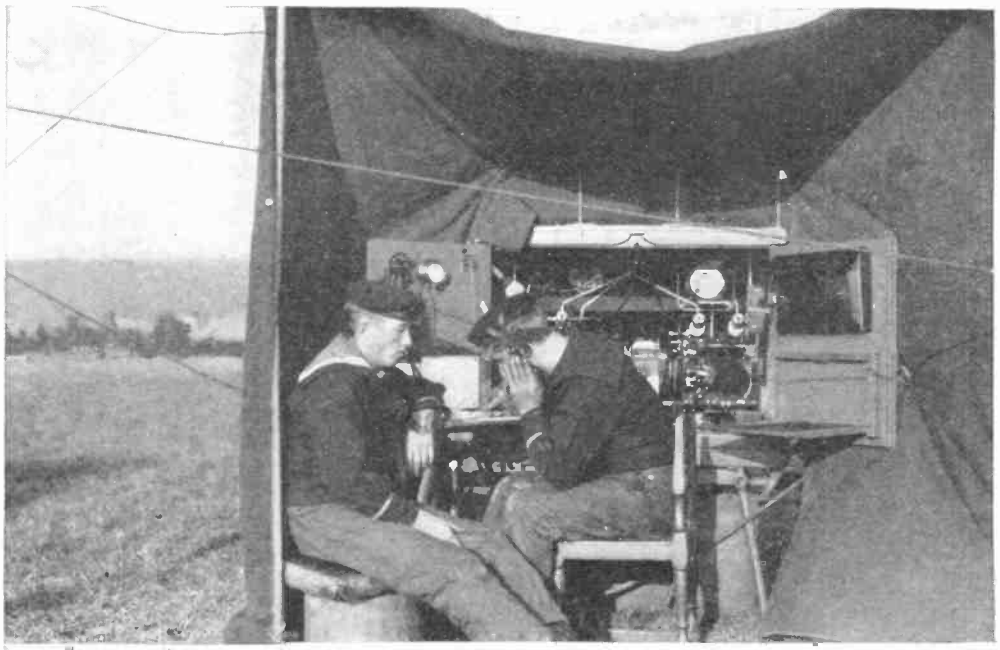
The army manœuvres commenced on September 30th and ended on October 5th. Two of the transportable stations and the third, designed to be carried on a horse and designated as the portable one, were distributed as follows: Transportable station I, with central headquarters; transportable station II, with general staff; portable, with the cavalry.

The two transportable stations always ensured a satisfactory connection both with one another and with the portable station. In view of the short distances (25 to 30 miles) quite inconsiderable

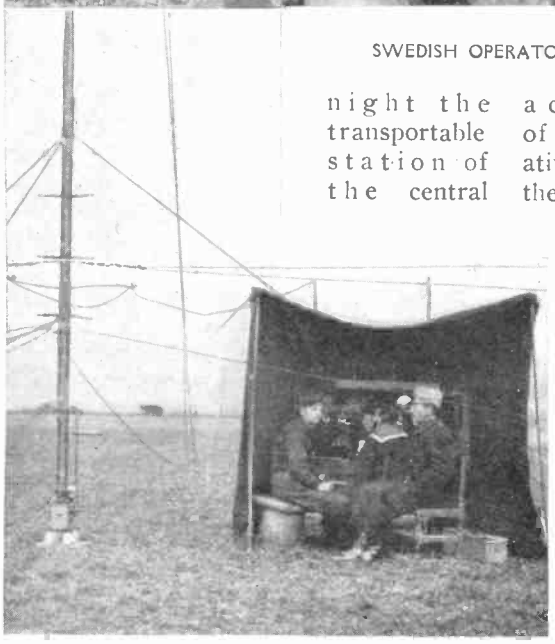
ERECTING A TRANSPORTABLE STATION IN THE FIELD; SHOWING ALSO THE PORTABLE EQUIPMENT CARRIED BY PACK HORSE

amounts of energy were employed throughout the time of the manœuvres. During intervals in operation the transportable station installed at Falköping and the portable station at Eriksborg communicated with Göteborg, over 80 and 58 miles distant, respectively. At night the transportable station of the central headquarters communicated with Karlskrona at 190 miles, with Stockholm at 145 miles, with Danzig, Germany, at 260 miles and with Norddeich at 380 miles distance.

Whereas the wireless stations during the first days—most likely on account of a certain lack of confidence on the part of the older officers—had to convey relatively few telegrams, they were during the last days temporarily strained beyond their powers.



SWEDISH OPERATORS ON DUTY DURING THE MANŒUVRES



Electric Waves for Lighting Lamps

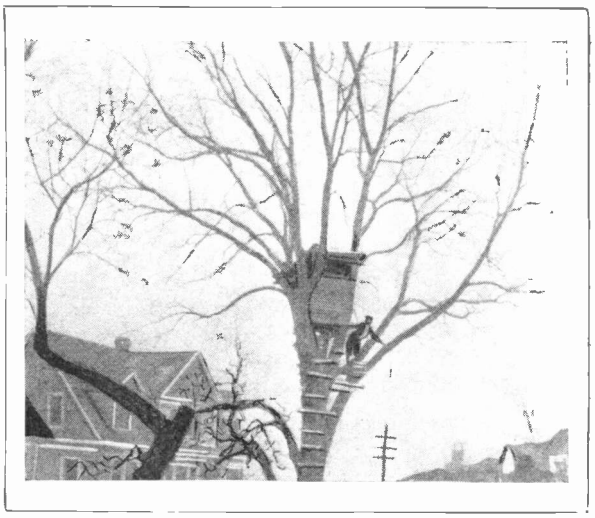
A German inventor, M. Grimmeisen, has perfected a method by means of which gas lamps can be lighted or extinguished by means of wireless electric waves. The receiving appliances attached to the lamps are adjusted for a wave of determined length.

Eyrie Office of the Robin Hood Club

About the most remarkable office of a wireless plant in the country is that on Mason Terrace at the crest of Corey Hill, Brookline, the highest hill immediately adjacent to Boston.

It's in the top of a lofty elm and overlooks the neighboring houses like the eyrie of an eagle.

This is the "Administration Building" of the Robin Hood Wireless Club of Brookline, an institution managed by a group of clever boys from the Devotion and Brookline High Schools.



THE EYRIE OFFICE

This office in a tree contains a telegraph instrument and this is connected by wire with the wireless plant which is located in the Di Pesa stable, some score of yards away.

From their office the lads can look off over the city of Boston and the Harbor, even beholding the hills of the north and, on a very clear day, with their marine glass, they can peer clear up to the mountains of New Hampshire.

The Di Pesa family, the famous restauranteurs of Boston, recently bought a grand estate lying near the crest of the hill, Summit Avenue, and Alfred, the grandson, Donald and Stewart Nixon, and other lads set about the institution of a wireless.

While they were equipping their plant in the stable, they said little as to where they were to locate the office, for they didn't mean to listen to any more lugubrations about the danger of construction than they had to.

When they began to nail strips up the side of a venerable elm and it became known that "those boys" intended to build a house "away up there" the mammas of the neighborhood were in a great flutter.

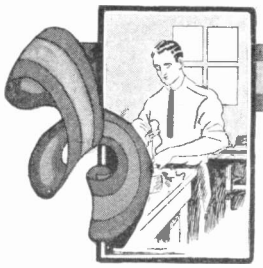
But a retired veteran fireman, who owns a handsome residence near by, was good enough to calm the critics and thereby gain the lasting admiration of the Robin Hoods. Indeed, he has been made an honorary member of the "Corporation" and declared he never had a greater honor.

"You can do it, lads, if you'll be careful and do your work right," was the fireman's injunction. "Spike on your scantling strong to them three forks of the tree and build so she'll stand."

Piece by piece, with anxious faces peering from many a window, the Robin Hoods spiked the foundation of their office into place. To the stout scantlings they nailed the sides and eventually had the roof on.

Finally, they could systematically clamber up the row of cleats and up through a hole in the floor of the eyrie and with their heads sticking out of small apertures serving as windows, they could survey the world, the flesh and the neighbors in victorious glee.

In order to confer the degree of honorary member upon the old fireman, the boys suggested that he would have to climb up there to receive his honors. But his old-time skill enabled him to "shin" up with a celerity that brought cheers of delight from the "directors" who watched the performance from start to finish.



For Practical Electrical Workers

Elementary Electricity for Practical Workers

By W. T. RYAN

Chapter II—A General Review of the Commercial Applications of Electricity

Electrical engineering may be defined as the industrial application of electrical and magnetic principles. The electrical engineer applies these principles to industry; the physicist studies them because of a desire to find some new principle which no one has yet found, and because of his love of science.

Electricity is a name given to a certain class of phenomena in Nature, and must be accepted as such, just as we accept the fact that when we throw a ball into the air it will fall to earth again.

It is often said that we do not know what electricity is, which is true. We do know, however, the effects it produces, we have discovered the laws which govern it and we are able to produce it, to control it and to use it.

The following is a synopsis of the important commercial application of electricity:

(1) Distribution of light and power.
(2) Transmission of signals and speech.
(3) Electro-chemical applications.
(4) Production of heat.

The above is what would ordinarily be considered their order of commercial importance. If they were arranged in the order of their importance to the human race and their effects on civilization, there is no doubt but that the transmission of signals and of speech would come first. Without electricity we could easily get our power from other sources. Electric motors could be replaced by steam and gasoline engines, etc. We could use gas, acetylene gas, petroleum, gasoline, etc., for the production of light. Without electricity we could not transmit signals great distances. Electrical energy is the only form into which sound energy may be converted, transmitted a long distance and then changed back again into sound energy. Without the telephone and the telegraph civilization itself would be set back a long way.

Distribution of Power and Light.

In the power station, mechanical power is first produced by waterwheels, steam engines, gas engines, or other forms of prime movers. These prime movers are connected to electric generators or dynamos which simply change the mechanical energy already produced into a form in which it may transmitted a considerable distance through copper wires with only a small loss. The important point is that the electric generator only converts mechanical power already produced into another form known as electrical power. It does not produce or generate anything, it merely converts.

At the end of the transmission line, this new form of power is received by electric motors and converted back into mechanical power and utilized for such purposes as driving street cars, running lathes, printing presses, etc.

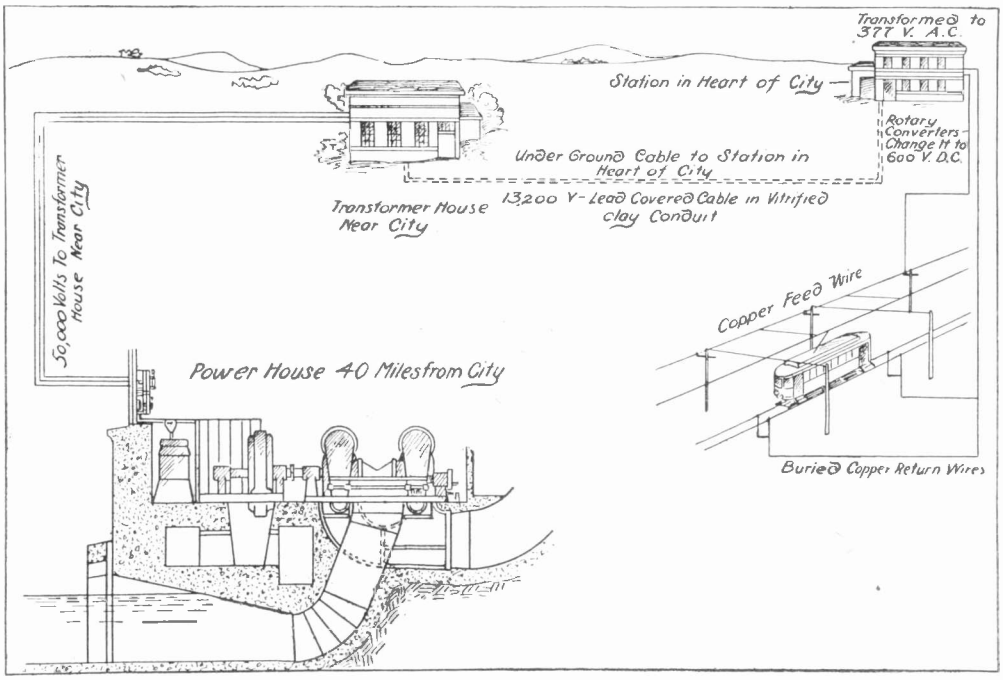


FIG. 1. GENERAL SCHEME OF A POWER TRANSMISSION AND RAILWAY SYSTEM

A good example of the distribution of power is a street railway system. Mechanical power is produced by, say a waterwheel 40 miles away. A generator changes the form of energy into electrical energy at a certain potential or voltage. By transformers this voltage is raised to say 50,000 volts. It is transmitted by means of three wires say one-half an inch in diameter to the limits of a city whose population is 200,000. Here in a transformer house the voltage is reduced again to say 13,200 volts and it is transmitted under ground through lead covered cables in vitrified clay conduits to a station in the heart of the city where its pressure is again changed from 13,200 to say 377 volts. This 377 volt current is then supplied to a rotary converter which changes it from 377 volts alternating current to 600 volts direct current. This 600 volt direct current goes out of the station through copper wires to the trolley wires, then down through the trolley into the motors which are devices for changing it back to mechanical power. This mechanical power is utilized to drive the street car. The current returns to the power house through the rails, which are of course "grounded," one terminal of the direct current machine in the station also being "grounded." Figure 1 shows the general scheme of such a system without going into all the numerous accessories such as switching and measuring devices. In this case, a buried copper return wire is shown which is used often in cities to prevent electrolysis.

We thus see that in its application, electric power may pass through a number of successive steps: its conversion from mechanical power, transmission, transformation, transmission again, another transformation, change of form, distribution and utilization. The requirements regarding its character imposed by these successive steps are usually different and frequently contradictory. The design of the whole system must, therefore, be a compromise. Utilization, for instance, usually re-

quires a low voltage, 110 to 600 volts. On the other hand economical transmission requires as high a voltage as possible (roughly 1,000 volts per mile).

When electricity passes through a conductor, heat is produced. The amount generated depends upon the nature of the material and its dimensions. It is evidently harder to force a given current through a long conductor of small area than through a short one of large area. When the amount of heat generated in any part of the current is great enough, incandescence is produced. For example in the tungsten incandescent lamp a filament is heated in a vacuum to a temperature of approximately 2,250°C., with the result that light is given off. In the arc lamp, current flows between two carbon rods, Fig. 2, separated by a short distance (⅛ to ½ inch) and connected by a stream of ionized air. The current in overcoming the resistance of the ionized air heats the ends of the carbon rods to such a temperature that they become incandescent. As carbon is one of the most refractory substances we have, the arc temperature is extremely high, sometimes over 3,000° centigrade.

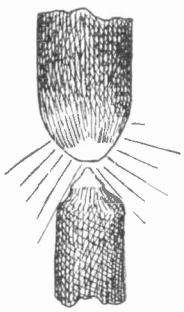


FIG. 2. ARC LAMP ELECTRODES

All of the radiation from any hot substance may be resolved into parts, each of which is a train of ether waves of definite wave length. All of these parts have one common property, i. e., they produce heat in any substance which absorbs them. Hence all the radiation from a hot body is properly called radiant heat. That part of the radiation whose wave lengths lie between 40 and 80 millionths of a centimeter affects the optic nerves and gives rise to the sensation of light. Even in a tungsten incandescent lamp this is only about eight per cent of the total. As you know, a steam engine will convert only ten to fifteen per cent of the heat of combustion into work. Therefore, scarcely one per cent of the coal used in electric light plants is at the present time actually converted into light.

Light obtained as indicated above is said to be due to phenomena of incandescence and its intensity has a definite relation to the temperature. As a method of producing light, incandescence is characteristic of solids and liquids. Gases also produce light by incandescence when small particles of solid carbon are liberated in a flame and remain incandescent until consumed by oxidation or carried away as smoke. When gases become luminous under the influence of certain electrical and chemical stimuli, as in the Geissler tube, in luminous arcs and in the sodium flame a very different phenomenon of light production is obtained. It is supposed that these stimuli break up atoms of the gas, causing them to release their constituent electrons and to project them with a velocity approaching that of light into the surrounding gas, thus inducing vibrations characterized by light emission. The phenomenon is known as luminescence. Luminescent light sources are now attracting very much attention and may in time displace other forms. As a rule they are more efficient than incandescent sources.

A good non-electrical example of luminescence is the Welsbach gas mantle. The thorium oxide contained in the mantle when heated to a comparatively low temperature gives off light.

