Popular Electricity
In Plain English

VOL. V MAY 1912 No. 1

How Farmers Tap the German Transmission Lines

"OVERLAND transmission stations" is a term used in Germany to denote a type of installation designed to take current from the high voltage transmission lines which traverse many parts of that country and transform it to a voltage suitable for use in the rural districts. For instance, the Deutsch-Krone overland station supplies an extensive district in western Prussia, including 62 villages and farms.

Stationary and portable transformer stations are used to transform the high tension current to a voltage suitable for the use of the patrons. The stationary stations are picturesque little houses of brick, as shown by the initial cut, and are generally to be found in the villages.

Farmers are more and more coming to use the current for threshing, plowing, grinding, etc., and for their benefit a type of portable transformer house has been designed. This is drawn on wheels by a pair of horses to the point on the main line most convenient to a farm or group of farms to be supplied.

USE OF A PORTABLE TRANSFORMER IN GERMANY FOR SUPPLYING FARM DISTRICTS

A Government Telegraph Office in Alaska

(Uncle Sam's Emergency Lines of Communication, page 8)

Popular Electricity
In Plain English
Henry Walter Young, Editor

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By ARCHIE RICE

This is the first of several articles which will appear in this magazine from time to time, presenting some of the big problems in the development of hydro-electric power successfully solved by a spirit of pioneer daring. Mountain rivers of California have been harnessed to make them produce cheap and transmittable electric energy. Electricity so produced has been applied to California's mines and fields and factories and to furnish light and transportation in her cities. And the writer of the articles is intimately familiar with the whole situation.—Editorial Note.

MAKING A RIVER DISGORGE ITS BURIED GOLD

Gold is where you find it. Electric power is wherever you can develop it.

California was always amazingly rich in both of these possibilities. But the gold deposits were never discovered till 64 years ago. Then during one season a hundred thousand red shirted miners, swarming along the foothill streams, shoveled and washed gravel by hand and harvested $83,000,000 in gold. They employed the most primitive of individual methods.

Twenty years later organization had developed companies and bigger schemes to get at the gold wholesale.

The mountain streams are steep in California. Ditches were surveyed to tap the flow high up in the hills, lead the water gradually out along some projecting ridge, and from an attained elevation suddenly shoot it down through a pipe line.

In that way torrents of water directed through mammoth nozzles rocketed and roared and tore asunder hillsides and dissolved and sluiced off everything but the bowlders, the smaller stones, and the actual gold. The weight of the gold lodged it safely along the little wooden cleats across the bottom of the outlet flumes.

Before another 20 years this gigantic process of converting foothills into muddy water was found to be alarmingly filling up the river channels down in the great level agricultural valley.

The farmers had gone along for a quarter of a century with more land than they could properly cultivate. They had had levees built here and there to confine the Sacramento River to a restricted channel. As the bed of the river filled up, the levees were built a little higher. At Marysville the surface of the water behind the restraining levee gets higher than the housetops.

Miners' mud seriously lessened the navigability of the Sacramento River. It increased for miles the spring menace of overflowed fields. And when the water got onto the fields it had to remain till it evaporated.

Such were the conditions that brought about the long legal and legislative war between California's valley farmers and her mountain miners. Nearly everybody was a miner at first. Farming didn't count. But when mining had become an organized industry operated by companies with large capital, farmers had grown increasingly numerous and important. Moreover, they had votes.

Sacramento, the capital of California, is on the river, right at the heart of that great valley. What the hydraulic mining back in the foothill country was doing to that big river and its cheap transportation for farm products was a close object lesson for the legislators. They have always convened during the flood season.

So hydraulic mining was practically prevented in California by law.

There came a time when the electrical engineer began to see opportunities in California. He never even dreamed of the actual magnitude of what was to develop. Nor did any one else.

Plenty of gold was left where the hydraulic miners used to get it out of the hillsides. The old pick-and-shovel boys had only worked the banks of the larger streams down to where seepage water flooded them out. But as far as they went they got gold.

Gold mining is like any other commercial industry. It pays only when it yields more money than the expense of producing the product.

They might have built portable cofferdams along the rivers and pumped out the water while getting at the gold bearing gravel. But the cost would have been too great. They might have constructed floatable steam dredgers and scooped up gravel from the depths of the streams. But fuel and its transportation were expensive. Coal has always been scarce in California. The State's amazing oil fuel industry was scarcely in its infancy, and when developed later was nearly 300 miles from the placer gold fields.

Twenty years ago the world didn't know that electric energy could be created in one place and transmitted great distances for use in another place. It was supposed that where electricity was generated right there it must be used. Telegraph and telephone wires might carry enough current to operate the sensitive little instruments at the stations and the terminals. But to send hundreds of horsepower by wire was a different and a dangerous thing.

Somebody had to make the experiment. It happened that physical conditions, commercial prospects, and personal daring were favorably combined in the California situation. The result was that California showed the world how.

The American River is a branch of the Sacramento. It comes down out of the Sierras and joins the parent stream at the city of Sacramento. Up the American River half a hundred miles is the spot where Marshall made the first discovery of gold in California. The entire course of the river was rich in gold bearing gravel. Thousands of individual miners worked it for all they could get by the methods they used.

Agriculture was developing. Lumber was needed. There was an abundance of big yellow and sugar pine timber all over the wooded slopes drained by the headwaters of the American River. A company was formed to get out the logs

and float them down to where a sawmill could be built.

An artificial waterfall was necessary to furnish power for the sawmill. A river dam and a diverting ditch were required to produce the fall. Water rights had to be obtained in order to divert any part of the river flow.

So the company bought a long strip of land from an old Spanish grant. It included the channel of the river. Then followed years of litigation and preparation.

The dam would cost hundreds of thousands of dollars and the canal a whole lot of cash. Where the dam was to be the river cañon was narrow and walled with granite.

California was gaining permanent population. A second penitentiary was needed. The state determined to have the new institution located where the convicts could be worked in a rock quarry. There were but two favored places. One was adjacent to that proposed dam across the American River.

Out of the procrastinating political evolutions of the time emerged an agreement. The state was to get a tract of 484 acres of the mill company's land along the American River. It was to give in exchange convict labor needed for the construction of the dam and a part of the canal.

The scheme dragged. Convicts worked for six years upon the masonry of the dam and the diverting canal.

The state also received the privilege of having the canal skirt the prison property and drop the immense volume of water seven and a third feet into the prison power house to produce electric energy. Trouble and more delays came from disputes as to whether the prison or the mill had the right to control the outflow from the dam. And litigation went on for 20 years before the final appeal was settled by the highest court.

At the prison they objected to the passing logs. All they wanted was the water power. But the lumber company had to have logs. Also the company had decided that a large power plant could be erected near its proposed sawmill. Industries would be lured there to take the power. A manufacturing town would

The Folsom Power Canal. At the left The Folsom Penitentiary, Granite Quarry and Power House

be developed. The water would be carried on and sold for irrigation purposes.

It is the steep pitch of the rivers running down out of these mountains that makes California such a wonderful place for the development of hydro-electric energy. Flanking every stream are great corrugated ridges out along the sides of which ditches can be made to divert the water for a fall of hundreds of feet.

The state prison figured on getting 800 electrical horsepower out of the little fall of the canal in the prison yard. The lumber and water company, with that vision of factory sites right near its power plant, decided to build big.

The river dam itself is a solid masonry wall of granite 81 feet high, sixteen feet thick and 854 feet from bluff to bluff of the river cañon.

The canal is two miles long, 50 feet wide, and carries a rapid flow of water eight feet deep.

The company's power house was to be built at the little town of Folsom, famous since 1855 as the site of the first railroad shops in the western part of America. It was also the temporary terminal of the first transcontinental railroad. From the very bricks of that historic railroad building were to be made the power house itself.

Behind the power house, constructed of granite, is a forebay reservoir 150 feet long, 100 feet wide and twelve feet deep, with a masonry partition to provide two equal sections. This arrangement permits the cleaning of one section to remove silt and sediment while the other section is supplying water to the turbines.

From this reservoir four huge steel pipes, each eight feet in diameter, let the ponderous columns of water plunge down a perpendicular distance of 55 feet and force the revolution of the four turbine wheels, each ten feet in diameter.

These water wheels, making 300 revolutions a minute, are connected to the armature shafts of the electrical generators. The outer rim of each wheel travels at the speed of nearly two miles a minute. Each wheel weighs 10,000 pounds. The centrifugal force is so great that a heavy steel rim is shrunken on like a wagon tire to preserve the

Famous Early Power Plant of Folsom. The 22-mile Line from this plant to Sacramento

Marked the Beginning of Long Distance Transmission of Electric Power

massive wheel from the strain of its natural tendency to fly to pieces.

While this substantial plant was being built a small installation for a mine in another part of California actually demonstrated that electric energy could be successfully transmitted a distance of thirteen miles.

But when the Folsom dam was started neither long distance transmission of electric energy nor a high fall of water for practical power purposes had ever been practically demonstrated.

At the time of its installation, that hydro-electric equipment in the Folsom power house was the most massive and powerful in the world, excepting only the plant at Niagara Falls. It weighed 400,000 pounds.

The Folsom plant was equipped to produce 6,600 electrical horsepower generated at a pressure of 800 volts and then increased through transformers to a pressure of 10,000 volts for transmission. Now it is sending out current at 60,000 volts.

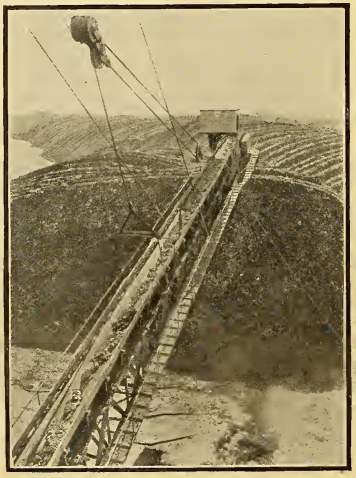
But even before the plant started generating electricity with that tremendous volume of water, dropped through what is now considered as a low head, other changes had come.

Now came to the owners of the dam a vision of taking their electric power on down to Sacramento and selling it to run cars and industries and light the streets and buildings. The people of the Sacramento steam power electric plant laughed at the idea. One of them facetiously offered to take into his own system, barehanded, all the current they could bring down as far as Sacramento.

But even while Sacramento, today a city of 50,000 people, was absorbing the power from the Folsom plant 22 miles away and using it for street cars and lights, other developments were happening. They were destined to connect the Folsom plant directly with the gold mining industry and once more make the channel of the American River yield its harvest of gold.

The idea of a gold dredger operated by electricity had recently been successfully tested in California. And the proven long distance transmission of electric energy made cheap power a certainty.

A gold dredge is nothing more than a large flat boat equipped with machinery for operating an endless chain of scoop shovels that dump rocks and



In the Wake of the Electric Dredge

mud and gravel upon the boat. A washing process and mercury plates secure the gold. The stones are carried off upon an ascending belt that dumps the debris on a high pile at the rear. A large, well equipped gold dredger costs more than $100,000. It is no tool for a poor miner.

But it makes placer mining a luxury. Very little water is required to float the boat. Some dredgers are constructed in a scooped out spot in a dry field. When all is ready and the electric power wire is connected with the motors that operate the machinery, water is piped in to form a tiny pond in which the boat can float and begin operations.

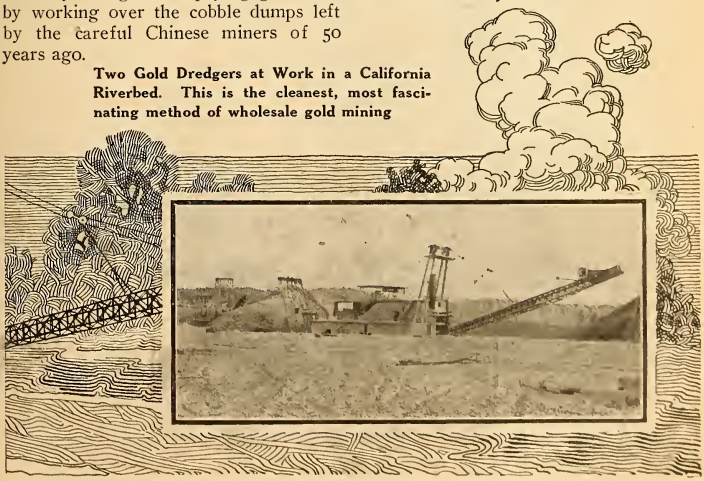
A half dozen men, including electricians and cook, constitute a dredger crew. The amount of work done by one dredger would make a regiment of old placer miners, accustomed to shovel-and-pan methods, look like an array of red ants trying to move a barrel of sugar a grain at a time.

The dredger scoops down to bed rock, sometimes 70 feet below the surface, and analyzes every square inch of possible territory. It gets out paying gold even by working over the cobble dumps left by the careful Chinese miners of 50 years ago.

The gold dredgers in California run day and night, with three shifts of men. Being well lighted, they work right along. Thus they are able to secure very favorable power contracts on account of this continuous load. At Hammonton alone, on the Yuba River, a few miles from Marysville, there are 30 of these huge dredgers working in one group.

And along the American River, between the Folsom power house and the city of Sacramento, the landscape is punctuated with the peculiar top works of dredgers craning above the apparently illimitable billowy rows of high piled cobblestones.

The gold dredger takes the whole river bed and the district a half mile or so on each side of the river. And it gouges down deep. What it does to the beauty of nature is almost unbelievable. Vegetation and every particle of soil and sand disappear from the face of the earth, being sluiced away into the depths and lost. Behind the dredgers are strewn in close furrows nothing but glaring, grayish cobbles and bowlders piled higher than an ordinary house.



Two Gold Dredgers at Work in a California Riverbed. This is the cleanest, most fascinating method of wholesale gold mining

Uncle Sam's EMERGENCY LINES OF COMMUNICATION

By Waldon Fawcett

As all persons who keep in touch with electrical progress are aware, the United States government has, for years past, made extensive use of the telephone and telegraph. There is, however, in this utilization a wheel within wheels that is little known, even to the electrical public. This is Uncle Sam's extensive and ever increasing use of emergency telephone and telegraph lines. All along the line of the Panama Canal, in the great reclamation, irrigation and conservation work in the West, in the development of Alaska, in constantly expanding military operations and in other equally important spheres the Federal authorities have found emergency communicative lines an indispensable aid, and, spurred by the possibilities disclosed, they have made bold to disregard the limitations usually supposed to obtain in the case of temporary installations of this kind.

Emergency telephone and telegraph systems, as the term is used

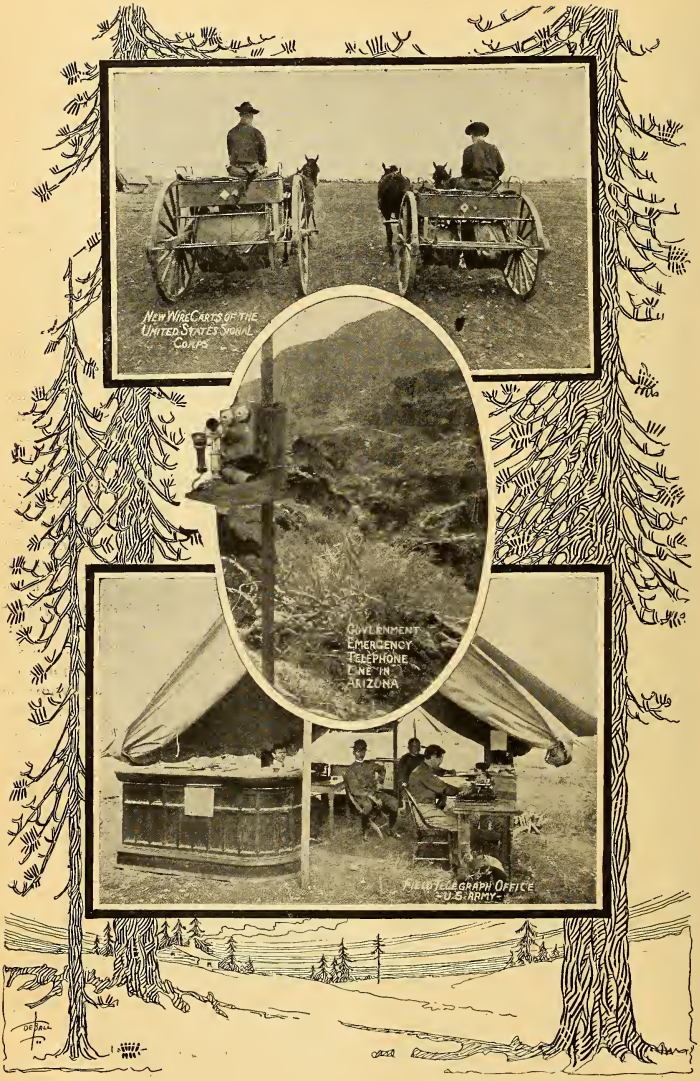
with reference to Federal projects, are of dual character. First, there are the emergency lines which are exactly what one might suppose from the designation; namely, wires installed in order that government workers in an isolated or remote region (removed from regular communicative facilities) may be kept in touch with the outside world and, more especially, with their bases of operations. Such lines are usually, at the outset, makeshift affairs, provided for temporary use, but, if circumstances warrant, this primitive plant is succeeded by one of more permanent and lasting character. In this category also should be included, probably, the temporary telephone and telegraph lines which are provided by United States military forces operating in the field on the occasions of maneuvers or "hurry calls," such as the recent mobilization of troops on the Mexican frontier.

The second class of emergency lines provided by the government are those which are designed for use in case of emergencies, but the presence of which does not necessarily imply quite the same pioneering or prospecting conditions that we are apt to associate in our minds with the first mentioned division of emergency systems. In this second division are such electrical nerve systems as the telephone and telegraph wires whereby Uncle Sam's forest rangers give warnings of forest fires and summon assistance. Likewise the wire meshes which encompass the vast irrigated areas that Uncle Sam is developing in the West, these particular lines being designed to allow the prompt sounding of an alarm when a canal breaks or a dam gives way under flood conditions. Such emergency lines, like those in the first division, are originally installed by Uncle Sam, but there is this difference, that in the case of the second class of emergency systems it may be advisable as the country develops and fills with settlers for the government to turn over the telephone and telegraph chains to private enterprise, or, preferably, to co-operative organizations of local residents.

In no branch of our governmental activities has the telephone exerted a more revolutionary influence than in the Bureau of Forestry which is charged with the care and management of our great national forests. The Secretary of Agriculture and the United States Forester after going over large areas of little developed and almost unexplored national forest land, came to the conclusion that systems of telephones with proper connections would be invaluable in the wilderness regions of the West. What rapid progress has been made in the conquest of the solitude is evidenced by the fact that there are now 7,381 miles of telephone line in the national forests and this is being increased to the extent of hundreds of miles of new construction each year.

Yet the officials feel that the work of establishing telephone lines as the most important adjunct of the protective patrol system of the forests has been hardly more than begun. The newest idea is to carry the telephone wires to "lookout towers" established at strategic points in the forests. A man stationed in the tower scans the landscape in every direction with powerful glasses at frequent intervals and if he discovers anywhere in the two or three hundred thousand acres under his observation the tell-tale smoke of an incipient forest fire he quickly gives the alarm by telephone. During the past year the officials of the Forest Service have discovered that, as a supplement to the permanent telephone lines, temporary lines of insulated copper wire can be laid cheaply and rapidly. Insulated wire, weighing less than 30 pounds to the mile, is carried on a pack horse to any point from which it is desired to extend an existing line temporarily, and the insulated wire is then laid on the ground. This expedient has proven entirely successful for distances up to 60 miles.

There is no field of either governmental or private enterprise that has ever


NEW WIRE CARTS OF THE UNITED STATES SIGNAL CORPS
GOVERNMENT EMERGENCY TELEPHONE LINE IN ARIZONA
FIELD TELEGRAPH OFFICE U.S. ARMY

been more absolutely dependent upon emergency telephone lines than is the United States Reclamation Service in its task of transforming the deserts. Indeed, as a rule, the very first step in undertaking any new irrigation project has been to install a telephone line, for the undertakings have almost invariably been in wild and sparsely settled country where there were no existing lines of communication and where the telephone or telegraph had to be depended upon to keep supplies moving and enable the directing engineers to receive reports from the crews working in more or less widely separated localities. At the outset such wires often have pole supports of a very primitive type but latterly, when power generation is attained on the projects, the wires are usually carried on the towers of the transmission lines.

The Reclamation Service now has in service nearly 1,700 miles of telephone line but oddly enough this wire system serves less than 800 telephones, an average of only one telephone for more than two miles of wire. As the projects progress the telephone systems will be extended until the lines parallel all the main ditches of the great waterways systems and the "ditch walkers" will have at hand the means of almost instantly communicating the discovery of any break in the ditches or other mishap that would involve loss of the precious water. Of course, as settlers come in and take up the land under irrigation the number of telephones will grow until the present ratio of a few telephones to many miles of wire will be reversed. The longest single telephone line in the Reclamation Service's emergency system is in the Southwest and has a length of approximately 100 miles.

The United States Army, through the United States Signal Corps, makes extensive use of emergency lines, both telephone and telegraph. During the army mobilization on the Texas border (the first opportunity which has been afforded for a practical try-out of its latest approved equipment) this institution accomplished wonders in the rapid installation of communicative lines and established under canvas field telephone and telegraph offices that were models of the kind. Much of the credit for the speedy work of installation unquestionably belongs to the improved types of wire carts which have lately been perfected by Uncle Sam's experts—one type designed to carry two reels of wire and the other a single reel of wire.

The War Department maintains in Alaska a full-fledged telephone and telegraph system that may rightfully be designated an emergency installation. It comprises fully 1,125 miles of land line, in addition, of course, to the submarine cable that connects this country with Alaska, and the problem of keeping these lines open in the winter months is one of the most perplexing ones that confront the men in charge of Uncle Sam's electrical "intelligence system."

Safe Expert Uses an Electro-Magnet

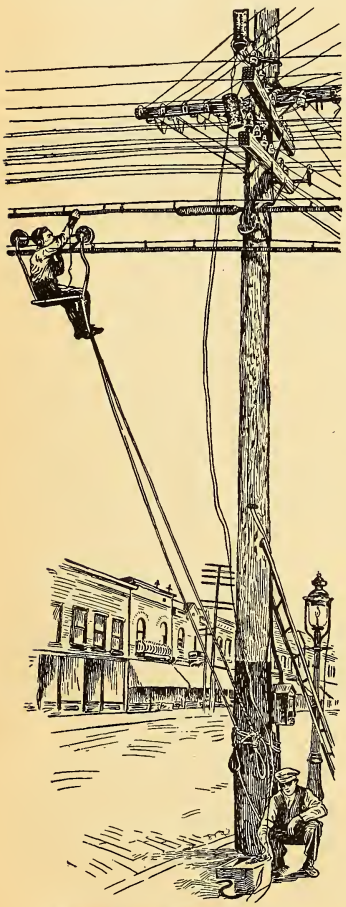
A bank in an Illinois city recently had some trouble with the time locking device of its huge 60 ton safe, of the type in which the clock inside the door controls the expanding rings which lock the door.

An expert was called in, who, after making the repairs and locking the safe, accidentally dropped a small screw into a hole in the top of the door, while replacing a part of the controlling device. This screw dropped down far into the interior and lodged between two levers, preventing the unlocking of the door.

After working all day to get it out, he gave up the job. Then some one suggested a magnet, and one was constructed by a local electrician. It was made with a small iron core, a few turns of magnet wire and a few cells of battery. This core was dropped down into the opening and after a half hour's work the screw was fished out.

Exploring Cables with the Telafault

Inside the lead sheath of an aerial telephone cable are several hundred pairs of fine wires all carefully insulated from each other. Each pair represents the line to some one's telephone. Now suppose lightning gets into the cable and puts a cross on some pair of wires or causes a high resistance ground between a wire and the lead sheath, or suppose an opening develops in the sheath and moisture gets in and ruins the insulation. These things are liable to happen, and how are you going to locate the trouble? The usual way is to locate trouble as nearly as possible by certain electrical measurements from the nearest open point on the cable. The point of trouble can only be located approximately in this manner. Then it becomes necessary to begin and open up the cable sheath at frequent intervals in each direction to test. In this manner the exact point of fault is finally found. But the method is slow and laborious.



EXPLORING WITH THE TELAFAULT

The most up-to-date method is to use a little instrument called the "Telafault." After the fault is first located approximately, as in the above case, the man on the ground, through a set of portable instruments, places an intermittent current on the line in trouble. The overhead man then works along the cable with a little exploring coil connected to a head telephone receiver. The intermittent current causes a buzzing in the receiver, but at the instant it passes the fault this buzzing ceases and this is the place for repairs, and only one opening is thus necessary.

Electric Vehicles and Horse Feed

The following figures were compiled recently by one of the electric vehicle journals: During the last five years the cost of oats has increased eleven per cent, the cost of corn has increased sixteen per cent, the cost of hay 24 per cent, and the cost of horses 100 per cent. Within this period the cost of electric vehicles has decreased remarkably and the efficiency of the electric truck has increased 25 per cent.

Some SECRETS of Electrical Stagecraft

By T. J. Newlin

PART III

"SHADOWS" FROM THE UNDERWORLD

Now for a few words about "specters." Close your eyes and challenge the memory centers of your brain or subconscious sense to draw from its innermost recesses the most weird, uncanny ghost, hob-goblin or what-not you have ever, in your imagination, had the fortune or misfortune to gaze upon. For I am going to delve deep into the optical art of the magician and explain a wonderful optical illusion sometimes employed by clairvoyants to play upon your imagination, and in such a manner as to cause an hallucination vivid enough to hark back for a decade and rattle the bones of the family skeleton with jealous envy. Before doing so, however, I will say a few words on those unpleasant visitations known as ghosts, to which all people are liable, either through an overworked brain or some organic disease.

The peculiar appearances known as specters in optics are certain illusions of vision in which an object is apparently presented to the view which does not really exist. In such cases either the brain, the retina, or the optic nerve are unnaturally excited and made sensitive to an appearance that, physically speaking, does not exist. There is such a close connection between the senses and the mind that we continually, and without knowing it, transfer to the physical world that which belongs to the domain of thought. A picture which has struck us during the day will appear to us at night during sleep, with every detail perfect, or possibly under a form modified by the capricious wanderings of our thoughts. A sudden fright may sometimes be the cause of optical illusions which will pursue us unceasingly.

Fear, despair, passion, ambition, and other violent mental phases are capable of evoking images closely connected with the state of our brain, appearances that we often take for realities, and the truths of which we have to test by our faculty of reasoning, before we can set them down for positive illusions. In fact, we have the cases of Newton and Napoleon as examples of where the imagination revives the images of luminous objects for months or even years after these impressions took place. Napoleon was often found gazing at a supposed bright star which he imagined was leading him onward to victory, but which suddenly went out at Waterloo.

After the occurrence of such phenomena, it is easy to comprehend how shallow is the division that separates reality from the spectral illusions.

Specters may be divided into two classes: the subjective, which are caused by some unnatural action of our bodies and which belong to the science of physiology, and the objective, which are caused by some peculiar illusion acting from outside forces. In many known cases of the power of imagination over the life of the body it has been shown that the power of judgment is destroyed, so great is the terror of the unfortunate sufferer. Even men with the strongest nerves are not free from such illusions.

The most fascinating and mysterious specters, in which the science of optics plays so important a part, are the re-

FIG. 17. A STAGE GHOST AS VIEWED BY THE AUDIENCE

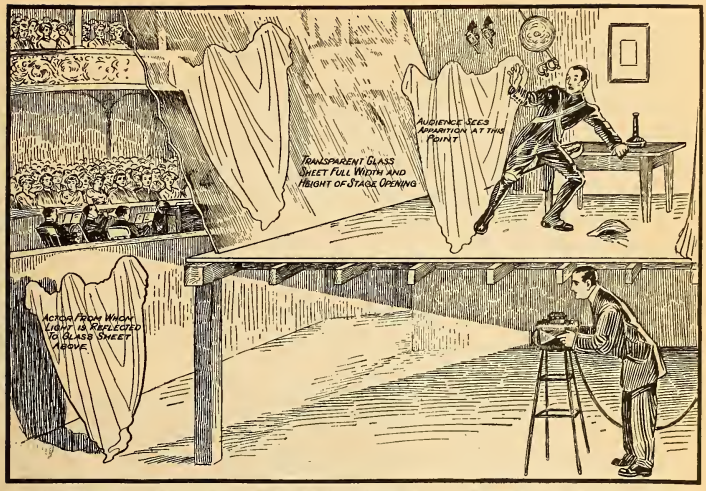


FIG. 18. METHOD OF PRODUCING THE GHOST BY MEANS OF A GLASS SHEET AND REFLECTED LIGHT

sult of the imagination being deceived by art with the assistance of science.

THE GHOST TRICK—AN OPTICAL ILLUSION

Specters form the principal part of the ghost trick which has been practiced at various Parisian theaters for a number of years, more especially at the Théâtres du Châtelet and Dejazet. The Adelphi of London also employed Mr. Pepper to heighten the effect of the excellent acting of Mr. Toole and Mrs. Alfred Mellon, in the dramatic version of Dickens' "Haunted Man," by the introduction of various spectral effects. And the same trick was called into requisition with success in several of the New York theaters. At the Polytechnic, London, very remarkable effects were produced and few who ever saw them will forget the surprise they felt at seeing the first representation of an imponderable ghost endowed with motion and even speech.

Among the most successful productions in this way was the entertainment of M. Robin, successor to Robert Houdin, the prince of prestidigitators. Evening after evening he not only "called spirits from the deep," but "made them come." He pierced them with swords, he fired pistols through them and made them appear and disappear at will. He showed the Zouave at Inkermann, lying dead amongst a heap of slain, who at the familiar sound of the drum, rose, pale and grave, and showed the bleeding wounds from which he died. Among other scenes shown was one of a specter appearing to an armed man, who after trying in vain to shut out the vision from his sight fired a pistol at the intruder. Fig. 17 shows the scene as viewed from the audience, and Fig. 18, the method by which the illusion is produced and operated. In the latter the theater is shown in section. On the left, at the end, are seen the spectators; on the right is the stage upon which the scene is represented. Beneath the stage is the actor clothed in white to personate a ghost whose image is reflected by the glass above. The glass is placed at an angle and fills up the whole front of the stage.

the edges being carefully concealed by curtains. The glass of course must be of a very large size and should be of the very best quality, so that it cannot be seen by the audience. The actor must take care to place himself in such a position as to counteract the effect produced by the glass being placed at an angle.

At first the cavalier is seen sitting at a table. After soliloquizing for a time in a very remorseful manner, touching several murders that he has committed, the ghost of one of his victims gradually appears. This is effected by gradually turning the electric light upon the concealed actor. The murderer and victim parley for a short time, when the former, unable to withstand the reproaches of the ghost any longer, fires a pistol at him point-blank. The ball of course takes no effect, so the villain draws a sword, but before it has left its scabbard the spirit of the victim has vanished with a mocking laugh, or, in other words, the electric light is suddenly turned off.

The management of the light is exceedingly difficult under the circumstances. The theater, the stage and the portion beneath ought to be lighted in a very careful manner, for if either is too bright or too dark it mars the whole effect.

It must be remembered, too, that the person performing the part of the specter and the real actor above cannot see each other, consequently all the action has to be carried on by guess work. The actor below has to walk along an inclined plane, keeping himself exactly at right angles to it.

