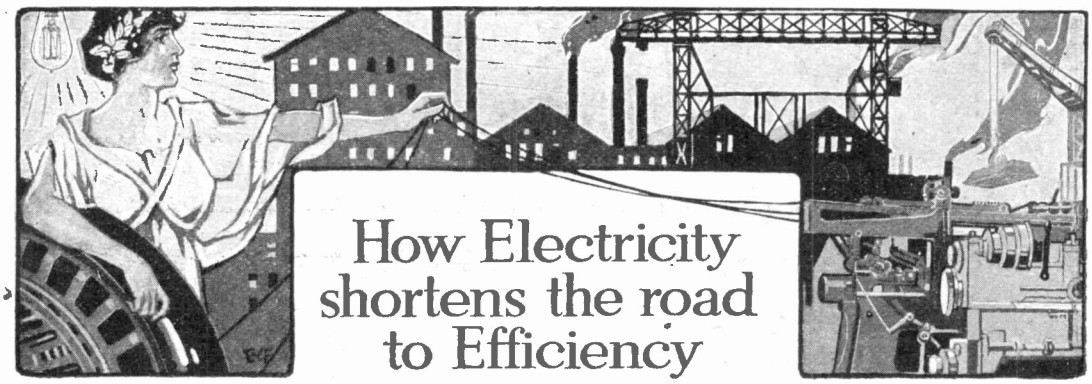
AUGUST

15 CENTS

Popular Electricity Magazine



How Electricity shortens the road to Efficiency

"A road made smoother is a road made shorter," said an old engineer.

This is a pretty good text for a word about the way electricity is shortening the road to that great modern goal—Efficiency. That text applies to store and office as well as to factory, machine shop or distribution room.

The steel industry offers a practical illustration. Growth means greater needs—need for bigger tonnage output, for lower production costs, for more efficient and more economical methods with an absolute continuity of process. It was these needs that linked steel and electricity. It was electricity that played a foremost part in accomplishing that high industrial efficiency that has given the steel industry its world-fame.

Allied industries have felt the same impulse, and what has happened to construction work, mining, ship, car and engine building, is happening in countless lines of industry throughout the country. Electricity has raised efficiency in the fundamental branches of production, such as lumber, mining, cement and brick laying; textiles, paper, etc., and in the vital manufacturing lines such as clothing, food products, shoes, soap, automobiles, household goods, office equipment, etc.

In other words, the application of efficiency principles led straight to electrification.

To take the textile field as another example, the leading textile mills have found it a competitive necessity and a direct economy to use electricity in subdividing power units, in answering the need for clear overhead space unobstructed by shafting and belting, and in using power sources most economically.

In paper making, the facility with which electricity could accomplish motor drive and lighting made it a natural resource for regular power as well as for supplementary lighting and emergency power generation. With wired power the mill proper need not adjoin water supply but could be located at such distance as might be demanded by shipping facilities and labor requirements. By such separation it often became possible to select the best waterfall instead of second or third best or to combine the power of several.

Not only has electricity made it easy for cereal companies to improve their output by regularity in the speed of machines, but the cleanliness of electricity, eliminating unsightly belts and dripping oil cups, has made it possible to give plants a tidiness and attractiveness that naturally led to the show-place plan for daily visitors. The visitor to the great bake shop, the towering sugar refinery or the newspaper press room sees in all these strictly modern displays of productive efficiency the results of electrical help. The visitor may not guess the advantages of the speed control, or the wide economies of operation in electrically-run machinery, but the actual cleanliness of the modern way gives an impression of efficiency that has a selling power in itself.

The reduction in insurance rates, which often follows as a matter of course, the cleanliness which does so much for the acceleration of production, the immense increase of direct productive power through both machines and men—these are great factors that have linked electricity and efficiency in the modern industrial world.

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

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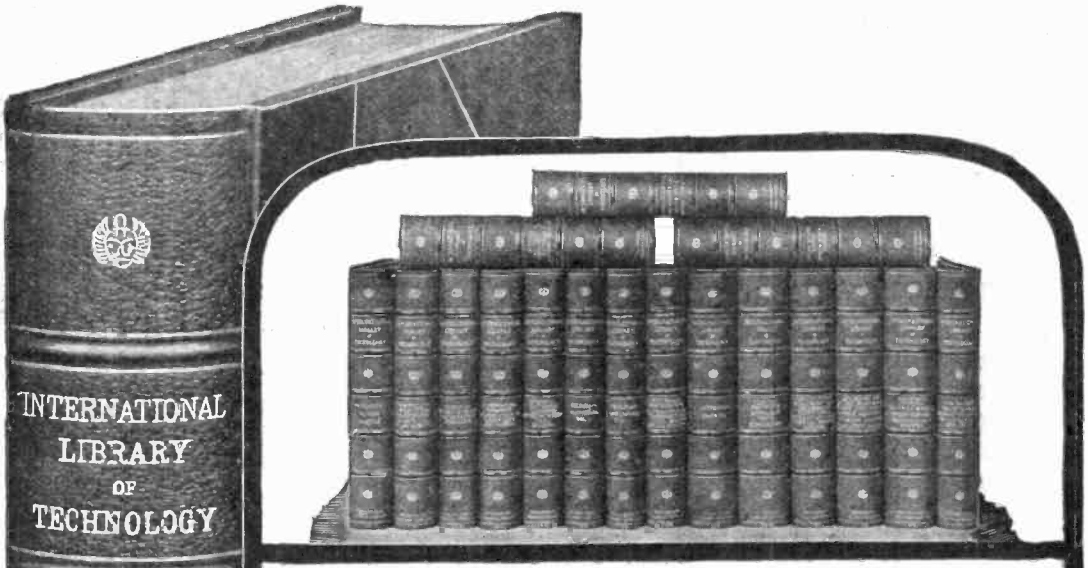