The mercury vapor lamps, Fig. 3, the vacuum tube, flaming and luminous arcs are the principal examples now in use of electrical illuminants involving luminescence.

TRANSMISSON OF SPEECH AND SIGNALS.

Electricity is the only feasible means by which speech and signals may be transmitted long distances. In the telephone the strength of the current is varied, whereas in the telegraph its dura-

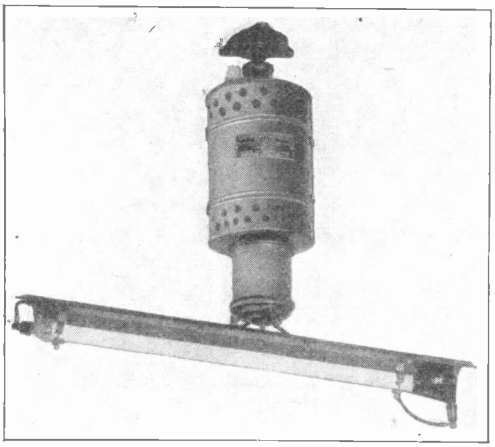


FIG. 3. THE MERCURY VAPOR LAMP

tion is varied. The bare essentials in a telephone circuit are the transmitter, a battery and the receiver. In the transmitter are carbon granules the pressure upon which is varied by the vibration of a disk under the action of the sound waves impinging on the diaphragm against which the speaker talks. This variable pressure upon the granules varies the resistance and therefore the amount of current in the circuit. In the receiver there is an iron diaphragm placed near

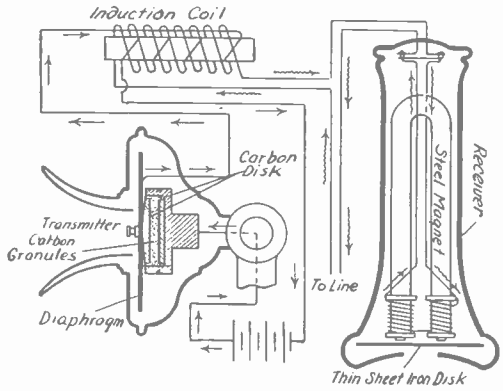


FIG. 4. ESSENTIAL FEATURES OF A TELEPHONE TRANSMITTER AND RECEIVER

the end of an electro-magnet. This electro-magnet is actuated by the varying current from the transmitter, therefore attacks the receiver diaphragm with a force that varies as the current, thus reproducing the sound waves. Figure 4 shows the essential features of the telephone transmitter and receiver.

As said before, this is only the principle of the telephone. Upon this principle has been built up all of the marvelously intricate details of a complete telephone system.

The essentials of a telegraph circuit are a battery, a key, and a sounder. The key closes the circuit for long (dashes) or short (dots) intervals. Combinations of these signals represent the letters of the alphabet. The diagram, Fig. 5, illustrates the essential parts.

ELECTRO-CHEMICAL APPLICATIONS

When current is passed through a salt or between electrodes immersed in a liquid, decomposition of the salt or

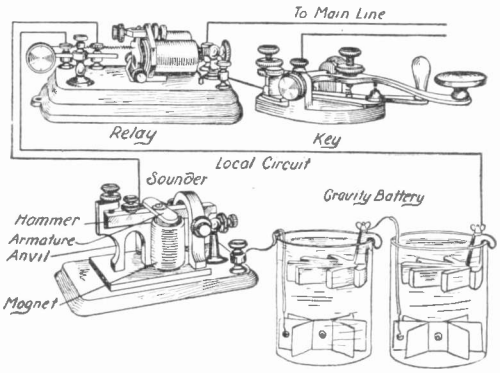


FIG 5. ESSENTIAL PARTS OF A TELEGRAPH CIRCUIT

liquid usually takes place. The storage battery is undoubtedly the most important electro-chemical application to engineers. Primary batteries, the refining of copper, and the oxy-hydrogen generator are other important applications.

PRODUCTION OF HEAT

Light, in incandescent lamp sources, is only a by-product of heat, but there are certain other applications, such as cooking, ironing, warming, etc., which are becoming quite popular. These devices are of very simple construction, consisting merely of a high resistance surrounded with insulating material and imbedded in the body to be heated. This method is highly efficient, as practically

all the electrical energy is turned into heat. We cannot afford to heat our houses with electricity at the usual rates, as it would cost more than it does to heat them with a furnace. We can afford, however, to take the chill off a room and give it a cheerful appearance. We can

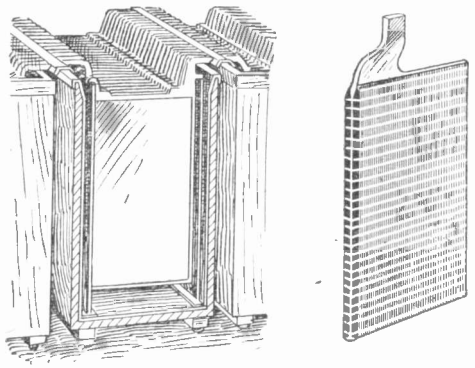


FIG. 6. CROSS SECTION AND ONE PLATE OF A STORAGE BATTERY

also afford to heat sad irons, and various cooking utensils, since we do not need to heat the top of the stove and the surrounding atmosphere at the same time that we heat the iron. The use of such devices as broilers, chafing dishes, cigar lighters, coffee percolators, water heaters, corn poppers, curling iron heaters, disk stoves, foot warmers,

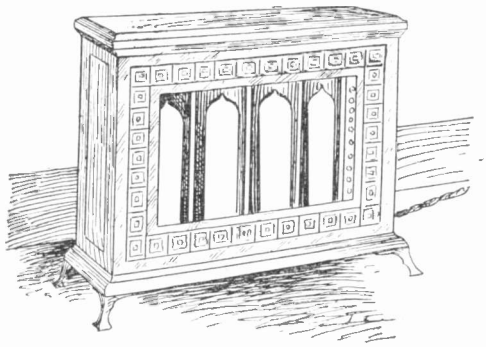


FIG. 7. ELECTRIC LUMINOUS RADIATOR

sweating blankets, tea kettles, warming pads, nursery bottles, waffle irons, etc., not only popularize the use of electricity but they increase the income of the central station very considerably.

Figure 7 illustrates an electric luminous radiator which consumes one kilowatt. If current costs six cents per kilowatt hour, it will cost six cents an hour to operate this radiator.

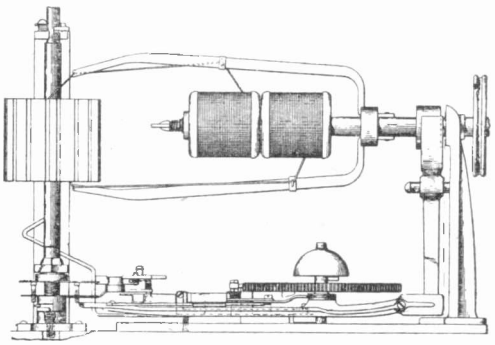
By means of the electric arc and the passage of current through high resistances it is possible to produce reactions not otherwise possible. The making of artificial graphite and of carborundum are good examples of the tremendous heating effects of electricity.

(To be continued.)

Machine for Winding Armatures

This odd looking machine is designed to perform the work of winding slotted armatures and the inventor is Frederick N. Pike, of New York City.

The ordinary method of winding such armatures is by hand, mounting the spindle between lathe centers and turning



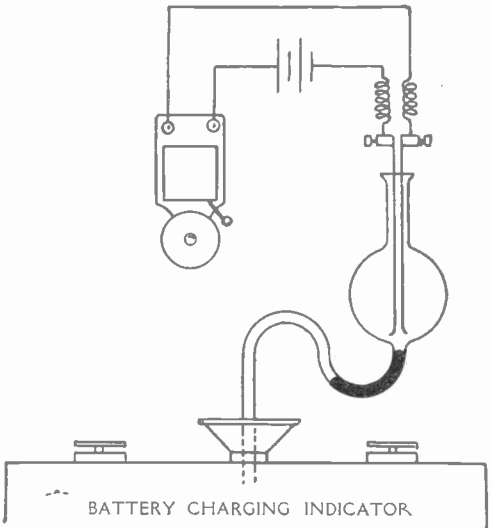
ARMATURE WINDER

the spindle in the centers as the conditions of winding require.

In the apparatus shown the spindle rests in fixed centers and is capable of automatic rotation. The winder is so directly connected with the spindle adjusting mechanism that, after the wire has been laid in a groove, the spindle is automatically shifted the proper number of degrees of rotation to suit the armature. In this way, when the wire is laid in the second part of its revolution it reaches a slot not directly opposite the first slot, but adjacent to it.

Battery Charging Indicator

This apparatus is very simple; it utilizes the pressure of the gas which is disengaged when the charging of the storage battery is completed. Into a glass tube which has been bent twice a small quantity of mercury is poured; this



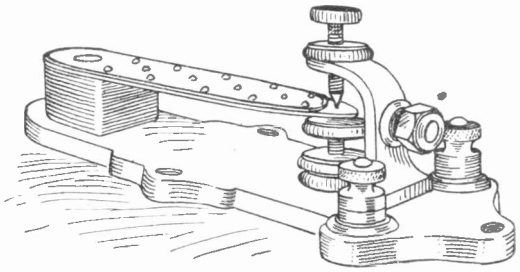
BATTERY CHARGING INDICATOR

mercury is in connection with the space above the battery, which is enclosed. When the charging is complete and gas in excessive quantities begins to be given off, the pressure pushes the mercury in the tube until it forms a connection between two wires which form part of the circuit of an electric bell. A sort of safety valve is also provided for the escape of any accidental sudden pressure, caused for instance by the pressure of the stopper or by the sudden expansion of heated gas.

Greenhouse Temperature Alarm

One of the chief requisites in conducting a successful greenhouse business is that the temperature remain within certain limits.

The Mesco adjustable thermostat is designed to give warning of dangerous temperature changes. The necessary apparatus consists of a thermostat, two batteries, bell wire, switch, tape and staples. The thermostat is located in the greenhouse and set to sound the alarm when certain temperatures are reached. The



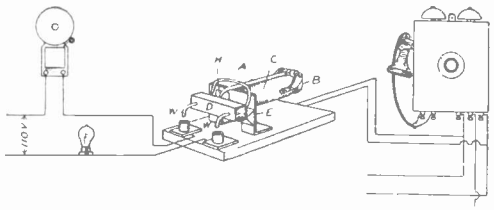
THERMOSTAT FOR GREENHOUSE ALARM

bell is usually placed in the keeper's room. The device works on the expansion-with-heat and contraction-with-cold principle. A blue print showing the wiring connections and directions for installation accompany each outfit so that anyone can connect it.

Power House Extension Bell Circuit

The accompanying arrangement we use in the power house for ringing a twelve inch extension bell when the telephone bell rings. The bell and a 110 volt lamp are in series and the leads from the telephone operate this device for closing the 110 volt direct current circuit.

In the diagram (D) is a drop, consisting of a fiber stick which carries a piece



EXTENSION BELL CIRCUIT

of No. 8 wire bent as shown and hinged to the support (E). This support also holds a solenoid (C), the terminals of which connect to the telephone wires as indicated. When the telephone bell rings, the solenoid attracts armature (B) which is rigidly connected to arm (A). This releases the catch at (H) and the bare ends (W) of the wire drop into the two mercury cups thus closing the circuit of the second bell.—MARSHALL LOKE.

Making a Hammered Copper Table Lamp

The following directions for making a hammered copper table lamp may also be considered as general hints for working copper or brass.

The hammering should be done before the work is cut to exact size, as the metal is stretched during this operation. The only exception is in case metal is to be "raised," which will be explained later. The hammer, Fig. 1, should have

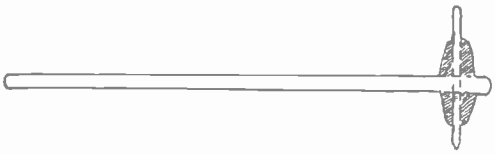


FIG. 1. SMALL RAISING HAMMER

a round nose about the size of a hazelnut and should be polished with fine emery and crocus paper until free from marks and possessing a mirror finish. The copper should be held on a smooth, hard wood block and struck with the nose of the hammer as uniformly as possible to give a regular succession of hammer marks all over its surface.

During this process the metal becomes stiff and warps out of shape. To straighten, heat to redness over the burner of a gas stove or in a coal range, plunge into cold water and hammer gently on the convex side with the flat end of the hammer covered with leather, or use a wooden mallet. This will bring it back to a perfectly flat surface. The process of softening is called annealing and will be designated by that term hereafter.

After the copper has been prepared by hammering, the work should be laid out on it with a sharp nail or scratch awl. Be careful as precise work will save time in trying to fit inaccurately cut parts. Tin snips are best for cutting, but a sharp cold chisel and a block of hard wood will answer for a small amount of work. A small three cornered file will work out awkward corners that cannot be readily cut. Very light weight copper, twelve ounce or under, may be cut with ordinary scissors. Holes may be drilled with an ordinary brace and twist drill bit.

In all sheet metal work there is a great deal of soldering to do and the soldering iron should be kept in good condition, hence a few words as to its care. Procure a few ounces of commercial hydrochloric acid, some scrap zinc and a piece of sal ammoniac two or three inches square. Pour about two ounces of hydrochloric acid in a water glass and place in it as much zinc as the acid will dissolve. This produces what is commonly known as "soldering acid." In another glass of water dissolve a piece of sal ammoniac as large as a hickory nut; this is used to clean the iron when taken from the fire. The iron must first be "tinned" on the point so that it will pick up and hold solder. This is accomplished by heating it to a faint red, filing every side of the point bright and rubbing it on the block of sal ammoniac together with a little solder. If properly done the iron will have a bright coating of solder all over the point and can be kept in this condition by being careful not to overheat and by plunging the tinned end into the sal ammoniac solution for an instant when removing from the fire before starting to solder.

In art copper work all soldering should be done on the inside when possible but it will sometimes be necessary to solder on the outside and in this case as little solder as possible should be used and the surplus scraped off with a knife. Use the soldering acid freely on surfaces to which solder is to be applied and if the iron is hot and the surface clean, no trouble will be experienced by solder not adhering.

For bending copper a wooden mallet or a hammer covered with leather should be used to strike the metal and the bending should be done over the edge of a hard wood block, working gradually all along the edge of the piece, forming

first a slight bend and finally securing as abrupt a turn as necessary.

Ornaments consist usually of medallions and rivets. Use ordinary copper trunk rivets and give them an antique effect by hammering the heads into irregular shapes. A little practice and a few spoiled rivets will enable almost any one to form heads of any desired shape.

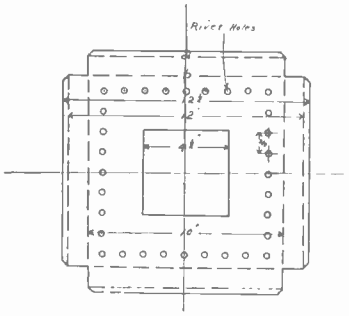


FIG. 2

Practice on waste scraps of copper before making medallions. This work requires that the metal be "raised." The term "raising" here indicates that a plane surface is shaped into a convex or concave one. To raise a piece of work the hard wood block must be prepared

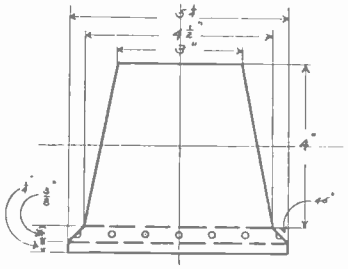


FIG. 3

by making in it a depression about the size of a dollar for small work and sloping gradually from the edge to the center—in fact, just such a hollow is needed as would be left by a large ball if it fell upon the block and made a dent. A few irregularly shaped depressions will also be necessary, such as one shaped like the bowl of a spoon. The work to be "raised" is first cut to the shape desired then held on the block in a slightly elevated position so that its edge rests on the surface of a depression whose form is nearly the same as the edge to be raised. Then it is hammered lightly with the round nose of the hammer, keeping

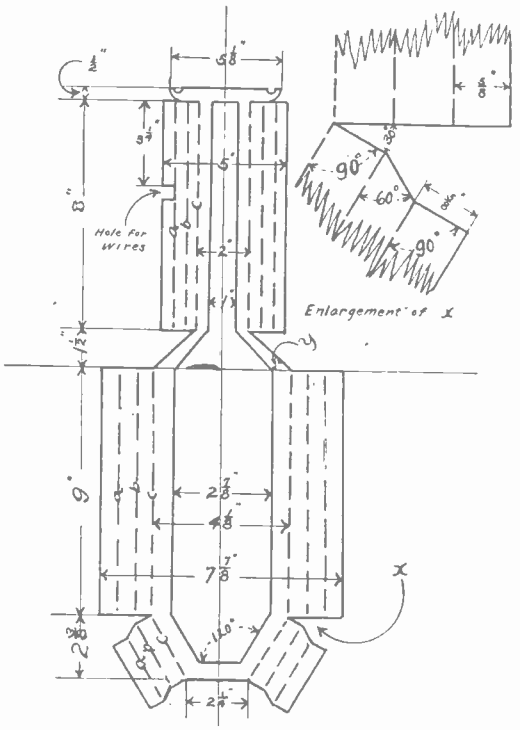


FIG 4

in mind the fact that a large number of light blows will result in more even work than a few heavy ones. Work all around the edge and each time around a little nearer to the center line or point of the piece. If the metal becomes too hard, anneal before proceeding.