When well arranged, the ghost trick leaves far behind all the efforts of a similar nature that were obtained by the ancients in the way of magical illusions. It is also incontestably true, contrary to what some people have supposed, that they were unable to perform this illusion in the way it has been described, for they were ignorant of the method of manufacturing and polishing glass plates of sufficient size and clearness for the purpose.

The production of living but impalpable specters is thus an entirely modern achievement, as we have already proved, and which has taken its place among

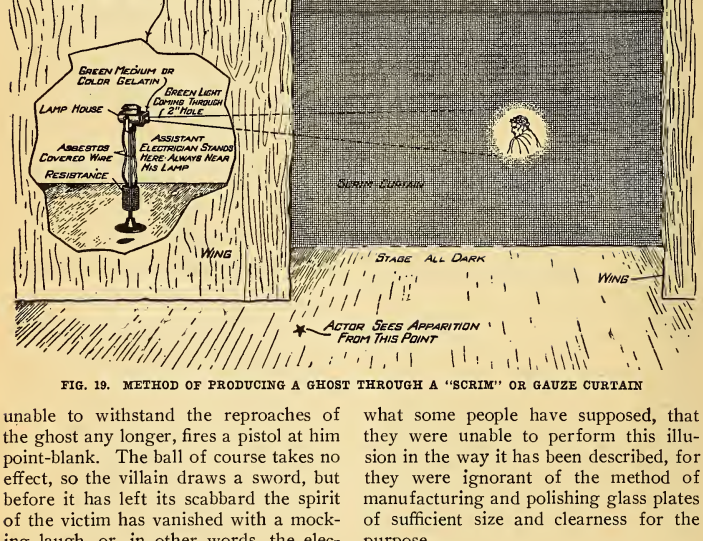


FIG. 19. METHOD OF PRODUCING A GHOST THROUGH A "SCRIM" OR GAUZE CURTAIN

the applications of science to stage art, to the total exclusion of all effects depending for their production on the old-fashioned phantasmagoria and magic lantern.

"GREAT CÆSAR'S GHOST"

This expression you will often hear as an ejaculation or exclamation of surprise, so I am going to explain just how you can cause him to gallantly walk forth and greet you in all of his ghostly majesty. This method is unlike the more elaborate one just described, as it is by far more simple. The easier way to produce a ghost effect is like that adopted by Mr. Robert Mantell, the eminent Shakespearean actor. Mr. Mantell as Brutus, the assassin of Cæsar, has a very nicely acted scene with his ghostly lordship. Just before the battle of Philippi the ghost of Julius Cæsar appears, and in the most hollow and sepulchral tone of voice the apparition informs Brutus it will visit him again at the battlefield. In his great stress of mind at the irreparable loss of his lovely wife and the burdensome affairs of State, he gives orders for the army to march on Philippi and in desperation meets his inevitable fate as prophesied by the ghost of Cæsar.

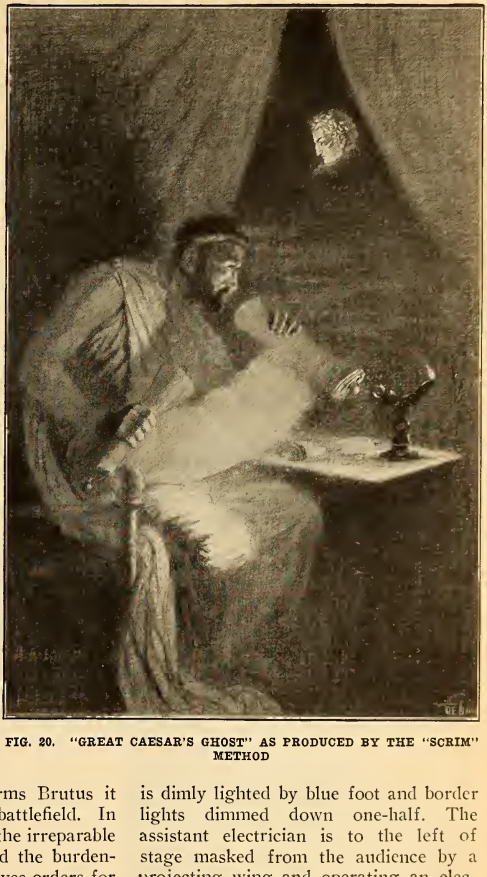


FIG. 20. "GREAT CAESAR'S GHOST" AS PRODUCED BY THE "SCRIM" METHOD

CÆSAR'S GHOST BY THE "SCRIM" EFFECT

In Fig. 19 is shown the method by which the ghost scene is produced. A "scrim" or gauze sheet is interposed between the actor and the ghost. The stage is dimly lighted by blue foot and border lights dimmed down one-half. The assistant electrician is to the left of stage masked from the audience by a projecting wing and operating an electric arc lamp, which throws the light upon the apparition as shown in the cut. This wing is situated behind the scrim or gauze sheet and separates both the electrician and the ghost from the actor, who is in a position in front of same and in full view of the audience. At the given cue a green light from lamp is thrown upon the actor characterizing "Cæsar's

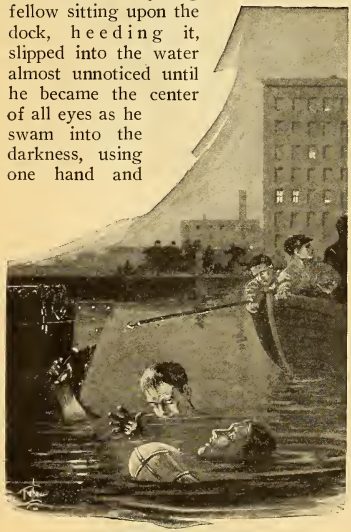
Ghost," taking care to light up the head only. The stage being dark and with light shining on the ghastly features, the rest of the body is in total darkness and absolutely obscured; while the audience through the scrim sees the pale, death-hued face of the murdered Cæsar, as in Fig. 20, which gradually dissolves and fades from view as the light is masked off. In this effect the real body is shown instead of an electrical or optical illusion; and so, of course, is not supposed to be fired upon or run through with the sword.

In the next chapter of this series, which will appear in an early issue, besides describing the production of the "Lightning Bolt" in King Lear, the author will take up the production of stage illusions, through applications of the science of optics, particularly the simulation of moon effects, rainbow effects and the separating of colors by the prism. The wonderful, fascinating Sciopticon for the production of luminous images will also be treated in detail.—Editorial Note.

Flashlight Directs Night Rescue

A spectacular rescue from drowning in which a cool head and an electric flashlight played the prominent parts took place recently in the river harbor of a big city.

An ocean steamer lay at the dock one evening with other smaller craft near by. There was suddenly a cry of "Man overboard." A young fellow sitting upon the dock, heeding it, slipped into the water almost unnoticed until he became the center of all eyes as he swam into the darkness, using one hand and waving above his head with the other hand an ordinary pocket flashlight. Reaching the almost exhausted victim, the uplifted light now directed the throwing of a life preserver and a quick rescue.



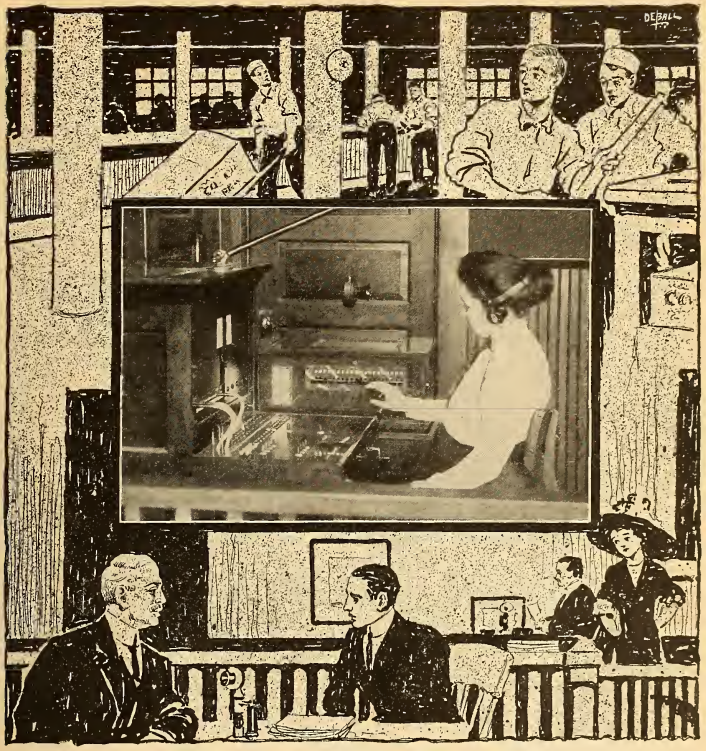
A SPECTACULAR RESCUE

Steam Versus Electric Transportation

Through a small suburb of Chicago, the steam and electric railroads run parallel with each other, the depots for the village being only half a block apart. A number of the electric road's patrons, who cannot but admit its superiority in the good weather months, usually change to the steam road on account of a supposed more reliable service during the winter months. But the severe weather of the past winter has entirely disproved their assertion, as the electric railway's schedule was maintained within about ten minutes of its regular time during the heaviest snowstorms and coldest weather, while the steam railroad was considered to be doing well if it ran anywhere within one to 2½ hours of its regular schedule.

The Autocall

A new device termed the Autocall has recently been installed in many large factories as a means of locating instantly officers and employees whose duties carry them all about the works. The device looks very much like a small telephone switchboard and is usually installed near the operator of the branch exchange.



THE AUTOCALL AS THE FACTORY MESSENGER BOY

A number of ringing stations are located at convenient intervals in the factory and each employee, foreman. superintendent, etc., who may be wanted for any purpose has a prearranged signal of long and short dots and dashes, much after the style of the Morse code. The wires from the ringing stations converge at the central board and terminate in the central Autocall board. When a party is desired the lever shown on the front of the central board is moved along until it comes under the notch of the individual wanted. Then the lever is depressed and the call is simultaneously sounded throughout the works. The party called hears his signal and gets the office by telephone to know what is wanted.

The system is entirely separate and distinct from the telephone system and by an ingenious contrivance the call is insistently repeated at frequent intervals automatically. This system has been installed in many large established factories and gives almost universal satisfaction as it obviates the disturbance necessary in calling up department after department to locate a party wanted.

The Pulmotor

The load dispatcher's office of a big electric light and power system is the point from which, night and day, the operation of the system is directed. And this is the reason for placing on the table in this office of the Commonwealth Edison Company of Chicago a plain wooden box the size of a suitcase. Within this box is a device called a pulmotor, a machine that works marvels in reviving persons who have been shocked by electricity or suffocated by gas. The telephone bell rings and the hurried query, "Is this the load dispatcher's office?" may come at any moment, followed by "This is Dr. ——. I have a bad case of asphyxiation."

That is enough. The dispatcher knows that the life saving pulmotor is wanted.

"Where shall we come?"

"To No. ——, —— street."

"We will be there in eight minutes," is the dispatcher's answer.

In less time than it takes to write it, two men appear in the dispatcher's office. One seizes the handle of the ordinary looking wooden box while the other leads the way to the elevator and in a minute's time, seated in an automobile kept for this special service, they are racing with death, for the loss of two or three minutes or even less may mean life snuffed out by gas.

As the speeding automobile draws up to the curb, both men spring out, carry the oak case into the house and place it upon the table or floor close to the patient.

AT WORK WITH THE PULMOTOR—A MACHINE FOR RESUSCITATION

"Breathing?" asks the operator.

"Slightly," answers the physician.

"There's hope," and the young operator smiles in the face of Death. The race is almost won.

The cover of the case is opened, a sort of a face cap with a soft rubber rim is connected by two rubber tubes to the

apparatus and then placed over the mouth and nose of the patient. In the face cap is also a small rubber bag which enables the operator to grasp the patient's tongue with a pair of forceps and hold it in such a position as to give free access to the lungs. Now touching a lever the pulmotor begins pumping. In the box is an iron cylinder 3½ inches by 21 inches containing oxygen at a pressure of 2,800 pounds. By the operation of valves, bellows and pistons, oxygen mixed with air is forced into the patient's lungs and drawn out again. This operation is repeated several times a minute, depending upon the lung capacity of the patient.

Presently the patient shows signs of breathing. This becomes more marked until the chest rises and falls with regularity, the fingers twitch, the arms may move slightly, and a life has been saved.

The pulmotor is the latest step of science in coping with death caused by asphyxiation, electric shock or poisoning; in fact, it is used in all cases where respiration has been suspended or restricted.

It was introduced in Chicago by the Commonwealth Edison Company about eight months ago to be employed in cases of severe electric shock, but the device has been widely used in gas and poison cases.

From January 16 to and including February 29, the pulmotor has been hurried out to treat 67 persons. Of this number 34 were brought back to life, sixteen were revived while the machine was on its way, two were not pulmotor cases and fifteen were dead before the arrival of the machine. The longest time the pulmotor was ever used and was successful was two hours and 20 minutes.

The Commonwealth Edison Company has in all cases sent the pulmotor without charge of any kind. Three more machines have been ordered and will be placed in various sections of the city to reduce to the minimum the interval of time between an accident and the arrival of the pulmotor.

Puzzle: Find the Motor

A so-called "perpetual motion machine," erected over one of the side streets of Los Angeles, California, rotates day and night and attracts the attention of passers-by to the advertisements painted upon it. The inventor claims, or allows it to be assumed, that

A "PERPETUAL MOTION" SIGN

the rolling of the large brass balls from centre to periphery produces enough power to maintain the wheel always in motion, but those observers who were skeptical were rather amused to note that the wheel ceased its motion when a large fire in the neighborhood caused the electric current to be interrupted.

Changing Song Slides

In some moving picture theaters it is very difficult for the operator in the booth to hear the singer and know when to change the slides. The following arrangement will work very satisfactorily: Place an ordinary telegraph key on the floor just to the left of the pedals of the piano. Four dry batteries in series with the key and connected to a four volt lamp in the booth by a No. 18 drop cord will enable the piano player or singer to press the key with the foot and flash the lamp in the booth.

Telephone in Timing Motor Boats

Modern motor boats which are propelled at almost express train speed are hard things to time in races. Owing to the high speed, the course is necessarily long and the usual method of firing a pistol and having the man at the finish line catch the flash in starting his watch is not satisfactory. The most approved method is to use the telephone in connection with a submarine cable, which has been tried with success in at least one big race.

A submarine cable is laid between the wharf or barge at the starting point and the boat at the finish, connecting telephone instruments at the two points. When a motor boat is brought up to the starting line and all is ready the starter fires his pistol in front of the telephone transmitter, starting his watch at the same instant. The judge at the other telephone also hears the pistol and starts his watch. Then when the boat arrives at the finish line the judge of the finish takes the time and announces the exact moment through the telephone to the starter. In this way there is a double check, as two watches are held on the contestant.

THE STARTER FIRES HIS PISTOL IN FRONT OF THE TELEPHONE TRANSMITTER

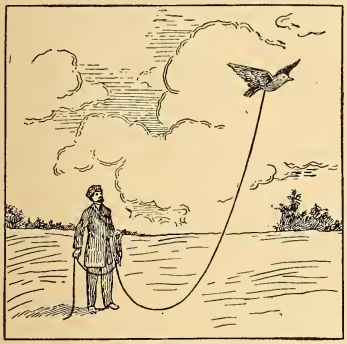
THE JUDGE AT THE FINISH HEARS THE SHOT

Chicago-New York Business Trip Without Going Out of Doors

A big hotel will be built this year in New York, by the New York Central and the New York, New Haven and Hartford railroads. When it is completed it will be possible for a person arriving from Chicago on the Twentieth Century to disembark at the Grand Central Station, take an elevator to the lobby of the hotel, and then proceed to his room without going out of doors. He can take a Turkish bath, eat his luncheon and then go to Wall Street by the subway, transact his business in one of the big buildings adjoining the subway station, go back to the hotel, and return to Chicago, without stepping his feet upon the pavement of New York.

Bird Aeroplanes

The soaring flight of birds has always been one of the secrets of the air. The Wrights have been experimenting along these lines with some degree of success, and Lilienthal sacrificed his life in his endeavor to solve the problem. M.



BIRD AEROPLANE

Briane, a French aviator, is using unique methods in striving to solve the riddle. He has constructed a model aerodrome and is experimenting with bird models. One of his recent experiments was the construction of a 1-20 horsepower electric motor so small that it could be used in the body of a crow, supplying power for the crow's soaring flight.—*Mechanics for Everybody.*

An Immense Projecting Sign

A novel electric publicity device which is designed to be operated from the roof of a large building is called the Stero-Spec-Funnel-Ad-Scope. It is a sign of the projecting lantern type, but on a very large scale. The little house at the left contains the projecting lantern in which various slides are used. These slides are projected boldly, and in colors if desired, out on the large screen placed where it can be seen far up the street.

PROJECTING SIGN

Sign that Stops Traffic in the Strand

Electric signs are not used to nearly such a great extent in England as in America, consequently they attract even more attention than in our own cities. The sign illustrated in the cut, which

SIGN THAT STOPS TRAFFIC

appeared on a London theatre, soon became known as "the sign that stops the traffic in the Strand." It is the type of sign which is more or less common in our large cities, and represents one clown throwing balls to another, who catches them and places them one by one on the table. The second clown then takes them off the pile and throws them into the word "Cinema," until this part of the sign is fully lighted. The process is then repeated.

The first night the sign was in operation complaints were made to the police on account of the crowds who collected to watch it, and for a number of weeks it was necessary to keep a man on the roof to turn off the current as soon as a crowd collected.

ELECTRIC VEHICLES

FOR BUSINESS AND PLEASURE

by

W.C. JENKINS

PART IV.—COMMERCIAL ELECTRIC VEHICLES

The electric truck is distinctively a modern creation. It, however, is but the natural evolution of the pleasure vehicle into a more useful and valuable utility.

The gasoline vehicle builders quickly arose to the need of a small delivery wagon, at a reasonable first cost and large numbers of these gasoline delivery wagons suitable for the use of the butcher, baker, grocer and similar merchants were rapidly introduced.

The electric vehicle manufacturer has been somewhat handicapped in getting the electric truck into general use because of the first cost being somewhat higher than the gasoline wagon. A great many central station men have complained of the high price charged for electric trucks, but it must be remembered that the vehicle manufacturers have had the burden of a great many years of hard work to bring the trucks up to their present standard of efficiency and reliability, and that the trucks sold to date have not been in proper proportion to the builders' original investment expense. The builders claim that as soon as the central station men mastered all the details of the electric vehicle proposition, as they have mastered the power supply business and the sale of current to other consuming devices, then the price of trucks may be materially reduced.

Central station companies are coming to the front very rapidly in their efforts to encourage the use of electric trucks, and current rates for this class of service are being reduced each year. A little study of the question will show why this is so. In the operation of any light and power plant it is obvious that the load is not constant throughout a 24 hour day. There are times, in the morning and evening especially, when the load climbs up enormously. The daily load when plotted in the form of a curve runs up into enormous peaks. This means that expensive machinery and equipment must be provided to supply current during the leaks, a large part of which must lie idle during the period of low load. The electric supply companies are, therefore, constantly on the lookout to secure business which will come on to the lines during the low load periods, so as to keep the machinery busy earning money. In other words, they are seeking day and night to flatten out that load curve. To secure such business they make better rates. Practically all the companies are now following this plan.

The charging of electric truck batteries furnishes exactly the kind of load

that the central station is seeking. The logical time to charge the batteries is during the night when the trucks are idle. Fortunately this is the time when the central station load is at its lowest ebb and special rates can be made.

There is a field for a small electric wagon of from 500 to 750 pound capacity which would come between a pleasure vehicle and a 1,000 pound truck. This sized vehicle would be of a great convenience to the small tradesman and could be furnished to the electric light companies and dealers in general at a price that would not scare a prospective buyer.

This type of a wagon would be a proper thing for a small central station to start an electric vehicle campaign.

It may be stated, without qualification, that the development, perfection and production of the electric commercial machine is now being backed up with the same quality of sound brains and capital responsible for the development of many other electric utilities which have become necessities in our daily life.

In establishments where power is usually produced at low cost the electric vehicle fits in so harmoniously as to require very little argument in its favor. There is, in such concerns, a quality of mechanical ability quite competent to care for the electric truck, and its simplicity of control renders available several operators for each machine, thereby insuring almost constant service.

An economical feature of the electric vehicle is that when the machine stops or is delayed at shipping depots, its cost of maintenance also stops, which is not the case with the horse employment.

One peculiarity in machine performance has not been realized by the average person, and this is that the consumption of current, tires, gears and battery material is in direct proportion to the work performed, and that periodical renewal of such consumed material is as much an essential part of the program as is the renewal of horseshoes, wheel tires, blankets or any similar material requiring constant renewal with horse service. The periodical renewal of this consumed material does not indicate the gradual breakdown of the entire vehicle, because the machine proper undergoes very slight wear and the annual depreciation is less than ten per cent.

No one endowed with ordinary judgment can impartially consider the constituent makeup of an electric machine without recognizing that it is composed of the least number of parts that it is possible to incorporate in a self-propelled vehicle. It is a simplified street car with the same motive power, equally reliable and free from restriction as to mobility and direction, with mechanism entirely devoid of reciprocating parts.

As pleasure vehicles they may be operated by children and as commercial machines with a class of labor but little if any more expensive than that employed with horse vehicles. They can be made to perform their specific day's work uninterruptedly and receive a fresh supply of energy silently during the night and operate with the same automatic precision as an adding machine or a cash register.

The user has the satisfaction and assurance that the power equipment is no haphazard arrangement, but is a well ordered development and natural production of such large organizations as have provided most of the street railway, lighting and power plants of the country.

Electric trucks may be found today in almost every industry where the conveyance of persons or goods is required. They are used as police ambulances and patrols, hospital ambulances, banking wagons, tower and emergency wagons for electric light and railway companies, pumping wagons, hoisting and derrick trucks. Besides they are used for fire departments, insurance patrols, hose wagons, chemical engines and supply wagons.

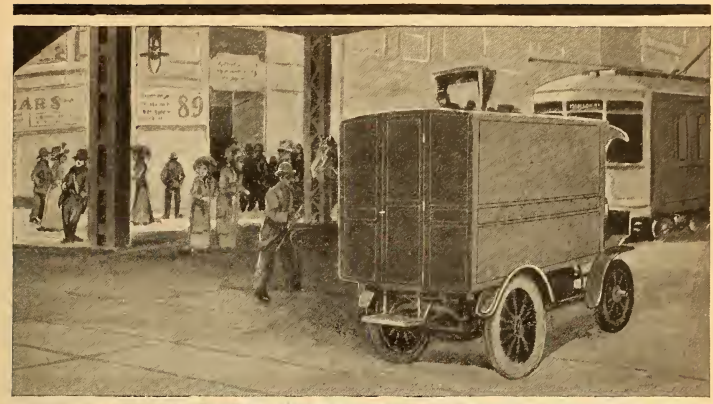
THE COMMERCIAL VEHICLE IS AN INCREASING FACTOR IN RELIEVING TRAFFIC

In several large eastern cities the fact seems to be realized that for fire departments the electric vehicles are especially fitted. This is largely on account of their efficiency, cleanliness around the fire stations, the absence of fire risk, simplicity of operation and general economy. In regard to fire risk there is no comparison with the gasoline cars. Everybody knows that many fires are daily reported which are directly traceable to the gasoline driven machine, and it would seem that fire departments should be the first to adopt a vehicle that would minimize the fire risk, especially when it can be done without deteriorating the efficiency of the department's service.

With respect to reliability the electric vehicle is unquestionably the most dependable. It is not freakish, is always ready to start and requires no cranking. Its simplicity is one of its strongest points. There are no reciprocating parts to shake the chassis and machinery apart; no engines with their multitude of details; no carburetors; no oil tanks; no clutches; no reversing levers; no transmission gear cases filled with a multitude of parts—just a simple controller handle similar to that on the street car, which in turn throws on the amount of current for the speed desired, either for forward or backward motion.

The efficiency of the electric vehicle has probably nowhere been better demonstrated than in San Francisco, where a test was recently made on one of the city's steepest hills. The Fillmore Street hills were chosen, not only because of the fact that no electric vehicle had ever climbed them before, but also for the added contrast between the power of the electric auto and the electric trolley car, which on this street has to be hauled up the hill by the old cable system. The electric car made a standing start from the foot of the hill and continued without pause to the top. It was then turned and coasted down the hill, making several stops to show the efficiency of the brakes.

The chief obstacle to the introduction of the electric truck is the plain conservativeness of the horse owner, and the presentation of the facts to that individual is the only means by which the central station industry and the manufac-



CONGESTION IN CITIES—A POTENT AID IN THE PREVENTION OF CRUELTY TO ANIMALS

turers of vehicles and their equipments can reach the goal of profitable off peak loads, extended sales and economic installation.

The electric truck is a machine capable of doing more under favorable conditions than can be handled by horses. It is more reliable, advertises its owner and frequently shows a return of 30 per cent on the investment when compared with the system of horse usage. It is free from dirt and odor and is capable of doing a full day's work on one charge of the batteries with a margin to spare. Many supporters of the electric vehicle have argued that good street conditions are necessary for its successful operation. It is perfectly true that an electric vehicle will not travel as many miles in one day under conditions of severe grades as it will on a level road, but the successful operation of the electric truck in many hilly cities has convincingly proven its superior advantages in this direction.

During severe winter storms the electric auto has on many occasions demonstrated its superiority—as the large electric truck as well as the pleasure vehicle find no difficulty in getting around. On the cleaned streets running is easy and even when the deep snow remains they go through apparently with but little additional effort. It has frequently happened that an electric truck was able to clear a block due to a stalled horse drawn truck. The electric drawn truck is under much better control than any other type of vehicle. It can start slowly and graduate its acceleration as desired.

The machines are thus able to meet most successfully the strain due to heavy snow, and they show no effects of the increased strain, except a somewhat increased rate of battery discharge.

The delay to traffic caused by horse drawn vehicles during winter storms is often very costly to the business interests of every large city. It is also a matter for humane consideration. The poor animals suffer not only from the excessive strain of hauling, but from frequent bad falls.

The electric pleasure vehicle has already displaced thousands of horses, and the modern electric truck is now coming into favor so fast that it will not be long until horse drawn vehicles will be the exception, and when we see the thou-

sands of horses still plodding along our streets we can realize the tremendous demand there will be for the product of the central station when these changes are made.

All the Edison companies are pushing the electric vehicle to the front. Many of them have large garages for the care of their own machines and have discarded horse drawn vehicles entirely, doing their heavy trucking as well as making their business calls by the use of electrics. In this way they not only set an example to the public, but find that they save money.

It is considered a fallacy to drive an electric truck faster than eight miles an hour, except when the streets are in excellent condition. The possibility of handling trucks of a larger capacity than five tons is merely a question of tire maintenance and the making of a vehicle that can be safely handled in our crowded streets. The present cost of the upkeep of rubber tires on 7½ to ten ton vehicles is so high that lighter trucks would, undoubtedly, prove less expensive in the total cost of the delivery of merchandise.

The use of electric motor trucks for railroad station work has made wonderful headway since the Pennsylvania Railway experimented with the scheme three years ago. The application of motor trucks for this class of work may be classified as follows:

Tracks utilized to replace box cars in the transfer of freight between different stations in the same city; trucks to replace horse drawn vehicles in the transportation of both passengers and merchandise in the public highways; trucks to replace manual labor in the handling of baggage and mail in large stations; machinery and supplies in railroad shops and in the large freight and transfer stations.

The transfer of freight between two stations, when accomplished by electric trucks instead of box cars results in quicker service, more available platform area, more useful truck space and more box cars available for freight transportation.

When we consider that the employment of electric machines removes from the problem of city merchandise transportation many uncertainties and expensive casualties with which the employment of horses is constantly attended, the change would seem to be imperative at the earliest possible moment.

Any reasonable speed can be previously arranged for, and any radius of action consistent with working time available for the operation of the vehicle can be supplied with an exactitude with which no other form of vehicle can favorably compare. This regulation or selection of capacity can be determined in advance by the most scientific instruments available in the mechanic arts, and when it is considered that the cost of operation is almost in direct ratio to the work performed and always subsides with cessation of labor it will be seen that the electric should be accorded universal recognition.

During the last fifteen years that the manufacturers have been engaged in pushing the business they have had occasion to know what the real problem is. Business electric wagons have greatly improved, but the point that makes an impression in the history of their development is that as long as ten years ago the power electric wagons had already reached a point which made them more economical than horses for all service within certain limits.

The average cost of bedding and feeding a horse is 55 cents per day. In other words, it costs $33.00 per month simply to feed and bed a carriage team. If this team covers 25 miles per day at a speed of approximately ten miles per hour it is doing more work than the average team can stand. In the electric vehicle man has devised a utility that can do twice the work of the average team, twice as quickly at one-half the cost.

It is estimated that there are 25,000,000 horses in this country, and that 3½ acres are required for raising food for each horse, an area amounting to 87,000,000 acres. Seventy-five per cent of the horses are used in trucking. The replacement of these horses by the electric truck would relieve many thousand square miles of land which could be used for raising food for human consumption. The price of hay and grain has been going upward while the price of electric current has steadily been downward.

A movement is already on foot in the eastern metropolitan cities to restrict the horse from certain congested thoroughfares. With the elimination of the horse and steel tires the expense of street cleaning departments and street repairs would be greatly reduced. The surface of the streets would gradually become smoother and harder, and practically free from dust and flying particles of stable refuse, and the clatter of the horse's feet would be a thing of the past. There is a good reason why municipalities should favor the adoption of the motor truck.

From the standpoint of the user, rents of stable properties, as well as cost of harness and feed, are steadily advancing, and hence he turns instinctively to the electric vehicle manufacturer for relief. The customer observes that the motor truck does not require so much space when at rest or when turning around and is much more easily and quickly handled. He also sees there is a saving in maintenance of tires on an electric as compared with a gasoline vehicle.

While numerous stops and starts are imperative in congested districts, the electric shows the gainer in time, as it has no crank, gear or clutch to manipulate. Then again, the life of the electric is from two or three times that of the gasoline machine, due chiefly to lack of vibration which always attends the operation of a machine containing an engine of the explosion type.

No extra insurance is imposed on electric trucks or the buildings and contents where they are housed, and the electric is admitted to wharfs and freight sheds from which the gasoline trucks are excluded.

It would seem that a campaign among municipalities in behalf of the electric vehicle for police and fire department service offers great possibilities. It would help manufacturers to dispose of their products and would be of advantage to the cities and the underwriters. The charging and operating conditions of the electric offer no barrier to its introduction into fire departments because the capacity of the battery is ample to meet all requirements.

The better a man becomes acquainted with an electric car the more apt he is to consider it simple than before he was well acquainted with it. Those parts which may not seem simple to the purchaser he need not bother with, because experts have thought the matter out for him and have arranged these parts so well that the user need never bother with them.

(The End.)

Electrical Securities

The Duties and Obligations of Public Service, or Utility, Corporations to the Public—Some Explanations, Criticisms and Suggestions—Frank Acceptance of the Principle of Government Control, but Based on the Loyal Support of the People at Large—Publicity and Openminded Square Dealing the Logical Conclusion of the Modern Method—The Reasons for Monopolization, of the People, for the People and by the People.

By "CONTANGO"

In last month's article a good deal was said as to the responsibility of the banker, broker or bond house to the public. After suggesting what should and should not be expected some certain tests for determining the standing of such houses were brought out. This month a somewhat like discussion of the obligations and duties of the large public service corporations of the day, in so far as the people at large are concerned, will be attempted. By the term the "people at large" is meant, not only those who are patrons or buyers of electric current for light or power, or of other public service offered for sale, but also those who are owners and partners of such enterprises by virtue of stock holdings, or who participate in the earnings and are vitally interested in the standing of such properties as holders of the securities in the form of bonds or otherwise.

In the present times customers, owners of shares and holders of securities dovetail into each other. Nearly always a security holder or owner of stock living in the locality his particular company serves is also a customer, though of course hundreds of thousands of customers have nothing to do with shares or securities *except,* and the exception is very important, to the degree the amount of dividends or rate of interest paid affects the scale of prices charged for the particular public service rendered by such corporation.

Now the men who have the initiative and perspicacity to undertake the starting up of these large affairs, and who, therefore, naturally control and manage them, are most wideawake to the value of general public support in carrying on and expanding their enterprises; they know that the more the public is honorably interested the more certain they are of continued success. Indeed, public support both from within and without is the final test of the survival of the fittest. The principle of public control in a general way as to certain matters of policy, public policy it may be called, is, therefore, cheerfully accepted as the right method; that is to say, a judicious governmental control is the best assurance of public confidence. Stability and fair play to all, to those who pay for service and to those who furnish the money to render the service, is thus attained. No more need be said here of this quasi-political side of the question. It is merely touched on as an explanation of the ever-widening tendency, the constant broadening of its scope, characteristic of the public service or utility corporation of the day.

The point to be insisted on is that in proportion as these companies grow and spread so do their duties and obligations to the people at large increase far and near.

Let it be supposed you own shares in such a corporation, one selling, say, electric current to the community. You are naturally anxious to get the best possible return on your money, but you also must recognize that the rate of dividend you receive must be based on fair prices to the customers of your company who supply the business that earns those dividends of yours. You may yourself be a patron or customer, call it how you will. In such case you would be the first probably to object to a high charge for your electric light or the current used for your power. You have also to consider the rate of interest paid on your company's

outstanding bonds or securities owned by other members of the community—you may yourself, indeed, own some of these securities. You are thus confronted with three factors, a reasonable charge for your current, as low as you can get it would please you best; the certainty of your regular income in the form of interest on your bonds; satisfactory dividends on your shares.

Right here, then, is the test of the really great and well organized public utility corporation. It is certain the vast numbers of customers who are neither partners nor bondholders will not stand for excessive rates for the service given them. It is certain that the bonds by which money is raised for extending the business and its operations must earn a fixed rate of interest or nobody will buy them. It is equally certain that the stockholders will expect fair returns on the money invested. The fair and proper adjustment of these three points is the first duty and obligation of those in control of and managing such enterprises.

In some parts of the world a limit is set to the amount per cent allowed to be paid as dividends. Where earnings exceed the fixed charges, that is, interest on bonds and the like, and a certain per cent has been paid on the stock—maybe six per cent or maybe seven or maybe eight—and a certain amount has been set aside for the surplus account, which means to the security holders protection of the property bonded to them, should there come lean years, then the rest of the earnings are applied to reduction of the rate charged the public for the service given. You as a customer buying current thus benefit again in the final outcome.

The people at large allow a centralization or monopolization of a public utility corporation on the grounds of economy—the economic survival of the fittest mode of operation by which the people as a whole are to benefit in the lowering to them of the charge for service. The instant they do not so benefit the reason for the monopoly ceases to be. It then becomes the oppression of the many for the benefit of the comparatively few. Therefore we come back to the matter of fair charges or rates for the current or whatever service is furnished, and these are usually scaled or fixed by a public service commission or the municipalities in which such companies do business; in other words, supposedly by the people themselves through their representatives. Understanding now all these points you will more readily grasp the necessity for knowing the character of the men at the head of such corporations.

Unfair financiers, for example, increase the issue of shares for the purpose of concealing high earnings made. Sometimes they give extra dividends of stock, sometimes merely offer a further lot of shares for public subscription. We do not, however, wish to deal with the evil effects of poor financing. To advance the price of shares may, it is true, interest capital—nay, command it—but after all the final solution must be found in what there is behind this high price. It is better by far to jog along in the usual way and leave the price of your shares and securities to the judgment of the public, than to try and anticipate or regulate it by inside manipulation.

This should demonstrate at once the absolute need for full publicity and open-minded square dealing as to every financial transaction of moment. Last month some reference was made to officials who deal or speculate in the shares of their own company—an absolute destroyer of confidence—also to brokers or bond houses that make different prices to different individuals for bonds, or even shares, where they are not generally dealt with or tested on the public exchanges. The same thing applies to the responsible management of a reputable public service corporation; it is its duty and obligation to protect the public against such impositions; it cannot protect the public, however, against its own demand and therefore the public in a free market, to a degree, makes its own prices.

But the speculative element and the professional speculator must never be lost sight of, although having nothing to do with this suggestion.

Traveling in an elevated railway car the other day the writer heard two postmen discussing the bonds of a very well known public service corporation. They both expressed their liking for these particular bonds and their desire to buy, but considered the price too high and too uncertain, "too much commission charged and the price never the same in any banking house" was the way they expressed it. Probably they exaggerated, for it may be remarked that reputable bond houses do not maintain two prices for their bonds, as do some of the fly-by-night concerns of poor reputation. The policy of the house of standing is one of fair dealing with their customers. They are content, moreover, with a fair and reasonable margin of profit or commission. Where the investor has first investigated a bond house and found that it stands high in the financial community in reputation and conservatism, he need not fear one moment that he may be overcharged. Investors should be intelligent enough to realize this fact. But the bond business is a great big profession today, and like all other big things its rapid expansion has drawn into it some riff-raff and ultra nimble-witted traders, whose moral sense has become overclouded solely by the desire for the profit obtainable and with a minimum of desire to safeguard the investor.

If such people can get five or six or even 20 points above the market price from an investor, they will jump at the chance.

It is best then for those who want to buy to inquire of the officials of the particular corporation if there is the least doubt in their minds, and the latter, if they are "square," efficient and worthy of confidence, will rightly inform and direct the prospective purchaser, for reputable officials most certainly have this duty and obligation to the public, and they know full well that public confidence is their best asset.

This indeed is one of the true tests of public confidence—the belief that the management does not manipulate the prices of its company's shares or securities. Another is the belief that there is property, dollar for dollar, behind the particular corporation's shares and securities. Yet another test for public confidence is the official attitude as to the rates; that is, prices charged for the public service rendered. When a company persistently fights a reasonable reduction in the face of fair dividends on large stock issues, it can no longer expect public support or confidence. It is to get rid of such conditions that the best posted, most progressive and intelligent of the men who control public service corporations would gladly welcome some plan for a "fair and proper" governmental control of such companies. A "fair and proper control" is the right expression, because it does not convey arbitrary or confiscative measures against the legitimate use of great amalgamations of capital in the direction of monopolies practically formed of the people, by the people, for the people. Nor does it mean guarantee of securities issued, or guarantee of the price of shares offered.

To turn to another side of the matter of the duties and obligations of public utility and kindred corporations, there is the daily, hourly, every minute contact with the people in all their varying moods —the divers nationalities, lack of, or superabundance of, education, timidity or aggressiveness, degree of honesty or the reverse—the friction and wear of daily life in fine. It is the duty and obligation to remember through it all that on the good will of each member individually, and of all the members collectively, of the general public depends the real success or lack of it of even the greatest organization, which owes its very existence to public service adequately and acceptably rendered. It is almost unneces-

sary to recall here how in the case of certain well known traction companies, well known most certainly to the readers of these pages, a lack of such obligations and duties produced the most disastrous results. The day of "the public be damned" policy has long since passed away and not even "one of the little ones" can, in the broad sense, be neglected.

There is finally the question of the relations of the public utility corporation with its employés in connection with its finances, its property and its shares and securities, even the degree to which they may be admitted as partners by a distribution to them of something over and above their mere wages. This, with the affair of the wages themselves, employés insurance and savings schemes and retiring or length of service compensation may be considered in a later article.

You have then had placed before you the salient points which you should bear in mind, or look up, should you intend buying the shares or securities of any public utility or service corporation. The larger the companies; that is, the more comprehensive and embracing the centralization, the better for your purpose. They are the safest and by the very reason of their widespread public business their general reputation and standing is more readily ascertained. Harmonious relations with local authorities and lack of pronounced political leanings are also of course very pertinent points to be considered. The securities of a company always at war with public officials and authorities, or with anyone, for that matter, are not by any means desirable from the investment standpoint.

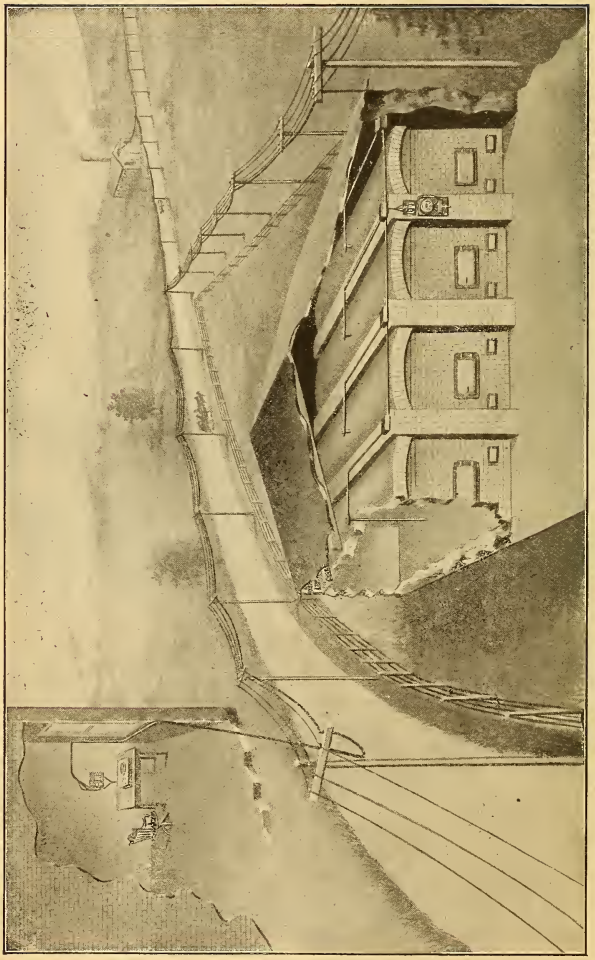
(To be continued.)

Pumping Barges on the Missouri

At Williston, North Dakota, two barges fitted with immense pumps operated by electricity are afloat on the Missouri. They are owned by the government and used in irrigating 25,000 acres of bench land along the river. The barges and the manner of supplying them with electricity are both unique.

In order to generate power the government has turned miner. A ten foot lignite coal vein on government land adjacent to Williston is worked and the lignite carried from it to a plant two miles away and there converted into electrical power. The electricity is transmitted from the plant to the barges. It was not feasible on account of the ever shifting shore line of the variable Missouri to place the pumps in buildings on land, so these two barges were devised as a unique substitute and the pumps placed aboard them. In order that the boats may accommodate themselves to changes in the level of the river, they are connected with the bank by pipes fitted with flexible joints. The pumps operated by electricity force the waters of the Missouri up through the barges into these pipes and thence into settling vats on shore.

A PUMPING BARGE IN THE MISSOURI



BATTERY OF FURNACES WITH ELECTRICAL THERMOMETERS READING SIMULTANEOUSLY IN WORKS AND OFFICE

Measuring Temperatures with an Electric Thermometer

There are today many industries in which the precise control and consequently the accurate measurement of temperature is of great importance. For instance, there are many forms of furnace products which must be treated within a certain limited range of temperature. Other materials must be treated in ovens or by live steam or by heated air. An expert workman may, perhaps, by long practice, determine, by looking into a furnace, when the temperature is about right, or he may be able to judge in a general way by the action or appearance of the materials when the working temperature is approximately correct. But this method is at best little more than guesswork. In this day of efficiency and large output, no process can be left to guesswork.

For the measurement of temperatures in industrial processes, the ordinary thermometer is of little or no avail. It is hard to apply and hard to read in the comparatively low temperature work, and for temperatures running far up into the hundreds or even thousands of degrees, obviously out of the question. So what are known as electrical resistance thermometers have been developed, as notably exemplified by the Leeds & Northrup system of temperature measurement.

This system is applicable for measuring any temperature, from the lowest which can be obtained up to 2,200° F. It employs the fundamental principle of electricity that a conductor of electricity presents a resistance to the flow of current in an unvarying ratio to the temperature of the conductor. There are, then, only two elements necessary to the system—a resistance bulb which contains the resistance wire and which is located in the region where the temperature is to be measured, and a temperature indicator which makes visible to the observer the changes in the resistance of the wire which are brought about by the heat.

Without going into technicalities, it may be simply stated that an electric current is passed through a circuit including the little resistance wire and the indicator. As the temperature increases or decreases the resistance of the wire is increased or decreased and less or more current flows through the system, as the case may be. This varying flow of current is recorded by the pointer on the dial of the instrument which is made to read in degrees of temperature. There are varying forms of this indicator instrument, one form which even makes a graphic record on a paper strip of every temperature variation in a given period. The resistance bulb is also constructed in varying forms to suit the particular class of work in hand.

The great advantage of the system lies in the fact that the exact temperature of one or several furnaces may be read from a single instrument, even by a workman who cannot read English; or several instruments may be electrically connected to the same bulb or set of bulbs so as to be read at different points, however far away, as, for instance, in the office in one building and in the works off somewhere else in another building. The illustration on the opposite page is an example. Here there is an indicator at the front of the battery of furnaces. A cable leads from that indicator into the office where another instrument is located and over in the building in the upper right hand corner of the picture still a third instrument is located, all giving simultaneously the exact temperature in any one of the four furnaces indicated. By the movement of four switches, one after another, the four temperatures may be ascertained at a glance.

The Biggest Thawout on Record

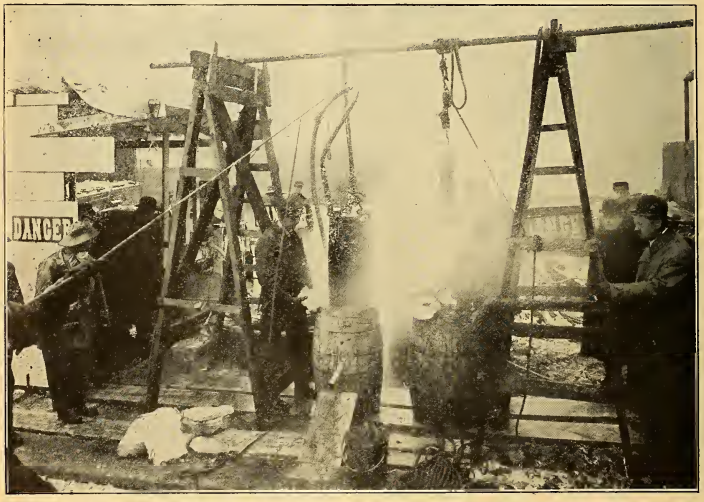
By ARTHUR H. MILLER

On March 6 the New York Edison Company received word from C. F. Lacombe, chief engineer of the department of water supply, gas and electricity, of New York City, to undertake the startling task of thawing with electric current the six-inch water main under the East River, on which North Brother Island is dependent for its water supply.

For more than a month this pipe had been frozen and the conditions on the island were becoming serious. Although surrounded by water, the inhabitants of North Brother Island were facing the prospects of a water famine. The island is devoted to a number of departments of the City Hospital and so alarmed were the authorities becoming over the situation that orders were issued from the department of health for the removal of a large number of the patients.

METHOD OF ATTACHING THE CABLES TO THE WATER PIPE

The pipe rests on the bed of the river. The fact of the matter is that more ideal conditions for freezing up a pipe could hardly be found. It's just like an ice cream freezer. The water of the river being salt water, will go down as low as 28° F. without freezing, while the



WATER RHEOSTATS FOR CONTROLLING THE CURRENT IN PIPE THAWING

COFFEE AND SANDWICHES FOR THE THAWING CREW

water in the pipe, being fresh, must necessarily freeze at 32°, unless it is kept on the move. First the pipe froze up tight at the North Brother Island end where it comes out on the beach and is exposed at low tide to the zero temperature of the air. When these few lengths froze the water in the rest of the pipe stood still and soon froze solid.

Within just one hour after the New York Edison Company received word from Chief Engineer Lacombe to proceed, the work was under way. W. T. Morrison, the engineer in charge of the Bronx district, took command. First a gang of carpenters put up a shack on the shore of the East River at 141st street, which was turned into a temporary sub-station. A bank of four 100-kilowatt transformers were installed to step the current, which was taken directly from the company's mains, from 2,000 volts down to 200 volts. A water rheostat was also installed. A cable carried the current to the point where the pipe was severed. The pipe was also

A TEMPORARY SUB-STATION WITH FOUR TRANSFORMERS AGGREGATING OVER 500 HORSEPOWER

severed at the North Brother Island end and the current taken off there and returned to the mainland on the company's cables and then put back in the circuit through the pipe again. In this way the immense volume of current flowing through the pipe heated it and finally melted the ice.

The men worked all night on the sixth and at 10:15 a. m. on the seventh the current was turned on. At 11:30 it was increased to 800 amperes and 200 volts. Pumps were installed on North Brother Island and a pressure of 80 pounds maintained in the main. These pumps were operated by electricity. During the evening of the seventh the current was increased to 1,000 amperes. A lamp wagon of the Bronx district was pressed into service as a lunch wagon and sandwiches and hot coffee were served to the gang of men at work both on the mainland and on the island.

The next day was Friday, the eighth, a cloudy day with rain toward night. Another boost was given the current so that it was kept up to an average of 1,300 amperes. The pressure was temporarily taken out of the North Brother Island end of the pipe and the city water pressure applied in the Bronx end. This was without results and the pressure at the island end of the pipe was resumed. Early in the afternoon the hopes of the men were raised. The cause was a considerable amount of steam which came out of the pipe on the Bronx shore. This was not a slight vapor but real steam. It continued to pour out for some time and seemed a sure indication that the ice was melting.

All that night the current was kept up to 1,300 amperes and on Saturday morning, the ninth, it was boosted to 1,500 amperes and 400 volts, the temporary substation being enlarged and two more 100 kilowatt transformers installed. At 11 o'clock on Sunday morning it was put up to 1,600 amperes and two hours later to 1,800 amperes. It was kept to that point until 6 p. m., when on account of the night city load it was dropped back to 1,600 amperes.

On Monday, March 11, the current was again brought up to 1,800 amperes. It was indeed a "Blue Monday," for although the current flowed into the pipe unceasingly, nothing happened of any note. With the coming on of the city load Monday evening the current was again dropped back to 1,600 amperes.

Success came most unexpectedly at 6:20 a.m. on Tuesday, March 12. Without the slightest warning, water started to flow from the mainland end of the pipe. The pumps on North Brother Island which had been working all night keeping up a pressure of 50 pounds in the pipe were forcing the water through. Within a short time the flow of water proved that the pipe was entirely thawed out.

Saved by the Mine Telephone

Two miners, or "shot-firers," to be exact, employed by the Girard Coal Company in a mine at Radley, Kansas, are today more than thankful for the invention of the telephone. The mines of this company have recently all been equipped with mine telephones, and, according to the rules of the coal company, the shot-firers must report to the night engineer by means of the telephone the progress of their work as they go through the mine lighting the shots. This enables the engineer to know where his men are, so that if he does not hear from them at certain intervals, a rescue party is sent down.

One evening after the miners had left, the shot-firers went down as usual to fire the shots which would bring down the coal for removal during the next day. The two men had just entered a refuge hole and one was in the act of ringing the engineer to tell him they had lighted the shots in that particular entry, when an explosion occurred. The force of the explosion was so strong that it blew in the back end of the refuge hole, and the shot-firer did not even get to

talk, but was immediately overcome by the after-damp. His partner, who was with him, was likewise overcome. The night engineer, knowing that this was the station from which they should next report, immediately tried to call them, but was unable to get any response and started the distress whistle. In fifteen minutes after the explosion had occurred a rescue party was in this refuge hole and had the two shot-firers out working upon them and succeeded in resuscitating them. A little later it would undoubtedly have been impossible to revive them.

Kicking That Battery Around

No half completed structure is placed on the market by Mr. Edison on which, after the user has consumed all his available time in attempting to follow long-winded instructions, he suddenly discovers he has completed an autopsy.

When the Edison battery was at last completed to the apparent satisfaction of all concerned, and associates were imploring Mr. Edison to market it, he sketched out the apparatus shown in Fig. 1. This went to the engineering

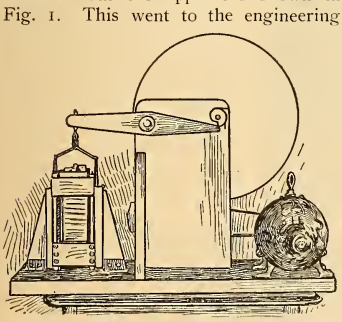


FIG. 1. APPARATUS WHICH LIFTED AND DROPPED ONE CELL 2,000,000 TIMES

and construction departments of the laboratory, and he patiently awaited completion of the machine.

"When six cells, picked at random from several hundred, stand up to tests, itemized below, you may start the foundation for that factory," was written to Mr. Bachmann, the general superintendent of the laboratory. Accompanying were the following tests as laid out:

"1. Mount cell in cage of apparatus.

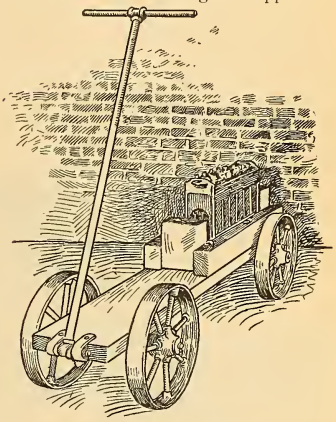


FIG. 2. THE BRICK WALL TEST

No cushioning whatever between the cell and cage. Run the apparatus continuously until the cell has been raised three-quarters of an inch and dropped on a solid block, *two million times.*

"2. There must be no sediment in the bottom of the can after this test, and the cell must have as great electrical capacity as before the test.

"3. Having run through six successive cells satisfactorily, mount them in a six-cell tray, secure tray to a truck longitudinally, and project truck against a brick or stone abutment *five hundred times, at speed of fifteen miles an hour,* at moment of impact.

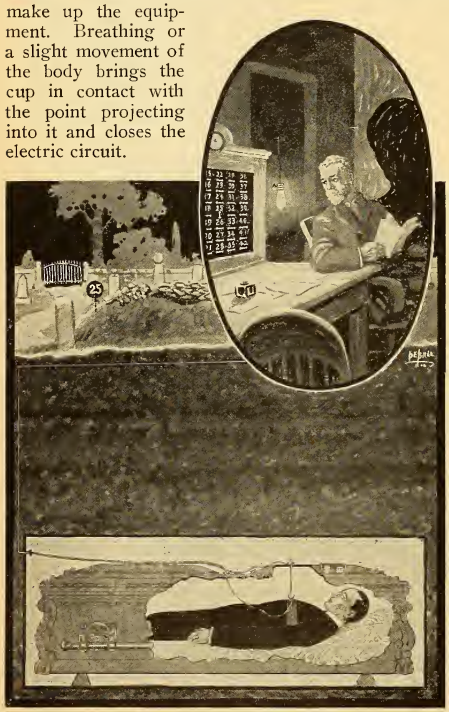
"4. Then place tray of cells laterally across truck, and repeat performance.

"5. Report to me when ready to try 3 and 4. EDISON."

About a year elapsed between the completion of the testing machine and truck and the satisfactory perfection of the battery to withstand the tests.

"What If in the Tomb I Awake?"

Many suggestions have been made and patents issued on schemes to make these words from Shakespeare impossible of realization, and in the plans electricity has not been forgotten. The accompanying picture presents one of these suggestions. A body belt holding a copper cup, an adjustable point, connecting wires, a battery and an ordinary annunciator and bell make up the equipment. Breathing or a slight movement of the body brings the cup in contact with the point projecting into it and closes the electric circuit.



SUGGESTED METHOD OF ARRANGING A GRAVE ALARM

And such suggestions are not to be questioned or ridiculed, for the fear of being buried alive presents itself to every thinking person at some time in life, and to many, among whom may be found well known people, the thought has caused provision to be made to insure against any such horror. The physician to a United States supreme court judge was pledged to cut the throat of the judge in case of death, before permitting burial to take place. Hans Christian Andersen, Wilkie Collins and Lord Lytton are among those who provided against any possibility of being buried alive.

Physicians are well informed as to states into which the body may pass and assume a death like appearance and so continue for days or even weeks and yet the spark of life is still present. Many countries have recognized this, and laws have been made regulating the time that must elapse between death and interment. In Netherlands the body cannot be committed to the grave until 36 hours have elasped. In France the law specifies 24 hours, in Saxony 72 hours and in Austria the body is examined by medical inspectors quite independent of the attending physician and tests are made. Also, should relatives desire it, a post-mortem operation may be made upon the body in the presence of the inspectors and police and the heart pierced through to preclude burial alive.

Precautions like those mentioned might be multiplied, for proof of their necessity is not lacking. In "Premature Burial," by Tebb and Vollum, 381 instances from reliable medical sources are classified as follows: One hundred and forty-nine cases of buried alive, 219 cases of narrow escapes from being buried alive, ten cases of escapes from

dissection alive, one cremated alive and two embalmed alive.

The present method of embalming, of course, sets aside any possibility of life remaining after the process is completed, yet methods may be changed and in accordance with the suggestion offered, electricity may be made to watch over the body whether in a grave or vault for the purpose, until all doubt is dispelled. Then the wiring may be disconnected and the same circuits applied to later graves.

Record Run of the "Lightning Bugs"

The touring automobile that averages 20 miles an hour is going some, as any experienced motorist will tell you. Very few gasoline cars can keep up that speed, and for an electric to come close to it was something unheard of until very recently.

But the fiction that such speed is impossible with electricity for the motive power was thoroughly smashed when not one, but two, electric roadsters covered the 244 miles between Boston and New York in exactly 12 hours and 20 minutes, actual running time.

Mr. W. H. Francis, of the Boston Edison Company, who made the trip in one of the cars, says that the roads between Stamford and New York, the "home-stretch," were in the worst possible condition, and that had they been as good as those covered on the earlier part of the trip, a much better record would undoubtedly have been made.

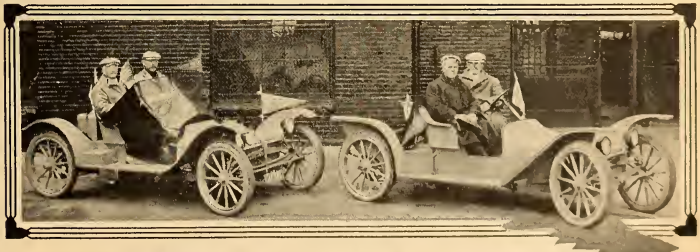
On the strength of this demonstration the Boston Edison Company bought six "Lightning Bugs" like the ones that made the run, for use in its trouble department.

Euphonious Chemistry

Something over a year ago, Mr. Edison asked one of his lieutenants to take charge of a very exhaustive experiment in chemistry. Now, if there is one subject of which that man knows nothing at all, *Chemistry* ranks No. 1. He protested his ignorance, supplemented by predictions of delay and expense, because of it. It had no effect. Mr. Edison smiled good naturedly and said:

"That's just the reason why I want you to undertake this. If you were a chemist, you would not try a lot of things I know you *will* try, because you would conclude ahead of time that they would not work. Now, if present *knowledge* of chemistry would deduce this result, it would have been accomplished long since. It hasn't. Therefore, we have 8,000 bottles of chemicals, I don't care how long it takes, and will pay the bills. So it is up to you."

Our friend undertook that task very much as would a novice pick a horse to win a race—by the attractiveness of the *name*. Wonderful to relate, a combination of a few chemicals having the most euphonious names accomplished the result.



THE SMALL ELECTRIC AUTOS—KNOWN AS THE LIGHTNING BUGS

Dime in the Slot and a Photo in One Minute

In the space of one minute this machine will take your photograph, develop, tone, wash and deliver it—a clear, clean, well defined portrait. If, for any reason, the plates are exhausted, for the machine holds but 100 plates at a time, the Auto-Foto hands you back your dime without a single kick.

A small electric motor sets the machinery in motion when the dime is inserted

DIME-IN-THE-SLOT PHOTO MACHINE

and the lever is pushed. An electric lamp attached to the top of the cabinet furnishes the necessary light; this is automatically turned off and on, so that daylight or darkness is of no importance in the operation of the machine. It meets all conditions.

The "works" are incased in a steel cabinet. In front of the cabinet is a stool where the subject sits. The stool has a circular or oval shaped back serving as a background for the picture. As the stool is adjustable, the reflection of the subject's face is visible in a small mirror on the front of the cabinet; this acts as a finder. The sitter places a dime in the slot, pushes a lever and in three seconds a bell rings announcing that the picture has been taken. In 57 seconds more the Auto-Foto delivers the picture completed, and framed in a round brass frame.

The secret of the machine lies in the *single* chemical solution required to make the picture, which was discovered by Henry Doyle, a New York newspaper man.

Hotel That Is Electrically Charged

A curious freak of electricity has come to light in the Jefferson Hotel, a half million dollar structure recently erected in Peoria. Every metal column and pillar on the mezzanine or second floor is apparently heavily charged with electricity.

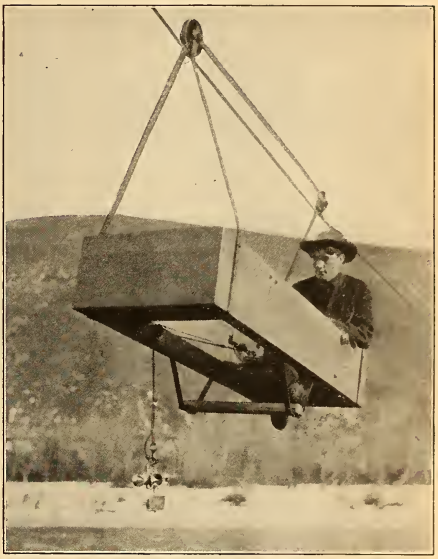
The floor is constructed with numerous heavy metal columns, pillars and railings that wind around the balconies, and none of them seem to have escaped the electrification. The curious phenomenon was first noticed when a young woman, a guest at the opening reception of the hotel, leaned against one of the metal columns, and was shocked so strongly that she was compelled to refrain from dancing for several numbers. Every time a hand is placed against a pillar, or when the railing is touched in descending the stairs, a noticeable shock results.

An explanation that is accepted by the hotel management is that the electricity is caused by the carpets on the floor. The friction caused by walking over them, it is claimed, causes the body to be charged with static electricity. Then when a hand is placed against the metal pillar, it is claimed that a circuit is formed and a shock is the result.

Measuring the Flow of Large Streams

The very first thing to be determined in the preliminary plans for building a water power electric plant is the flow of the stream in cubic feet per minute or per second. For the volume of water flowing is one factor which, together with the speed, determines the power which may be developed. In the case of plants already established, careful investigation in this manner, of the power available, will in many cases show that all the power is not being used and that more turbines and generators may be added, increasing the earnings of the plant.