For small work a small hammer will

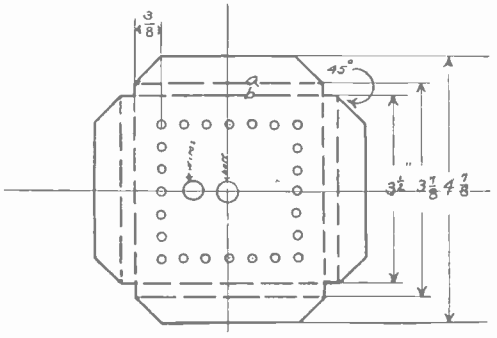
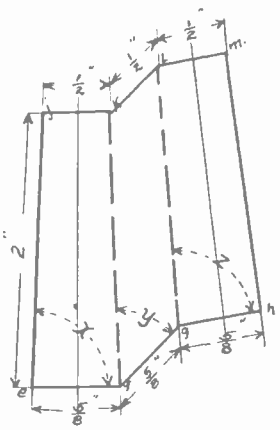


FIG. 5

be required. A piece of broom handle, a heavy wire nail and some solder is all that is necessary to make it. Fig. 1 shows how these are put together.

When the piece is satisfactorily raised,



This pattern fills shoulder of pedestal
Lay out this piece before folding Fig 4.
Make angle Y equal to Y in Fig 4.
Make angle X equal to Z.
Lines e-f-g-h are paralell to j-k-l-m.
Cut two pieces by this plan.
Fold one with lines on outside and one with lines on inside whichwill fill both shoulders of pedestal.

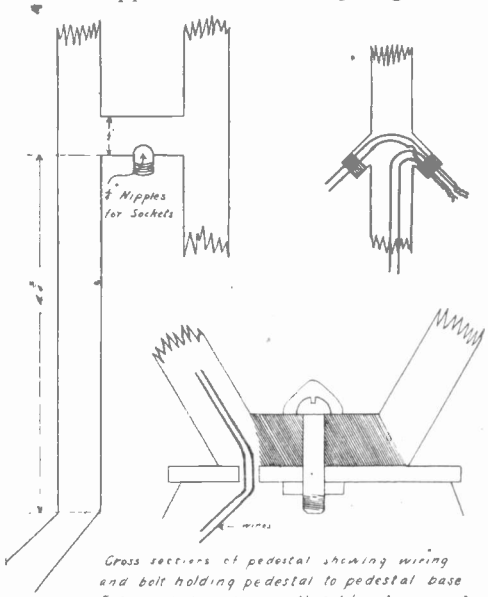
FIG. 6

daub the inside with soldering acid and fill with solder, then lay it flat on a piece of iron and mark the copper with the hammer and it will have the appearance of having been forged from a piece of heavy copper. Light copper, ten or twelve ounce, will work easily and give good results. The medallions are fastened by laying them in place and applying a hot soldering iron, which causes the solder on the under side to melt and adhere firmly provided the part to which it is to be fastened has been "tinned" and well daubed with soldering acid.

If copper is left exposed to the atmosphere it will gradually oxidize, but this process may be hastened by chemical means. Before this is attempted, however, all solder showing on the work must be covered.

A piece of copper sulphate the size of a walnut dissolved in a glass of water, acidulated with half a teaspoon of hydrochloric acid and applied with a piece of cotton to the solder will give a very thin coating of copper. This will cover the solder so that it will be scarcely noticeable after coloring, but a better result can be obtained by having the whole lamp copper plated at a plating works. Plating should not cost over $1.50 or $2.00.

Half a thimbleful of potassium sulphide dissolved in two quarts of water and applied with a piece of cotton will darken copper and if the high lights are



Cross section of pedestal showing wiring and bolt holding pedestal to pedestal base Fill shaded portion with solder to prevent crushing by bolt

FIG. 7

polished off with finely powdered pumice stone and water, a very pleasing result will be obtained. This may be made permanent by applying a coat of fixture lacquer which may be obtained at any electrical fixture store.

The drawings show how to make the hammered copper table lamp illustrated. All heavy black lines show where the metal is to be cut; dash lines, where to

bend; dotted lines, angles. Light solid lines are dimension and center lines. Bend dash lines in the order in which the letters of the alphabet appear; thus, line (A) first, (B) second, etc. Use for the body of the lamp eighteen or 20 ounce copper. Parts shown in Figs. 2, 3, 4, 5 and 6 should be made in the order named and the lamp built up as the work proceeds. Fig. 7 shows the wiring. This provides for two electric bulbs, but the wires need be run up only one side of the pedestal and then run from one outlet to the other. About ten feet of electric fixture wire will be needed and it can be fished through by dropping a thread with a buckshot on the end down through the pedestal and by means of

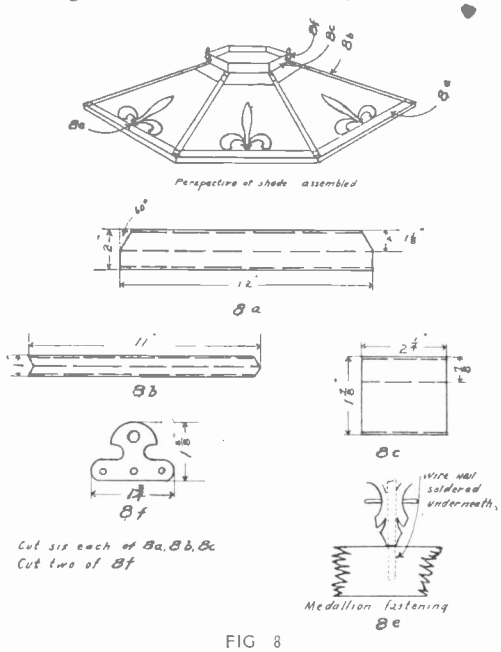


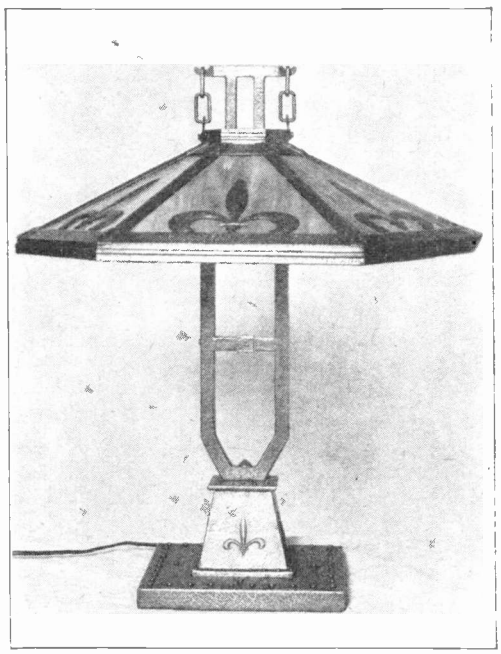
FIG 8

this drawing through a heavy cord and with the heavy cord drawing in the fixture wire.

The cross bars in the pedestal are squares of metal folded into tubes.

The covering for the bolt head is a circle of metal with one segment cut out, folded into a cone, soldered on and hammered to give it the appearance of a copper bolt head.

Fig. 8 shows the details and assembled view of the shade. The dash lines close to the edges of (8a), (8b) and (8c) show where the metal is to have about 1/16 inch of its edge turned over to give it the appearance of thickness. For a small charge a tinsmith will run a bead on these pieces, as shown on the shade in the illustration, but this is not essential. The angles at the corners of (8a) and (8c) are purposely cut so that they will not meet, as they are covered by the piece (8b) and leaving these open gives an opportunity to soldier (8b) into place from underneath before riveting, making the work easier. Solder the six pieces (8a) together first, then (8c) and join the two with the pieces (8b). No drawings are given for medallions as individual taste may be exercised. The glass is fastened under the shade by means of small copper lugs soldered on the under side.



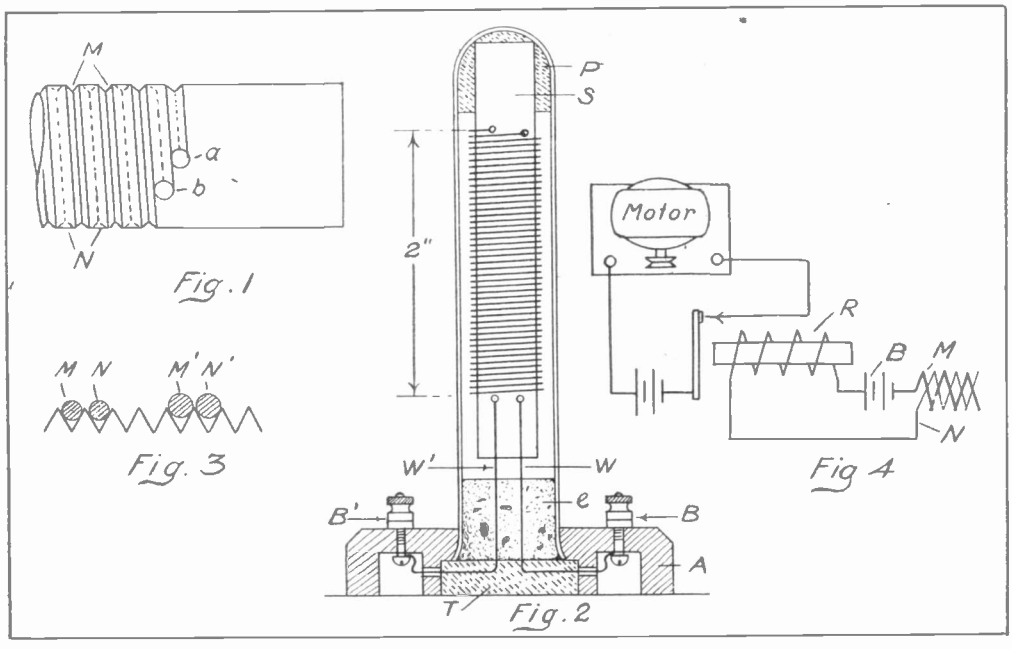
LAMP COMPLETED

To Make a Selenium Cell

Procure a round slate rod ¾ inch in diameter and four inches long or get a square rod and turn in a lathe to the above dimensions. Cut two separate spirals on the rod by putting it in the chuck of a lathe. Begin one inch from the end, using a tool for cutting V threads and cut for a distance of two inches along the rod. The depth of the thread should be 1/64 inch and the lathe should be fed at such a speed that the distance between the centers of adjacent convolutions is 1/16 inch. This cut is shown at (M), Fig. 1, which represents a portion of the slate rod. A second similar spiral is now cut exactly half way between the convolutions of the previously cut spiral. The length of this spiral along the rod is also two inches. A portion of this spiral is represented by the dotted lines (N), Fig. 1.

At each end of each spiral (M) and (N), a 1/16 inch hole is drilled diametrically through the rod as at (a) and (b). The hole (b) should be drilled at a slight slant so that the other end of the hole is nearer the end of the rod to prevent it from coming out through the spirals.

Each spiral is wound with a separate piece of brass wire. To wind spiral (M) one end of the wire is thrust through the hole (a) until it projects about ¼ inch on the other side. The projecting piece is then bent at right angles to the hole, preventing the wire from unwinding from the rod. Wind the wire tightly on the spiral (M) until the hole at the other end is reached. Thread the wire through this hole leaving about six inches to use for one terminal (W), Fig. 2. Another wire of the same size as on (M) is wound on the spiral (N) leaving an extra six inches for a terminal at (W'), Fig. 2. As it is improbable that every one constructing this cell will cut the spirals to the exact dimensions given, the size of wire to use is not stated because this depends upon the distance apart the two spirals are cut. The smaller the distance between adjacent convolutions the more sensitive the cell. The feature



DETAILS OF A SELENIUM CELL

about this cell is that by increasing the size of the wire the distance between adjacent convolutions can be made smaller. This is illustrated in Fig. 3. It is therefore left to the constructor to choose the size of wire that suits his requirements for making the distance between adjacent wires as small as possible. This distance should not be greater than 1/64 inch and the distance between the adjacent convolutions of the two spirals which were cut on the rod should not be so great as to require wire larger than No. 24 B. & S. gauge. No two adjacent windings must be allowed to touch each other. Before winding on the rod the wire should be thoroughly cleaned with sandpaper or emery cloth. The selenium used is the kind that comes in sticks. It can be obtained from most dealers in wireless telegraph supplies at small cost.

The rod with its windings is laid in a crockery dish and set in an oven, or a blow torch flame is held against the under side of the dish until the wire on the rod is hot enough to melt the selenium. This can be ascertained by touching the wire with the selenium. When this temperature is reached the rod is removed from the dish and the wire on it is covered with a thin film of selenium by rubbing the selenium stick over it. By using a knife with a thin steel blade the spreading of the selenium may be facilitated. When heating the rod care must be taken to prevent the rod from getting too hot in which case the selenium will form into globules and behave in a manner very much like mercury.

It is necessary to anneal the selenium on the wire. Put a brass plate on a tripod and place a strip of mica on the plate. The rod with the selenium covered wire is laid on the strip of mica. A blow torch is set under the tripod and the size of the flame is slowly increased until the whole surface of the selenium has turned to a dull gray color. Cautiously the size of the flame is increased until signs of melting appear. The torch is now quickly removed and the flame lowered. In a few seconds, when the dark gray spots have hardened, the burner is replaced and left for two hours, during which time the temperature of the selenium should be only a few degrees below the melting point. The selenium is then allowed to cool very slowly by gradually lowering the size of the flame over quite a period of time, at least 30 minutes.

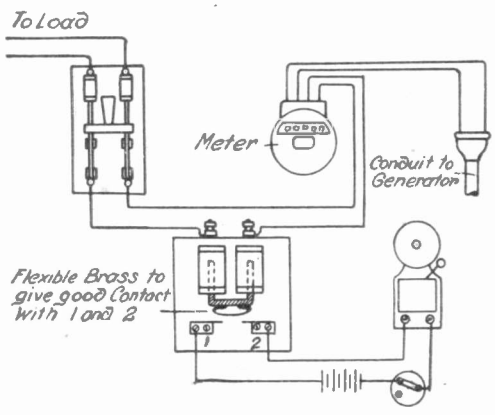
The cell is now mounted in a test tube 1 by 6 inches. A piece of sealing wax the size of a half inch cube is melted in the tube and the cell end placed in this, the end with the wire terminals being at the open end of the tube. In Fig 2, (P) represents the sealing wax and (S) the cell. The open end of the test tube is closed by a cork (C) two holes having been pierced through it with a red hot hat pin for wires (W) and (W').

The base (A), shown in section, is made of wood and is 4 by 4 by ¾ inch. A 1¼ inch hole is drilled half way through the center of the base, the remainder of the distance being bored with a bit just large enough to allow the cylindrical part of the test tube to go through but not the flared part. The terminal wires are connected to binding posts (B) and (B'). The instrument is now held upside down and melted sealing wax is poured over the corked end of the test tube at (T). This will prevent any moisture from entering the test tube and will also hold the test tube more firmly to the base.

A diagram for wiring is shown in Fig. 4. (M) and (N) represent the two windings of the cell. (R) is a relay. When the cell is in darkness no current will flow from the battery (B) through the cell because of its high resistance in the dark, but as soon as a ray of light falls on the selenium its resistance is lowered, allowing current to flow through it between the windings (M) and (N) operating the relay and its armature and starting the motor.—W. H. DETTMAN.