For measuring the velocity of small streams the method which was outlined in the April issue of this magazine is satisfactory; that is, by timing the progress of a float down the stream. But in the measurement of larger rivers there are many elements such as undercurrents, eddies, whirls, rapid and slow portions of the stream, etc., which enter to make the method cumbersome and inaccurate.



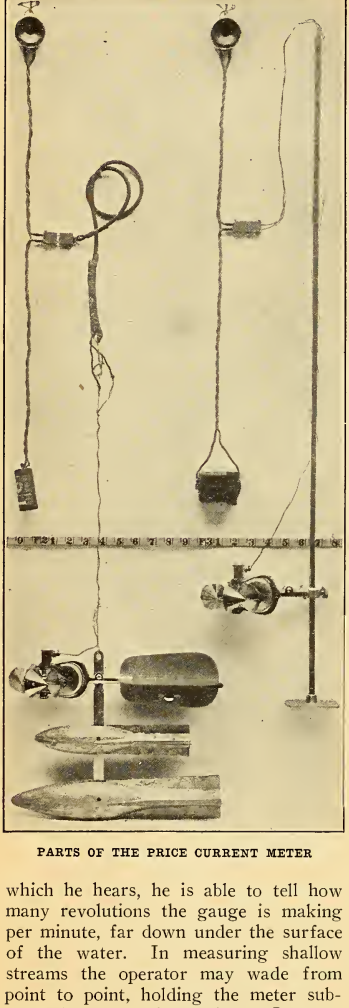
Photographs by Courtesy of Stone & Webster.

OPERATING THE CURRENT METER FROM A TRAVELING CAGE

In order to gather accurate records of the velocity of all portions of the stream, various types of current meters are employed. One type is known as the Price meter, extensively experimented with and improved by the United States Geological Survey. It is highly interesting to watch the measurements being made with this sensitive bit of mechanism, half electrical, which swims in the stream like a minnow.

The parts of the instrument are plainly shown in one of the illustrations. A series of vanes, similar to the tail of a fish, keep the head of the device pointed up stream and a weight permits its suspension at any depth. The moving part comprises a little vertical revolving shaft carrying four horizontal arms with cups on the ends, similar to a wind gauge. The rapidity with which the cups revolve is proportional to the velocity of the water in which they are suspended. In addition, there is a device for registering the number of revolutions. The instrument is calibrated so that the operator knows that a certain number of revolutions, in a minute, say, represent a flow of a definite number of feet per minute or per second.

In some forms of the instrument a telephone attachment is employed, with a watch case receiver, which the operator holds to his ear. Then, by the clicks



PARTS OF THE PRICE CURRENT METER

which he hears, he is able to tell how many revolutions the gauge is making per minute, far down under the surface of the water. In measuring shallow streams the operator may wade from point to point, holding the meter submerged to take his readings. In some streams he may work from a bridge. In other cases, however, it is necessary to drag him across the river on a suspended cableway.

A Remarkable Case of Electrolysis

During alterations in a poultry commission building in South Water Street, Chicago, it was found necessary to remove a brick partition wall from the basement under the sidewalk. On the wall was fastened a 50 ampere, double pole knife switch enclosed in an asbestos lined wooden box.

The switch box and its lining were found to be wet, because the basement was so damp. The switch itself was found to be almost entirely loose from the wooden box, as the screws which had held the switch were pushed out of the rotten wood by a crystalline mass which covered the entire back of the switch.

When the switch was separated from the crystalline mass it was observed that a shiny liquid filled a hole in the back of the switch. This liquid resembled mercury at first, but it soon began to change its appearance, a coating of white deposit changing its bright, shiny surface to a dull gray.

When the point of a pencil was dipped into the liquid, a small flash would spurt up about an inch or so. Both the liquid and the crystalline mass were fast changing their form, the first to a white substance and the second to a shiny mass.

Desiring to know what kind of substance the liquid was, it and the crystalline material were taken to the laboratories of the Commonwealth Edison Company, where, through the courtesy of Mr. McClure, the head chemist, the liquid was analyzed and found to be metallic soda or sodium. Many globules of sodium were found inside the crystalline mass, where they had been protected from the oxidizing effect of the air.

The question was, how the sodium happened to be in such a peculiar place, but as chloride of sodium is common salt a solution of the problem was quite

METHOD OF USING THE CURRENT METER FROM A BRIDGE

easy. Much salt had been used above and in the vicinity of the brick wall, consequently the wall and the wooden switch-box, with its asbestos lining, were thoroughly impregnated with salt.

Current had leaked, from a screw in the hole in the back of the switch, to the ground through the moist asbestos, wooden box and brick wall.

This current was sufficient to break up the salt into its elements by electrolysis.

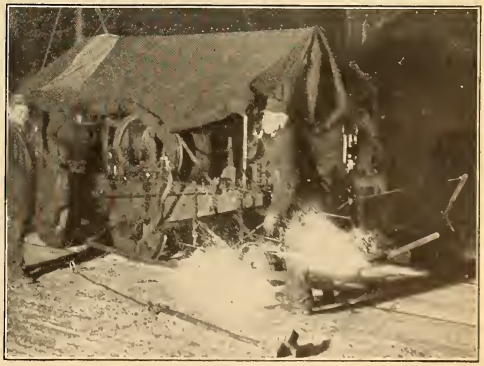
HENRY L. TRANSTROM.

Linguist Operators

In Egypt the telephone operators are men. They must be linguists too, for before a man can find employment as a telephone operator he must speak English, French, Italian, Greek, and Arabic, for the Egyptian telephone has to serve all these different tribes of mankind.

Grinding Down the Rails

After street car rails have been welded end to end, the rough, uneven joints must be ground down perfectly smooth. This is done by an electric grinding machine, which works day and night. Current for the operation of the motor, carried on a small car, is obtained from



RAIL GRINDING AT NIGHT

the trolley wire. The motor is then belted to the grinding wheels which are dragged behind the car. These grinders are mounted on a carriage. The whole machine works automatically, the anchor and rope in the foreground operating to reverse the motor and draw the emery wheels back and forth over the joints until the surfaces are perfectly smooth. The grinder is shaped so as to finish off the inner as well as the top side of the rail at the same operation.

The Gruenwald Grotto

This is a picture of the famous "Grotto" of the Gruenwald Hotel, New Orleans, La. Seated at a table in this odd dining room one can spend hours in studying the grotesque forms worked into the walls, pillars and ceilings. One of the most striking features, however, is the method of illumination. Hidden among the overhanging stalactites and in wall recesses are hundreds of electric lamps which not only light the place but produce queer light and shadow effects upon the cave-like interior. And this wierdness is further heightened by using incandescent lamps of a great variety of colors.

THE GRUENWALD GROTTO

"Freezing Out" the Resistance

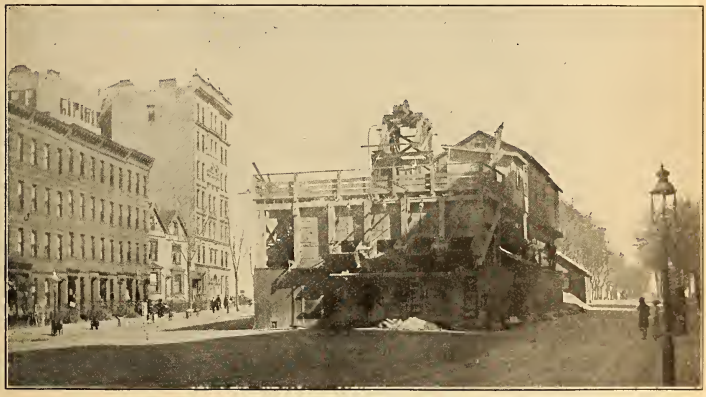
That the resistance of the common metals (including that of mercury, a metal liquid at our ordinary temperatures) increases somewhat as they are heated has long been known. But what will happen if the temperature is decreased way below the normal, say, close to the absolute zero of the scientists? Several years ago Prof. H. Kammerlingh-Onnes, of the University of Leyden, found that when pure gold was lowered in temperature to —262° (or about 440° below zero, Fahrenheit) its resistance was only 1/400 of what it was at 30° F., while that of mercury fell to only the 1/120 part.

Recently the same investigator has succeeded in liquefying the rare gas helium and by doing so has been able to reach temperatures within six degrees of the absolute zero. There he found that the resistance of pure quicksilver was only a millionth part of what it was at 32° Fahrenheit. In other words, the resistance of metals seems to be a quality depending largely on their temperature and one which may be said to be practically "frozen out" when this temperature is greatly lowered.

Metropolitan Mining by Electricity

By GEORGE H. HALL

Any reference to mining operations ordinarily presents to the mind the rough surroundings of the open country, the big steam driven head-hoist, the flickering of hundreds of little lamps in the caps of grimy miners, the continuous rattle of steam drills and the throb of steam pumps. The operations now in progress through, or rather under, the heart of our greatest city are of particular interest on account of the absence of these usual accompaniments. Yet they may certainly be considered as mining operations on a most elaborate scale.



DOWN 200 TO 750 FEET BELOW THESE HEAD HOISTS THE TUNNEL "MINERS" ARE WORKING

This work constitutes the delivery end of the largest municipal water system that has ever been undertaken. The system starts in the Catskill Mountains, about a hundred miles from New York City, where a number of enormous reservoirs furnish the water supply that will be brought to the city through a huge aqueduct having a length of 92 miles. Fifty-five miles of this aqueduct will be built by the "cut and cover" method of construction, six miles will be of steel pipes, while the remaining 31 miles will be tunneled through the solid rock. One feature which is in itself a masterpiece of engineering, is the passage of this tunnel under the Hudson at a depth of 1,100 feet below the surface of the river.

While the work in the mountains, and through a large part of the course toward the city, can be carried on by the usual tunneling methods, conducting such work through the center of a great city presents unusual conditions that call for a wide departure from the ordinary ways and means of tunnel construction. Down through the entire length of Manhattan this tunnel is now working its way, but so quietly and unobtrusively is it proceeding as to attract but little attention from the general public. Occasionally one may hear the dull boom of a heavy blast somewhere down in the earth below, but, except for the sight

of frequent hoisting and dumping stations, no other signs of this stupendous work are visible.

The shafts are nearly all located in public parks or squares where a head-hoist and a few temporary buildings are enclosed by a high board fence, and from these centers the dump carts are busy at all times carrying away the rocks and dirt which constitute the only product of these peculiar mines. These shafts are sunk straight down to a depth varying from 200 to 750 feet, and from the bottom the tunnel is driven in both directions, north and south, to meet the tunnels from the shafts next in line.

A most interesting feature of this great work is the extent to which electricity is employed for the operation of all of the machinery that is used. One of the most serious obstacles to the construction of such a deep tunnel is the presence of water, requiring constant pumping to prevent flooding. In ordinary mining operations, steam driven sinking pumps are employed, requiring long runs of steam and exhaust pipes, which increase in length as the shaft deepens, and involve considerable losses in condensation, as well as the presence of clouds of exhaust steam which would be particularly objectionable in the city. Instead of this, we here find all of the pumps driven by motors which may be sunk to any depth, or carried to any part of the tunnel, and require only a flexible armored cable for bringing the power from the surface.

The drills are operated by compressed air instead of steam, and the air for this purpose is supplied from motor driven compressors. All of the hoisting is done with huge, electrically driven winding drums, operating night and day, but so quietly as to cause no disturbance to the thousands of people living in the vicinity of the shafts. The lighting is, of course, done by electricity, thereby dispensing with the more picturesque but less serviceable miners' lamps.

Illuminating a Carnival

A novel method of using electric light for the purpose of municipal advertisement has been adopted by the Romohawks, of Rome, N. Y. The Romohawks, be it understood, is an organization of business men formed for the express purpose of "boosting" the city. The first week in September of each year is set aside for the Romohawk Carnival. The city is gayly decorated and there are many daylight diversions, including the Oneida County Fair. But the greatest feature of the carnival—that which attracts thousands of strangers to the city each night—is the beautiful and unique illumination of the streets and parks.

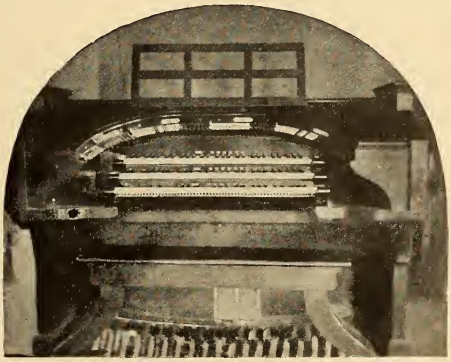
PRETTY STREET ILLUMINATION OF ROME, NEW YORK

In the scheme of illumination the incandescent lamp is omnipresent—indispensable. Strings of glowing bulbs are looped across all the principal streets at frequent intervals. On the main business thoroughfare tall white pillars, each encircled with a spiral of small lights, are placed along the curbs and linked together with chains of larger lamps.

The Unit Orchestra

By MAURICE ROSENFELD

More than 30 years ago in Atlantic Garden, on the Bowery in New York City, below Canal Street, there was a sort of elephantine music box, which could be wound up like a clock, and would then play with more or less orchestral effect—there were drums, cymbals, castanets and snare drums within the mechanism—certain musical pieces according to the perforated rolls which the instruments contained. The Orchestrion, I think it was called, was used during the midday, when the regular orchestra was off duty, and I watched its mysterious workings many times, and listened to its mechanical music-making with considerable wonder. That it could not be regulated by anyone after it was wound up, that no tonal nuances could be produced, and that it was in a way simply a machine, ingenious enough, occasioned no further thought.



Now, after 30 years, we come to the latest invention of Robert Hope-Jones, a celebrated English organ builder and we have an instrument which he styles the "Unit Orchestra."

Mr. Hope-Jones, known at first as an English expert electrician for a telephone company, was always interested in music, and finally diverted his electrical knowledge for the purpose of perfecting an instrument which would have all the tonal colors of the symphony orchestra, but which by electrical contrivances and motive power could be played by one musician at a keyboard from whence all the different orchestral combinations could be brought into play.

He was present last summer at a meeting of the National Association of Theatrical Producing Managers in New York City and one of his chief backers in his invention is William A. Brady, president of that association, who has prophesied that this new "Unit Orchestra" will shortly displace the usual orchestra in theaters.

This instrument is on the order of a pipe-organ with the usual pipes, but supplemented with a great many more contrivances for tonal colors than the regular pipe organ which we know, and with sets of reeds, flute and even a sort of string-like sounding stops and pipes, which resemble the violin family of tones. Besides, there are many percussion stops such as the various drums, cymbals and castanets; there are also the cleste, harp, xylophone and bells. The advantage of the Unit Orchestra over any other pipe organ or mechanical player is that it brings forth really orchestral effects and can be played like a solo instrument with the manifold colors and combinations of a symphony orchestra.

The performer is not restricted to certain records or rolls in the choice of his

selections; he need not wait for rolls of the pieces he wishes to play, but he can take the score of any composition, no matter how difficult or intricate, and reproduce it with all its shadings on the instrument. The artist manipulating the instrument retains his individuality of interpretation, he can exercise his musical taste and style, he is only limited by the existing literature of all kinds of music, whether symphonic, choral, operatic, vocal or instrumental.

A theater which employs but a small orchestra of not more than ten men and a leader must figure on a yearly expense for music, which amounts to thousands of dollars per annum. Taking a minimum amount, say, of ten men, would mean an outlay of $250 per week and for only a short season of 30 weeks, it would sum up to $7,500 during the year. Even if the initial price of the Unit Orchestra should amount to nearly that, in two years, and an artist of the first rank be engaged to play it, there would undoubtedly be a balance to the credit side of the Unit Orchestra.

An organ of the approximate dimensions of the Unit Orchestra has been in use for several years at Ocean Grove, N. J., during the summer chautauquas held under the auspices of the National Association of Organists and Mr. Clarence Reynolds, a friend of Mr. Hope-Jones, has served as official organist for the association. Here both Madame Schumann-Heink and Madame Lillian Nordica have sung to the accompaniment of this organ and have expressed themselves in highly commendatory fashion concerning its practical utility for their purposes.

It would undoubtedly have a strong tendency to improve the standard of the music heard in hotels and in the theaters during the entre acts, and while the larger artistic symphony orchestras would not be affected in their higher musical spheres, the general musical taste would receive a decided uplift through the installation of the Unit Orchestra in the smaller theaters and in other places where music is made one of the features of entertainment.

There is also a similar instrument installed in the Statler Hotel in Buffalo, N. Y., where the pipes are placed in one of the hotel rooms on the fourth floor, while the keyboards, there are two of them, are respectively in the main dining room and in the gentlemen's grill room, either of which can be played with equal facility. The tone is "shot down from the fourth floor by a system of deflectors," so Mr. C. Gordon Wedertz tells me. Mr. Wedertz is organist and choirmaster at St. Bartholomew's church in Englewood, Chicago, and has made an exhaustive study of the instrument.

Mr. Wedertz has had many conversations with Mr. Hope-Jones concerning his inventions and has studied the Unit Orchestra in Buffalo exhaustively. He has trained boys' choirs for a number of years, and also drilled the mixed chorus which is employed behind the scenes at the performances of Wagner's musical drama, "Parsifal," when it was given in Chicago two successive years at the Auditorium by the Metropolitan Grand Opera Company, under Mr. Dippel's management.

Concerning the Unit Orchestra, Mr. Wedertz says: "It is operated both electrically and pneumatically, the process being in no wise more intricate or complicated than in the usual organs."

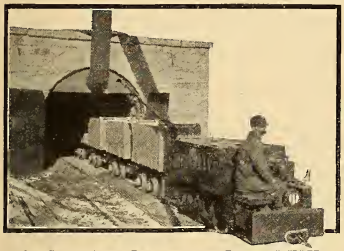
The establishment of a Unit Orchestra in the Cort Theater in Chicago has added another test of its efficiency, and this opens up a new field for the musician. That it will take a skilled artist to manipulate it is true, but it will also carry with it a remuneration commensurate with the artistic ability of the performer.

It is the intention, I believe, to open a school for the instruction of musicians to learn the art of playing the Unit Orchestra, and its superiority for the purposes mentioned above, over the small and indifferently organized hotel or theater orchestras, will soon make it one of the most popular musical instruments.

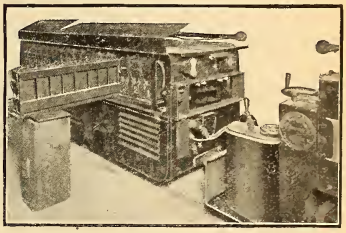
Locomotive That Hauls Its Own Power

It has always been considerable of a problem to get the ore out of the mine safely and cheaply. At first it was loaded into little cars and pushed out by huskies with more muscle than brains. Small mules or burros were pressed into service and did well within their limitations. The steam locomotive was tried, but it used up too much of the precious air. The compressed air locomotive brought in air, but not enough to keep itself going very long, let alone doing much work. It remained for electricity to solve the problem.

In some mines a trolley locomotive similar to the ordinary street car does the hauling. In others, where there is little room overhead, the trolley wire was too dangerous for the miners, or the sparks that flew when the trolley pole slipped off were likely to ignite the explosive gases that accumulated. Hence came the storage battery locomotive. The one shown in the photograph is



OUTSIDE THE MINE THE TROLLEY IS USED



BATTERY TENDER WITH BATTERIES CHARGING

THE ELECTRIC LOCOMOTIVE SOLVES THE MINE HAULAGE PROBLEM

remarkable in that the battery is carried on a separate tender and as the storage battery is the source of power it may be said that this locomotive hauls its own power.

The battery consists of 208 of the latest Edison nickel-steel cells, which seem to stand the severe banging they get when the chauffeur on this locomotive undertakes to start a string of loaded ore cars in motion by running into them at top speed.

When the locomotive is outside the it sets the tender on a sidetrack for charging and runs from an overhead trolley.

SAWING THROUGH STEEL

An unusual sight to the layman but a familiar one to workers in a steel mill is the cutting in two of heavy pieces of steel. The picture shows a 30 horsepower motor turning a saw 45 inches in diameter at a speed of 1,700 revolutions per minute as it rapidly eats its way through an 80 pound steel rail, throwing off showers of hot iron sparks. The saw is covered by a strong metal hood to keep the particles of iron saw-dust from flying about. The cover also confines water which is directed under pressure upon the rail where the cutting is being done to keep the rail partially cool.

SAWING THROUGH STEEL

Telephone Features at a Masked Ball

A novel circulating telephone exchange operator was a feature of a masked ball recently given in Braddock, Pa. The young woman was equipped with a breast transmitter and head receiver, which

CIRCULATING TELEPHONE AT A MASKED BALL

were connected in series and terminated in a cord and two-conductor plug. She also carried in her hand, for the use of the other dancers, a Dean bull neck type common battery desk set which also terminated in a two-conductor cord and plug. This type of desk set was used because of its lightness. A line was run into the hall and terminated in a strip of ten jacks. These jacks were multiplied so that, no matter which one you put the plug into you would get the operator.

The equipment was furnished and installed by the Pittsburgh & Allegheny Telephone Company. The participants in the affair were at first unconscious of the fact that actual telephone service would be given. When the discovery was made dancers throughout the ball room were enabled to talk from the floor to friends in any part of the city—this service being free and unlimited.

A German Precaution

An investigation was recently made in Germany to determine whether any accidents had ever been caused in gas works by the ignition of gas with sparks from telephone instruments. No such accident had ever been reported, although it was found by experimenting that gas could be ignited in this way if it were projected upon the instruments while they were in operation. After this test it was decided that the use of telephones in gas works would be permitted, provided the instruments were inclosed in a guard of fine wire gauze.

Religion Advertising

Salvation is free, but it is certainly costing a lot of money in New York City during the activities of the Men and Religion Forward Movement. This may be a paradox, but to invite men to visit the churches of New York, and to extend this invitation by means of electric signs along Broadway, is expensive.

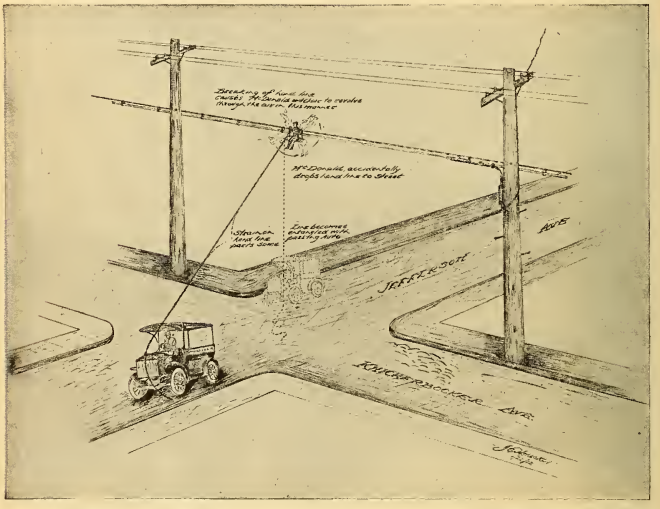
At Twenty-third Street and Broadway, the beginning of the "Great White Way," is placed a sign with letters 13½ feet high, reading:

"Welcome for Everybody in the Churches of New York. Religion for Men and Men for Religion."

This sign, it is stated by those in charge of the Movement, is but the beginning of a campaign of church advertising.

Looping-the-Loop

A peculiar accident happened to lineman Jas. McDonald, while reclipping an aerial cable at Jefferson and Knickerbocker Avenues, Brooklyn. McDonald's hand line having fallen to the street, a passing automobile became entangled therein, and while the rope broke from the strain, McDonald was caused to make two complete revolutions of the strand and cable. Apparently no damage was done either to machine or man.



By Courtesy of the Telephone Review.

SHOWING HOW THE LINEMAN SWUNG THROUGH THE AIR WHEN HIS HAND LINE WAS PICKED UP BY AN AUTOMOBILE. AFTER REGAINING HIS BALANCE HE COOLLY RESUMED WORK

A Railroad Telegraph School

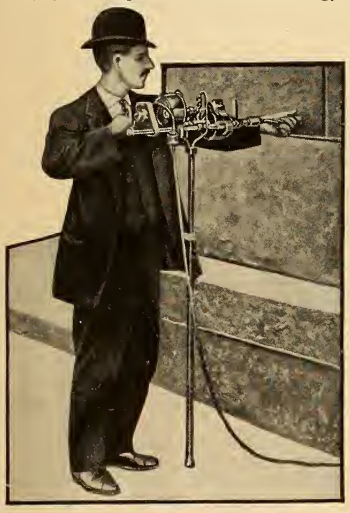
In order to train telegraph operators, the Pennsylvania Railroad has been maintaining a school of telegraphy at Bedford, Pa. The school is equipped with the most modern appliances, while the library is well stocked with books on electricity. In addition to being taught telegraphy the students are instructed in the use of the telephone in railroad work, and are taught to keep the station accounts. A miniature railroad is used to give practical demonstrations in train operation. It takes from six to eight months to complete the course, after which graduates of the school are given employment on the Pennsylvania Railroad.

Pitchblende Mining

It is announced that the Austrian government will shortly purchase the pitchblende mines of Joachimstal at a cost of nearly $500,000. The mines are able to produce five grams of radium annually, which at the current value of $90 a milligram means a lot of money for one gram.

Reciprocating Electric Drill

This electric drill is eating its way into solid stone, impelled by 800 blows in a minute. The little motor uses up only ⅛ horsepower of electric energy.

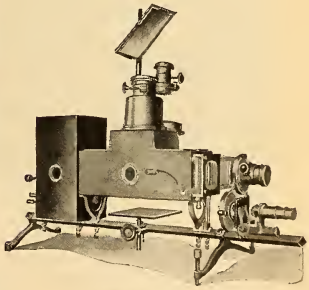


WORKING WITH THE RECIPROCATING DRILL

The mechanical principle is the converting of rapid rotary motion, supplied by the motor, into reciprocating motion, by means of a circular cam, a ball bearing, a floating ring and a spring, which constitute the basic principle of the patent. This machine is suitable for concrete, tile, stone or brick drilling. As the drill point strikes the stone, under the terrific bombardment of blows, it is slowly revolved by hand or by an automatic arrangement.

Four Methods of Picture Projection

The Universal projectoscope combines in one piece of apparatus four methods of picture projection. The direct projection of a picture upon a screen is accomplished by the use of a glass slide upon which the picture is made and through which the rays from the arc lamp pass. In opaque projection, pictures, cards, or drawings are placed on the



PROJECTOSCOPE

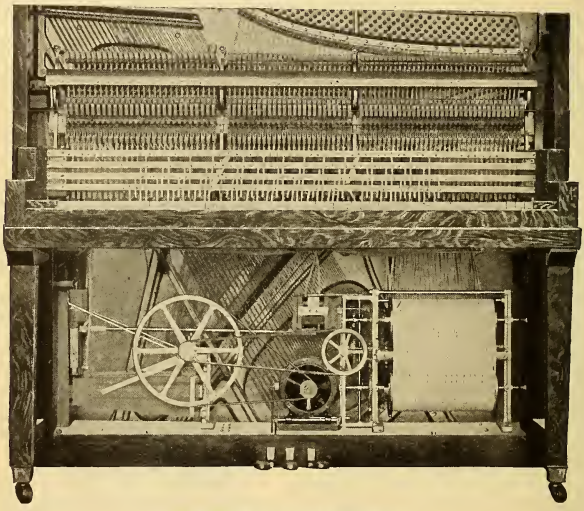
table shown under the middle of the machine and, by light thrown upon them and reflected by a mirror, the screen receives the picture. In each case lenses are used to concentrate and direct the light to the screen. A third interesting feature of this lantern is the device for producing pictures from microscope slides by a slight adjustment of lenses, and a fourth advantage is in being able by the mirror to project pictures in their original colors upon the ceiling. This last feature can be made use of by decorators.

Coin Operated Piano

The "Ariston" is a piano. But the word "piano" does not begin to convey an idea of all that the instrument will accomplish. By pushing in a little lever the music changes instantly to that of an orchestra with drum, cymbals, wood winds and all.

The mechanism, including the bellows and piano movement, is operated by a small motor as shown in the cut. The music is produced pneumatically by means of a perforated roll containing 20 compositions. From one to 20 nickels may be deposited in the coin slot and the piano continues to play one tune after another automatically as long as the money lasts. When the twentieth coin is used the music roll is automatically rewound and stops in position for the first tune.

This instrument is intended for public places such as cafés, hotels, etc.

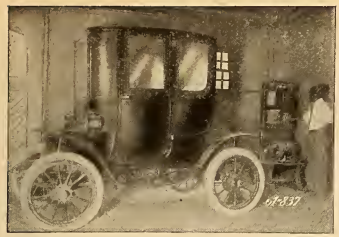


THE ARISTON COIN OPERATED PIANO

Current Converter for Private Garages

Battery charging must be accomplished by direct current; that is, current which flows continuously in one direction instead of reversing its direction of flow many times per second as in the case of alternating current. Since the current most commonly used in light and power circuits is alternating, a converter must be used to change it to direct for charging batteries.

One way of doing this is to use a converter as shown in the illustration. This is a small machine resembling a motor, but it has two windings on its armature. One is the motor winding, which is fed from the alternating current circuit and causes the armature to revolve. The other winding is the same as that of a direct current dynamo, and it supplies direct current to the battery charging circuit through a commutator.



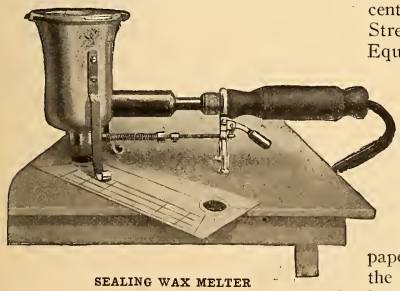
CURRENT CONVERTER IN PRIVATE GARAGE

In fact, we have a motor and a dynamo in one machine.

The advantage of this unit lies in the fact that, in addition to possessing the efficiency and reliability of the large motor-generators used in large charging stations, it is of a size and capacity suitable for use in private garages.

Sealing Wax Melter

The old-fashioned way of placing sealing wax upon letters and packages; that is, by holding a stick of wax in one hand and a match or alcohol lamp in the other, has been brought up to date by the electric wax melter. A metal bowl for the wax with a heating unit in the bottom,

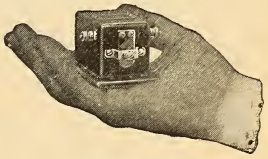


SEALING WAX MELTER

legs for setting on the table and a cord and plug for ready attachment to the lighting circuit, complete the device except for the most important feature. This consists of a small lever handle convenient to the main handle by the pressing of which the bottom of the wax pot is opened to allow the amount of hot wax required to run out.

Baby Spark Coil

This is the smallest stock spark coil in the world. The coil itself is 2⅜ inches long, 1½ inches wide and 1½ inches



BABY SPARK COIL

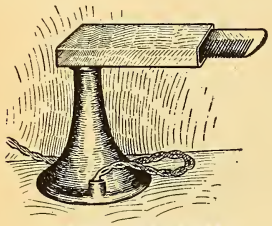
high, and is being used regularly by a well known manufacturer of miniature gas engines. While this coil is small enough to be used as a paper weight, it is a perfect working model and is unusually efficient for its size. It is designed to be operated in connection with three ordinary dry batteries.

Laundry in a Bank Vault

A ten days' job of ironing was recently completed in the vault of a Wall Street bank because of the fire in the Equitable Building, New York City. Pieces of paper, 3,000 in number, representing more than $3,000,000 were taken from sub-cellar vaults of the burned building. The papers were water soaked almost to a pulp. Blotting paper was resorted to in an effort to remove the water but without success. Electric fans were then tried, the notes and papers being carefully hung on lines in the vault. When the air from the fans had carried away nearly all of the moisture a half dozen electric pressing irons completed the work, each paper being ironed out on an ordinary board. Of the 3,000 pieces not one was left in bad condition.

Heating Combs Electrically

As a cheap substitute for an electric hair drier, a German firm is putting out a comb warmer into which a flat comb

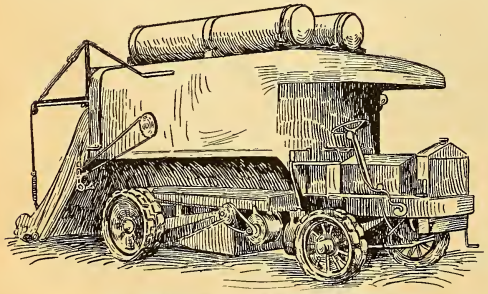


ELECTRIC COMB HEATER

can be slipped. When thus warmed, the comb not only helps to dry the hair if the latter is wet, but also avoids the friction sparks and the crackling which are so objectionable in cold weather.

Gasoline-Electric Street Sweeper

There are four of these machines in successful operation in New York and eight others will be sent to Boston shortly. The prime mover is a four cylinder gasoline engine which drives, by a silent chain, two dynamos which furnish the current to electric motors performing the various operations. The motors are an advantage in this case, over direct drive by the engine, owing to the simplicity of application and ease of control.

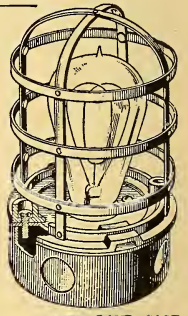


GASOLINE-ELECTRIC STREET SWEEPER

A revolving brush, coming in contact with the street surface, brushes the dirt onto a conveyor belt operating in a steel chute. The dirt is carried up into a large tank, from whence it can be dumped from the bottom at suitable intervals.

In order to prevent dust from being stirred up by the broom, an exhaust fan, driven by a small motor, is used; the set being placed in a small compartment at the forward end of the body and provided with a suitable screen to prevent the escape of dust.

Locking Up Lamps to Prevent Theft



A LOCKED LAMP CAGE

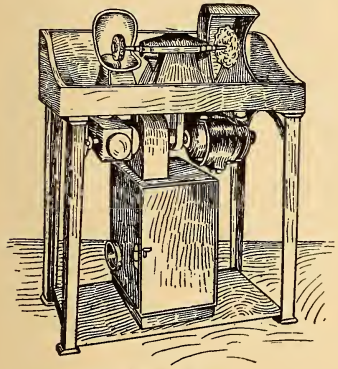
There is a growing demand for a device to prevent the theft of lamps, and at the same time to prevent the overloading of circuits, as in theater dressing rooms, by plugging too large a number of laundry irons, curling irons, etc., into the lamp sockets. The latest method is shown in the cut. A base fitting over the outlet carries a strong metal cage which is locked over the lamp. Unauthorized persons cannot make way with the lamp or insert another current consuming device.

A motion picture theater has been fitted up in the Royal Palace at Bangkok. The exhibitions are, as a rule, intended only for the royal family, although at certain times the general public is admitted to the theater.

Dust Collector on Polishing Machines

More attention is being given to providing safeguards for workmen in shops and factories where dust particles are thrown into the air by grinding, polishing and buffing machines.

The electric motor as shown in the illustration affords a means of operating



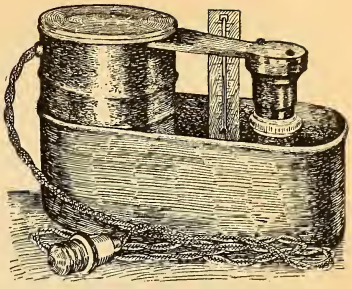
DUST COLLECTOR

a suction dust collector on such machines as well as of operating the machine itself. The grinding and buffing wheels are partially surrounded by a metal hood, while a fan and receptacle below complete the suction outfit.

Moisture Regulator For Rooms

In heating houses in winter the most common complaint is that the air is too dry. This dryness is usually called to our attention first by its effect upon furniture.

Various devices to provide the necessary moisture are used and among them an electric Humidor. The arrangement of the apparatus is shown in the illustration. A 30 watt incandescent is held partially submerged in the water in the pan and a thermometer regulates the turning off and on of the lamp, according to the

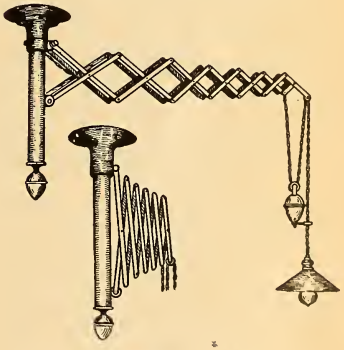


MOISTURE REGULATOR

temperature of the water, the burning of the lamp being thus regulated so that more or less water is evaporated.

Extension Lamp Arm

A convenient fixture for making a single light more serviceable is here illustrated. The Lazilite extension is

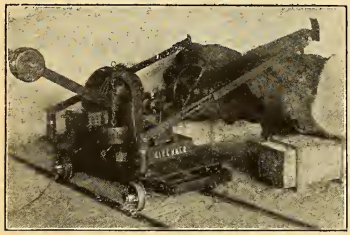


EXTENSION LAMP ARM

constructed of steel strips and enables the light to reach any point within a circle ten feet in diameter by simply moving the lamp to the desired position. The fixture is supplied finished in dull nickel, brass or oxidized silver and is equipped with a cord adjuster for raising or lowering the light.

A "Walking" Saw

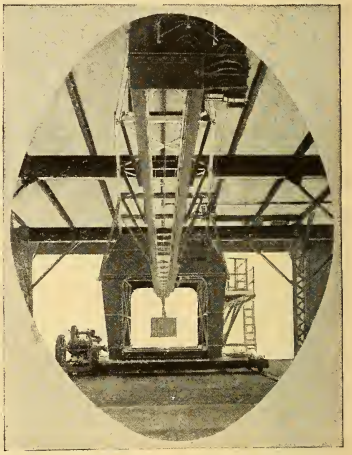
Again the mountain seems to be coming to Mahomet, for sawmill operators are learning that it is often easier to move the saw than the timber. Instead of sliding the bulky and heavy log past the saw, the log is rested on any convenient props and the saw teeth are attached to a chain driven by an electric motor. A couple of sharply pronged arms on the carriage of the motor keep this from moving endwise, so that the cut is made squarely through the log. Then the little car is quickly moved into position for another cut, a single man being able to slide it along while it would take several to move the log.



A "WALKING" SAW AT WORK

Unloading the Ships at Montreal

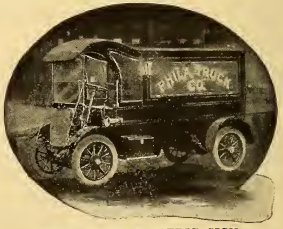
When the warehouses of the harbor of Montreal were built, account was not taken of the possible mechanical discharge of ships' cargoes. When electrically driven unloading apparatus was taken into consideration, it was found that the rooms were too low to permit of the usual type of crane. In consequence a special type of combination gantry crane and derrick was devised. The whole apparatus rests on a wheeled platform, and as this is moved forward toward the entrance the great arm is thrust out over the hold of the ship. A traveling carriage on this arm lets down its ropes and grappling appliances and seizes the box or crate. Then the platform with the whole crane moves back, under the impulse of the motors, into the building and at the same time the traveling carriage with its load is run back over the rearwardly extending arm of the crane into the extreme interior.



MONTREAL WAREHOUSE CRANE

Truck with Electric Sign

As the electric truck carries a good supply of electric current, it is not strange that one company, at least, has hit upon the idea of installing an electric sign on each side of the vehicle. This may be lettered in any way desired to advertise the goods of the vehicle owner.

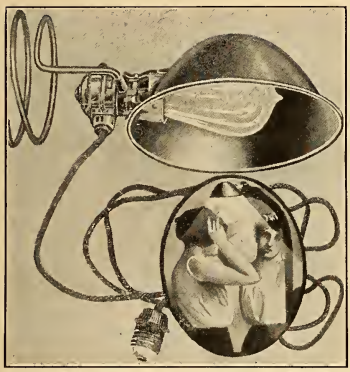


TRUCK WITH ELECTRIC SIGN

The side panels of the truck are made of sheet iron, lamps being installed between them. In each outward facing panel the letters of the sign are inserted. The letters being of glass, the light shines through with good effect.

Handy Lamp Bracket

An eight candlepower lamp would often replace with good results one of sixteen candlepower, if the fixture could be so located that the light shines directly

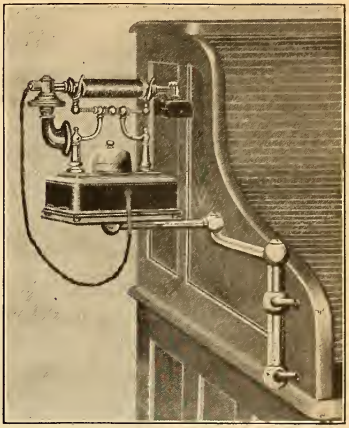


HANDY LAMP BRACKET

on the required place. For looking in dark closets, playing the piano, reading in bed, writing, and for numerous other purposes a direct light fixture is convenient. The device illustrated is attachable to the writing desk, dresser, etc. by means of the coiled spring, which is covered with silk for home and office use, and with rubber for shop service.

An English Telephone Desk Set

The accompanying illustration enables one to compare the English idea of a desk telephone set with the instruments used on this side of the Atlantic. While the American manufacturer arranges the



HOW THE ENGLISH DESK SET IS MADE

bell and ringing apparatus so that it is installed on the wall and is connected by a cord to the transmitter and receiver, which are sometimes secured to an adjustable arm, the English set places the whole somewhat cumbersome looking equipment upon the arm. The receiver and transmitter are connected, the connecting bar serving as a handle for holding the instrument while talking.

Telephone on Church Spire

The new Episcopal Cathedral of Saint John the Divine, in New York City, contains a complete and unique system of telephones, for every part of the big building is linked to every other part through a central switchboard.

There is a telephone at the top of the spire, more than 400 feet above sea level. Another instrument is placed on the highest point of the dome. There is a telephone in the choir loft, while another instrument is at the elbow of the organist.

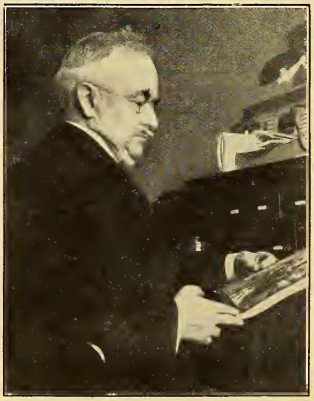
The system extends to the synod hall, where the canons have their offices, and to the choir school.

Electrical Men of the Times

HORATIO A. FOSTER

There is perhaps no better illustration of the youth of electrical science than the fact that Horatio A. Foster, although he did not take up electrical work until he was twenty-six, and is still in middle life, was a pioneer in the days when men were just beginning to learn some of the possibilities of electricity.

Mr. Foster's name is familiar to every one having to do with the practical applications of electricity, through his "Electrical Engineer's Pocket-book," the backbone of every American electrician's working library. Through his connection with such projects as the first Niagara power development, and many large electric lighting and traction installations, Mr. Foster is widely known in his own profession. And it adds interest to his present eminence in his field that, although he is a member of both the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, he never had any scientific training except such as he was able to acquire from practical work with his own hands and brain. Otherwise, as he says, he is a graduate of H. K.—Hard Knocks.



Mr. Foster was born in a suburb of Philadelphia, January 12, 1858, but his boyhood was spent in Northampton, Mass., where he left the High School in 1876 to go to work in a cotton mill. In 1877, at the age of nineteen, he became superintendent of the mill, and in the next six years so increased its efficiency that from being a losing venture it became a ten per cent investment. In 1883 he went to New York to work for Rice & Warner, a firm of railroad contractors.

"One morning in the summer of 1884," says Mr. Foster, "I saw a newspaper paragraph headed, 'A New Profession for Young Men.' It spoke of the possibilities of electrical engineering. I had never heard the term 'electrical engineer,' but I decided I wanted to be one. I had picked up some mechanical engineering in the cotton mill and some civil engineering in my railroad work, but in electricity I had never even so much as wired a bell."

The Daft Electric Company was manufacturing motors at Jersey City Heights. Young Foster got employment there as an apprentice, and less than a year after he started, in April, 1885, he was selected to go to Baltimore, where the Daft Company had taken a contract to equip a two-mile electric railroad for the Baltimore Union Passenger Railway. Two or three experimental electric railways had previously been laid in private grounds and at expositions, but even among electricians there was serious division of opinion as to whether electricity could ever be used successfully for motive power.

At first it looked as though the skeptics were right, for the Baltimore road

consistently refused to run. It was a third rail system, with the unprotected current rail in the middle. Numerous attempts to carry the current from the dynamo to the other end of the track failed, until Foster devised a plan of copper wire bonds for electrically connecting the rails, substantially such as were generally adopted later in street railroad practice. The theory of the unprotected third rail was that a low potential current such as was proposed to be used would not hurt anyone.

"The first day the current was turned on," says Mr. Foster, "a fine Jersey cow with a chain dangling from her neck got out of her pasture and started to cross the track. She got half way across, the chain struck the third rail, and bossy calmly and immediately died. The first car was started that night—there were two of them, named 'Ohm' and 'Volt.' One or the other was in the repair shop all the time. The first one out had gone a few rods when a pinion slipped and stopped it effectively. An old horse started toward the car to investigate. He put one foot on the third rail and departed, via the electric railroad, for horse heaven. The third rail was protected before any more attempts were made."

It was a peculiar coincidence that 21 years later, in 1906, Mr. Foster was the engineer selected to superintend the rebuilding of the entire power plants of the Baltimore electric railroads.

In 1886 Mr. Foster entered the employment of the Thomson-Houston Company and remained with them five years, during which time he was for a year in charge of the engineering department of their Philadelphia business, and for three years superintendent and engineer of their arc lighting plant in New York.

The census of 1890 was the first in which the government took notice of electrical industries. In 1891 Mr. Foster was retained by the census office as chief electrical expert.

Then, early in 1893, he went to Chicago as editor of "Electrical Industries," and made a complete and detailed report for the various issues of that paper on the electrical and mechanical exhibits at the World's Fair. In Chicago he met Professor George Forbes of London, chief consulting engineer for the Niagara Falls Power Company, and at the close of the Fair went to New York to take charge of Professor Forbes' American office. He thus had a hand in the inauguration of the greatest electrical project that had been dreamed of up to that time, and personally worked out many of the details of the great installation, including the methods of testing the huge dynamos. While associated with Professor Forbes he was also, for a short time, editor of "Electric Power." In 1895 Mr. Foster located in Buffalo as a consulting engineer and made for the Cataract Power & Conduit Company what was probably the first accurate series of tests of existing steam and electric power plants that had ever been made in the United States.

In 1906 Mr. Foster became associated with L. B. Stilwell in the rebuilding of the Baltimore power houses, and in 1907 he became associated with Bion J. Arnold, in the appraisal of electric railroad and lighting properties, especially the Metropolitan Traction Company of New York and properties in Southern California.

Mr. Foster's first book, "The Electrical Engineer's Pocketbook," had its inspiration in an early mechanical engineer's pocketbook which one of the mechanics in the cotton mill in Northampton showed him in 1878. The idea of producing such a manual for electrical engineers occurred to him soon after he engaged in electrical work, and he began then accumulating data to be included in it. It was nearly fifteen years later before the first edition was published, but it was the first book of its kind even then. Mr. Foster is devoting himself to the valuation of public utilities and has just brought out a second book, "Engineering Valuation of Public Utilities."

FRANK PARKER STOCKBRIDGE.

Electrical Interests of Women

EDITED BY GRACE T. HADLEY

The Lure of Beauty

"A beautiful woman smiling betokens an empty purse gaping," so runs an eastern proverb, but most women would willingly empty their purse in order to be beautiful. Skin deep beauty carries a conviction that the tactful woman can deepen and make fast with her wits, and if a woman be not clever, if she be lovely, she has a personal asset that allures. Even the clever woman cannot afford to be neglectful of personal charm if she wishes to attract to herself the delighted glance. A woman should attract at first sight, since slow processes do not belong to this day of quick scrutiny and active estimate. The modern woman is not permitting herself to get old and grow gray, even though she may have brought up a suitable family. She goes out of the four walls of her home, joins various organizations and perhaps becomes a club president. But before she does this, with mirror in hand, she has an interview with herself. She considers the practical and beautiful method of winning to herself a large, spontaneous approval.

Suppose she detects some flaws, a line here and there, a wrinkle, a complexion slightly impaired, a dullness of eye, a sagging of the facial muscles—what does she do? The wise woman betakes herself straightway to a modern *salon de beaute,* where a special research has been made in the study of beauty values and where she may call to her aid scientific and hygienic helpfulness. She comes forth a beautiful woman, smiling with a fresh new outlook upon life.

The modern *salon de beaute* is very different from the old-time beauty parlor and the methods of treatment are radically different. There is a spaciousness and artistic beauty about the rooms. The decorations of wall and ceiling and the entire furnishings are exquisitely harmonious. There are reposeful waiting rooms where ladies who come in tired can rest while waiting for an appointment. A cloak and checking room and telephone booths make up some of the conveniences. The part of such an establishment given over to the treatments is complete and sanitary in every detail. The floors are of mosaic, the booths are partitioned in white enameled steel. The chairs are comfortable, the toilet tables handsome. But best of all, every brush, comb, massage device or other article in use in the modern beauty establishment, is freshly sterilized for each treatment.

The modern facial treatment is a complete change from old methods. In the first place it is strictly a cold water treatment. There is no face steaming, no hot water used, no swathing of the face in hot towels. Hot water may be temporarily stimulating, but it makes the muscles flabby and it has a tendency to make the face dry and withered. Mrs. Gervaise Graham was the first to introduce and insist upon a strictly cold water treatment and to discard hot towels and all hot applications. One's face is first cleaned with a cleansing liquid on a bit of absorbent cotton, gauze covered. This is to prevent the cotton from sticking.

Then the hydro-vacu treatment is used. A cold water tank transmits the water through a long rubber tube to a vacuum cap which is gently pressed on the skin and moved about from place to place. The tissues are lifted out of old set grooves and impurities removed. From the vacuum cap through another tube the waste water runs into a pail. The face is then wiped with absorbent cotton and the skin food is applied. Electricity now comes in as an aid to the would-be beauty. It is used chiefly on account of its curative and stimulating effects. The vibrator is too strenuous for facial treatment, but it is highly recommended for body and spinal treatments. Faradic electricity is the kind that is used, beginning with a very gentle current from a dry battery. The operator administers the electricity through her finger tips, one of the connections with the battery being fastened to her wrist. The other is held in the hand of the candidate for the beauty league. The operator works over the skin very carefully and against the lines. All facial treatment must be gentle. The skin is held in place and not moved about any more than is necessary. In scalp treatment the reverse is true. The scalp is agitated as much as possible, to loosen it and make it pliable. Then there is now a tired eye treatment in which electricity is used very successfully.

After the lines and flaws of the face have been treated, the Cupid's bow of the mouth is worked up with the fingers, the muscle about the mouth is gently massaged and the eyes receive a special massage. The throat and back of the neck also receive special attention. The face is cleansed again with cotton and a liquid preparation applied. Layers of absorbent cotton are dipped into cold water and laid upon the face to tone up sagging muscles and make them firm. The face is dried with more cotton and is

powdered and tinted. The eyelashes and eyebrows are lightly brushed and touched up. When the would-be beauty regards herself in the mirror, the story of the mirror pleases. It is an eloquent song without words.

"Very good," says the plain sister who lives far from an artistic *salon de beaute*, "but what can I do to be beautiful? How can I help myself, if I live in a suburb or a small town?"

You can learn a few simple rotary movements and treat your own face. You must have a good cleansing cream or liquid, a pound of absorbent cotton and you should have a small dry battery with two soft rubber sponges with which to treat your face. Do not use the vibrator on the face. Keep it for body treatments. You may be able to give yourself the hydro-vacu treatment, as it is easy to use and surely every woman has at hand plenty of fresh cold water. If your face requires special treatment it is best to consult a specialist.

There are many types of fascination in faces and it is possible to acquire an ally in a clear complexion or lovely tinting. The wise woman acquires tact, serenity, poise and a certain composite quality called charm. The lack of allurement may be wholly a lack of systematic effort on the part of many women.

A Window of Blooms by Lamp Light

Here is an artistic window that tells an interesting and effective story, a window of blooms brilliantly illuminated. When the breath of winter was still in the air, the window was full of the promise of spring. It was warm with light and color. There was the creamy white of the lilies, the delicate tints of the roses, the purple of the violet, the rich hues of the carnations, the color tones of the tulips all mingled, but harmonious in arrangement. Every one agrees that goods properly displayed will practically sell themselves, especially if they are efficiently lighted. This window is illuminated by an imported French crystal prism fixture and two small side lights. Eleven 40 and 60 watt tungsten lamps are concealed within the central fixture.

LIGHTING A FLORAL WINDOW DISPLAY

Artistic window dressing is worth while. It attracts the eye. It makes people stop and look. It makes them want to buy. The object of a lighting fixture is first of all to provide illumination. Satisfactory illumination means that you have neither too

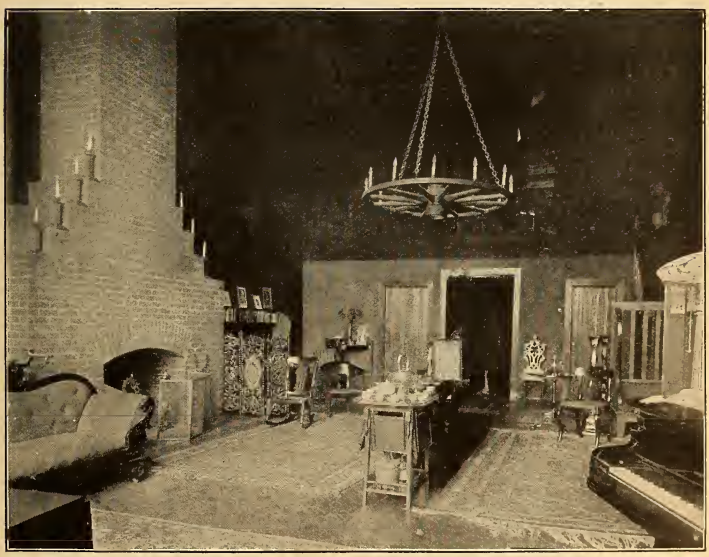
much nor too little light and that the light sources do not offend the eye. Art in the window display is an expression of the owner's individuality. Gorgeousness and splendor are not essential elements of true art. Delicacy of decoration is important.

A Wagon Wheel Chandelier

The most striking feature in the drawing-room of Mrs. Katherine Gillette-Hill, a wealthy resident of Washington City, whose house is a model of artistic adornment for the palaces now being erected there, is the electric chandelier pendent from the center ceiling.

This chandelier consists of a wagon wheel; not a make-believe wagon wheel, but the real old fashioned, iron rimmed affair of the early fathers. It is made of highly polished black oak, with wrought iron tire and spokes, boxes and hub complete. It is suspended from the ceiling by three chains of burnished copper, which hold it horizontal, with just enough play to permit a gentle swing to and fro.

At the points where the spokes join the rim, there rise porcelain candles on the tips of which shine incandescent lamps. The under side of the hub is concave to receive a curved reflector of polished metal in the center of which is an incandescent lamp of high candle power, thus concentrating, when desired, a powerful light, in the nature of a drop light, throwing its rays immediately below the chandelier.



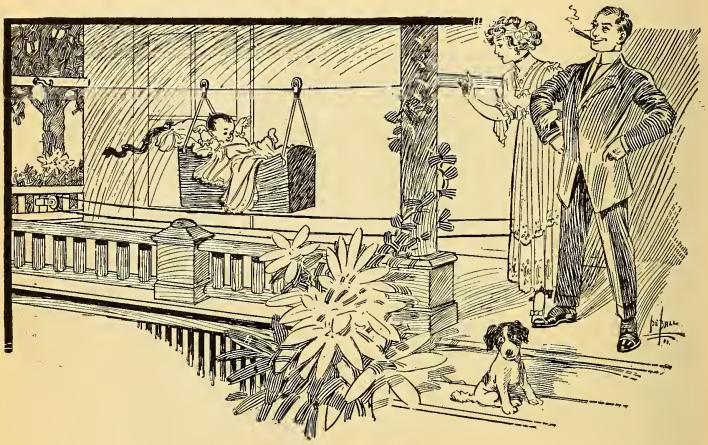
WAGON WHEEL MADE INTO AN EFFECTIVE CHANDELIER

The idea of this most original chandelier was suggested to her, says Mrs. Gillette-Hill, from her memories of the early pioneer days of Illinois, her former home, when the meeting houses of the settlements were oftentimes lighted by candles fixed on the rim of a wagon wheel suspended from the ridge pole.

Trolley Cradle for the Baby

A certain city in South Carolina owns its lighting plant and employs a young man as superintendent who is an original and enthusiastic electrician. He recently became the father of a vigorous son who demanded a great deal of attention, a large part of which was contributed by the father in rolling a baby carriage up and down the long shady porch. It was here that electrical genius came to his aid.

A strong iron cable was strung the whole length of the porch. A little crib with wheels on it something on the order of a cash basket in a dry goods store was made and suspended on the cable. By means of a cord attached to the crib and operated by a sewing machine motor the crib moves along the cable and when it reaches the end the motor is automatically reversed and the crib goes to the other end and so on. By the turning of a switch the baby is kept quiet and happy indefinitely.



A NEW WAY OF ENTERTAINING THE BABY

Bridget's Change of Heart

"I'm leaving in a week, ma'am," announced Bridget, feeling sure that her words would strike terror to the very heart of her mistress, who had a luncheon party scheduled for Wednesday.

"Very well," said her mistress, sweetly, "I already have a servant in the house." It was Bridget's turn to be shocked at the equanimity of the mistress.

"Faith, and who may it be?" faltered the cook.

"Have you forgotten that I had the house wired last week and that I now have electricity at my service? I have ordered a vacuum cleaner, a toaster stove and several other electric cooking utensils, so that I shall not be entirely helpless, and I can cook, you know."

Bridget trudged down the stairs and prepared dinner. The next day she announced that Patrick was wanting to marry her, but that she would stay awhile and oversee the new servant.

House Wiring a Simple Problem

During the past four and a half years, 3,350 homes have been wired for electric service in Chicago. Since August, 1907, the owners of unwired houses and apartments have been induced to have their premises wired on the instalment plan, the local light and power company doing the wiring and furnishing the fixtures at cost and spreading the payments over a period of two years. The general impression was that there would be considerable damage to woodwork and decorations, but this impression was soon dispelled by the methods used by expert wiremen. The wires are fished between partitions and under floors to avoid making holes in the plaster or injuring the woodwork. A flexible metallic conduit protects the circuit wires completely and still enables them to be fished around corners and in loops. An experienced wiring man is able to get around almost any structural difficulty without having to cut the plaster to reach the outlet. Sometimes it is necessary to remove a baseboard or a single board in the flooring, but these are easily replaced without a trace of disturbance.

A small cottage may be wired for ten lights, the lights being placed as follows: Hall one, parlor four, back parlor three, and one light in each of two bedrooms. The average cost of wiring cottages of this kind in this manner is $45.00, not including fixtures. Spreading the cost over a period of 24 months, as is done by the Chicago company, makes each monthly payment only $1.88. For complete wiring of a two-story frame residence, a two-story brick apartment and a three-flat building the cost ranges up to $275, in the last instance including fixtures. Wiring is not so much an expense as an investment.

The possibilities of electrical service in the modern home are so self-evident that it seems almost unnecessary to enumerate them. There is the facility for flexibility and convenience of control. Electricity as an illuminant is safe and sanitary and in many cases it is an actual domestic economy. There is the broad application of electric service to so many of the household processes and it is a practical solution of the servant problem.

Radium Baths in Bohemia

The old town of St. Joachimstal at an elevation of over 2,000 feet in the Ore Mountains, about 20 miles north of Carlsbad, was once famous for its silver mines. Long after the silver and copper mining activities of St. Joachimstal had come to an end, other ores, more particular uranium (pitch-blende) were mined there. However, it is only since the discovery of radium that the St. Joachimstal uranium deposits have become famous. They are richer in this most precious metal than any similar deposits in the world.

The chief use of radium is for medicinal purposes and recognizing this, the Austrian government several years ago installed a provisional bath house near the mines. It was then demonstrated that the radium treatment was helpful in cases of gout, rheumatism, neuralgia and similar diseases. The building of a modern "cure house" was begun at the mines and this structure was formally opened on October 22, 1911, in the presence of various high government officials. The building is equipped with the latest and most practical devices for the application of radium therapeutics.

The "radioactivity" both of water and air is utilized in these cures. The new bath establishment has numerous bathrooms where warmed radioactive water from the uranium mines is available in tubs, the exact degree of radioactivity necessary for every case being carefully regulated. Besides the emanation from the water through the skin, provision has been made for drinking the radioactive water as well as inhaling radioactive air. The very latest scientific inventions are used to preserve the radioactivity of the waters.

Artistic Electric Candlesticks

A pretty candlestick is always a welcome addition to any table, mantel or dresser and is the more attractive when

CANDLESTICKS OF DECORATED GLASS

made to use electricity. The candlesticks here shown are real works of art in glass working and are arranged to be equipped with a small electric lamp and finely finished silk cord with a plug for connection to the nearest lighting socket. The base of metal finished in almost any desired style adds to the beauty of the decorated glass portion.

An Advantage of Electric Cooking

One of the advantages of electric cooking which should appeal to the housewife is the fact that a moderate temperature may be used, with a resulting preservation of weight and bulk of the material, as compared with flame cooking at high temperature. The result is not only an improvement in the quality of the material after cooking, but it has been shown recently in the *Standard* that it may actually affect the amount of the butcher's bill. Figures are given covering four years for a family of six persons, who, as far as is known, partook of meat just as often in the two years under electric cooking as in the two years under the use of gas. There was a slight increase in the expense for heating, cooking and lighting, amounting to from $10 to $25 per annum. There was a decrease in the butcher's bills, however, amounting to $80 per annum.

The statement that the shrinkage and evaporation is much lower with electric cooking is substantiated by a caterer's journal, which estimates this loss as low as six per cent with electric cooking, whereas it reaches 18 to 20 per cent with other methods.

A Demonstration by the Visiting Lady

The dining room was beautiful. The table was mahogany, with a spotless white cloth. In the center was a gilded basket filled with ferns and purple violets, so real that fashionable persons without their glasses mistook them for the large blooms of early spring. A heavy handsome dome was suspended above the table, which was laid for breakfast. Electricity as an illuminant was very much in evidence.

Out in the kitchen the chocolate colored cook was struggling with an unwieldy gas range. She tried to make toast in the oven of the gas range—and burned it badly. The visiting lady who happened to stroll into the kitchen took in the situation at a glance. She hastened upstairs and soon returned with an electric disk stove which was tucked away in her trunk. This she attached to a lamp socket under the dome of the dining room table. When the house lady, her daughter and another guest sat down at the table, the visiting lady was busy making toast on the electric stove. The colored cook entered apologizing for the scorched toast.