When Load Goes Off

This arrangement is used in a light and power plant to warn the operator when the load goes off. A pair of heavy current coils with a U-shaped armature is placed in series with one side of the circuit. When the load is on the line the

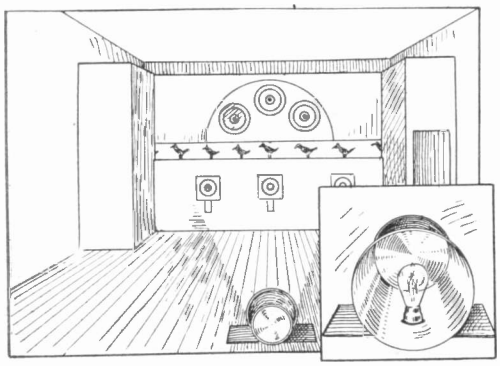


INDICATOR FOR POWER CIRCUITS

armature is drawn up into the coils by the current flowing through them. The moment the load goes off and there is no current flowing in the line the U-shaped piece drops upon the two brass contacts, (1) and (2), closing the battery circuit and ringing the bell.—MARSHALL S. LOKE.

Home-made Target Light

The proprietor of a shooting gallery received many complaints from his patrons that the light from the two electric lamps which were hung in front of the

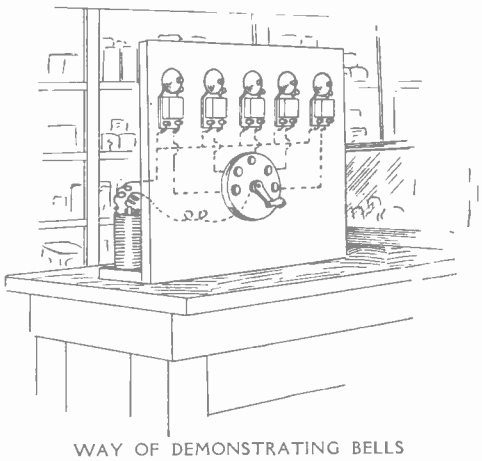


LIGHT FOR TARGET GALLERIES

targets and birds shone in their eyes. A scheme which righted this is as follows: He purchased an ordinary four quart tin bucket and cut a hole through its side. He then nailed the bucket to a board and fastened to it a porcelain lamp socket through the hole which he had cut in the side of the bucket. When a large 250 watt lamp was used and the board fastened at the floor so that the light from the lamp would fall upon the targets but none into the eyes of his patrons, he had a good light on the targets, no more complaints and his patronage increased.

Demonstrating Electric Bells

The way we show a customer electric bells in our shop is to have one bell of each kind and size mounted side by side on a board. A wire connects with the



WAY OF DEMONSTRATING BELLS

left hand binding post of every bell and with one pole of a dry battery. The other pole connects with the arm of a switch having as many contacts as there are bells. Then there is a wire from each of these points to the right hand binding post of each successive bell. In order to show the customer the ringing powers of any bell, all we have to do is to move the switch to the contact corresponding with that particular bell. This saves considerable time in making a sale and is very satisfactory.—MARSHALL S. LOKE.

Electrical Securities

By "CONTANGO"

Further Consideration of a Company's Balance Sheet — the Liabilities

The first thing to be made clear, and it is a point as a rule understood not at all by the general public, is that the principal liabilities of any incorporated company are the stocks and bonds outstanding. Not just the bonds, let it be reiterated, but the stocks—shares of stock—and the bonds. Therefore the first liabilities to be considered are:

CAPITAL LIABILITIES

These consist of the amount of stocks and bonds outstanding. Notes maturing within a year may also be included in this account. But so generally are people unfamiliar with financial affairs and terms that they may be misled by the scheming and dishonest type of promoter who points to the heavy capitalization figures of his particular company, as though this capitalization were money.

"A fifty million dollar corporation," he says glibly enough. This may or may not mean much. His statement should be analyzed very carefully, as it may turn out that there is a good deal of wind and much water in it. This is possible even in the case of reputable and really substantial organizations — substantial from the viewpoint of credit and financial backing.

On the other hand, to illustrate the opposite extreme, one would mention the case of the First National Bank of New York which has never had a stock capitalization of over $100,000 and yet is today one of the richest banks in the world, returning thousands per cent annually on its capital stock. It has indeed done so since its foundation.

If one had a true financial basis for any company it would be that its capital assets and capital liabilities should agree; that is to say, be on an exactly equal basis. But in actual practice this is not likely to obtain for the simple reason that capital stock—and it must never be forgotten that this represents a liability—is so often boosted up into enormous proportions for controlling or promoting purposes. The stock may be issued at a discount and much of it may be given away as a bonus. Accepting these conditions, it is easy to understand that care must be exercised not to judge a corporation merely by its huge capitalization, for all is not gold that glitters.

CURRENT LIABILITIES

These should and rightly do include some of the most important accounts in a balance sheet and include: Negotiable Bills, Payable or Receivable, which are usually short time or demand notes, practically commercial paper, interchangeable between firms or banks and issued for borrowing purposes; Accounts Payable —that is to say, money owing for supplies and material, payrolls and the like.

Now here is a very important point. Although some corporations show taxes, interest and dividends accrued and to come due under the separate head of "accrued liabilities," it is best to regard them as current, even though they may not be actually due. And similarly interest, dividends and other accrued receivables should be placed on the other side of the balance sheet as part of the current assets.

And this suggests the point that a company's "working capital" may be ascertained by comparing the respective totals of the current assets and current liabilities. If the former are the larger then that represents the working capital

But when the total of the current liabilities exceeds that of the current assets the difference represents the formidable item known as:

FLOATING DEBT

The fact of whether a company has working capital or a floating debt is most important. All companies in a really sound financial position should have plenty of working capital, but of course it must be remembered that as a public service corporation does a business which is practically cash it does not require such a large working capital as a manufacturing enterprise. One can very well illustrate this by pointing out that during the panic of 1907 the big public service corporations of such cities as Chicago and New York were in a very advantageous position by reason of their incoming cash which came in faster than they had to pay it out. When even banks were tied up, they were not, and their securities stood firm. The next item to be considered is that of:

DEFERRED LIABILITIES

which according to the best authorities are defined as "Reserves"—that is, sums set aside out of earnings to meet special contingencies. Some of the purposes of such reserves are as follows: to offset depreciation in the value of physical properties from wear and tear; to provide for special repairs or equipment; to allow for loss from bad accounts, fire losses and accidents and the like.

CONTINGENT LIABILITIES

As the name implies, this represents sums for which a corporation may or may not be held liable, according to circumstances. Usually, contingent liabilities are guarantees of principal or interest of a bond issue of a subsidiary corporation, or the guarantee of dividends on the stock of another company. If the subsidiary company earn enough to pay its own interest charges or dividends, so much the better. But if the subsidiary company fails to earn enough to meet such charges then the guaranteeing company is held responsible and the liability at once ceases to be contingent and becomes current.

It will therefore be apparent that a corporation's obligations in the way of guarantees are very well worth looking into. Thus there are some corporations, more particularly railways, which would be placed in bankruptcy were they forced, by default on the part of subsidiary companies, to make good all or even a considerable part of their guarantee obligations.

DEPRECIATION

This represents the direct allowance made by a corporation for the loss of value in its plants by reason of regular wear and tear. Corporations sometimes avoid this particular account by declaring that they spend sufficient money on repairs, renewals and improvements, as part of their regular operating expenses, to offset any depreciation. Other companies claim an enhanced value in their property holdings as an offset to this liability. The investor should, however, get very clear proof of this for the simple reason that the life of the average electrical plant, as from the time it was started, is not more than fifteen years. That is to say, if nothing were done and the plant were allowed to be in service for that length of time without renewals of any kind, it would at the end of fifteen years be worth nothing except as mere junk, over and above, of course, the value of the property on which it might stand. In the case of electrical concerns, the constantly changing character of the machinery must too be kept in mind. Though actual depreciation in the case of many large concerns does not amount to much by reason of proper repair and renewal work, yet the average loss, taking public service corporations, should be set at not less than three per cent per annum, when you include the distributing system. You may then allow on this basis three per cent off the values of assets every year by reason of depreciation. When a corporation lumps or consolidates its plant accounts with its intangible assets it serves the double purpose of concealing capital as-

sets and the amount of water in its total capitalization. It also prevents the investor from determining the actual rate of depreciation which is being charged off.

SURPLUS

There is probably more misunderstanding of the "Surplus Account" than any other item on the balance sheet.

If a company's total assets exceed its total liabilities, including outstanding stocks and bonds, the difference is the "surplus," sometimes called profit and loss surplus. But it must be clearly understood that surplus is not all cash. On the contrary, there may be and oftentimes are conditions where a corporation may have quite a large surplus, a legitimate surplus, and yet not a dollar of a cash surplus. Roughly speaking, it is best to consider "surplus" as representing the difference in favor of what a corporation owns and what it owes; that is to say, when an examination of its books will show that it is solvent and has a balance or surplus in its favor. Nothing can be paid out of surplus, though dividends and other disbursements may be charged against it, which is quite a different matter. Understanding this the investor need never be misled into false conclusions by the showing of a surplus account in the balance sheet.

Finally there is the

DEFICIT

If the total of a company's liabilities exceeds its assets, the difference is called the "Profit and Loss Deficit." It then appears naturally on the other side of the balance sheet, among the assets, so as to bring up the total volume of the assets. The presence of a profit and loss deficit in a balance sheet is not as a rule a good thing for the particular corporation publishing it. It is indeed an indication of weakness.

A Corporation's Earning Power

THE INCOME ACCOUNT

It naturally interests anyone contemplating investing his, or her, money in the securities of electrical or other public utility corporations to learn something about how to judge their earning power. To be able to get a good idea of their solvency and substantiability by consideration of the balance sheet has been the object of the two articles in this and the preceding issue. It is now the intention to go somewhat into what is known as the "Income Account" with a view to throwing light on a company's earning capacity.

The income account for any year determines absolutely the earning capacity of any given company for that particular year, but in arriving at a just conclusion it is necessary to take up the income for several years and get the average.

Thus you take say a period of five years and compare the different items as shown year by year.

The first item presented in the income account is the statement of:

GROSS EARNINGS

This means the total receipts from a company's operations, without any deductions whatever having been made. An examination of this statement covering a period of years will show at once to what extent the company has grown or the reverse.

After expenses, that is "Cost of Operation," together with the item of taxes (which latter may or may not be considered a fixed charge in the same way that interest and dividends are) have been deducted from the "gross earnings," you will have left:

NET EARNINGS

Now the main thing to be considered in connection with operating expenses is whether the company is properly keeping up the property and at the same time

properly keeping down the expense account. The ratio of increase in expenses to the increase in gross receipts is therefore most important. But it may be stated that as a general rule a large public utility corporation is quite certain to be generous in the matter of expenses for exploiting and promoting new business. Therefore the operating expenses are likely to show large increases, though they should not be at a faster rate than the increase shown from year to year in the receipts—by this is meant that the proportion or ratio of increase should not be greater.

A steadily decreasing ratio might be considered the most favorable sign with companies other than public service, but scarcely with them.

Taxes make up a large item with the big electric light and power companies. For example, where a city receives a proportionate share of a public service corporation's receipts, it represents the taxation paid the municipality and in the case of one very large company operating in an important center this item amounted last year to $433,844.34.

In the next issue the matter of "net earnings," "fixed charges" and "net profits" will be gone into thoroughly.

(To be continued.)

List of Selected Bonds Showing Income Yield

Under the above heading, from month to month, a list of carefully selected securities will be given showing the approximate income yield. In this connection it is to be remembered that the income yield depends upon the price that is paid for the bond, and, as in the case of commodities, bond prices fluctuate according to the laws of supply and demand and to the quality or worth of the security in the opinion of the buying public. For instance, if a bond of a face value of $1,000 and paying six per cent interest can be bought in the market at 98, or, in other words, for $980, the income yield to the purchaser will not be six per cent but a little over 6.1 per cent. That is, a year's interest on the bond is $60. If it is bought for $980, the income will be $60÷980=6.1 per cent. Correspondingly, if the bond is bought above par, say 102, the income yield in that case will be $60÷1020=5.88 per cent.

In compiling the list below, the income yields given are perforce those determined by the market prices of the bonds at the time of writing, which is somewhat earlier than the date at which the magazine reaches its readers. But as the market price on stable securities such as these fluctuates very little the table is sufficiently accurate to enable the prospective purchaser to make his selection intelligently.

BONDS TO YIELD 4.70% TO 5.40%

Northern Texas Traction Co. 1st 5s, 1913–33	4.85
Commonwealth Edison Co. 1st 5s, 1943	4.87
Pacific Coast Power Co. 1st 5s, 1915–40	4.93
Western Electric 1st 5s, 1922	4.97
Western Union Tel. Co. 4½s, 1950	4.70
Grand Rapids Ry. Co. 1st 5s, 1916	4.70
Dominion Power & Transmission Co., Ltd., 5s, 1932	5.15
Terre Haute Water Works Co. 1st 4½s, 1909–19	5.25
Merchants' Heat & Lt. Co. (Indianapolis) Ref. 5s, 1912–22	5.25
Rockland Light & Power Co., Nyack, N. Y. First mortgage gold 5% bonds. Mature 1938. ($1,000.)	Yield about 5.03
Rutland Railway, Light & Power Co. Rutland, Vt. First sinking fund gold 5% bonds. Mature 1946. ($1,000.)	Yield about 5.40
St. Clair County Gas & Electric Co., East St. Louis, Ill. First cons. gld. 5% bonds. Mature 1959. ($1,000.)	Yield about 5.30
St. Croix Power Co., St. Paul, Minn. First gold 5% bonds. Mature 1929. ($1,000.)	Yield about 5.30
St. Joseph Railway Light, Heat & Power Co., St. Joseph, Mo. First Gold 5% bonds. Mature 1937. ($1,000.)	Yield about 5.00

SCIENCE EXTRACTS FROM FOREIGN JOURNALS

Fortuny System of Stage Lighting.—The recently inauguarated theater at Charlottenburg near Berlin is one of the largest in Germany and is laid out on the most modern ideas, especially as regards the use of electricity both for stage effects and for general lighting. Quite a little interest is attracted by the Fortuny method of lighting the stage, and this gives a much better illumination than the ordinary methods. The system is based on the use of an indirect lighting by a number of arc lamps, combined with an artificial sky which is made up in cupola shape. In this way the sky and the horizon give the illusion of natural light, and the result is quite pleasing. In fact the circular horizon formed by the cupola gives the effect of a widespread view, and where the scene represents an open view or landscape the Fortuny cupola adds much to the natural impression by representing a vaulted sky, this being superior to the usual flat scenes to which we are accustomed. As the cupola closes over the stage at the top, the effect as regards height is much better and the whole scene appears larger. The color given by the arc lamps is much nearer that of natural daylight than with incandescent lamps. At the new theater the present method allows of realizing all the effects which are needed for the different operas.—*Allgemeine E. G. Review, Berlin.*

Radium Rays and Budding Plants.—The German scientist, H. Molisch, finds that radium rays have quite a marked effect upon woody plants and cause the budding of these latter in a number of cases. Such plants carry buds which are undeveloped during the winter and remain in repose. Radium causes the buds to open out and this brings about a precocious budding. He tried this with the syringa plant, experimenting with the terminal buds, and these were exposed for two days to the rays coming from a very strong preparation of radium salt. These syringa bushes were found to develop the buds even in the month of December, while the ordinary buds remained as they were and developed much later in the season. He finds that the time of exposure to the radium rays must be closely calculated, and if too short there is no action, while a long exposure does harm to the buds. Another point is that the radium does not act at the commencement nor at the end of the repose period, but must be applied in the middle stage. Quite a number of plants can be made to bud in this way, and the present researches add to the striking discoveries about the action of radium on plants which this scientist has already made.—*Review Scientifique, Paris.*

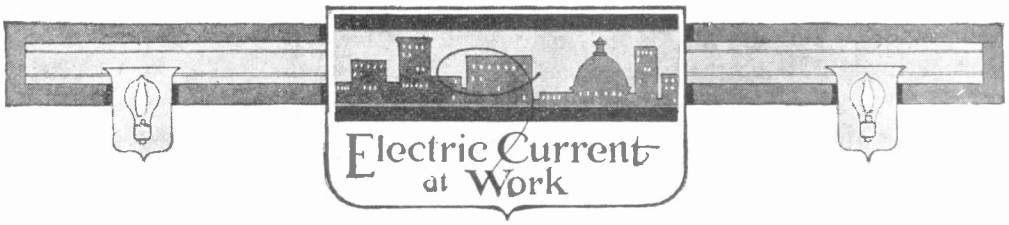
Wireless Saved the Day for Flower Growers.—Wireless has saved the situation in the Scilly Isles, near England. At this time of year active business is in progress among the growers on these islands, for an important trade is carried on with flowers and hothouse fruits for the early market. Large consignments of narcissus, violets and lilies of all kinds—and as regards hothouse commodities, grapes—are sent to Liverpool, Manchester and other northern towns which are far too distant from the continent to allow of the satisfactory transit of such perishable goods from the flower and fruit growing districts in the south of France. As a consequence, business between the English growers and salesmen is actively carried on over the wires. But the recent rough weather has quite cut off the telegraph connection, for the heavy gales have resulted in the breaking of the sea cable at a point seven miles from the main-

land. At present, wireless comes in as a very effective aid, and all connections are being made through the government wireless stations.—*The Marconigraph, London.*