"Never mind," said the visiting lady, "I am serving the brownest of toast hot off the grid. An electric disk stove is not really the proper utensil with which to make toast. One should have an electric toaster, but I want to show you just how easy it is to have hot brown toast made right at the table, instead of

badly burned toast that tried to make cinders of itself in a gas oven."

The cook was open mouthed with astonishment. The house lady was deeply interested. She used electricity most recklessly as an illuminant, but this was the first demonstration in cooking with electricity that had ever been made in her home. Like thousands of other women, she had not waked up to the possibilities of table cooking.

"And that is all you have to do!" exclaimed the house lady, "simply attach the cord and turn on the current?"

"That is really all that is necessary," said the visiting lady, "and electricity will make you the best and brownest of toast. Best of all you can have it hot, which is the first requisite of good toast."

Table Decoration at a Southern Dinner

"We had a delightful time in New Orleans," said Mrs. T. to a visiting friend, "but nevertheless we are glad to get home again. We were entertained a great deal and driven about the quaint old city in a very fine limousine; in fact, we had so much attention shown us that we felt duty bound to reciprocate. As we were stopping at a hotel I could think of no better way to do this than to give a dinner party. The first thing that perplexed me was the matter of table decoration. There were loads of violets to be sure, and many small flowers but I did not care to use them, neither did I care to indulge in American beauty roses at seven dollars a dozen; these are shipped south from Chicago, hence their increased cost. Finally, I consulted the hotel manager and told him I wanted American beauty roses, but I felt that the price of imported roses was rather prohibitive, and I asked him what I could use for table decoration.

"Well," he said, with that promptness so characteristic of the up-to-date hotel manager, "we have a basket of electrically lighted roses that will appeal to the most fastidious taste."

"Now, I was somewhat dubious at first, as I had never used anything in the way of table decoration, except the fresh cut flowers, but when I saw this basket of electrically lighted roses in the center of the table I was delighted with it. There must have been at least two dozen roses in the basket and garlands running from the basket to each plate; the roses were remarkably true to Nature both in color and form and the flexibility of the wiring made it easy to carry out a beautiful wheel design. Fresh green smilax was used in profusion and completely hid from view all traces of the wiring. The effect was most realistic and the whole arrangement so artistic that it presented a fairy-like scene. I was more than pleased with the idea and my dinner party was a great success."

Business Methods Good for the Home

An English woman writer has pointed out that the functions of the home are protective, educational and social. The household produces use values, while other organizations produce exchange values. The home is not operated on profit making lines. The absence of profit making has certain drawbacks. While business houses have had competition to urge them on to better things, the household has remained in a more or less backward state. Housekeepers continue to use old-fashioned utensils and ranges and antiquated systems of water heating. Inventions make way more slowly in the average home than in a profit making industry.

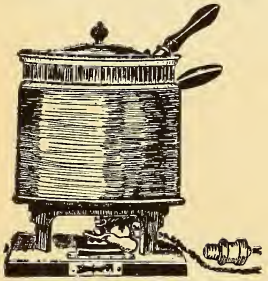
The electric era is here. Business houses are rapidly installing electrical apparatus to do their work and housewives are gradually waking up to the fact that there is a Servant in the House, ready to do their bidding at the turn of a switch.

It does not follow that the place in which we dwell need be made any less

homelike by adopting business principles and business methods, or be turned into a private hotel and café. It simply means that that great word "efficiency" which so stirs the business world might well be better understood and respected in the home.

Combination of Cereal Cooker and Stove

An ideal way to prepare breakfast is afforded by the double boiler combined with the electric stove. The inner vessel is made of white porcelain and the outer one is of copper, double tin lined and nickel plated. This can be used alone



CEREAL COOKER AND STOVE

on the stove as a single boiler. It holds half as much again as the porcelain vessel. The electric stove is mounted on a slate base, is furnished with six feet of cord and a lamp socket plug. The cost of operating this combination is not great. Three heat stoves are recommended as they permit an accurate control of the cooking, and save current.

Mental Character Determined by Machine

A British scientist announces that he has invented a machine by which the mental character of a person may be determined. It looks like a box camera, and has a revolving mirror. Flashes of colored light are thrown rapidly into the mirror and reflected into the eye of the subject. It is said that the sensation of color persists for a short time after the external impulse has ceased. The duration of this persistence and a scale of perseveration are the means by which the scientist takes measurement of character by electric lights.

Fundamental Principle of Electric Cooking

Loss of heat by radiation from a coal or gas stove is very great. This is practically eliminated where an electric range, or, in fact, any electric cooking device is employed. The fundamental principle of electric cooking is that the heat is where it is wanted and nowhere else.

The Kitchen to Become a Laboratory

"Instead of feeling like a drudge in a smoky, smelly, overheated kitchen," states a writer who has made a study of foods and their preparation, "the housewife and the professional cook of the future will have the dignity of working in a clean, cool laboratory for the scientific preparation of savory food, and the abolition of dyspepsia. On the principle that prevention is better than cure, they will take the place of physicians."

Cleaning of Bulbs and Reflectors

Housekeepers who will spend several hours a week cleaning house, who dust, scrub and polish, often pay too little attention to keeping their electric lights and reflectors clean.

They will keep their windows clean, and are worried if they are the least bit streaky, keeping out the daylight. But the electric lights they neglect. They will not waste the daylight, which costs them nothing, but are profligate with electric light, for which they have to pay.

In some instances it has been found, due to dirty globes and reflectors, that people are getting only one-half of the light for which they pay. A damp cloth will soon remedy these conditions.

Junior Section

A College Prank

In commemoration of its 125th anniversary, the University of Pittsburgh employed an electric signboard 40 feet long and fifteen feet high in a prominent location, bearing the inscription: "1787—

"THEY HAVE STOLEN OUR ADVERTISING"

University of Pittsburgh—1912." In a spirit of levity students of Carnegie Technical School, which is also located in the city of Pittsburgh, stole the advertising.

The letter "T" was used; "B" was converted into "E" by severing several wires; "G" was made into "C" and the letter "H" appropriated. All other lights were cut off and when the sign was turned on at night "TECH" blazed forth.

Electricians after many hours splicing succeeded in correcting the sign before the three day celebration was ended.

Electrifying the Checker Game

Genius invents an electrical checker board which will add much interest to the old diversion. R. C. Jackson, of 31 Green street, Dayton, Ohio, has electrified the checker game. The game with Mr. Jackson's invention triples the psychological element involved, the skill, the ingenuity and the interest in the ordinary checker game. The unique new checker board comprises an ordinary 64-square board. Each square on which the checkers are moved is faced with two copper electrodes, or contacts. Each player is provided with a plug board, properly screened from the view of the opponent. Each plug board has a contact for each playing square on the board, which makes a duplication of the main board, and by means of a flexible cord either player may "plug in" on any square on the board upon which he calculates that his opponent will move.

If the player whose turn it is to make a move really does move his checker onto the square so plugged, the move rings the alarm, which is a small electric buzzer. In every instance the player who in moving rings the alarm, is compelled to move back to the square he left. This, of course, is a deviation from the usual game. In moving back

he loses his move in the play. If, however, a player moves to a square not anticipated by his opponent the move is to his credit, just as in the ordinary game.

In beginning the game the men occupying the king row are termed "royal guards," which is another slight deviation from the customary game. As long as the king row contains "royal guards," or men who have not been moved from their original position, these four guards must be surrendered, one by one, to the opposing player as fast as the opposing player forces his opponent to ring the alarm by the moving of any of his other men.

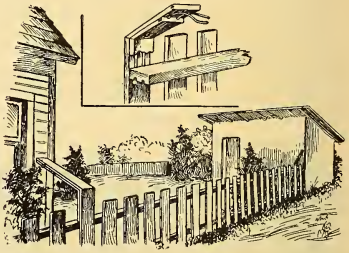
By this new rule it will be readily seen that in the new game there is at once one grand break to vacate the king row for fear of being forced to surrender the four "royal guards." These first four men are the only ones surrendered without being "jumped." If they can be gotten out of the king row before the player is compelled by his opponent to ring the alarm there is then no danger of losing them by surrender. No player can "plug" against a single jump, and a single jump must be taken. If a player is presented the choice of two or more jumps then his opponent can "plug" him on either of two co-ordinate jumps or on the second of a serial jump. Not more than two or three games will be required to convince any player that the psychology of the checker game is involved to about three times the extent of the common checker game.

The checker, or "man," in the new game is an ordinary checker jacketed with sheet metal, which serves as a contact to complete the circuit and ring the alarm when it is placed upon a square the electrodes of which have been charged.

The electrical energy for the board is supplied by a single cell dry battery, and the raising or lowering of either player's screen covering his plug board automatically cuts the current in or out of his end of the board.

Fooling the Chicken Thief

In running wires from the chicken house to a dwelling for the purpose of sounding an alarm in case some one should unlawfully seek the "makings" of a chicken pie it is quite essential that the wires be deftly concealed, otherwise they would be easily discovered by the thief and disconnected. In the case of



METHOD OF CONCEALING ALARM WIRES

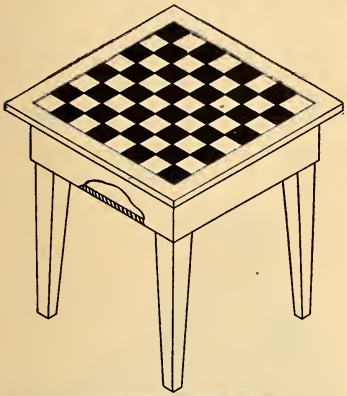
a closed circuit system this would mean putting it out of service. Such wires might be placed in a metal pipe or conduit underground, but this is rather expensive.

I have installed wires in the manner shown in the illustration and in very few instances has my attention been called to them by some sharp-eyed observer. The illustration is self-explanatory. From the house two horizontal boards extend to a pair of vertical boards on the fence. Between the boards in grooves are the two wires. From the vertical boards at the dwelling the wires pass through to the under side of the 2 by 4 of the fence and thence toward the hen house. Here an arrangement similar to that from the dwelling to the fence is provided. Sometimes the disguise may be made more complete by having the horizontal board over a gate at the front and also at the rear, the wire carrying boards appearing to be a part of the wooden framework of the gates.

BOHUMIL KREJCIK.

Illuminated Checkerboard Table

The top of this table is made of glass, preferably ground, on the surface of which a checkerboard is painted. The lower part of the table is built in the ordinary way except that a box-like structure is placed directly beneath the glass. This is enclosed so that a light



ILLUMINATED CHECKER BOARD

or lights may be introduced. These lights may be permanent and so arranged that a connection may be plugged into the lamp socket. C. H. Sampson.

The Ambrose Channel Lightship

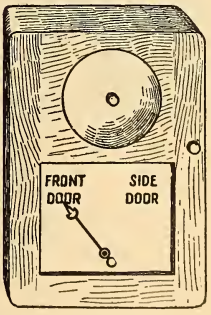
As a result of a series of tests which extended over a year and were made by the United States Lighthouse Department, the Ambrose Channel lightship, marking the eastern end of the new channel into New York Harbor, has been equipped with flame arc lamps. There are two signal masts, each carrying three lanterns of standard lighthouse design hung in gimbals in order that the plane of illumination may be maintained horizontal regardless of the motion of the vessel. A vertical type carbon flame arc lamp, working at 110 volts and 6½ amperes, and giving a

AMBROSE CHANNEL LIGHTSHIP

maximum horizontal candlepower of approximately 4,000, is placed in each lantern. The arc is placed at the focus of the lens, which is so arranged that the light emitted is concentrated, and passes from the lens with a divergence of about eight degrees, the result being that a powerful cone of light is projected horizontally. The three lanterns are spaced at equal distances about the masts, and at least two of them are visible from any point of view. At a distance of approximately two miles the two lights apparently merge into one light source.

Caller Is at Which Door?

A number of bells in a house is rather confusing as it is hard at times to determine whether it was the front, side or back door bell which rang. To do away with this troublesome feature a combined bell and annunciator has been recently placed on the market, which indicates the door the caller is at. Only one bell is used and the annunciator automatically resets itself.



DOOR BELL ANNUNCIATOR

Paris Engineer's Odd Dining Room Railway

M. Hagnauer, a noted electrical engineer of Paris, has devised for the amusement and instruction of his little daughter an ingenious electric serving railway for his dining table. He has built a little track running from the slide connecting his pantry and serving room with the dining room, on which runs a little motor engine run by current from the city supply. Attached to this is a car on which can be loaded bottles of wine, plates of food, etc. The railway completes a circuit around the table, so that dishes can be placed upon it and sent back over the track to the pantry slide. M. Hagnauer can operate the railway from his seat at the table, by means of a little dial having push buttons around its face, each one controlling a different movement of the motor, such as starting, stopping, reversing, etc. A cord carrying the controlling wire runs from this dial along under the railway to the pantry, where it is connected with a switch attached to the electric light circuit. It has proven to be of much practical use, besides affording continual amusement for his little daughter.

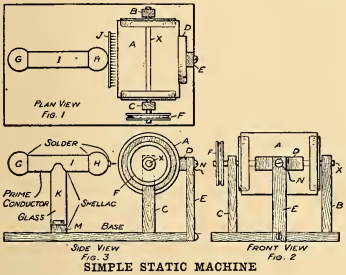
PARIS ENGINEER WHO AMUSES HIS LITTLE DAUGHTER WITH A DINING ROOM RAILWAY

A Simple Static Machine

The accompanying illustrations show a cylinder electrical machine that is very

simple in its construction and operation. Fig. 1 shows a plan view of the machine, Fig. 2 a front elevation and Fig. 3 a side elevation.

The glass cylinder is four inches in outside diameter and five inches long. This is designated by (A) in all the illustrations. Two pieces of well seasoned oak are cut to shape so that they will fit in the ends of (A). The axle (X) is 7½ inches long and ¼ inch in diameter. The end pieces and axle should be glued



SIMPLE STATIC MACHINE

or shellacked in place and allowed to dry firmly. The two uprights (C) and (B) are made of well seasoned oak and are five inches high and ¾ inch wide and ½ inch thick. They are fastened to the base by means of screws passing up from underneath. They have ¼ inch holes drilled in them so that (X) will fit in. A pulley (F) is put on one end. This can either be flat or grooved as desired.

The base is of well seasoned oak and is ½ inch thick. All the wooden parts should be given two coats of shellac and allowed to dry well.

The rubber is shown in (D) in the illustrations. It is three inches long. A piece of wood three inches long, ½ inch wide and ¼ inch thick is wrapped with about four turns of flannel and then covered with two turns of silk. This piece (D) is fastened to an upright (E) by means of a short round head brass screw. (E) should be so placed that the rubber (D) will press firmly on (A). The brass screw is connected to the ground by means of a wire (N). The rubber should be kept covered with an amalgam which is made as follows: Melt together in a ladle, two parts of zinc and one of tin. When melted add six parts of mercury and pour the mixture in a wooden box and shake well until cool. When used, this amalgam should be mixed with a little lard and rubbed over the rubber.

The prime conductor (I) is made as follows: Secure a piece of brass tubing having a one inch outside diameter and four inches long. On each end solder a brass ball 1½ inches in diameter (G) and (H). Get a piece of strip brass ¼ inch wide and 3½ inches long. Drive a number of brass tacks in it as close together as possible. Solder all the heads to the strip. Then solder the strip to (H) with the tack points away from the prime conductor. Round off all sharp corners except the tack points. Connect the prime conductor to the base by a piece of glass tubing one inch in diameter and of a height that will bring the points of the prime conductor on a center with (A). Cut a piece of wood so that it will fit tightly in the glass tube (K) and screw it to the base. Put the tube (K) on this and glue firmly. The prime conductor (I) is placed upon (K) so that the points (J) will almost touch (A). Then fasten (I) to (K) with shellac or glue. The machine is now complete.

Carefully dust off all parts of the machine and warm well before the fire. Connect the rubber to the ground and turn the glass cylinder (A) briskly. A stream of violet fire will flow from (A) to the points on (J). If the knuckle is brought near (G) a sharp spark will jump and quite a powerful shock will be felt. This spark under favorable conditions will be from one to three inches in length.

To charge a Leyden Jar with this machine connect the outside coating of the jar to the ground and bring the knob of it near the knob on the machine. In a few seconds the jar will be charged.

B. Francis Dashiell.

Popular Electricity Wireless Club

Interference and the Inductive Tuner

By MARLIN O. ANDREWS

When the wireless operator comes to the practical operation of his set, he must shift for himself. He must learn to tune, by pulling a slider here, pushing another there, adding capacity somewhere else, until he brings in a station free from interference. Then he pats himself on the back and thinks he is becoming an expert. He copies only a few words, however, when another station or two come roaring in, bringing with them a mixture of surprise and despair to the late expert. He gropes for some time with a maze of unintelligible sliders, switches, coils and condensers, having about as much chance of tuning out the undesired signals as if he were trying to work the combination of a safe.

The majority seem to be looking for new apparatus, new systems of tuning, never stopping to think that perhaps they are not getting the greatest possible amount of selectivity from the instruments which they already have.

In any transmitting set using the ordinary spark gap, the oscillating and radiating circuits, whether direct or inductively connected, have, if not too loosely coupled, two periods of vibration, one longer and the other shorter than the natural period of either circuit. This is due to the interchange of energy between the two circuits.

If the common turns of direct connected circuits are decreased in number, or the distance between inductively connected circuits lessened; in other words, if the coupling is loosened, it is found that the coupled circuits still have two periods of vibration, but they have approached nearer to the natural period of each. It is, therefore, possible to loosen the coupling to such an extent that both circuits will vibrate in the same period and only one wave be radiated. When this is done the reading of the hot-wire ammeter in the radiating circuit will be lowered, due to the greater losses of loose coupling. However, this does not necessarily mean that the audibility of the signals at the receiving station will be decreased, since the meter registers the total amount of energy radiated, whether it is in one wave or divided between two. Therefore, signals are of the greatest audibility at the receiving station, when the transmitting set is closely coupled or is sending out two waves and the receiver is in tune with both. The next best condition is to have the transmitter loosely coupled and in tune with the single wave.

It is due to this double periodicity and consequent radiation of a double wave that we can receive from a station at two places on our tuning coil.

At first thought it would seem that this double wave length would be detrimental to good tuning, which is true in the hands of one who does not understand its value. With a little thought, however, it is possible to obtain greater selectivity with stations using a double wave than with those radiating a single wave.

Let us now consider the action of an inductively coupled receiving set in regard to the receiving of double waves.

In this set, if we have variable condensers in parallel with the primary and secondary circuits, we plainly have variable quantities, the inductance in the primary circuit, the inductance in the secondary circuit, the coupling between the two circuits, and the capacity of the condensers. By careful experiment we find the effects of these variations, on both the long and the short waves to which we are tuned, to be as follows:

1. Increasing the inductance of the primary increases the long wave length rapidly but the short wave length is increased so slowly that it may be considered as remaining constant. The opposite is, of course, true when inductance is taken from the primary.

2. Increasing the inductance of the secondary increases both the long and the short wave lengths equally, or nearly so, and vice versa.

3. Loosening the coupling between the primary and secondary decreases the long wave length and increases the short wave length. Tightening the coupling increases the long and decreases the short wave lengths. In other words, its action is the same as the oscillation transformer of the transmitting set. As the coupling is loosened the two wave lengths approach the wave length to which each circuit is individually tuned, and as the coupling is closed the two wave lengths are driven farther from the natural wave length of the circuits.

(Note.)—To have loose coupling does not necessarily mean to have the secondary pulled out from within the primary. We may have loose coupling when the secondary is totally within the primary. The point of maximum or closest coupling is reached when the middle of the active primary turns is directly over the middle of the active secondary turns. Then, if the secondary is pushed still farther within the primary, the coupling is loosened, giving us two points of loose coupling on either side of the point where the coefficient of coupling is maximum. This is important and should be thoroughly understood.

4. Increasing the capacity in the primary circuit increases both wave lengths, and vice versa.

5. The variable capacity in the secondary circuit is used principally to put the secondary in resonance with the primary, thereby allowing looser coupling than would otherwise be possible. This allows atmospheric disturbances to be cut out to some extent without decreasing the audibility of the signals.

We have already observed that it is possible to hear a station radiating a double wave at two places on our tuner. In one case, we are in tune with the long wave and in the other with the short wave. We may also be in tune with both the long and the short waves at the same time. This is a decided advantage as we will then receive energy from both waves, and the signals will consequently be much louder than when tuned to only one of the waves.

How may the different types of interference be avoided?

Case 1. When in tune with the long wave length of the transmitting station, there are four principal types of interference that we must dodge.

1. Another station may commence sending, whose long wave is of the same length as the one which we are receiving, but whose short wave is either longer or shorter than the short wave of the station from which we are receiving. For instance, suppose we are receiving from a station radiating waves of 1,500 and 500 meters respectively. We are tuned to 1,500 and 400 meters, and another station commences sending using waves of 1,500 and 600 meters. By referring to the effects of coupling on double waves we find that this type of interference may be tuned out by simply loosening the coupling which lowers our long wave length perhaps to 1,300 meters and raises our short wave length to 500 meters. The desired signals will then come in not on the long wave, but on the

short wave, where there is no interference. If the coupling is loosened too much our short wave length will be raised to 600 meters, where the undesired signals will again be picked up.

2. While we are still tuned to 1,500 and 400 meters, and are receiving from a station radiating waves of 1,500 and 500 meters, another station may begin sending, using a short wave of 400 meters and a long wave, either longer or shorter than 1,500 meters. It may be tuned out by adding capacity to the primary circuit, which increases both wave lengths to 1,700 and 600 meters, then by loosening the coupling our long wave length is again brought back to 1,500 meters and our short wave length driven still farther from the interference at 400 meters. The desired signals will again come in on the long wave but our short wave length has been raised to 800 meters, where it is comparatively safe from interference, as there are very few stations using wave lengths of from 600 to 900 meters.

3. Tuned as before to 1,500 and 400 meters and receiving from waves of 1,500 and 500 meters, we may get interference from waves of 1,500 and 400 meters. In this case, we are in tune with both waves of the interference and the desired signals may be entirely drowned out. This may be overcome by simply adding inductance in the secondary or capacity in the primary circuit, either of which raises both our wave lengths to 1,600 and 500 meters. We will then get our station on the short wave where there is no interference.

4. Under the same conditions as before, suppose a station begins sending, both waves of which are of exactly the same length as those of the station from which we are receiving. If there is no difference in the tone or intensity of the signals, we must wait our turn, as there is positively no way of getting around this type of interference. However, this is, fortunately, a very rare case and will not often be encountered.

Case 2. When in tune with the short wave length of the transmitting station, the types of interference are similar to those under Case 1, but the remedies are slightly different. One example will be given here, and the reader may work out the rest for himself.

1. We are tuned to 1,500 and 400 meters, and are receiving from waves of 1,600 and 400 meters. Interference of 1,400 and 400 meters may be tuned out by adding inductance in the secondary circuit or capacity in the primary, either of which will raise our wave lengths to 1,600 and 500 meters. The desired signals will then come in on the 1,600 meter wave.

Questions now begin to come up. How can we tell to which wave we are tuned? This sounds well on paper, but in practice how are we to determine whether we are tuned to the long, to the short, or to both waves? Nothing could possibly be more simple. All we have to do is to add inductance to the primary and observe the result upon the intensity of the signals. If the signals are cut out altogether, we are in tune with the long wave, if the signals are not affected or are only slightly decreased in audibility, we are in tune with the short wave, and if they are not cut out entirely but their audibility is considerably diminished, we are in tune with both waves.

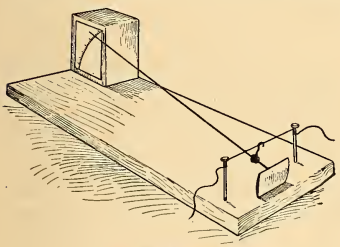
Is it not possible to strengthen weak signals by these methods? It certainly is. For instance, suppose we are receiving from 1,500 and 500 meter waves and are tuned to 1,500 and 400 meters. If the signals are weak, they may be strengthened by first increasing the inductance in the secondary until we are tuned to 1,600 and 500 meters. The signals will then come in on the 500 meter waves. Then, by taking half as much inductance from the secondary as was added to it, and loosening the coupling, we become tuned to 1,500 and 500 meters and are getting energy from both waves and consequently stronger signals.

Let us take another case. Suppose we are tuned to 1,500 and 500 meters and wish to strengthen the signals which we are getting from waves of 1,600 and 500 meters. Increase the inductance in the secondary, until the signals come in on the 1,600 meter waves, then take half as much inductance from the secondary as was added to it, and tighten the coupling. This brings us in tune with both waves.

A Hot Wire Meter

A very successful and delicate hot-wire meter may be made by anyone, at a net cost of ten cents. Following is the list of necessary materials: A twelve-inch hatpin; small stick of sealing wax; safety razor blade; one foot fine German silver wire; board for base, and two three inch nails.

Drive the nails firmly into the base near one end, about six inches apart.



HOT WIRE METER

Stretch the fine wire across the tops of these nails rather tightly. Fasten the head of the hatpin to the middle of the razor blade with sealing wax, and also fasten a small loop of bell wire, an inch or less long, two inches out from the head of the hatpin. These measurements are approximate and need not be followed absolutely. Finally, make a scale of any convenient small divisions and pin it on a cardboard box of some kind. It will probably be necessary to stick a chunk of wax on the razor blade to weight it down. Simply hook the loop of stiff wire over the middle of the fine wire as in the illustration, and place the scale beside the pointer.

Make your connections to the two nails, shunt the meter across three or four feet of the aerial circuit. The deflection of the needle varies directly with the current going into the aerial and is greatest when the aerial and condenser circuits are in resonance.

H. E. Rawson.

Ships of Navy to Report Positions

The United States navy department has issued orders to all vessels of the navy to send "position reports" when within range of wireless stations, giving their location, course and rate of speed. With this information on file, the position of a boat may be easily calculated and with the operators of naval wireless stations vigilant day and night, the nearest boat to one sending distress messages may be despatched without any loss of time.

Wireless News for Desolate Islanders

The inhabitants of the Magdalen Islands in the Gulf of St. Lawrence are entirely cut off from communication with the outside world all during the winter months. In order to keep in touch with affairs, the Postmaster General of Canada is arranging to have a weekly news letter sent them by wireless. The letter, which will be about 1,000 words long, containing a brief summary of the news of the world, will be sent to the clergy who will read it at the close of the Sunday services.

Wellington, New Zealand, will very soon have a long distance wireless station of very high power. The station is being erected on the top of Otari Peak, nearly 1,000 feet above sea level. The masts, two in number, will be 150 feet high. With this station wireless communication will be possible with Sydney, Australia.

Restoring Old Hard Rubber to Its Natural Color

All wireless amateurs who have ever paid a good price for some high class instrument, know how disappointing it is to find that the hard rubber parts have slowly but steadily changed to a spotted yellow color. I have run up against the same problem more than once, and so made up my mind to find some remedy for the trouble. Finally, after many experiments, I found a very simple method that makes the rubber good and black, and gives such excellent results that it pays well for the small amount of work.

Here is the way to do it. Simply saturate a small clean rag with full strength household ammonia, and rub the faded surface of the rubber with it until the cloth becomes dry. Repeat this operation a few times, and you will find that all the yellow color has disappeared. Always be sure to rub in one direction, so as not to mar the face in any way. After you have removed all the discoloration by the above process, polish up the surface with a piece of silk moistened in crude oil.

I have treated quite a few pieces in this manner, always with the best results. So far I have not been able to detect any after effects and have been able to find no deterioration due to chemical action from the ammonia.

EDWIN L. POWELL.

Questions and Answers in Wireless

By A. B. COLE

50.—My ground connection is made to the brass of a combination gas and electric light fixture. Why can I not receive loud signals?

The metal of such a fixture is insulated from the gas pipe by means of an insulating joint, which is required by the Fire Underwriters. In order to obtain a good ground connection it will be necessary for you to connect the ground wire to the gas pipe itself.

51.—Will an aerial supported by a kite give good results?

Kites have been used for this purpose, and a notable example is the long distance experiment of the old De Forest Company in 1907, when one thousand words were sent from the Manhattan Beach (N. Y.) station, to a station on the west coast of Ireland. At the latter station the aerial was supported by kites. It was reported at the time that about 500 words of the message were received, and this was considered a great achievement then.

The box kite is one of the best for this purpose, on account of its steady and strong pull in a good breeze. Kites are seldom used, however, except in experimental work, since the rising and falling motion varies the position of the aerial with respect to the earth, and consequently varies its capacity. This variation makes tuning difficult.

FIG. 17

52.—Give dimensions and description of a 30 foot iron pole for supporting the aerial.

A metal pole is to be recommended for amateur work, for it is inexpensive, durable, and easy to construct. A 30 foot pole may be made of water pipe, of the grade known as "heavy," and the method of joining the three sections is given in Fig. 17. Section (1) is a ten foot length of two inch pipe. (R) represents a reducing coupling, known as a 2 by 1¼ inch reducer. Section (2) is a ten foot length

of 1¼ inch pipe, section (3) is a ten foot length of ¾ inch pipe, and (H) is a 1¼ by ¾ inch reducer. The reducers should all be of malleable iron. The sections are held together by the reducers, into which they should be tightly screwed, and the pole and reducers should then be covered with two or three coats of waterproof paint. A hole (H), ⅛ inch in diameter, should be drilled near the top of the pole. A piece of heavy wire passes through this hole, and serves to support a pulley. A rope passes through the pulley and in turn supports the spreader of the aerial which may be lowered at any time for repairs.

53.—Give dimensions of a 70 foot iron pole.

This pole may consist of four sections of "extra heavy" iron pipe, as follows: section (1), 25 feet of four inch; section (2), 20 feet of 2½ inch; section (3), 15 feet of 1½ inch; section (4), ten feet of one inch. Reducers join the sections as in the 30 foot pole.

In general, poles should be designed to withstand the most severe storms which ever occur at the place where they are set up, and in this connection it should be remembered that in the winter, when ice forms on the aerial, the pole and aerial have a considerable weight to support in addition to their own.

54.—What is the purpose of a guy wire?

The iron poles described above are not sufficiently strong to stand unsupported. A guy wire (or several of them) is used to balance the strain caused by the wind and the tension of the aerial. Guy wires should be made of a strong material, such as steel or phosphor bronze, and should be so placed with respect to the pole that they resist the wind pressure in every direction. In time the guy wires will stretch, and it becomes necessary to take in the slack. The turnbuckle illustrated in Fig. 18 is a convenient device for this purpose. A turnbuckle should be placed in each guy.

55.—Is it necessary to break each guy wire and insert an insulator?

It is not necessary but desirable. Since these wires are grounded, although possibly indirectly, they act as aerials, absorbing some of the energy which would otherwise be radiated or received, and they are therefore a source of loss,

FIG. 18—TURNBUCKLE

reducing the operating distance. It is possible to draw sparks of considerable length from the guys of large stations, showing that much energy may be absorbed. If the guys are broken by insulators, however, there is little loss from this cause.

DETECTORS, POTENTIOMETERS AND RECEIVERS.

56. What is the purpose of a detector?

The oscillations set up in the aerial when it is struck by electro-magnetic waves will not directly operate a relay or produce sound in the telephone receivers. An intermediate device, generally known as a detector, is necessary to convert the high frequency oscillations into a form of electrical energy which will serve this purpose.

57. Name the general types of detectors.

Rectifiers; electrolytic; imperfect contact; magnetic.