What Boys and Girls Want to Read.—A discussion has recently occupied the English newspapers on the subject of what boys and girls read, and among the correspondents taking part in the question is Capt. Charles Gilson, who in an interesting letter points out the many changes of modern atmosphere which are affecting literature. While the love of adventures still holds good, this is being transferred more or less to the scientific sphere, and adventures of Indians, pirates or discoverers are now worn threadbare. What are now wanted are tales of dreadnoughts, wireless telegraphy, motor cars and aeroplanes, for these subjects have the elements of romance, bearing the stamp of the miraculous and are themselves concrete proofs of the inventor's imagination, which is the spirit of the age. Nor is there any great difference between the wants of girls and boys of to-day in regard to reading matter, for the education of the former has been broadened till nowadays it means practically the whole curriculum of the modern schoolboy, not forgetting the attention paid to the elements of science, so that the modern girl is able to appreciate a tale on wireless or kindred subjects quite as much as her brothers.—*The Marconigraph, London.*

Explanation of Globular Lightning.—Prof. Thornton of Armstrong College gives a simple explanation of globular lightning. According to his observations, the lightning descends gradually from a cloud, usually after a heavy thunder stroke, in the shape of a luminous ball of a blue color which then strikes the ground and rebounds, then runs along for ten or 20 feet. Such balls are apt to follow an electric conductor such as a gas pipe and they explode when coming in contact with water, although sometimes the explosion occurs in the air. In the latter case the ball disappears instantly with a violent explosion which may cause much damage, and it gives off a strong odor of ozone. He considers that ball lightning cannot contain any other substance than the gases of the air. As the luminous globe is heavier than air and has a bluish tint, ozone appears to make it up for the most part and it is known that ozone is 70 to 100 per cent heavier than air and its formation is accompanied by the familiar bluish hue or discharge. The explosion is caused by the ozone being transformed to oxygen, which sets free an enormous amount of energy.—*La Nature, Paris.*

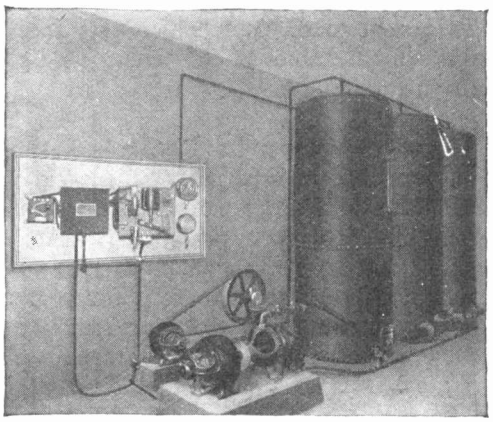
Electric Plowing in France.—Tests of a new method of electric plowing were made in France not long since in the prairie district near Arcachon, for clearing about 1000 acres of ground from small brush so as to fit it for agriculture. A temporary electric plant was set up containing two 40 horsepower dynamos. At each end of the furrow was a tractor fitted with a motor driven winch for drawing a cable connected with a Bajac plow, so that the plow is driven along between the two tractors and when at the end of the furrow, the tractors shift along by one step so as to move on to the next furrow. The electric motor not only drives the winch but also works upon the back wheels of the tractor in order to shift it, or in other cases to run it upon the road. In the present tests, with five men in all, including one man at the electric plant, there were cleared 2½ acres a day.—*Genie Civil, Paris.*



Maintaining Water Pressure in High Buildings

It is frequently the case in summer that occupants of the upper floors in tall buildings have poor water pressure unless expensive steam pumps and roof tanks are installed.

This expense may be reduced by an automatic, electrically driven pump and tanks as illustrated. The pump forces



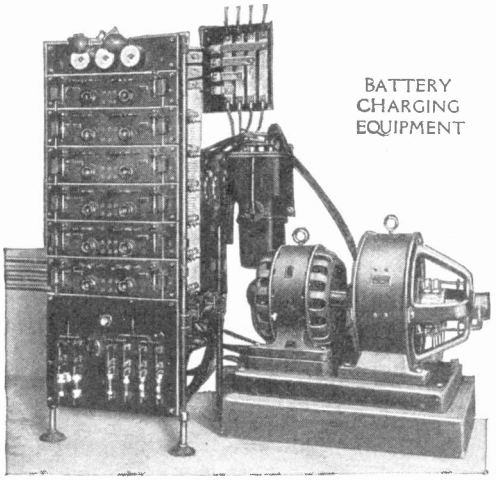
HIGH PRESSURE WATER SYSTEM FOR TALL BUILDINGS

water into the tanks in which there is a quantity of compressed air, thus causing a still greater compression, resulting in a continuous even pressure at the faucets whether the pump is being operated or not. The second motor and pump is used to pump up air in the tanks. When a certain amount of water has been used out of the tanks, an automatic pressure arrangement shown on the board sets the motor in operation, thus keeping a certain amount of water in the tanks at all times. The outfit may be placed either in the basement or on the roof as convenience dictates.

Charging Equipment for Garages

It is usual practice in electric garages and large charging stations to have each charging rheostat a separate unit which is located near the vehicle being charged; the charge is regulated by reading the vehicle meters. Considerable difficulty has been experienced in charging by this method because the operator cannot see the vehicle meters when operating the rheostat, and moreover the vehicle meters are subjected a great deal of unnecessary vibration and rough usage—in some cases the pointers are broken off.

The newest type of Westinghouse charging equipments provides all the charging and current measuring and reg-



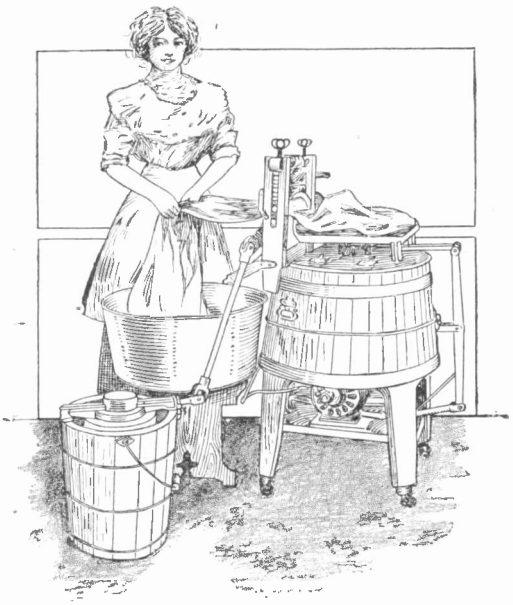
BATTERY CHARGING EQUIPMENT

ulating apparatus in one compact equipment as seen in the picture. At the right is the motor generator to change the usual alternating to direct current. The switchboard at the left is divided up into panels, the one here shown being a complete installation to charge twelve vehicle batteries at the same time. All the neces-

sary switches for controlling the current are right at hand and at the top of the switchboard are the measuring instruments which can be thrown onto any one of the twelve circuits. Conductors, enclosed in conduit, lead away to the various vehicle stations in the garage. Once the battery connections are made, the operator stands at this board and watches any or all of the charging circuits.

Automatic Electric Washer

A large number of washing machines on the market use what is called in mechanics a "dolly," a vertical shaft projecting into the tub and fitted with wooden pins. This shaft and attachments whirl



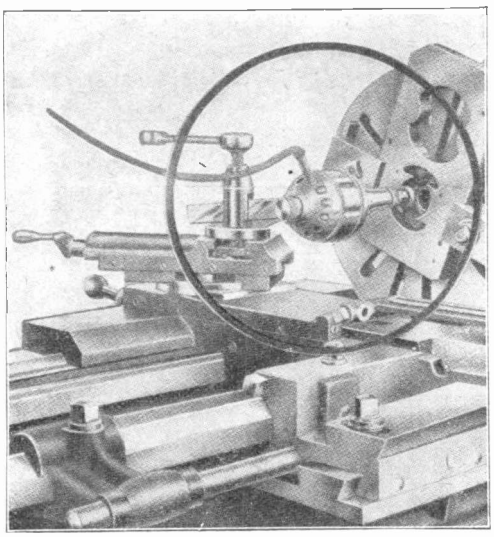
AUTOMATIC ELECTRIC WASHER

the clothes in one direction and then in the other in the water and washes them clean and quickly.

The automatic electric washer employs this principle, a round wooden tub being the receptacle. The machine will wash a tubful in from five to fifteen minutes without attention, will wash a tubful while it wrings a second, or run an ironing machine to iron the clothes as fast as they are washed and wrung. This last labor is performed by means of a motor operating through a universal rod. An ice cream freezer, churn, food chopper, etc., may be operated by the motor without running the washer or wringer, or at the same time. Both washer and wringer or either can be stopped instantly by touching a lever without turning off the power. The tub is drained through a spigot in the bottom.

Portable Grinder for Machine Tools

A portable grinder for keeping the cutting parts of machine tools in good working condition is a valuable addition to the machine shop equipment. The H-B grinder for this purpose consists of a small electric motor having an elongated armature shaft, on the outer end of which is mounted an emery or carborundum wheel. It is also provided with a steel handle or bar which can be clamped in the tool post of a lathe, for instance, or

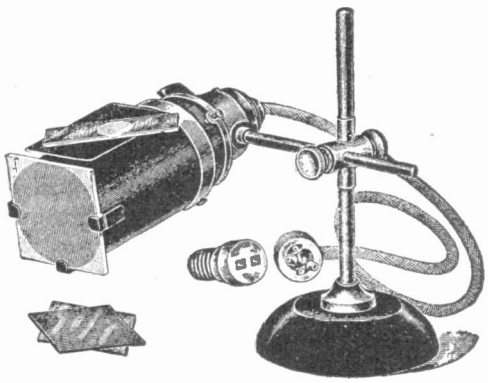


PORTABLE GRINDER FOR MACHINE TOOLS

in the bed plate of a milling machine or shaper. It is then capable of grinding dies, reamers, cutters, etc., used on these various machines. The illustration shows one of these applications. It works very well on either internal or external jobs.

A New Microscopical Lamp

Microscopists find electric light equivalent to daylight, provided the artificial illuminant can be properly directed and concentrated. Strong, diffused light that can be reduced, increased or colored by suitable screens, so as to bring out the object under observation most advantageously, is produced by the "Leitz-Light." It is adjustable in all directions and will not shine in the observer's eyes. A 60 watt incandescent lamp is used, and on the casing inclosing this is a little flat warming table adapted to fixing smears on the microscope slides by heat.

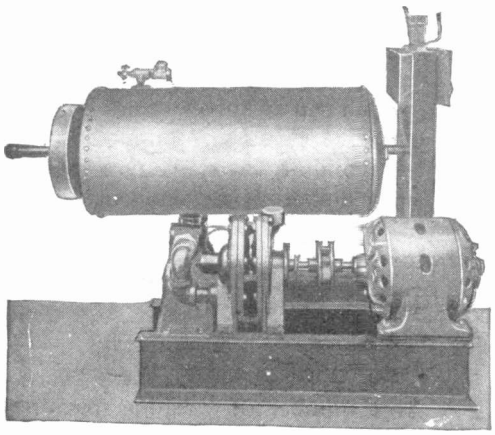


MICROSCOPICAL LAMP

The tested blue screen will equal, if not surpass, the effect of the slightly veiled north light, so much desired in precision work and is far superior to the average illumination obtainable from windows in the city.

Pumps Water from Steam Heating System

The accompanying illustration shows an arrangement for removing water from the steam heating system. A cylindrical tank is balanced horizontally in such a manner that when a certain amount of water has drained from the system into it the pressure downward at one end of the tank closes the automatic motor starter circuit of a motor driven pump which returns the water from the tank to the

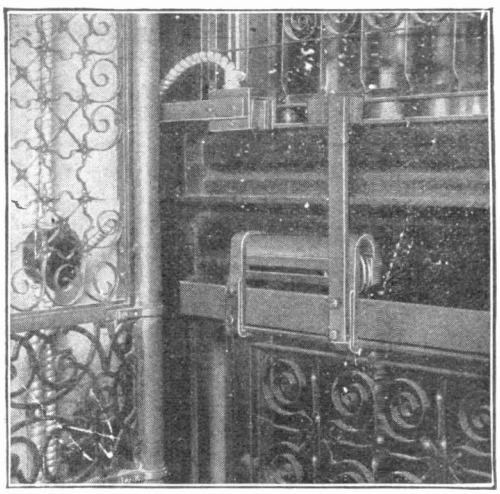


AUTOMATIC PUMP FOR STEAM HEATING SYSTEM

boiler of the heating plant. After the water is removed the tank resumes its normal position which stops the motor. By changing the distance of the counterweight from the end of the cylinder the frequency of the pumping operation is varied.

Automatic Safeguard for Elevators

The accidents caused by the operation of freight and passenger elevators with gates open or only partially closed are numerous. To avoid these an automatic device has been recently designed in which the final completion of the motor circuits is made through an attachment

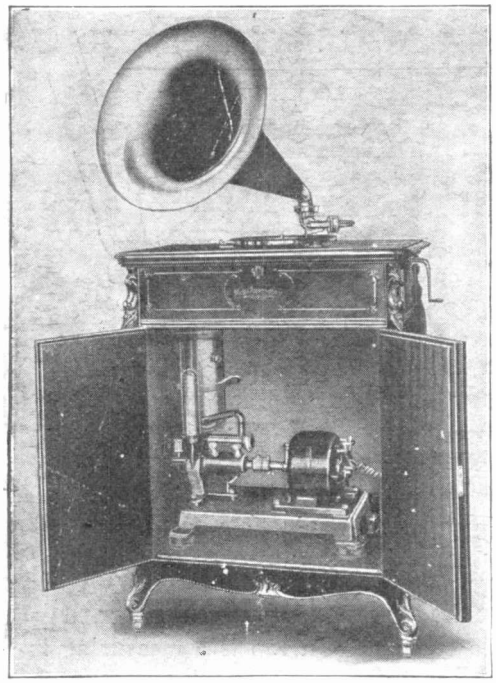


ELEVATOR SAFEGUARD

on the gate which must be in the closed position for the motor to start the car. In conjunction with this there are two signal lamps, one green and one red, the green one burning when the gate is open, showing that the motor circuit is open and the elevator safe to enter. The red light, located directly above the controller handle, burns when the gate connection is made, indicating that the circuit is alive and in an operative condition.

The Auxetophone

While the ordinary phonograph can be heard in a room of average size it is not adapted to large halls and assembly rooms. This failing, however, has been



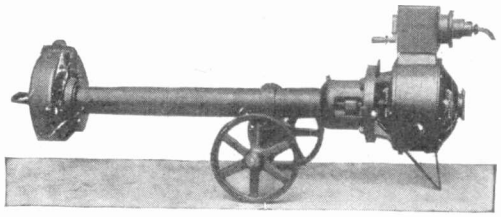
THE AUXETOPHONE

met in the Victor Auxetophone, in which a motor driven air pump is installed.

With this pump, forcing air from the megaphone attachment, the sound is increased to such an extent that it is adapted to places holding large audiences.

Grinds Projections from Heavy Castings

The saving of a steel plate or casting from the scrap pile is often a matter of grinding away an offending projection. The accompanying illustration is of a grinding machine used for this purpose and mounted upon a two wheeled carriage. The electric motor, shaft and



GRINDER FOR HEAVY CASTINGS

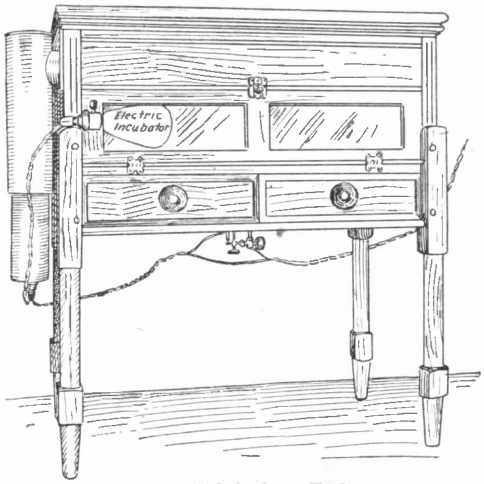
grinding disk are practically balanced upon the carriage, the operator using little effort in moving the disk over the surface to be trued up.

Protection from accidents is afforded by having the shaft from the motor to the disk entirely enclosed while the disk itself is partially covered by a metal shield. A flexible cable conveys current to a controller shown mounted upon the motor.

Incubating by Electricity

An electrical incubator has been developed by Mr. L. C. Byce, of Petaluma, Calif., a veteran maker of incubators in the little city that is known as the poultry center of America. Mr. Byce has tried out dozens of methods of incubation, beginning as a boy when he hatched out eggs in stable litter and made various more or less crude devices that have developed into the standard commercial incubators. The electric "artificial hen" is perhaps the most advanced product of his inventive genius and promises to be a commercial success when electrical power is abundant and cheap in the districts devoted to poultry raising.

The inventor describes his device as follows: For several years in our experi-



ELECTRIC INCUBATOR

mental rooms and at poultry shows and fairs we have used the electric current for hatching and brooding and many dealers have made use of a single globe in their show windows to keep the chicks warm when exhibited there. Our company was the first to use electricity for artificial brooding and hatching, and as far back as 1906 we hatched chicks in this way at the California State Fair.

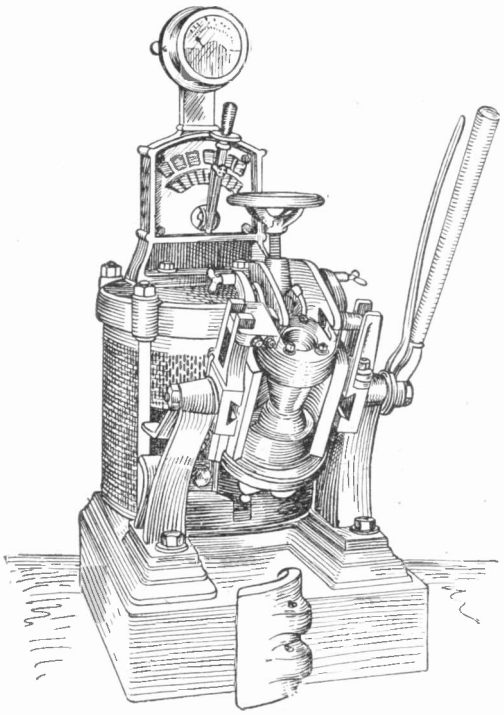
The regulator controls the flow of the current so nicely that the temperature is almost perfectly even. Of course the device is practical only in places where a 24 hour service is maintained by the power companies and where the price of the current is not excessive. To use electricity for our incubators it is not necessary to purchase special complete outfits. The device is simple and can be attached to any of our incubators at a trifling expense. It is connected by simply screwing an ordinary electric plug into the lamp socket of any standard electric light fixture and turning on the key.

The Helburger Electric Furnace

The Helburger electric furnace is a recent Swiss production, and it is intended for melting metals or other substances in a crucible which can be brought up to a very high heat within a few minutes. The apparatus is a most convenient one to use and can be set up almost anywhere, as it carries its own transformer and the whole outfit on a small base.

What is to be noticed is the new method for overturning the crucible so as to pour out the molten metal in the best way, and this is done by a lever at one side, after taking off the outer half of the protecting cover which surrounds the melting pot.

The whole apparatus is combined so as to give all the different heats which are needed, simply by working a hand wheel and switch lever for controlling



THE NEW HELBURGER FURNACE

the current. On top is a measuring instrument for observing the amount of current used. Dr. Ludwig Weiss of Munich finds in his experiments with the new melter that the bottom of the crucible is several hundred degrees hotter than the rest, so that the heat is better applied where it is needed. He finds that in ten minutes it reaches a temperature of 2,700° F. and in 33 minutes the extremely high temperature of 4,500° F.

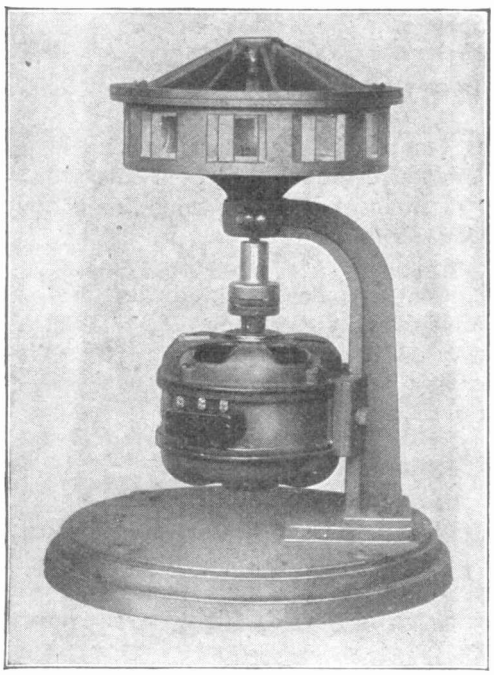
At this intense heat almost everything melts, even quartz sand, which is so difficult to melt except in the powerful heat given by the electric furnace.

X-Rays in the Study of Flowers

The applications of the X-rays to the study of phenomena invisible without their aid continually increase in number. Some of the results are rather more curious than useful, but substantial additions to knowledge are being made in this way. One of the latest scientific uses found for the rays is in revealing the inner structure of flowers and fruit buds. In some respects this is a better method than dissecting for the study of certain parts of plants.

German Boat Whistle

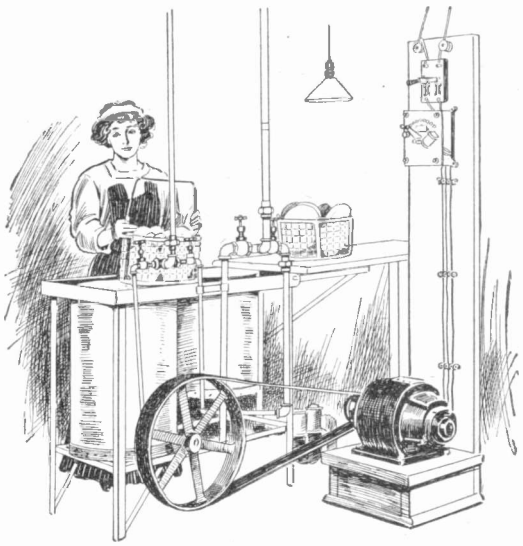
The equipment shown in the accompanying picture with the odd arrangement of the electric motor serves as a whistle upon small German boats. The sound, electrically produced in the upper lamp-like part, is hastened on its way by a fan. When installed the outfit is enclosed in a moisture-proof cylindrical casing which fits upon the base plate. The roof is conical with extending edges similar to the cap over the old fashioned stove pipe chimneys. The tone of the "motorsirene" is sharp and clear.



ODD MOTOR OPERATED WHISTLE

Electric Dishwasher

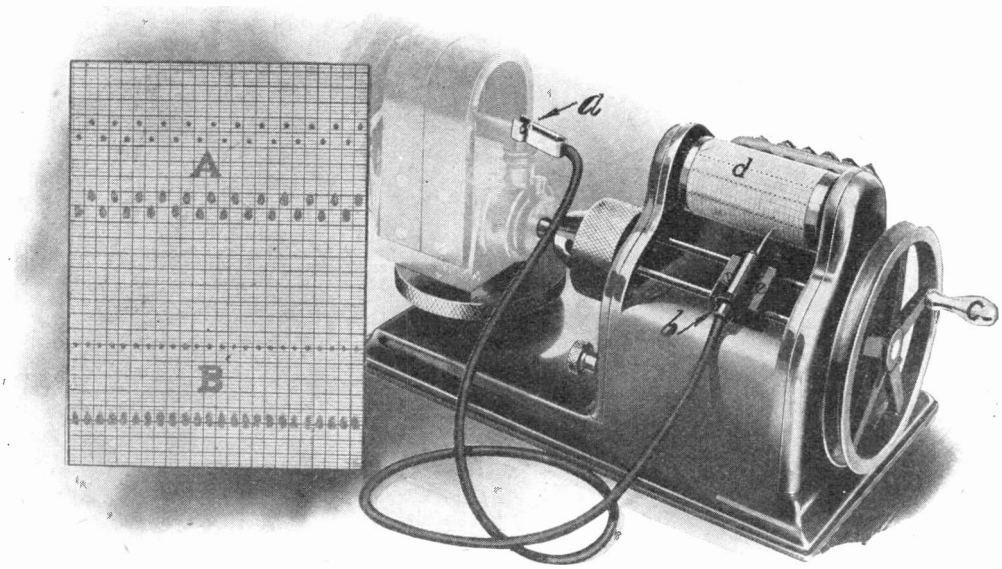
Many dishwashers of an automatic nature have been invented and some have been placed on the market, not all of which have been successful or practical. The motor operated washer shown in the illustration, however, is very effective; in the kitchen of a small hotel where it is installed, one girl, by simply putting the dishes in and taking them out, accomplishes as much as six girls formerly did, washing them by hand. In operating the washer, the dishes are stacked in wire baskets which are placed, one at a time, in the first or larger tank where warm water is forced over them; the basket is then transferred to the smaller tank where the dishes are rinsed with hot water, after which they dry quickly without wiping.



DISH WASHER EFFECTIVE FOR RESTAURANTS

Ignition Tested by Hitenagraph

The Hitenagraph, deriving its name from its accomplishments (high tension graphic recorder) is an instrument by which a graphic record is made of the heretofore illusive high tension or secondary electric currents used in ignition on automobiles, motorcycles, etc. It tests and reveals the trouble in ignition systems.



THE HITENAGRAPH AND ONE OF ITS RECORDS

The device is shown connected to an automobile magneto.

The ignition system under test is simply connected to the Hitenagraph, and the driving wheel (c) is turned, causing the magneto (a) to rotate at the same speed and the chart drum (d) at an increased speed so arranged that the spark index (b) which travels (through connection with a worm) longitudinally across the chart drum (d) is always diametrically adjacent, at the time the discharge should occur, to the line on the chart itself on which the last produced spark registered.

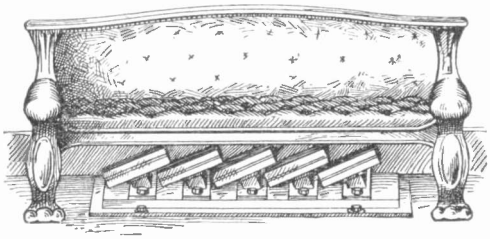
In this way is shown, by the alignment of the sparks on the chart, the relative timing of each cylinder and also the intensity of the spark by the area affected by it on the chemically prepared chart. The chart is divided into 180 degrees and travels twice as fast as the magneto being tested, so that each time the magneto produces a spark—which is ordinarily twice per revolution or 180 degrees apart—the chart has made a complete revolution and each succeeding spark should fall on the same line of the chart as the one preceding it.

On the chart, (a) shows a magneto out of time five degrees and also shows plainly how much better the spark is at "advance" than at "retard." At (b) is shown a "hitenagram" of the same magneto after being repaired.

"Tricity" Ship Heater

Although electric heaters are now put to such a great variety of uses, shipboard heating is a field that has been somewhat neglected. This want is now anticipated by the new Tricity ship heater of English make designed for staterooms or saloons.

The Tricity design uses a low heat so that there is no danger of fire. It consists of a stout cast iron grid containing the patented heating element and giving about five square feet of heating surface.



SHIP HEATERS

The pedestal heaters can be used singly in a stateroom or in groups of two or three for saloon heating. Another way is to mount a series of heaters under seats as shown and in this case they can be located in a low space.

Ice Cream—10,000 Quarts a Day

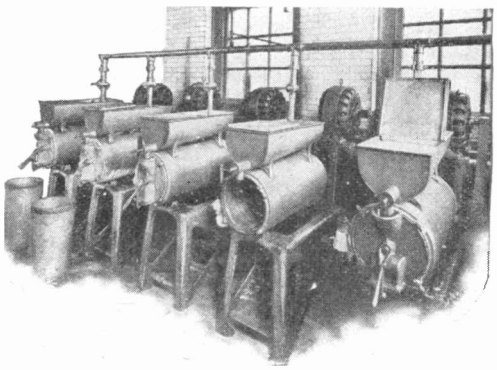
Supplying 90,000 people, each with a dish of ice cream daily, is an ambitious task. Yet in Philadelphia there is one company which undertakes to do this—in other words, it turns out 10,000 quarts of ice cream in a day.

Realizing the specific advantages of electrical operation from an economical as well as sanitary point of view, the company has equipped its factory throughout with electric drive, a total of seventeen motors with an aggregate capacity of 139 horsepower having been installed.

Most of these motors are used for refrigerating purposes, the ice being used only for preservation of the ice cream in its frozen state during its transportation from the factory to its destination.

The cream is brought to the factory in sterilized cans from dairy farms, where every precaution is taken to insure purity. It is pasteurized by the latest scientific process and forced through slow cooling coils until it reaches the proper temperature, when it is automatically delivered to a silver lined mixing machine, or homogenizer; the other necessary ingredients, including sugar and macerated fruits, are also introduced, and all thoroughly mixed into one homogeneous mass. This machine is belted to a shaft driven by a ten horsepower Westinghouse motor, which also drives the cooling apparatus.

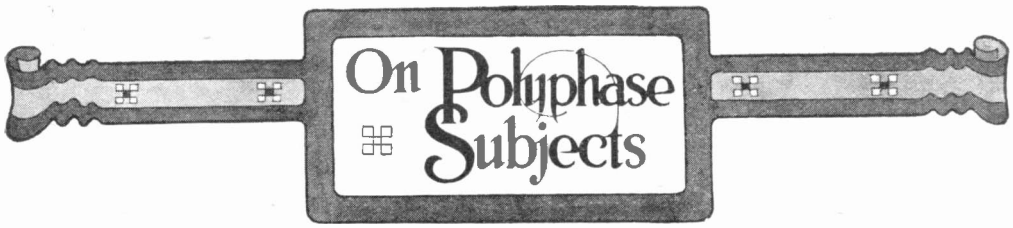
From the mixing machine the prepared cream is forced through a series of cooling coils, passing at decreasing temperature into the six 40 quart, individual, German silver, lined, freezing machines, each driven by a three horsepower induction motor, as shown in the picture.



A BATTERY OF ICE CREAM FREEZERS

The cylindrical freezer is surrounded by a brine jacket, the brine being kept in constant circulation by the brine pump, which is driven by a ten horsepower motor. When the cream reaches a consistency which will just permit of its being poured, it is drawn out of the freezers into ice cream cans.

A particularly interesting feature of this installation is the method of determining when this consistency has been reached. This is accomplished by the installation in each freezer motor circuit of an indicating ammeter which shows the current taken by the motor driving that particular freezer. Of course, as the cream hardens the motor performs more work and naturally the ammeter needle indicates this, so that it is a simple matter to graduate the ammeter scale to determine the consistency of the cream.



Electric Service in Flood and Storm Week

With showers, squalls, storms and washouts the lighting companies throughout the country were taxed to the utmost during the month of March. Even in those cities that were not in the path of tornado and flood unusual conditions were felt, for dark days due to cloudy weather brought a great increase to the various lighting loads. More than half the days during March were cloudy; 49.2 per cent of the first 25 days alone being unusually dark. That this condition was out of the ordinary is seen in comparison with the same month of last year, when only one-third the days were what the lighting companies term "dark days."

It is on such days as these that the central stations are put to it to prove their efficiency, and very few cases were reported where they fell down in the emergency. Of course in the cases in Ohio and Indiana, where whole towns were inundated and the lighting plants swamped, the loss of light was but a single element in a great catastrophe. And even in those cases the service was resumed without great delay in places where the transmission system had not been wiped out.

Where dark days were the only problem the increased load was met simply through the preparedness of the stations. The most trying time during the entire period for the cities of the East came on the morning of March 6th, when a sudden shift in the wind brought great banks of clouds out of the northwest. The pall reached New York shortly after eight o'clock, by eight-thirty the city was in darkness and the demand for current came from all quarters. In a period of hardly ten minutes more than a million 50 watt lamps had been turned on. The sudden demand was met without the least drop in the supply voltage, for a warning had been sounded by the central station weather man.