58. What is the generally accepted theory of the action of rectifying detectors?

The oscillations produced in the aerial system somewhat resemble alternating currents used for electric lighting, especially when the station is one of a system operating with slightly damped waves. Rectifying detectors seem to have the peculiar property of acting as electric valves, cutting off the oscillatory currents as they flow in one direction and allowing them to pass as they flow in the other direction. Probably this effect is due to the heating of the two materials

of the detector at the point of contact, at which, although it is claimed there is a "perfect contact," there is undoubtedly far from a perfect electrical contact. Detectors of this type require no battery in series with the telephone receivers.

59. Name the most sensitive rectifying detectors.

Perikon; silicon; carborundum; ferron or pyron; molybdenite; audion.

60. Describe these detectors.

A perikon detector consists of a stand having two metal cups holding the sensitive materials, and so arranged that the points of contact between the materials and the pressure of one on the other may be changed at will. A spiral spring contained in one of the tubes supporting the cups is employed to give the required pressure. The essential material of the perikon detector is zincite, which is an oxide of zinc, and is chemically known as ZnO. Various materials have been used in combination with zincite, such as chalcopyrite, bornite, galena, carbon, brass and others. One of the most sensitive combinations which the author has had occasion to use is that of zincite with silver or gold telluride, or metallic tellurium.

The perikon detector is very satisfactory for most purposes, and many are in use by the army and navy.

A silicon detector consists of a metal rod, terminating in a point at the lower end, and so arranged that the pressure upon a small piece of silicon may be varied. The silicon is often held in a metal cup by means of solder or other readily fusible metal. A spiral spring in the vertical tube furnishes the pressure of the metal point on the silicon.

Silicon is a product of the electric furnace, and is made in several grades, whose compositions vary from a small percentage of silicon to as high as 98 per cent silicon. The lower grades are not nearly so sensitive as the higher grades.

The low cost of making this detector its reliability, ease of adjustment, and sensitive qualities, make it the general favorite of amateurs and operators. No local battery is needed with this detector or with perikon.

A carborundum detector may be made from a silicon detector by substituting carborundum for the silicon. Some pieces of carborundum are more sensitive than others, and this is probably due to the fact that at different parts of the furnace the temperature is different, and possibly compounds of various compositions result.

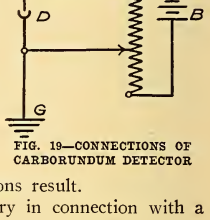


FIG. 19—CONNECTIONS OF CARBORUNDUM DETECTOR

A local battery in connection with a potentiometer should be used with a carborundum detector. Two or three dry cells may be required, depending on the kind of carborundum used. This is a very satisfactory detector, and is extremely sensitive when a good crystal is used. The green variety of carborundum generally gives very good results. Fig. 19 shows how the carborundum detector may be connected to (L) the lead-in wire from the aerial, (T) a telephone receiver, (P) a potentiometer, and (B) a battery.

The sensitive material of the ferron, or pyron, detector is iron pyrites, sometimes known as "Fool's Gold." This occurs in Nature in large quantities. Unlike silicon, iron pyrites is not equally sensitive at all points on its surface.

This material may be used in the same type of detector stand as silicon, and when the metal point rests on one of the sensitive points, the ferron detector is very sensitive. It is practically unaffected by static. No local battery is needed with this detector.

A molybdenite detector may be made from a silicon detector by substituting a thin piece of molybdenite for the silicon. For best results considerable pres-

sure of the metal point on the molybdenite is required. No local battery is needed for this detector. It is little affected by static, and by proximity to the spark gap, and is not so sensitive as silicon or carborundum.

Directory of Wireless Clubs

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

Aero Wireless Club.—A. Garland, President; W. Ladley, Vice President; D. Beard, Napa, Calif., Secretary and treasurer.

Allegheny County (Pa.) Wireless Association.—Arthur O. Davis, President; Theodore D. Richards, Vice President; James Seaman, Leetsdale, Pa., Secretary and Treasurer.

Alpha Wireless Association.—L. L. Martin, President; F. A. Schaeffer, Vice President; G. F. Girton, Box 57, Valparaiso, Ind., Secretary and Treasurer.

Amateur Wireless Association of Schenectady, N. Y.—D. F. Crawford, President; L. Beebe, Vice President; C. Wright, Treasurer; L. S. Uphoff, 122 Ave. "B," Schenectady, N. Y., Secretary.

Amateur Wireless Club of Geneva (N. Y.).—H. B. Graves, Jr., President; C. Hartman, Vice President; L. Reid, Treasurer; Benj. Merry, 148 William St., Geneva, N. Y., Secretary.

Berkshire Wireless Club.—Warren A. Ford, President; William Yarkee, Vice President; Charles Hodecker, Treasurer; Jas. H. Ferguson, 18 Dean St., Adams, Mass., Secretary.

Canadian Central Wireless Club.—Alexander Polson, President; Stuart Scorer, Vice President; Benj. Lazarus, P. O. Box 1115, Winnipeg, Manitoba, Can., Secretary and Treasurer.

Cardinal Wireless Club.—K. Walthers, President; F. Dannenfelser, Vice President; Miss A. Peterson, South Division High School, Milwaukee, Wis., Secretary.

Chicago Wireless Association.—John Walters, Jr., President; E. J. Stien, Vice President; C. Stone, Treasurer; F. D. Northland, Secretary; R. P. Bradley, 4418 South Wabash Ave., Chicago, Ill., Corresponding Secretary.

Fargo Wireless Association.—Kenneth Hance, President; John Bathrick, Vice President; Earl C. Reineke, 518 9th St., Fargo, N. D., Secretary.

Forest Park School Wireless Club—W. S. Robinson, Jr., President; William Crawford, R. F. D. No. 1, Springfield, Mass., Secretary.

Frontier Wireless Club.—Chas. B. Coxhead, President; John D. Camp, Vice President; Franklin J. Kidd, Jr., Treasurer; Herbert M. Graves, 458 Potomac Ave., Buffalo, N. Y., Secretary.

Gramercy Wireless Club—J. F. Diehl, President; H. Green, Vice President; J. Gebhard, Treasurer; J. Platt, 311 East 23d St., New York, N. Y., Secretary.

Northwestern Wireless Association of Chicago—Rolf Rolfson, President; H. Kunde, Treasurer; Edw. G. Egloff, 2729 Noble Ave., Chicago, Ill., Recording Secretary.

Hannibal (Mo.) Amateur Wireless Club.—Charles A. Cruickshank, President; J. C. Rowland, Vice President; William Youse, Treasurer; G. G. Owens, 1306 Hill St., Hanubal, Mo., Secretary.

Haverhill (Mass.) Wireless Association—Riedel G. Sprague, President; Charles Farrington, Vice President; Leon R. Westbrook, Haverhill, Mass., Secretary and Treasurer.

Independence Wireless Association.—Boyce Miller, President; Ralph Elliott, Secretary; Joseph Mahan, 214 South Sixth St., Independence, Kan., Vice President.

Jonesville Wireless Association.—Frederic Wetmore, President; Webb Virmylia, Vice President; Richard Hawkins, Treasurer; Merritt Green, Lock Box 82, Jonesville, Mich., Secretary.

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

Manchester, (N. H.) Radio Club.—Homer B. Lincoln, President; Clarence Campbell, Vice President; Elmer Cutts, Treasurer; Earle Freeman, 759 Pine St., Manchester, N. H., Secretary.

New Haven Wireless Association.—Roy E. Wilmot, President; Arthur P. Seeley, Vice President; Russell O'Connor, 27 Vernon St., New Haven, Conn., Secretary and Treasurer.

Oakland Wireless Club.—H. Montag, President; W. L. Walker, Treasurer; W. R. Sibbert, 916 Chester St., Oakland, Calif., Secretary.

Oregon State Wireless Association.—Charles Austin, President; Joyce Kelly, Recording Secretary; Edward Murray, Sargeant-at-Arms; Clarence Bischoff, Lents, Ore., Treasurer and Corresponding Secretary.

Pacific States Wireless Association.—Howard W. Lewis, President; W. N. Hickman, Vice President; Earl C. Hanson, Recording Secretary; Stanley McClatchie, 288 Wilcox Ave., Los Angeles, Cal., Corresponding Secretary.

Peterboro Wireless Club.—G. B. Powell, President; C. V. Miller, Vice President; E. W. Oke, 263 Engleburn Ave., Peterboro, Ontario, Can., Secretary and Treasurer.

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

Rockland County (N. Y.) Wireless Association.—W. F. Crosby, President; Tracey Sherman, Vice President; Marquis Bryant, Secretary; Erskine Van Houten, 24 De Pew Ave., Nyack, N. Y., Corresponding Secretary.

Roslindale (Mass.) Wireless Association.—O. Gilus, President; E. T. McKay, Treasurer; Fred C. Fruth, 962 South St., Roslindale, Mass., Secretary.

Sacramento Wireless Signal Club.—E. Rackliff, President; J. Murray, Vice President; G. Banyard, Treasurer; W. E. Totten, 1524 "M" St., Sacramento, Calif., Secretary.

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

Springfield (Mass.) Wireless Association.—A. C. Gravel, President; C. K. Seely, Vice President and Treasurer; D. W. Martenson, Secretary; Club Rooms, 323 King St., Springfield, Mass.

St. Paul Wireless Club.—Thos. Taylor, President; L. R. Moore, Vice President; E. C. Estes, Treasurer; R. H. Milton, 217 Dayton Ave., St. Paul, Minn., Secretary.

Tri-State Wireless Association.—C. B. DeLa-Hunt, President; O. F. Lyons, Vice President; T. J. M. Daly, Treasurer; C. J. Cowau, Memphis, Tenn., Secretary.

Wireless Association of British Columbia.—Clifford C. Watson, President; J. Arnott, Vice President; E. Kelly, Treasurer; L. J. Bothel, 300 Fourteenth Ave. E., Vancouver, B. C., Corresponding Secretary.

Wireless Association of Canada.—W. Fowler, President; E. G. Lunn, Vice President; W. C. Schuur, Secretary and Treasurer.

Wireless Association of Montana.—Roy Tysel, President; Elliot Gillie, Vice President; Harold Satter, 309 South Ohio St., Butte, Mont., Secretary.

Wireless Club of Baltimore.—Harry Richards, President; William Pules, Vice President; Curtis Garret, Treasurer; Winters Jones, 728 North Monroe St. Baltimore, Md., Secretary.

For Practical Electrical Workers

Householders, Know Your Meter

By GUY R. GROVE

The little electric meter tells you each month just how much you have to turn over to the electric light company. It is a silent salesman and its accuracy is just as important as that of the scales used in public markets for weighing goods sold over the counter to the buying public. But not one in a hundred has any idea of what the inside of a meter looks like. The principle of the meter and its operation is a complete mystery to the majority of electric light consumers. It is this ignorance that leads to the general doubt of the public as to its accuracy in measuring electrical energy. However, in the face of all this doubt it can be proven that the modern meter is one of the most accurate measuring devices made.

Public service commissioners and civic committees which several of the states now have for regulating the prices and methods of selling commodities to the public have investigated the usual methods and practices of weighing and measuring and have found more need of improvement in other methods than has been necessary in the approved and modern methods of metering electricity. Instruments for measuring electrical units are accepted as being among the most accurate instruments known and the modern electric meter is indeed an instrument of precision when compared with the instruments, apparatus and means of measuring many other commodities. In order to insure that the meters may be maintained so as to operate with the highest degree of accuracy many of the lighting companies maintain a regular meter testing department, equipped with the most accurate standards obtainable.

The meter is a miniature electric motor of very delicate construction. It is so connected in the circuit that the current used in the circuit on which it is connected will flow through the meter, which causes it to run and consequently to register in direct proportion to the quantity of current flowing through it.

The watt is the practical unit of electrical measurement, the same as the pound is the unit of weight, and is equivalent to 1-746 of a horsepower. When a watt is used continually for one hour it is called a watt hour. As the watt hour is too small for a commercial unit of measurement the term kilowatt hour, meaning 1,000 watt hours, is commercially used. The term is usually abbreviated K.W.H. and all electrical rates and bills are based on the K.W.H. as a unit. For instance, when electrical energy is sold at ten cents it means ten cents per K.W.H., or ten cents for the use of 1,000 watts for one hour, or 500 watts for two hours. To get a better idea of how much a K.W.H. is we can compare it with an ordinary sixteen candlepower carbon lamp. If such a lamp is burned one hour it will consume 50 watt

hours, or 1-20 of one K.W.H., and would have to burn 20 hours before the meter would register one K.W.H. People often get the mistaken idea that they can use a 50 or 60 watt lamp for any length of time and only consume 50 or 60 watts. They do not take into consideration the time element, and instead of using a total of 50 watt hours they use 50 watt hours for each full hour they use the lamp.

On account of the extremely delicate construction of electric meters they have a general tendency to run slow rather than fast, due to the friction of the bearings. They seldom run fast unless subject to abnormal conditions. In fact, the First District of New York Public Service Commission has found that of meters tested during a recent period, 92.4 per cent were registering accurately, 5.8 per cent slow and 1.8 per cent fast.

In states which have a commission as mentioned above, the commission will test any meter on request of the consumer with the understanding that if the meter is running fast and to the detriment of the consumer the lighting company shall pay for the expense of the test; if the meter is found to be correct or running slow the consumer is required to pay the expense of the test. The expenses of these tests range from $2 to $10, depending on the size of the meter.

The report of one of these commissions showed that on these tests 90.5 per cent were correct, 8.2 per cent slow and 1.3 per cent were running fast. This shows that in this particular report that 98.7 per cent of the parties making the complaint paid for the expense of the test.

Meters rarely run over ten per cent fast if they run fast at all. Half of the people who have occasion to complain, or at least think they have, to the electric light office remark that their meter is running twice as fast as it should. This is a mistaken idea, as it is practically impossible for a meter to do so. Of course there are times when the meter shows a consumption twice as large as previous months but in 99 cases in 100 it is no defect in the meter. The current is going through the meter but is in most cases used by a "ground" or by lights burned in the house that the one complaining knows nothing about. Such complaints are given close attention by the company and the meter is tested.

Light users who have cause to suspect that their meter is running fast can make a rough test and satisfy themselves as to how it is running. This is done by reading the meter and keeping a record for a few days of the exact time the lights are used. In doing this a close tab must be kept of all lights burned and count all used even if only in use for ten or fifteen minutes at a time. The watts consumed by gem and tungsten lamps are marked on the bulbs, as they are rated in watts. Carbon lamps are rated in candlepower and the wattage is not always given on the bulb. However, following is the relative consumption:

4 candlepower carbon lamp— 20 watts
8 candlepower carbon lamp— 30 watts
16 candlepower carbon lamp— 50 watts
32 candlepower carbon lamp—100 watts

A reading of the meter should be taken before and after the test and the consumption shown on the meter compared with the K.W. hours shown on the tab record. If this is done and close tab kept of all lights used it will be surprising to find that light is used that had not been thought of before, the meter accurately recording the current all the time.

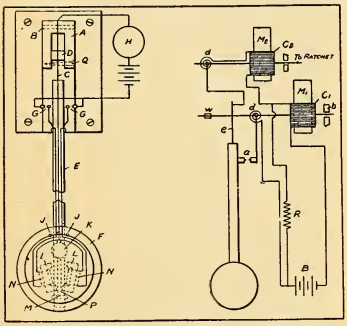
Using Old Carbon Ends

Instead of consigning old arc lamp carbon ends to the scrap pile they may be employed to advantage in connection with lightning conductor work. Because of the higher conductivity of pure carbon compared with coke, the unconsumed pieces of arc lamp carbons make an excellent bed for ground plates in the earth.

How an Electrical Clock Operates

In this article is presented a diagrammatic arrangement of the various parts of an electric master clock without giving dimensions and details. With a clear idea of the way such a clock operates the amateur should be able to build to suit his fancy as to size and materials available.

The first design, Fig. 1, is especially interesting from the fact that the greater



FIGS. 1 AND 2. PRINCIPLE OF ELECTRIC CLOCK

part of the operating mechanism is placed on the pendulum bob. By arranging small electro-magnets behind the bob in such a manner that a weight is drawn over to the high side of the bob at the end of each stroke, this weight is made to drive the pendulum. Such an action as this can be easily illustrated by watching a boy in a rope swing. At the end of each oscillation he quickly shifts the center of gravity of the swing and himself and gets the desired push.

Such a mechanism is shown in Fig. 1 in which (F) is the pendulum bob suspended by rod (E). Behind the bob are mounted the parts shown by dotted lines. (K) is a small weight mounted on an iron rod (P), and arranged to work on a knife edge (M). (LL) are the electro-magnets with coil (N) placed as shown, and connected to battery through the contact points (GG). (H) is a pull up mechanism to register the time and consists of a simple ratchet wheel which is moved one tooth at a time by means of an electro-magnet. The wheel train may be taken from an old alarm clock, together with the hands and dial.

The bob is suspended by means of a steel spring (C) held in the head block by means of pin (B). A split block (D) is free to slide up or down (in recess shown) when screw (Q) is loosened. In this manner the length of the pendulum may be changed and the clock regulated. Contact points at (G) are made of platinum. The circuit shown by light lines is run on the back side of the pendulum. The middle or common wire is fastened directly to (C), as shown. When (K) is pulled over by either of the electromagnets (L), it moves far enough to remain against the stop (J) without the aid of any fastening devices. This reduces the mechanism as a whole to the pendulum and one moving part.

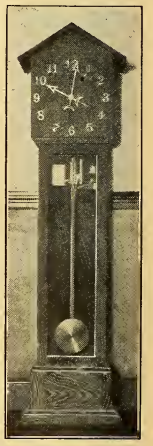


FIG. 3. ELECTRIC CLOCK

The pendulum bob is made of lead cast in a pie tin and suspended by means of a spruce rod. The bob weighs 22 pounds. The weight of (K) and (P) together is seven ounces. (P) is made of iron ¼ inch square. This clock requires two gravity cells for operation. Its time keeping qualities are not independent of battery strength but so nearly so that when used on gravity cells it keeps very good time.

A design was furnished to a Y.M.C.A. class in practical electricity (of which the writer was instructor), and a clock

was constructed by them for the city Y.M.C.A. of Lafayette, Indiana. This clock, the cut and circuits of which are shown in Figs. 2 and 3, is still in operation.

Referring to Fig. 2, it will be seen that when the pendulum is swung to the right, electrical contact is completed through the platinum points at (a). Coil (C), which is connected into the circuit by these points, holds two windings, one of which is energized at all times as can be seen from the diagram. This winding tends to hold the coil in the "up position" against the stop (b) by reaction with the field of the permanent magnet (M1). The other winding when energized by closing contacts (a), sets up a field equal and opposite to that of the first winding, and coil (C1) falls of its own weight and gives just enough push on the pendulum at (a) to keep it in motion.

The hands and wheel train (taken from an old clock) are driven by coil (C2), which is impelled upward by the reaction of its field with that of (M2), a permanent magnet, each time the pendulum makes contact at (a).

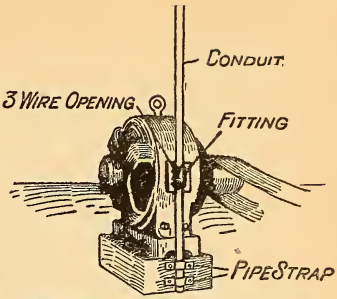
Electrical connections are made to moving arms through hair springs (d). A resistance (R) is inserted in the closed circuit to balance the resistance of (C2).

Since it is the force produced by the weight of coil (C1) dropping which drives the pendulum, this clock operates independently of battery strength and has been regulated to keep time within 20 seconds per month.

CHARLES B. MOORE.

A "Good Ending" in Conduit

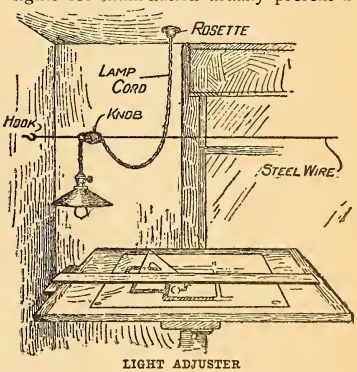
The illustration shows a much better method for ending conduit at motor terminal blocks when the conduit is run on the ceiling than is generally the case. Instead of ending in an outlet box at the terminal block, and being left to be pushed this way and that, a "T" fitting is used, having a three wire opening, from which the pipe is continued until it rests upon the floor, where it is fastened, thus affording a rigid support, and when the motor foundation will permit, it can be fastened to it with pipe straps.



METHOD OF ENDING CONDUIT AT MOTOR TERMINALS

Light Adjuster for the Drafting Table

Drafting rooms or carpenter shops which depend upon hanging incandescent lights for illumination usually present a tangled up appearance as to lamp cords, as each man twists and ties the cord to suit his particular needs, which may vary five or six times a day.

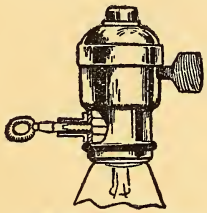


LIGHT ADJUSTER

By stringing porcelain knobs on No. 16 steel wire stretched across the bench or table and securing the flexible lamp cord to it by tape the lamp may be readily moved along to any point needed.

Locks Lamp in Socket

There have been devices on the market in the past, designed to accomplish this purpose, but the theft of lamps and shades was not prevented because the



LAMP SOCKET WITH LOCK

design was such that the socket could be opened by a hair-pin, toothpick or match.

If the socket is equipped with P. & S. Shurlok locking attachment, there is no possible way in which the lamp may be taken from the socket without the use of the key.

A Simple Flasher

The electric sign business of today is perhaps the most spectacular phase of electrical work. The degree of perfection reached and the artistic effects produced are truly wonderful. In every place of any size many and intricate designs are displayed and the average person little thinks how they are produced.

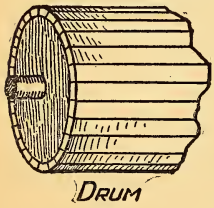


FIG. 1

The general principle is simple and can be carried out on a limited scale by almost anyone, with a little careful work. On a recent occasion a very simple flasher was built and it aroused so much interest that the diagram and description are given below:

A small wooden drum, Fig 1, about 2¾ inches in diameter is the most convenient size to use. A hole should be bored through it and a shaft of metal fitted. Upon the wooden cylinder ⅜ inch asbestos board should be placed in strips so as to entirely cover the wood. These strips should be held in place by countersunk screws. Supports can then be made and the drum should rotate

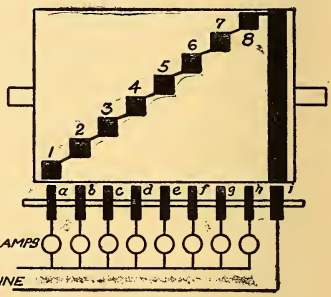


FIG. 2

freely. A crank can be attached for hand operation or a pulley if it is desired to belt it to a small motor.

Take eight small squares or strips of copper or brass and fasten them to the drum as shown in Fig. 2. (1, 2, etc.) One strip should extend around the entire circumference. Each piece should be connected to the next one as shown. The sketch shows the drum "flattened out" so as to be more easily understood. Light sheet copper or brass is the most suitable material.

Next contactors should be provided as shown (a, b, etc.). These may also be made of brass or copper and should be slotted and then screwed to an asbestos board support. The slot will allow some adjustment of pressure between the contactors and strips on the drum.

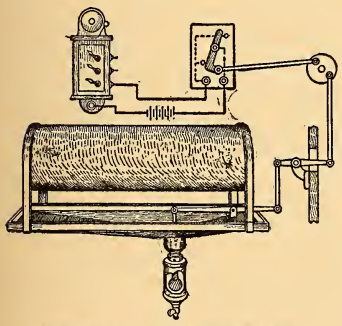
The lamps should be connected as in the diagram, Fig. 2, one side of each lamp to the contactors and the other ends connected to a common point. This common point is then connected to the line.

The other side of the line should be connected to the contactor pressing on the ring on the drum. As the drum is rotated the contactors make the circuit through the strips in the drum and thus the current flows through the lamps. One lamp goes out before the next comes on and thus a flashing effect of the lamps is produced.

If more than one lamp is to be used per contact they should be connected across the same points as the one lamp shown and heavier conductors should be used. Some arcing may result from the breaking of the current, but it will not be enough to be injurious.

Leakage Alarm for Boats

Motor boats are largely operated by gasoline carried in tanks, and it is quite an advantage for the boat operator to



ARRANGEMENT OF THE LEAKAGE ALARM

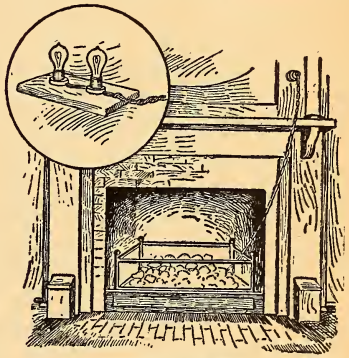
know that his tanks are in good condition and not leaking.

A device for warning of any leakage in the fuel tanks has been patented by C. L. Hoffman, Detroit, Mich., and is electrical. Under the tank is a drip pan, at the lowest point of which is a float within a small basin. The float is attached to a stem and levers so that a switch closes the circuit on an annunciator as soon as oil enters the basin and causes the float to rise.

An Imitation Coal Fire

Open fireplaces used as a means for heating houses are not to be compared with the more efficient methods of the present day, yet the open fire is gaining rapidly in favor.

This must be for reasons of sentiment alone, which are strong enough to



IMITATION COAL FIRE

endure the accompaniment of smoke, coal and wood ash blown through the house, which is invariably the case when atmospheric conditions are not favorable enough to produce a good draft. As the cheery effect of the fire seems to be what is desired rather than the warmth, this effect can be attained by means of colored electric lamps without any of the disadvantages incurred in using coal.

Two lamp sockets are secured to a shallow oblong metal box fastened to the inside of the back of the grate and arranged to be connected to a lamp socket in the room by an extension cord and attachment plug. The glow of the burning red lamps shining through a mixture of broken pieces of thick glass, red and amber isinglass and a few coals scattered over the top, produces a very realistic and pleasing effect.

H. G. Wilson.

Reversing Switch

The illustration, Fig. 1, shows an easily constructed switch for reversing small motors, changing the polarity of electro-magnets, etc.

The vertical section of wood (A) is mounted on a base (B) which also carries the four binding posts (C, D, E, F). Three copper segments (G, H, I) are

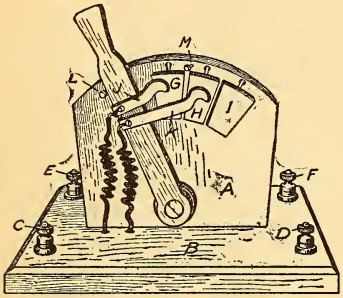


FIG. 1. SIMPLE REVERSING SWITCH

mounted closely together on the section (A). Segments (G) and (I) are both connected to the binding post (F) while the middle one (H) is connected

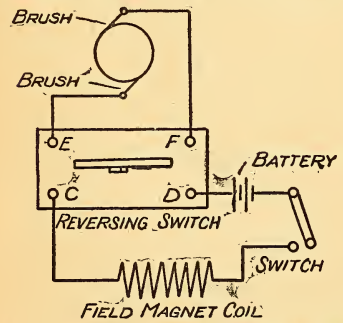


FIG. 2. CONNECTIONS OF REVERSING SWITCH

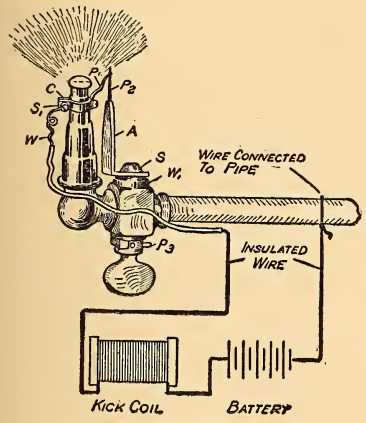
to binding post (E). A thin wood lever carrying the copper brushes (J, K) is mounted on the piece (A) with a screw, a washer being placed between the two to separate them enough to allow the lever to clear the segments (G, H, I) in passing over. Brush (J) is connected with binding post (C) and brush (K) to binding post (D) using coiled wires to allow free movement of the lever. Brush (J) must be just long enough to make contact with segment (G) when (K) touches (H). Moving the lever to the right brings brush (J) in connection with (H) and brush (K) with (I), thus reversing the current. Brads (L) and (M) may be used to stop the lever at the correct points. Fig. 2 shows connection for reversing a battery motor. When so connected the current will be reversed in the armature but not in the field magnet coil.—L. A. KING.

How to Make an Electric Gas Lighter

A very simple and inexpensive electric gas lighter can be made as follows: Obtain a valve and tip similar to the one shown in the accompanying figure. Remove the screw (S) and the washer (W_1), and provide a piece of 1/16 inch brass about 2¾ inches long, ½ inch wide at one end and ⅛ inch wide at the other end. Solder the washer to the large end of this 1/16 inch piece, drill a hole for the screw (S) and round the end of the piece to correspond to the washer. The 1/16 inch piece should now be bent as shown in the figure, so that the vertical portion stands about ¼ inch from the vertical pipe. Now make a collar (C) from some thin brass and clamp it to the pipe by means of a screw (S_1). This collar must be insulated from the pipe by a thin sheet of asbestos or mica. Obtain two short pieces of platinum, (P_1) and (P_2), from an old Edison incandescent lamp and mount them as shown in the figure. The upper end of the arm (A) must be cut to the proper length before the piece of plantinum (P_2) is fastened to it. An additional pin (P_3) should be placed in the

valve so that it can be turned through an angle of only 90 degrees. The platinum points (P_1) and (P_2) should be adjusted so that they break contact just before the valve reaches its full on position.

A spark will be formed when the platinum points break contact, if one terminal of a battery be connected to the pipe itself and the other terminal to the

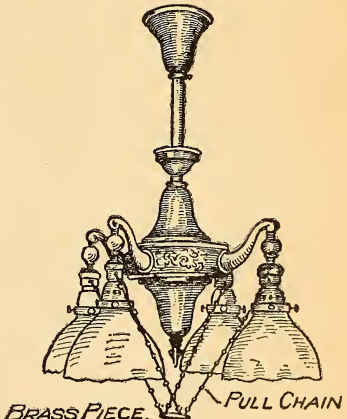


ELECTRIC GAS LIGHTER

collar (C). The insulated wire (W) affords a means of connecting one terminal of the battery to the collar. The spark that will be produced by simply breaking a battery circuit may not always be of sufficient intensity to ignite the gas. This difficulty can be overcome by placing a "kick coil" in the circuit. The kick coil is nothing more than a coil of wire of low resistance about a soft iron core and one may be constructed as follows: Obtain a small quantity of soft iron wire, about No. 20, and cut a sufficient number of pieces, eight inches long, to make a core ⅞ inch in diameter. Wind five layers of No. 18 B. & S. gauge double cotton covered wire on this core, insulating the winding from the core and the various layers from each other. Connect this coil in series with six dry cells and the spark produced when the circuit is broken will be ample to ignite the gas. The adjustment of the contacts (P_1P_2) should be such that the circuit is closed some little time before it is broken. David P. Moreton.