New York is supplied with light and power from the great Waterside station of the New York Edison Company, and on the top of this building is the weather man. He is not a weather prophet in any sense; he simply watches the sky from his lofty station and reports to the system operator the appearance of every cloud. He sounded his first warning on this morning shortly after eight o'clock, at a time when twelve of the big generators were meeting a demand of 96,000 kilowatts. This big load, or at least 100,000 horsepower of it, was being supplied the motors on the company system. Twelve thousand was being used in the aqueduct construction, another 12,000 was being used by the builders of the subway, and the balance was for the motor driven factories of New York.

At eight-thirty, when the day was blackest, hundreds of offices and shops began their work. The result was that thousands of lamps were turned on between half-past eight and 20 minutes of nine. The effect was recorded at Waterside when the meters jumped from 96,000 kilowatts to 154,000 kilowatts, while down in the basement the fires roared under a hundred boilers, and eighteen dynamos whirred to meet the demand.

At nine o'clock the clouds had blown away. One by one the engines slowed down until only twelve were running. The demand had returned to normal.

An old man who had led a sinful life was dying, and his wife sent for a nearby preacher to pray with him.

The preacher spent some time praying and talking, and finally the old man said: "What do you want me to do, Parson?"

"Renounce the devil, renounce the devil," replied the preacher.

"Well, but Parson," protested the dying man, "I ain't in position to make any enemies."

* * *

"You can't always tell from appearances. Now, Brown doesn't look as though he knew very much, but he's really accomplished."

"That so?"

"Yes, he can read his own gas meter and knows how much electricity a kilowatt-hour is."

* * *

First Coster (outside picture dealer's window) —"Who was this 'ere Nero, Bill? Wasn't he a chap that was always cold?"

Second Coster —"No; that was Zero; anuver bloke altogether."

* * *

"Going to get out here and stretch your legs?" asked the traveling man of his companion, as the train stopped.

"What place is it?" inquired the other.

"Chicago."

"No, I had a leg stretched here once before."

* * *

Mrs. Fussy (on her first visit to Niagara Falls) — "Oh, Harry. That reminds me I forgot to turn off the water in the kitchen sink."

* * *

"So you are going to Reno?"

"Yes."

"Isn't it rather sudden?"

"Oh, no, not at all. My husband and I haven't been living together since last April; but, you see, he's an automobile racer, so I thought I wouldn't do anything in a hurry. Now that all the races for the Summer have been held I don't see any use in waiting any longer."

* * *

Son — "Why do people say 'Dame Gossip'?"

Father — Because they are too polite to leave off the 'e.'"

Visiting his home town after many years' absence, a gentleman met Sam, the village fool.

"Hello, Sam," he said. "Glad to see you. What are you doing now? Still pumping the church organ?"

"Yessir, I'm still pumping the organ. An' say, Charlie, I'm gettin' to be a pretty fine pumper. The other day they had a big organist over from New Haven, and I pumped a piece he could'nt play."

* * *

"Do you act toward your wife as you did before you married her?"

"Exactly. I remember just how I used to act when I first fell in love with her. I used to hang over the fence in front of her house and gaze at her shadow on the curtain, afraid to go in. And I act just the same way now when I get home late."

* * *

"And so, after inviting your friends to a game dinner, you were not served with any part of the bird!"

"Oh, yes; I got the bill."

* * *

"Geese are supposed to be symbolic of all that is foolish." "Well, go on." "But you never see an old gander hoard a million kernels of corn and then go around trying to mate with a gosling."

* * *

The editor heard the report and hurriedly made an item of it, which he printed in this fashion:

" 'Our esteemed fellow citizen, John G. Harris, will go to the hospital tomorrow to be operated upon for the removal of his appendix by Dr. Smith. He will leave a wife and three children.' "

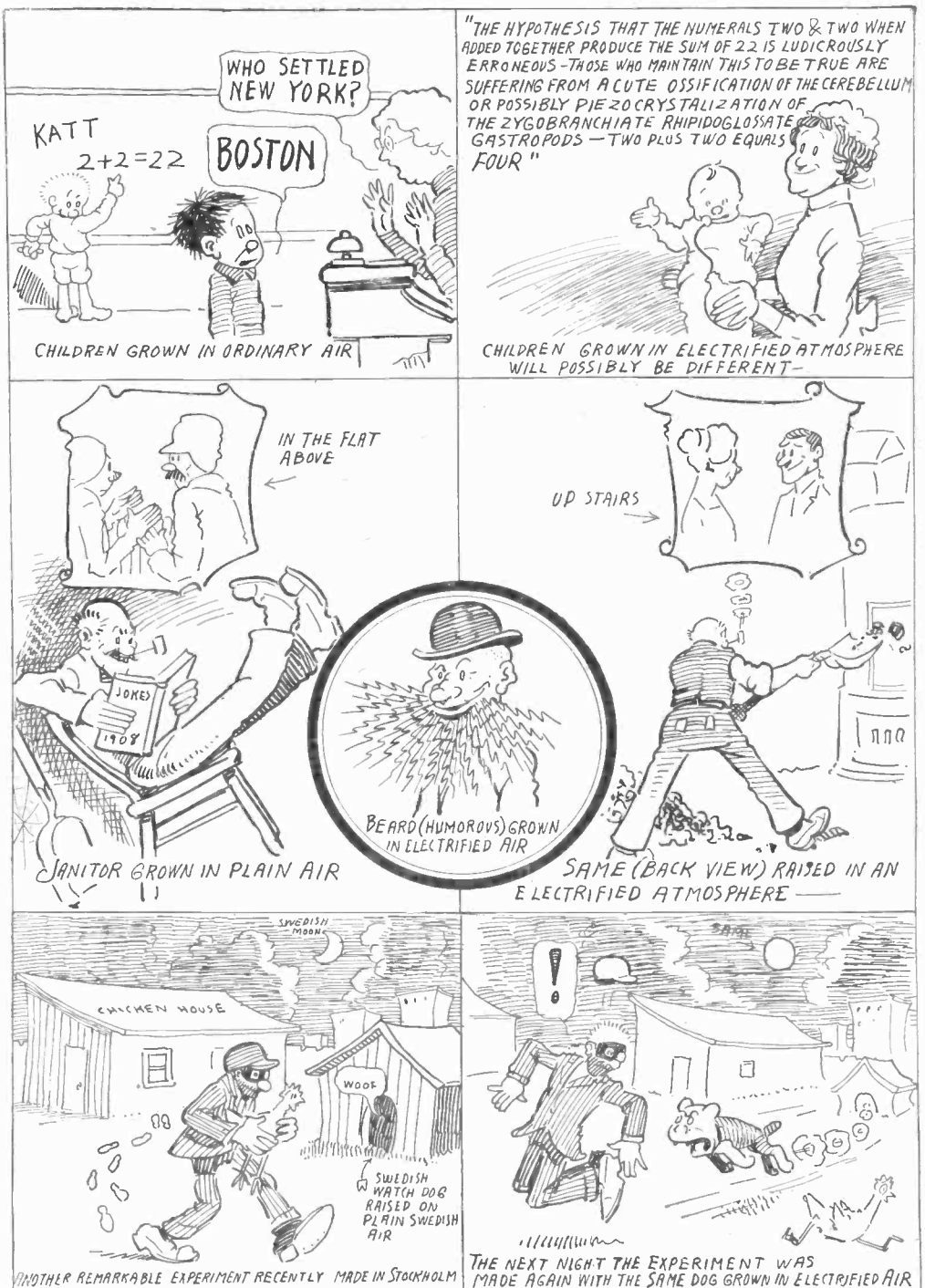
* * *

The best man noticed that one of the wedding guests, a gloomy looking young man, did not seem to be enjoying himself. He was wandering about as though he had lost his last friend. The best man took it upon himself to cheer him up.

"Er—have you kissed the bride?" he asked by way of introduction.

"Not lately," replied the gloomy one with a far away expression.

SPEAKING OF HIGH FREQUENCY TREATMENTS



$867 Buys the Material To Build This Home

NO MONEY IN ADVANCE

We Save Home Builders 30% to 50%

Design No. 152-D
Seven rooms and bath, modern, up-to-date interior, a beautiful home, 28x28.

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New Building Material Prices S-M-A-S-H-E-D

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Compare our offers and you will be satisfied that none can compete with our price *—and none can equal our service.*

Design No. 117
$708 Six Rooms and Bath. A Modern Bungalow, Excellent Interior. Size, 39 feet, 6 inches by 27 feet.

Design No. 55
$743 Six Rooms and bath, all rooms convenient and roomy. Size 22 ft. by 31 ft.

Design No. 50
$998 Eight Rooms and Bath, very attractive Exterior: Five Closets, Airy Balcony. Size 28 ft. by 28 ft.

Design No. 53
$1078 Seven Rooms, Bath, Large Living and Main Bedroom, Modern in every respect. Size 27 x 36 ft.

$10,000 BOOK OF PLANS Mail the Coupon Today FREE

A truly wonderful book given away Free. One hundred pages of modern, up-to-date designs. Free to all parts of the United States. Other points upon receipt of 25c.

$2 Brings Complete $50 Set Blue Prints and Specifications for Any of These Beautiful Homes

The object of this advertisement is not to sell plans, but if you are interested in any of the designs shown on this page, we will, to save time, send a complete set of Plans. Specifications and full descriptive Material List, showing sizes, style, quality and catalog number of the material that we furnish. The best part of it is, that the entire $2 will be credited on your order, or if plans do not suit, you may return them and all but 50c will be refunded. In addition, we will also name, upon request, delivered prices for complete Plumbing Outfit and Heating Plant of any kind and furnish complete specifications free of charge.

FREE Price Wrecking Catalogs

Send for our Special Building Material Catalog No. 101, Plumbing Catalog No. 133 and Heating Catalog No. 120 showing a complete line of construction of house, barn, or any other building. The newest and latest features in each line at low prices.

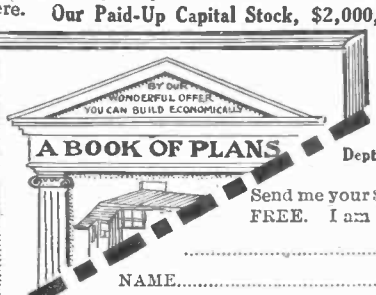
Read Our Guarantee—It Is Your Protection

Our guaranteed proposition to you is to furnish the material as specified in the Material List in *all brand new stock*, of the grade, sizes, style, quality and catalog number mentioned, and in quantities sufficient to complete the design strictly according to the plans. We also guarantee prompt shipment of order. All material loaded in one car from our plant here. **Our Paid-Up Capital Stock, $2,000,000**

Heating Plants
Write for our prices on our complete bathroom outfit. We guarantee a saving of 30% to 50%.

Plumbing Material
Steam, Hot Water and Warm Air. Let us estimate on your requirements. Big saving.

Chicago House Wrecking Company, Dept. F-145 CHICAGO



Chicago House Wrecking Company, Dept. F-145, Chicago, Ill.

Send me your $10,000 Plan Book FREE. I am also interested in

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NAME.....

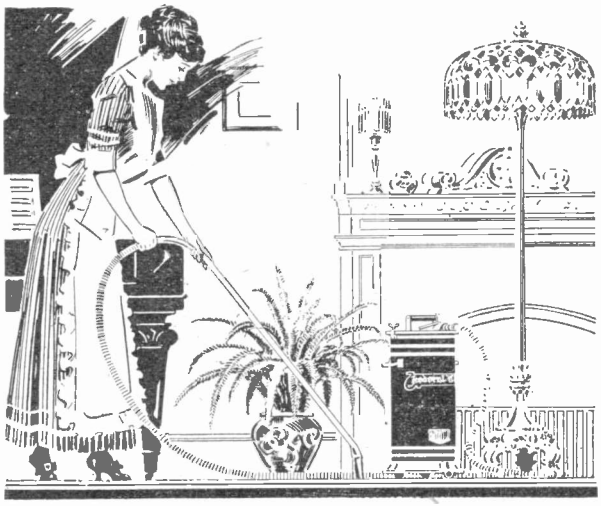
Town.....

County.....State.....

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Danger Lurks in Hidden Dust —Safeguard Your Family!

A *clean-looking* house may still be *insanitary*. That's the danger of sweeping with a broom. Shoes collect dried sputum from the sidewalks and deposit its dust on rugs and carpets. You can't see it, perhaps. But it's *there*. Then comes sweeping day. Your broom fills the air with invisible, germ-laden dust. It finds its way into your lungs—into your food—settles on the floor where playing children stir it up again and become infected. The *broom* is even more dangerous than the *fly*.



Federal Vacuum Cleaner

Sucks Up All the Germ-Laden Dust

No dirt too heavy—no dust too light and invisible to escape the FEDERAL Vacuum Cleaner. Its powerful suction searches every thread and fibre of rugs and carpets—clothing and drapery. Yet it can't injure the most delicate fabric. From the innermost depths of thick heavy padding, the powerful FEDERAL sucks out the dust and germ-laden air—making upholstery, pillows and mattresses as sweet and clean as new.

The FEDERAL is the Guaranteed Cleaner

But don't think that just any vacuum cleaner will do this. Some really do no more than a carpet sweeper. They pick up the *surface* dust—the *visible* dirt—but not the hidden, germ-laden dust. The Federal, which has no parts to wear out, like a *fan* device, a *bellows* or a *diaphragm*, creates a tremendously powerful suction. Constant use increases, not decreases, its power. The Federal is the machine that has stood the test of time.

The Powerful Rotary Pump

The Rotary Pump in the FEDERAL revolves steadily in one direction—like a powerful turbine engine on an ocean liner. It creates a suction impossible with a fan or bellows type of cleaner. Its working parts are few—simple—easy of access. No valves to work loose—no gears to rattle—no piston to pound up and down—no bellows to wear out—just a powerful, substantial pump and a motor—both revolving in one direction—steadily, silently, without jar or jerk.

Send for Illustrated Booklet, "Purity in the Home"

The Federal is not a cheap machine—price, $125—but it is the ***most economical*** cleaner to buy. We will gladly tell you why in our illustrated booklet, "Purity in the Home," No. 1453. Use the coupon ***now.***

Vacuum Cleaner Department

Federal Sign System (Electric)

Lake & Desplaines Sts., Chicago

SIGN, TEAR OFF AND MAIL

Federal Sign System
(Electric)
Lake & Desplaines Streets, Chicago, Ill.

Kindly send me your illustrated booklet, No. 1453, entitled, "Purity in the Home." It is understood that this places me under no obligations.

Name .....

Address .....

City .....

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THE COST OF ADVERTISING IN THIS SECTION IS 5 CENTS PER WORD

Remittance must accompany order, or advertisement will not be inserted.

Forms for the June issue close May 1st.

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THIRTY PERFECT PHOTOGRAPHS, world known aviators, machines, flights, etc.; interesting descriptions, $1. Six photographs, 25c. Aero Specialty Co., Revere, Mass.

COMPLETE PLAN, DRAWN TO SCALE, with concise Instructions for building a 3-foot Nieuport Monoplane, 25c. Other Plans: Bleriot, 15c, Wright, 25c, Curtiss, 35c, "Cecil Peoli" Champion Racer, 25c. Set of five, $1.00. 40 pp. Model Supply Catalog, 5c. IDEAL AEROPLANE CO., 86B West Broadway, New York.

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SEE WHAT I SAY UNDER "TYPEwriters." ATCHISON.

SEE DISPLAY AD, PAGE 50. DOUD LIGHTing Co., Chicago.

AGENTS — TWO FINE FORMULAS FOR furniture polish, 25c (coin). Taylor, Box 978, Norfolk, Va.

AGENTS. AWAKE FOR SPRING SALES. Just the proposition you want. Dept. 19, Beach Supply House, 3243 Beach Ave., Chicago, Ill.

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DON'T ACCEPT AN AGENCY UNTIL YOU get my samples and particulars. Money makers. Address SAYMAN, 706 Sayman Bldg., St. Louis, Mo.

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AGENTS MAKE BIG MONEY SELLING our new gold letters for office windows, store fronts and glass signs. Anyone can put them on. Write today for a free sample and full particulars. Metallic Sign Letter Co., 400 N. Clark St., Chicago, Ill.

AGENTS WANTED

YOU CAN MAKE MONEY AS OUR GENeral or local agent. Permanent business. Every woman wants a set; they buy on sight; big profits. Exclusive territory. Write to-day. Red Cross Supply Co., Dept. 2, St. Louis, Mo.

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AGENTS — OUR "HOME LAUNDRY TRIO" are winners. Greatest time and labor savers. Money Makers. Write for attractive proposition— To-day. Leibman, Lefferts Ave., Richmond Hill, N. Y.