Convenient Fixture Control

A cheap and easily installed device for controlling the lamps in a fixture makes use of the chain pull socket. An extra long chain is connected to each socket, with the free ends connected to a small circular piece of brass about the



CONVENIENT FIXTURE CONTROL

size of a half dollar, and from its center is hung another piece of chain as long as may be necessary for convenient hand reach. A straight pull on the central chain will turn on or off all the lights, and any one of the lights may be controlled by a side pull opposite in direction to the side on which the socket is hung.

A Pocket Storage Battery Voltmeter

One of the most convenient and accurate methods of determining the condition of a storage cell is a reliable, low reading pocket voltmeter. Fig. 1 is a plan view and Fig. 2 is a side view of an easily constructed instrument.

For the circular base (O) use hard rubber or fiber not less than 3-16 inch in

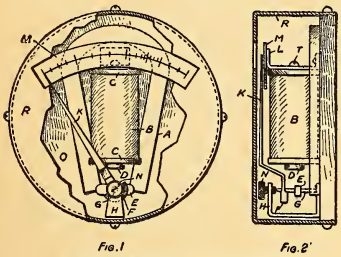


Fig. 1 Fig. 2

STORAGE BATTERY VOLTMETER

thickness. Fastened in the position shown is a small 1½ inch to 2 inch horseshoe magnet. Select a rather heavy magnet with poles not too close together. It should be of the best quality as the cheap toy magnets will usually lose most of their magnetism in a short time. Brass straps with small screws are used for fastening it to the base.

For the pivot (G) of the moving system, break off both ends of a large sewing needle, leaving the center portion about ½ inch long and then grind both its ends to sharp points. The armature (E) is about ⅛ by 3/32 by ⅜ inch, with ends neatly rounded. This must be of hard tempered steel and strongly magnetized. Soldered near the top of the pivot at the proper angle is the pointer (K), made of very thin springy brass nicely tapered and blackened. The counterbalance (F) is very important. It must exactly balance the pointer and also any inequalities in the balance of the armature. The various parts should retain the positions shown (Fig. 1), unless deflected by a current, no matter in what position the instrument is placed.

The support for the bearings of the moving system is the U-shaped brass piece (H). The lower bearing is a cone-shaped hole only part way through the piece itself, while the upper bearing is a similar hole in the end of the adjusting screw (N).

The coil (B) is composed of a soft iron core (D) about 3/16 inch in diameter. One end is bored and tapped to take a small machine screw (T). Two fiber heads (CC) are placed in position, the core insulated and then wound with No. 32 to 34 magnet wire. A few trials may be necessary to obtain the right amount of wire to produce the correct deflection. It is impossible to give exact data owing to the difference in friction in each instrument.

The completed magnet is supported by the brass piece (L), one end of which is bent over to form a support for the scale. The end of core (D) should be in such a position that when the armature is drawn around at right angles to its position in the figure there will be about 1/32 inch between them.

The scale (M) may be of heavy cardboard or better of 1/16 inch fiber with white paper pasted over it.

A good case (R) may be made of 1/32 inch brass bent into a cylinder with a diameter the same as that of the base. A brass cover with the portion over the scale cut away is soldered in one end of this cylinder. The other end is fitted over the base and held there by screws.

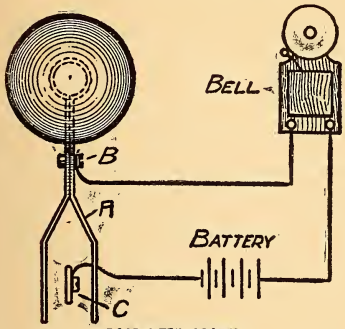
The instrument is now connected in parallel with a standard low reading voltmeter. The portion of the scale from 1.75 to 2.25 should be marked in very fine divisions.

The terminals of the coil (B) should be run to two convenient insulated binding posts (not shown) on the side of the case.

Either wood screws or machine screws may be used to fasten parts to the hard rubber. JAMES P. LEWIS.

A Simple Door Bell Alarm

An easily made switch for ringing a bell to let me know when anyone opened the door of my shop is here described.



DOOR BELL ALARM

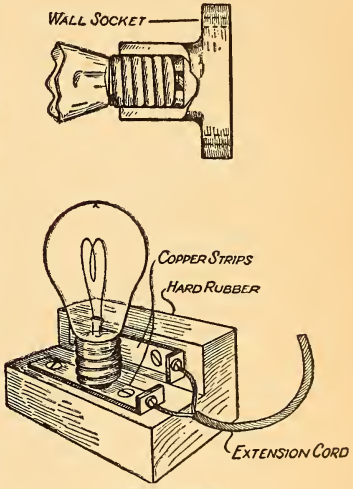
A metal strip (A) preferably of copper should be bent into a small circle at the middle to fit over the door knob bar. A small bolt will draw it up tight around this bar at (B). Place between the prongs and fastened to the door a metal strip (C) and the device is complete. By connecting a battery and bell as shown a slight turn of the knob either way will throw one prong or the other against (C) completing the circuit and ringing the bell. EBEN EDMONDS.

Time Savers in Testing Lamps

In factories and shops where many incandescent lamps are used or where lamps are packed for shipment, each lamp is usually tested before being placed in service or packed. To save time the devices illustrated are used, thus eliminating the turning of the lamps one by one into a socket to test.

The first device is made by removing the screw shell from a wall socket and hammering out the threads on a 5/8 inch pipe. The shell is then replaced. Lamps may now be slid into the socket and tested at a rapid rate.

The second device may be made from a hard rubber block shaped as shown. Two copper strips placed on the two faces of the block and connected to the

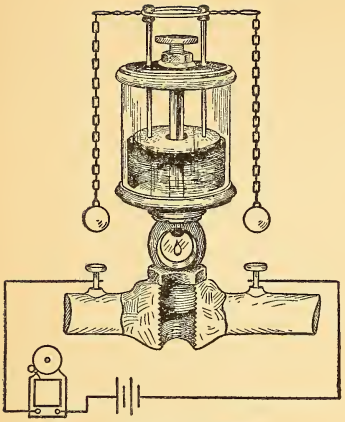


LAMP TESTERS

lighting circuit complete the outfit. The illustration makes plain the position of a lamp when tested.

When the Oil Cup Is Empty

The prevention of hot bearings is always a pertinent theme among engineers and different schemes have been presented to prevent these. One arrangement consists of a float which rises and falls with the amount of oil in the oil cup, making and breaking contacts by means of two metal chains and balls, one on either side of the cup and connected together by a ring insulated from the supporting rods. When the oil and float falls to a predetermined point the circuit is closed and an alarm sounds. If a large number of bearings are equipped, they are divided into groups of five or six on a circuit and these circuits are connected



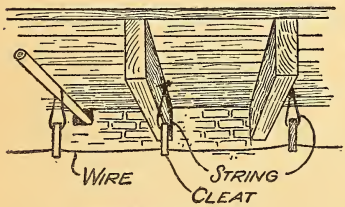
ALARM FOR OIL CUPS

to an annunciator. The circuits all being numbered and their location known, it is but a matter of a few minutes to locate the empty cup when the circuit number falls into view on the annunciator.

H. G. WILSON.

Safe Temporary Wiring

In the rewiring of buildings where it is necessary to have all the lights burning during the alterations, wires are



TEMPORARY WIRING JOB

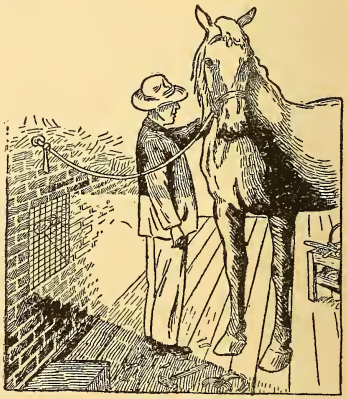
usually strung on or tied around any convenient supports.

A better method is to use cleats, of which there are usually a quantity lying around on jobs of this kind. One of the nail holes in the cleat is used to suspend it vertically by means of a piece of wire or string and the other hole affords a good support for the No. 14 circuit wire which is passed through it. The cleats holding the two circuit wires should be separated about six inches from each other and the distance between supports will vary according to the objects, such as pipes, etc., which may be convenient.

H. G. WILSON.

Light for the Blacksmith

The accompanying illustration shows how an enterprising blacksmith provides illumination in his shop so that the light will fall where most needed. Recesses in the wall contain each an incandescent



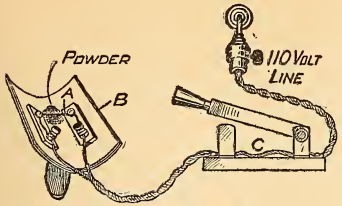
ARRANGEMENT OF BLACKSMITH'S LIGHT

lamp. The wires for these are run in conduit laid in the wall. It was necessary to place a wire netting over the wall recess to keep the horses from biting and breaking the lamps.

Firing Flashlights Electrically

The expression on the faces of a group of people taken by a flashlight is often strained or unnatural because of the suspense in waiting for the flash. The flash set off by electricity avoids this, for

the operator can watch for the proper moment and take them unawares.



FLASHLIGHT DEVICE

An easily made flashlight consists of two copper strips mounted on a piece of curved board (B), covered by a layer of ¼ inch asbestos. Between the strips and fastened by screws is a No. 32 or smaller iron wire (A). A single pole knife switch (C) arranged as shown will enable the operator to include himself in the picture. Although the writer has fired a great many flashlights in this manner with four ampere fuses on the house circuit, the fuses have never blown.

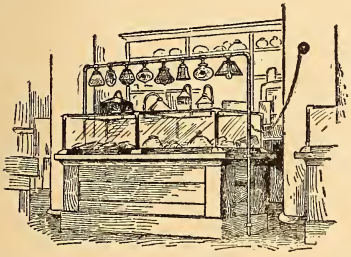
WESLEY G. PAULSON.

Electricity the Silent Salesman

Some helpful hints on the use of electric current in getting up show window displays. The following schemes have all been used with remarkable success.

To Display Shades and Lamps

It is always a help for storekeepers who sell electrical goods, to display the electric lamps and fixtures to good advantage, and with the lamps actually burning so as to produce a realistic effect. This scheme here shown is used successfully in the electrical department of a large store. Conduit is installed as illustrated, reaching to about four feet above the show case. It is fastened at the sides of the case and also by the ends at the floor. Outlets are spaced about eight inches apart and from these various types of shades and lamps are suspended and operated.



SHADE AND LAMP DISPLAY

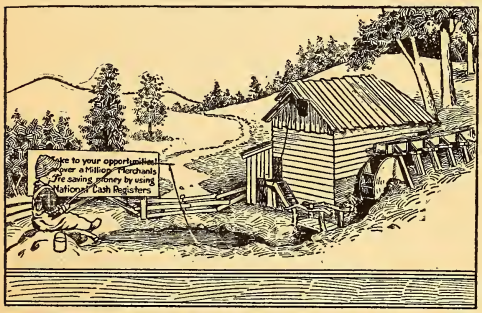
Candy Kettle in Window

The manager of a confectionary store attracted attention to his product by showing one of the large copper kettles used in candy making. It was placed upon bricks high enough to give room underneath for an imitation fire made by an electric light hidden under pieces of coal and bits of amber and red isinglass scattered over and around the light. Connection was made to a small steam pipe which allowed the steam to rise above the rim of the kettle, thus adding a touch of realism.

CANDY SHOW WINDOW

Fishing in the Old Mill Pond

In a window of one of the National Cash Register Company's offices a novel window display to call attention to a well known make of cash register was set up to represent a rural scene, with



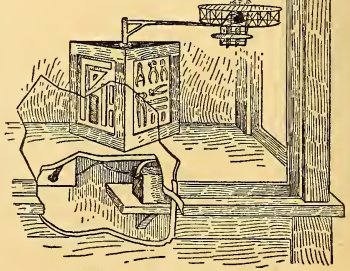
WINDOW DISPLAY THAT ATTRACTS IN SUMMER

a background of woods and fields. In the foreground is an old fashioned mill with a time worn waterwheel turned merrily by water flowing from the stream above. Just below the mill is the pond into which the waste water runs. Besides the pond is a log—the very same log that every man reared in the country will recognize as having sat upon a thousand times—and sitting on the log is a typical country boy, with one suspender and a ragged straw hat, sleepily nodding as he fishes in the mill pond. On the surface the cork is idly floating. As the passer-by stops a moment to look on the peaceful scene, he suddenly sees the cork dip. He's got a nibble! There is another and more vigorous dip, followed by a third more violent still, and one's fingers itch to have hold of that pole! Suddenly with a dart, the cork plunges out of sight—and one looks in disgust to see the fisher boy placidly nodding in slumber! In a few seconds the cork comes to the surface and rests quietly there.

The realistic antics of the cork are the attractive point of this display. They are exactly imitative of cork when a hungry, but wary, fish first nibbles and then takes the bait. These antics are effected by a mechanism which consists of a wheel with irregular teeth which, from time to time, engage a cord attached to the lower end of the cork, and, by pulling it for a long or short time, according to the length of the teeth, simulate the bite of a fish. The final dive of the cork is effected by a tooth of extreme length. The device is operated by an electric motor concealed within the mill and driven by a connection from a wall socket. The mill is about a foot in each dimension and the boy in the foreground about six inches high. The whole display is about five feet long by three deep and is accurately colored to represent appropriately the colors of Nature. It has proved a successful attraction.

Aeroplane Propeller Operates Window Display

The ordinary revolving showcase operated by a concealed motor has long since ceased to be a novelty. A unique



AEROPLANE WINDOW DISPLAY

adaptation of this idea, however, which is sure to attract attention is finding ready favor among hardware and other merchants who desire a rotary display.

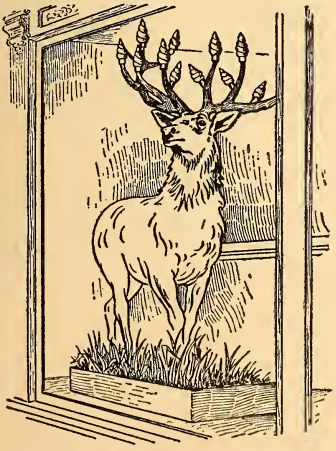
The cases of goods or shelves are attached to an accurately mounted tube, at the top of which is fastened an arm carrying a miniature aeroplane and passenger.

The power to revolve the display is obtained from a small motor and propeller mounted in the flying machine. The motor is connected with a storage battery by wires running inside the tube to a commutator at the base. The rate at which the case revolves is regulated by a rheostat placed under the window.

STUART R. WARD.

An Odd Window Light Fixture

A merchant realizing that the stuffed animals in his show windows failed to attract attention after a certain length of time decided to enliven the display with the use of small electric lamps. To each of the tips on the antlers of a stag he fastened with tape small candelabra sockets. These were equipped with lamps having peculiar twisted globes. The necessary fixture wire, being small, was invisible from the street.



THE HORNS WERE TIPPED WITH ELECTRIC LIGHTS

The lamps were connected in multiple and an extension cord with an attachment plug and socket connected to the lighting circuit to provide the necessary current. The scheme was all that could be desired, and succeeded in reviving interest in the display.

Sign for a Restaurant

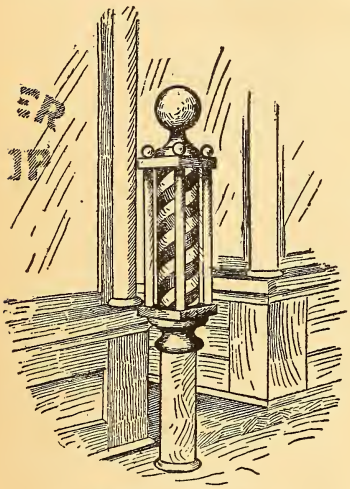
The sign is made in the shape and design shown in order that the impression may be that it is time to eat. The clock face with the lettering should be painted on ground glass. This glass is then placed in a circular box of sufficient depth to permit the introduction of a few incandescent lamps behind the face.

RESTAURANT SIGN

If hung over the sidewalk the ground glass face may be placed on both sides so that one may see it from either direction. The hands may be made of either metal or wood and so arranged that they can be pointed to any desired hour. The hands may, of course, be painted permanently upon the face.

The Rotating Barber Pole

The barber is not behind other shopkeepers in making use of electricity, as is proved by the growing popularity of the revolving barber pole driven by a



THE ROTATING BARBER POLE

motor installed within a supporting pillar. The turning portion is a glass cylinder upon which the stripes are painted and about it is a glass enclosure also in the form of a cylinder. Within the painted cylinder are two incandescent lamps which are used to illuminate the pole at night.

Harmonizing Cord With Window Display

The National Electrical Code rules for wiring require the use of reënforced drop cord for show windows when extension lights, fans and electrical novelties are connected temporarily to the lighting circuits for display purposes. This cord or wire is usually of a dark color which as a rule does not harmonize with the surroundings. To remedy this one store keeper wraps the lamp cord with whatever color of cloth or goods he has on display and in this way the cord goes practically unnoticed and does not detract from the appearance of his goods.

NEW BOOKS

LOW VOLTAGE ELECTRIC LIGHTING. By Norman H. Schneider. New York: Spon and Chamberlain. 1911. 85 pages with 23 illustrations. Price, 25 cents.

The object of this book is to give practical information on small low voltage electric light plants, suitable for farms, isolated houses, stores and country homes in general. Details are given showing how to estimate the size and number of lights required, their best location, the most convenient means of control and the plant necessary to furnish the current.

MODERN AMERICAN TELEPHONY. By Arthur Bessey Smith, Chicago: Frederick J. Drake and Company. 1911. 775 pages with 470 illustrations. Price, $2.00.

The intent of the author of this book is to make it of interest and practical help to the men who "shoot trouble" as well as to those whose duties call them into other relations to a telephone system. A chapter is devoted to wireless telephony and one to the automatic telephone.

THE RAILWAY CONQUEST OF THE WORLD. By Frederick A. Talbot. Philadelphia: J. B. Lippincott Company. 1911. 322 pages with 124 illustrations. Price, $1.50.

This volume is written with the purpose of telling in a popular manner the real romance of great achievements in railroad building. The difficulties and obstacles met in the construction of great railways are described, technical terms are absent and the work is made into a fascinating account of railway history interspersed with stories of adventure and humorous incidents. The illustrations are especially fine.

On Polyphase Subjects

A New Series by Archie Rice

The story of California's achievements in developing hydro-electric power is a long one, but extremely interesting. The first of four popular articles on these wonderful works appears in this issue and the others will follow in issues of the near future. There is probably no writer better equipped to describe to the general, non-technical reader the human interest features of these great plants than the author, Mr. Archie Rice, of San Francisco. The reason that his descriptions impress one so vividly is because he has obtained all his information first hand. A strapping six-footer, and then some, a rough rider and a hardened mountaineer, he has ridden and tramped far back into the mountains where the immense reservoirs, winding flumes and snaky penstocks deliver their thousands upon thousands of horsepower with almost irresistible impact upon the blades of the water turbine generators. It is very seldom that the ordinary tourist invades these remote places.

Mr. Rice, to use his own characterization, was evolved from two generations of Yankee and Southern stock with an Old World backing four-eighths Irish, two-eighths English, one-eighth Scotch and one eighth Dutch. In the early days of large affairs and open country in the San Joaquin Valley his father was called "King of the Plains"—the proven best rough rider in California or Western Mexico.

After his youthful start in the vaquero camps, young Archie discarded his lariat and .44's and made for the world of affairs via the High School and University route, entering Stanford University, as he says, "with its first round-up of 500 students." Four years later, on two rather long, thin-looking legs, he carried away from the campus some fond recollections and an A.B. degree.

Then he entered upon the field of metropolitan journalism and wrote much news matter and embroidered scores of Sunday supplement articles. Just preceding the San Francisco fire he was lured into the life insurance game and a little later, while the city was still smoking, he was a volunteer special policeman with a six-pointed star marking the spot under which beat proudly a half-Irish heart, knowing that it had at last come to its own.

But mostly his livelihood has been gained either by editing magazines and newspapers or by getting material for other editors.

For the personal fun of the thing he has swum three miles at a stretch in the open Pacific and hiked 40 miles through the Sierras, partly over slushy snow, in a day terminated by a rush into camp to devour a shameless meal. It was on such expeditions as the latter that he gathered the material for this series of articles.

Electric Taxis in Berlin

In the city of Berlin there are 2,000 taxicabs, of which 300 are electrics. In order to distinguish the electric cabs from the gasoline it has been prescribed by the police that the electrics shall be painted ivory white, while a brown livery has been ordered for the gasoline operated ones.

Patrick worked for a notoriously stingy boss and lost no chance to let the fact be known. Once a waggish friend, wishing to twit him, remarked:

"Pat, I hear your boss just gave you a brand-new suit of clothes."

"No," said Pat, "only a par-rt of a suit."

"What part?"

"The sleeves iv the vest!"

* * *

"I knew Butts' smoking would get him into trouble."

"Well?"

"At his wedding, when it came to the ring part, he reached into his pocket and handed the minister a match."

* * *

Little Nephew—Auntie, did you marry an Indian?

Aunt—Why do you ask such silly questions, Freddy?

Little Nephew—Well, I saw some scalps on your dressing table.

* * *

"Do you know who her grandfather was? Have you ascertained anything in regard to her pedigree? Those are things you ought to know about the woman you are to make your wife!"

"Oh, hang her grandfather!"

"My boy, that's just what they did do."

* * *

"My dear lad, what will your father say about your fishing? It's Sunday!"

"Well, last time 'e said: 'Where the 'ell's the fish?'"

* * *

The following composition on men is credited to a little girl: "Men are what women marry. They drink and smoke and swear, but don't go to church. Perhaps if they wore bonnets they would. They are more logical than women and also more zoological. Both men and women sprung from monkeys, but the women sprung further than the men."

* * *

Figg—Well, how do you like having a place in the country? Hasn't the exercise done you good?

Fogg—Yes, and so has the real estate agent.

"Now, boys," queried the teacher, "who can tell me anything about the dead languages?"

"They are languages that were killed by being studied too hard," answered the boy at the foot of the class.

* * *

Hicks—Mathers is one of those simplified spelling cranks, isn't he?

Wicks—I should say so! He spells wife "yf."

* * *

"I am sending you a thousand kisses," he wrote to his fair young wife who was spending her first month away from him.

Two days later he received the following telegram:

"Kisses received. Landlord refuses to accept any of them on account."

Then he woke up and forwarded a check.

* * *

"Did the recent drought hurt you farmers much?"

"I should say it did," answered Mr. Corntassel. "We used to make a heap o' money haulin' out automobiles that got stalled, but while that drought was on we couldn't afford enough water to keep up some of our best mud holes."

* * *

A French evangelist, who knew very little English, was fond, none the less, of speaking publicly in the unfamiliar tongue. One Sunday he was exhorting a congregation composed chiefly of Americans and English and startled his hearers by launching forth into a prayer ending with,

"And now, good Lord, we pray thee to protect and pickle us all the rest of our lives."

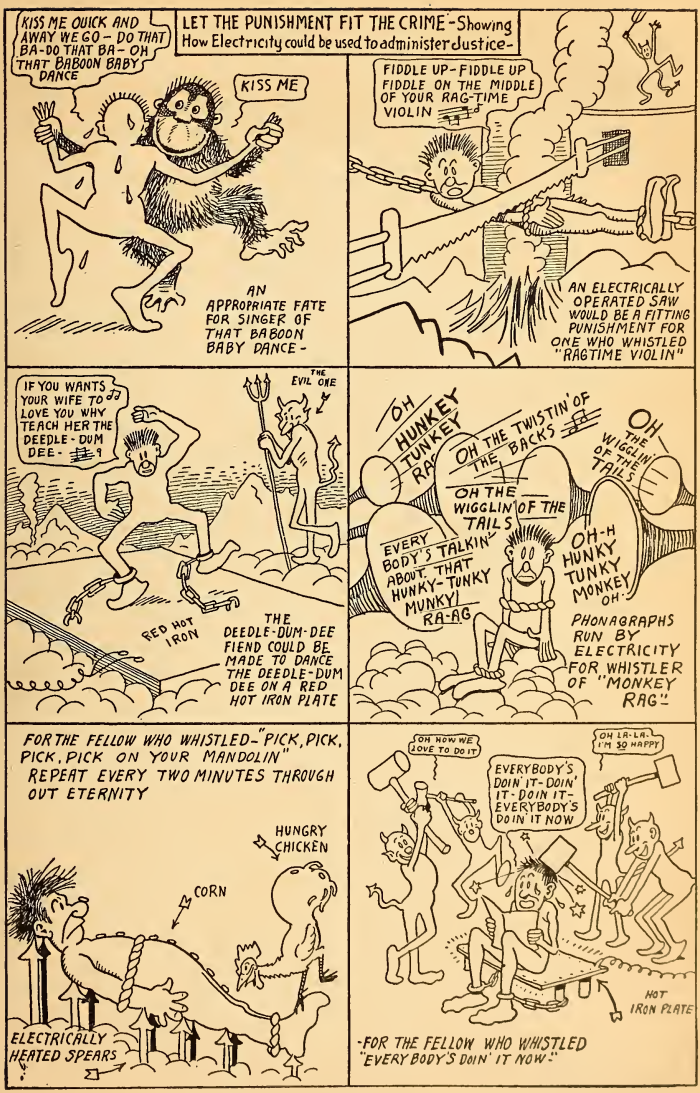
When the service was over the ambitious linguist's attention was called to his expression, "pickle us."

"Well, what would you?" said he. "Is it not the same, to preserve and to pickle?"

* * *

American Tourist (gazing into the crater of Mt. Vesuvius): It looks just like the infernal regions.

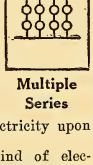
English Tourist: O, I say. How these Americans do travel.


KISS ME QUICK AND AWAY WE GO – DO THAT BA-DO THAT BA– OH THAT BABOON BABY DANCE
LET THE PUNISHMENT FIT THE CRIME-Showing How Electricity could be used to administer Justice-
KISS ME
AN APPROPRIATE FATE FOR SINGER OF THAT BABOON BABY DANCE-
FIDDLE UP-FIDDLE UP FIDDLE ON THE MIDDLE OF YOUR RAG-TIME VIOLIN
AN ELECTRICALLY OPERATED SAW WOULD BE A FITTING PUNISHMENT FOR ONE WHO WHISTLED "RAGTIME VIOLIN"
IF YOU WANTS YOUR WIFE TO LOVE YOU WHY TEACH HER THE DEEDLE-DUM DEE-
THE EVIL ONE
RED HOT IRON
THE DEEDLE-DUM-DEE FIEND COULD BE MADE TO DANCE THE DEEDLE-DUM DEE ON A RED HOT IRON PLATE
OH HUNKEY TUNKEY RA-AG
OH THE TWISTIN' OF THE BACKS
OH THE WIGGLIN' OF THE TAILS
OH THE WIGGLIN' OF THE TAILS
EVERY BODY'S TALKIN' ABOUT THAT HUNKY-TUNKY MUNKY! RA-AG
OH-H HUNKY TUNKY MONKEY OH-
PHONAGRAPHS RUN BY ELECTRICITY FOR WHISTLER OF "MONKEY RAG"
FOR THE FELLOW WHO WHISTLED-"PICK, PICK, PICK, PICK ON YOUR MANDOLIN" REPEAT EVERY TWO MINUTES THROUGH OUT ETERNITY
HUNGRY CHICKEN
CORN
ELECTRICALLY HEATED SPEARS
OH NOW WE LOVE TO DO IT
OH LA-LA- I'M SO HAPPY
EVERYBODY'S DOIN' IT-DOIN' IT-DOIN IT-EVERYBODY'S DOIN IT NOW
HOT IRON PLATE
-FOR THE FELLOW WHO WHISTLED "EVERY BODY'S DOIN' IT NOW-"

Common Electrical Terms Defined

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

MULTIPLE-SERIES.—When several groups of devices, such as lamps, with the units of each group connected in series; that is, one after another, are so connected that the several groups are in multiple, the connection is said to be multiple-series. (See cut.)



Multiple Series

NATURAL MAGNET.—An oxide of iron possessing permanent magnetism. This mineral is also called lodestone.

NEGATIVE CHARGE.—One of the two kinds of electricity which theory supposes in considering electricity upon a conducting body.

NEGATIVE ELECTRICITY.—The kind of electricity with which a piece of amber is charged when rubbed with a flannel.

NEGATIVE POLE.—In a magnet the south pole, the pole which the lines of force are assumed to enter. In an electric generator the terminal to which the current flows from the external circuit. In a battery the plate corresponding to the zinc plate in an ordinary voltaic cell.

NEUTRAL LINE OF COMMUTATOR.—A diameter line of a commutator which marks the points on which the brushes should be set. This line is practically perpendicular to the direction the lines of force take through the armature.

NEUTRAL WIRE.—The middle or central wire of a three system.

NON-CONDUCTOR.—Any material that does not carry electricity except with much difficulty because of its high resistance.

NORTH POLE.—The pole of the magnet that tends to point north.

NON-MAGNETIC WATCH.—A watch in which the hair spring, lever and escapement are made of materials, such as the Paillard alloys, that cannot be magnetized.

OHM.—The practical unit of resistance. The legal ohm is the resistance of a column of mercury one square millimeter (.055 sq. in.) in cross sectional area and 106 centimeter (41.6 inches) long.

OHM'S LAW.—The law which expresses the relation between the current flowing in a circuit, the resistance of the circuit and the electromotive force in the circuit. Algebraically it is written, $C = \frac{E}{R}$, in which C represents the current, E the electromotive force and R the resistance.

OIL TRANSFORMER.—A transformer in which the coils are immersed in oil as an insulator. In case of a break in the insulation the oil immediately fills in and closes the break-down gap.

OMNIBUS ROD.—See Bus Bar.

OPEN CIRCUIT.—An electrical circuit in which the wires are not continuous because of a break or because a switch is open.

OPEN CIRCUIT BATTERY.—A battery especially adapted to be used on circuits where current is used intermittently. Such a battery must not run down when left idle. The Leclanché cell is an example of this type of battery.

OPEN COIL ARMATURE.—A motor or dynamo armature in which the coils are not joined in one closed circuit but have their ends connected each to a commutator segment or bar.

OSCILLATORY DISCHARGE.—A discharge as from a Leyden jar in which the current rapidly changes direction. The discharge is really a rapidly alternating current of very short duration.

OUTLET.—The places in the electric light wiring of a building where fixtures for incandescent lamps are attached.

OUTPUT.—Commonly applied to the rate at which electrical energy is delivered by a dynamo or alternator.

OVER COMPOUNDING.—In a compound wound dynamo; that is, in one having both a series and a shunt winding, these windings are proportioned so that as the load increases the voltage at the terminals of the machine rises to make up for the increased drop on the line. This is done by providing more turns on the series coil. As the current to the outside circuit increases the amperes flowing in the series coil increase, causing a stronger field and consequent higher voltage at the dynamo terminals.

OZONE.—A form of oxygen stronger than ordinary oxygen gas, because it is made up of three portions or atoms of the gas chemically combined. An electric spark or a lightning discharge cause this peculiar combination, the ozone being readily recognized by its peculiar odor.

PAGE EFFECT.—The sharp tick heard when a bar of steel or iron is quickly magnetized or demagnetized. Theory assumes that the molecules of the bar change their positions at each magnetization and demagnetization, this action causing the audible sound.

PALLADIUM.—A metal closely allied to platinum and used as an ingredient of non-magnetic watch alloys.

PANEL BOARD.—A marble or slate board upon which fuses and knife switches are placed and from which branch lighting circuits or lines to motors are taken off. Panel boards are usually enclosed in steel or asbestos lined cabinets.