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MANUFACTURER OF GUARANTEED hosiery with linen heels and toes wants agent in every town and city. Re-orders insure permanent, increasing income. Exclusive territory. Credit. Parker Mills, 707 Chestnut St., Philadelphia, Pa.

SAMPLE FREE — BOYERS' AUTOMATIC Re-Finisher for Furniture, Store, Bank and Office Fixtures — Finest thing in the World. One application lasts a year. Applied with cheese cloth. Boyer Chemical Laboratory Co., State and Michigan Sts., Chicago.

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EARN $10 TO $15 A WEEK AND HOLD your position besides. No canvassing. We, as manufacturers of patented just-in-season specialties, have new easy Mail Order Plans to keep factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go-ahead kind, write for our most modern (copyrighted) plans. Sworn statement. J. M. Pease Mfg. Co., 550 Pease Bldg., Main St., Buffalo, N. Y.

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STAMPS—100 ALL DIFFERENT, FREE. Postage 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

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$100 PAID FOR 1894 DIME S. MINT, $8 FOR certain 1853 Quarters, $100 for certain 1853 Half Dollars. $2 for 1885 Dime S. Mint. $6 to $750 for certain $5 gold without Motto, etc. We pay highest cash premiums on thousands of coins to 1900. Keep all old money and send stamp for Large Illustrated Coin Circular. You have nothing to lose. The Numismatic Bank of Texas, Dept. 5, Fort Worth, Texas.

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SCOTCH COLLIE AND AIREDALE TERriers wanted. State age, breeding, color, markings, condition and price. Springdale Kennels, St. Charles, Ill.

BLOODHOUNDS — FOXHOUNDS, REGISTered; trained bear, deer, wolf, coon, and cat dogs; illustrated catalogue 5-cent stamp. Rookwood Kennels, Lexington, Ky.

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EXCHANGE I. C. S. CORRESPONDENCE course for what? H. Ferns, London, Can.

$35 COASTER BRAKE BICYCLES AT $22.50. Send for catalog. J. D. Newlon, 888 Main St., New Lexington, Ohio.

YOUR NAME IN GOLD ON 5 SILVER LINED visiting cards and 10 perfumed postcards, 10c; 3, 25c. R. C. Franklin, Dept. A, Axtell, Nebr.

CACHOO SNEEZE POWDER, 10c. THREE for 25c. Free copy Star Magazine with order. Levert Dolson, Hampton, Iowa.

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EFFECT AFTER FEW SECONDS. "ORIENtal" powder. Peculiar. Safely delivered, 12c. C. Wra, Longbeach, Calif.

PATENT FOR SALE—ADJUSTABLE CURtain fixture; simple, practical and needed. Particulars, E. Chabot, 86 Fairview St., Providence, R. I.

EGGS FROM QUALITY BARRED PLYMouth Rocks $1 per setting. Murray, Wadena, Minn.

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SEE WHAT I SAY UNDER "TYPEwriters." ATCHISON.

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SAVE POSTAGE. WEIGH ALL MAIL. Scale 10c. "Juron," CR1400 Noble, Chicago.

40,000 POUNDS LEAF TOBACCO FOR SALE. Mail stamps for samples to Anton Wavrin, Franklin, Ky.

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OUR KEYLESS COMBINATION BICYCLE, motor and baggage lock and chain is nickle plated ¾ inch in diameter. Opens in 10 seconds night or day. It saves you worry, checking fees and back fares. Its naked, brainy utility will surprise and delight you. 2154 sold last year. Price 50c postpaid. Satisfaction or money refunded. Bert Fisher, Medina, Ohio.

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INCREASE YOUR SALARY, LEARN, BE wise; complete business course, postpaid, $1.00. J. Hardway Co., 207 S. Lee St., Bloomington, Ill.

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BE A DETECTIVE. EARN FROM $150 TO $300 per month; travel over the world. Write to C. T. Ludwig, 201 Scarritt Bldg., Kansas City, Mo.

COMMON NEWSPAPER ADVERTISEments are worth from two to five cents each. Complete instructions for collecting and selling, 25 cents. William A. Temple, Fort Dodge, Iowa.

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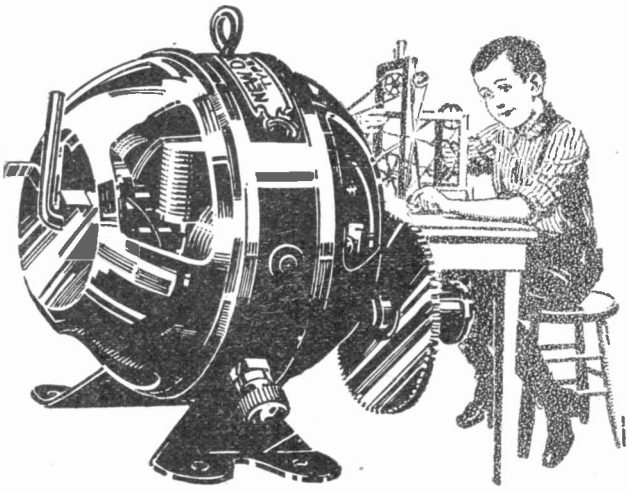
SPECIAL SALE *of* BATTERY MOTORS

FOR INGENIOUS BOYS



FOR MECHANICAL TOYS

Only a Few More Left at These Bargain Prices

THESE miniature battery motors will give any boy or girl a whole lot of pleasure and instruction. They are sturdy little affairs and on one or two dry cells will develop a speed of 3500 revolutions per minute. There is a type for every purpose; will operate all sorts of mechanical toys—lathes, planes, jig-saws, windmills, etc. These miniature motors are substantially constructed and will give good service. We have only a few of each type of motor, as noted below:

	Were	Now
Type C (Semi-Enclosed, snap switch)	$1.50	$ .90
Type D " " reversible	2.00	1.20
Type G (Fan Motor, semi-enclosed, snap switch) . .	2.50	1.50

The above prices are NET, that is, purchases will be sent express charges collect

Act Quickly—Send the Coupon

Select the motor you want and send us your money order for the amount of your purchases. But you should send in the coupon ***at once*** as there are only a few of these left at these bargain prices. Be sure to write plainly, telling which type wanted, how many and the price.

ELECTRIC SHOP

CHICAGO

Jackson and Michigan Boulevards

ELECTRIC SHOP CHICAGO, Jackson and Michigan Blvds.
Send me following described motors per your special sale offer in May Popular Electricity.
type_____, price $_____
type_____, price $_____
Name_____
Address_____

It will pay to Read These Advertisements

Because they are small you should not pass them over. The good things in life are worth looking for and many of the smaller advertisers have worthy products which they can sell you although many of them are not in a position to buy large space to tell their story. We bespeak your patronage for these advertisers.

POPULAR ELECTRICITY MAGAZINE

Small Ad Department

BOYS! This Ball Glove and The American Youth One Year 50c

Each issue of THE AMERICAN YOUTH contains clean, fascinating, snappy stories, of intense interest to every live boy. Departments devoted to Electricity and Mechanics, Athletics, Stamps and Coins, Boy Scouts, etc. Colored covers and beautifully illustrated throughout. This fielder's glove is made by one of the foremost American manufacturers, of finest leather, felt padded, leather lined, web thumb, deep pocket. Guaranteed. Order NOW.

The American Youth, 1126 Foster Ave., Chicago

The American Youth at all news-stands, 5c a copy

Do Your Printing!

Cards, circulars, books, newspaper. Press $5, Larger $18, Rotary $60. Save money. Big profit printing for others. All easy, rules sent. Write factory for press catalog, TYPE, cards, paper, outfits, etc. THE PRESS CO., Meriden, Conn.

WHITE VALLEY GEMS IMPORTED from FRANCE

SEE THEM BEFORE PAYING!

These gems are chemical white sapphires—**LOOK** like **Diamonds.** Stand acid and fire diamond tests. So hard they easily scratch a file and **will cut glass.** Brilliancy guaranteed 25 years. All mounted in 14k **solid gold diamond mountings.** Will send you any style ring, pin or stud for examination—all charges prepaid—**no money in advance.** Write today for free illustrated booklet, special prices and ring measure.

WHITE VALLEY GEM CO., 742 Saks Bldg., Indianapolis, Ind.

Avoids Mistakes and Saves Brain Work

For General Office or Personal Desk

Over 50,000 in use
Mostly sold through Recommendation

Buy from your Stationer or order direct

Price includes handsome Morocco case. Every machine guaranteed Money refunded if not satisfactory after 10 days trial.

Ref. Century Bank N.Y.—Jefferson Branch.
Agents Wanted.

P. E. Gancher A.A.M. Co 310 Broadway **N.Y.**

Underwoods, Olivers, Remingtons, L. C. Smiths, etc., visible or otherwise, from **$10** up. Every one perfect and guaranteed two years. Send for *Free Trial Offer, and valuable information.* Over 500 typewriters at $15.00 while they last. Send this ad. and 25c and get a $1.00 ribbon for any machine.

All Makes Typewriter Exchange Co.

157 N. Clark St., Ashland Blk., Chicago, Ill.

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Have *imported roller chains, sprockets* and *pedals; New Departure Coaster-Brakes* and *Hubs; Puncture Proof Tires; highest grade equipment* and many advanced features possessed by no other wheels. *Guaranteed 5 yrs.*

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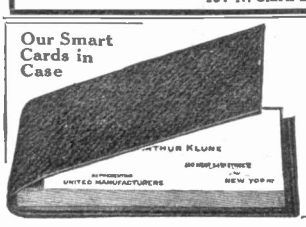

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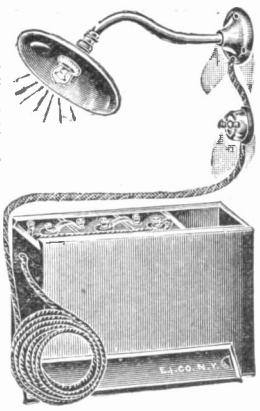

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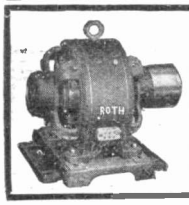

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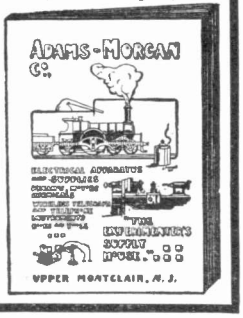

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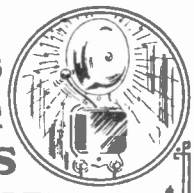

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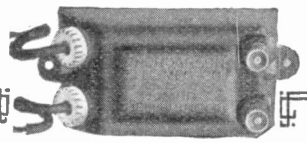
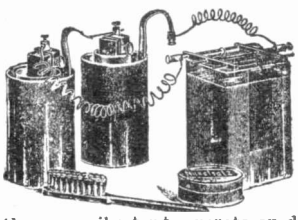


ELECTRO-PLATING OUTFIT



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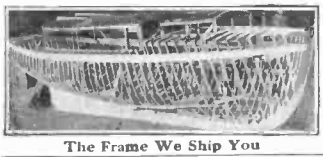

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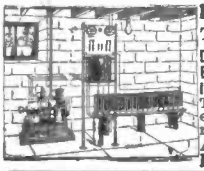

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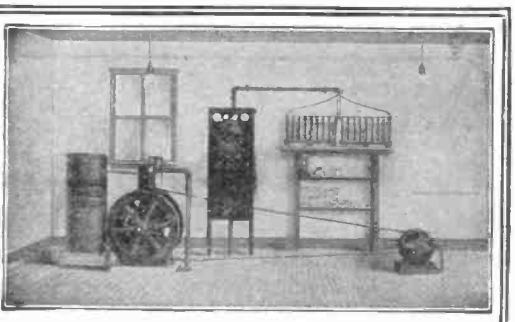

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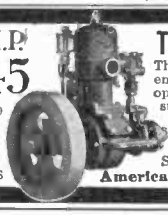

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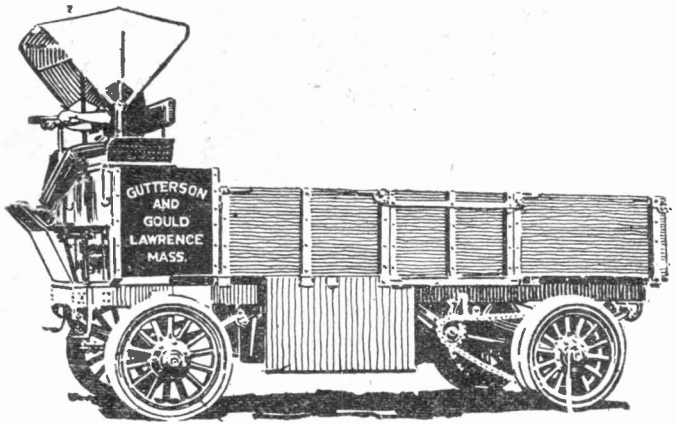

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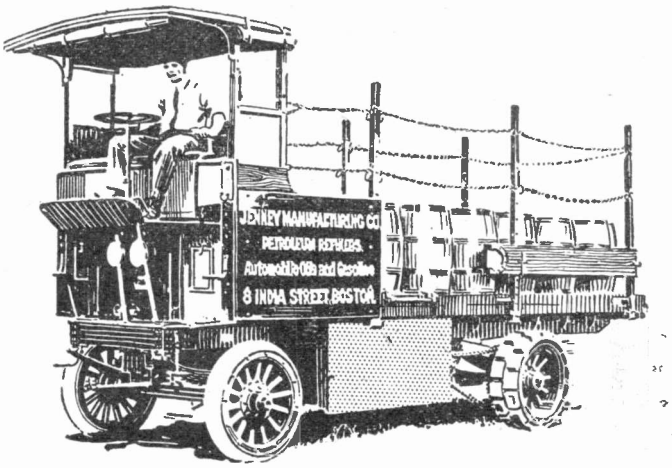

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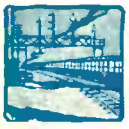

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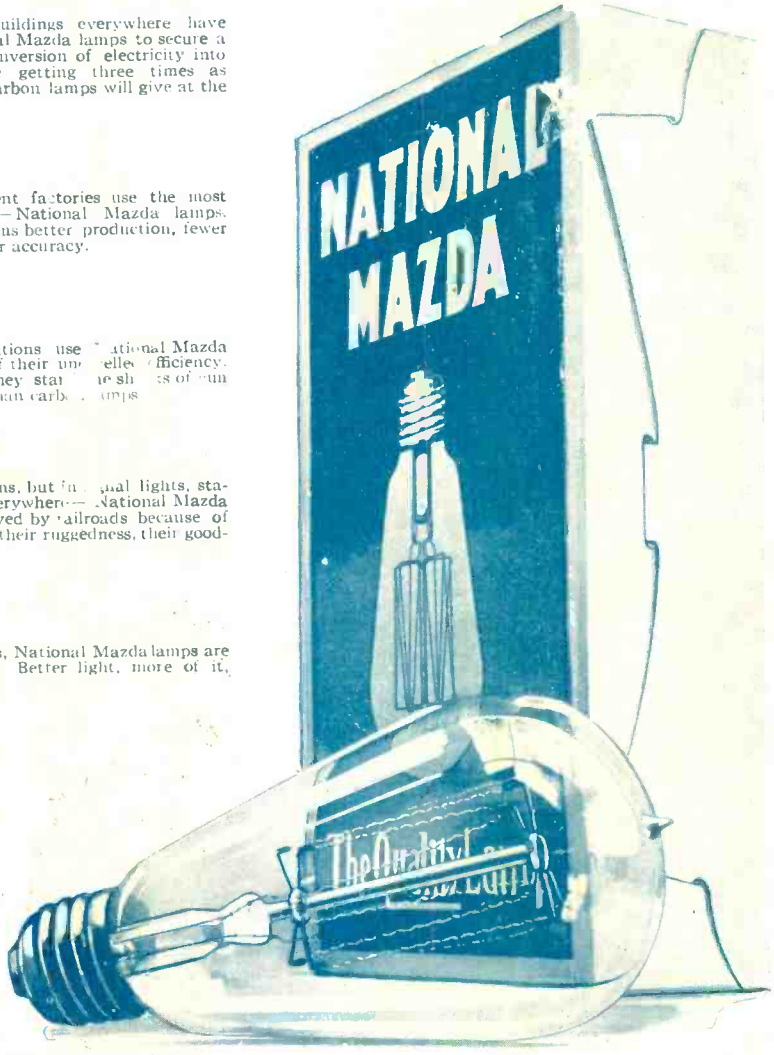

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