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FOR THE SAKE OF HER SOUL

By Reginald Wright Kauffman

Author of *"The House of Bondage," "Running Sands,"* etc.

came to call the "moral issue of the oncoming generation." Without fear or favor, and against the advice of many well-meaning friends, we secured and gave to our readers the hideous facts of the White Slave Traffic, which we proceeded to prove to be a menace to YOU—*to every home in the country*, however protected. With Mr. Kauffman's series of true and typical stories, "The Girl that Goes Wrong," as our chief feature, LESLIE'S became the first magazine, and Mr. Kauffman the first novelist, to attack the Modern Moloch. We sounded the danger-signal for the nation.

We say without hesitation that, great as was the good done by *author shows with the heart of its central character.*

That character, the character of the girl Joe Meggs, both a delicate and strong creation, is one that has come into literature to stay. A girl of The People—not born of the very poor, nor yet the very rich—she is the sort of girl that, save for unessential details, your own daughter is; the sort your own wife, sister, sweetheart is, in whatever stratum of American life you may chance to be. Precisely for that reason, in Joe the tempted and tried, finally triumphant through what she calls her "own will to be *good*," Mr. Kauffman, showing life's pitfalls and one way to avoid them, has given us what is among the most tender and firm, fine and beautiful figures in modern fiction.

We want to talk to you about this powerful work. In 1910, "The House of Bondage" almost blinded the nation by its terrific lightning-flash. Living among the White Slaves of whom he wrote, and making many firm friendships in that world, Mr. Kauffman worked with genuine art and burning sincerity. The result was a sensation such as no novel had, for a generation, created. Educators, clergymen, literary-critics, sociologists and physicians acclaimed this "The Uncle Tom's Cabin of White Slavery." Through translations, it is having a similar success in Germany, France, Norway, Switzerland, Belgium, Sweden and Austria.

Almost immediately after the publication of "The House of Bondage," LESLIE'S resolved on what then seemed a perilous course for any magazine: it undertook to put fearlessly before the public what President Hyde of Bowdoin College soon Mr. Kauffman's previous work, this new novel will do a great good, because it not only shows how girls fall, but how they may rise or avoid falling. Strong, realistic, dramatic, compelling, "For the Sake of Her Soul" is at once a triumph of literature and morals.

Some of Mr. Kauffman's few critics have complained that he does not generally take enough account of the influence of religion upon character: *this novel is one of the sincerest tributes to the power of the religious instinct that has ever been penned.*

Other critics have said that, though perhaps the strongest novelist that America has produced, so far as sheer force and power go, Mr. Kauffman is too brutal; yet this novel, while showing *even greater power than "The House of Bondage,"* draws full half of its appeal from *the moving sympathy and tenderness that, in every line, its*

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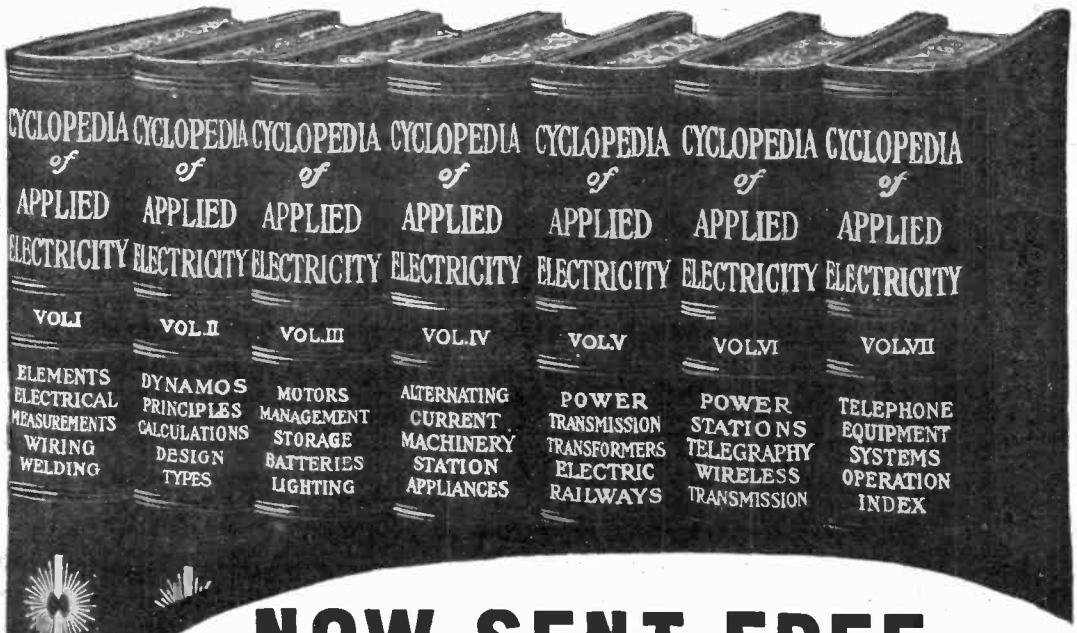

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POPULAR ELECTRICITY MAGAZINE

In Plain English

HENRY WALTER YOUNG, Editor

Vol. VI | August, 1913 | No. 4

CONTENTS

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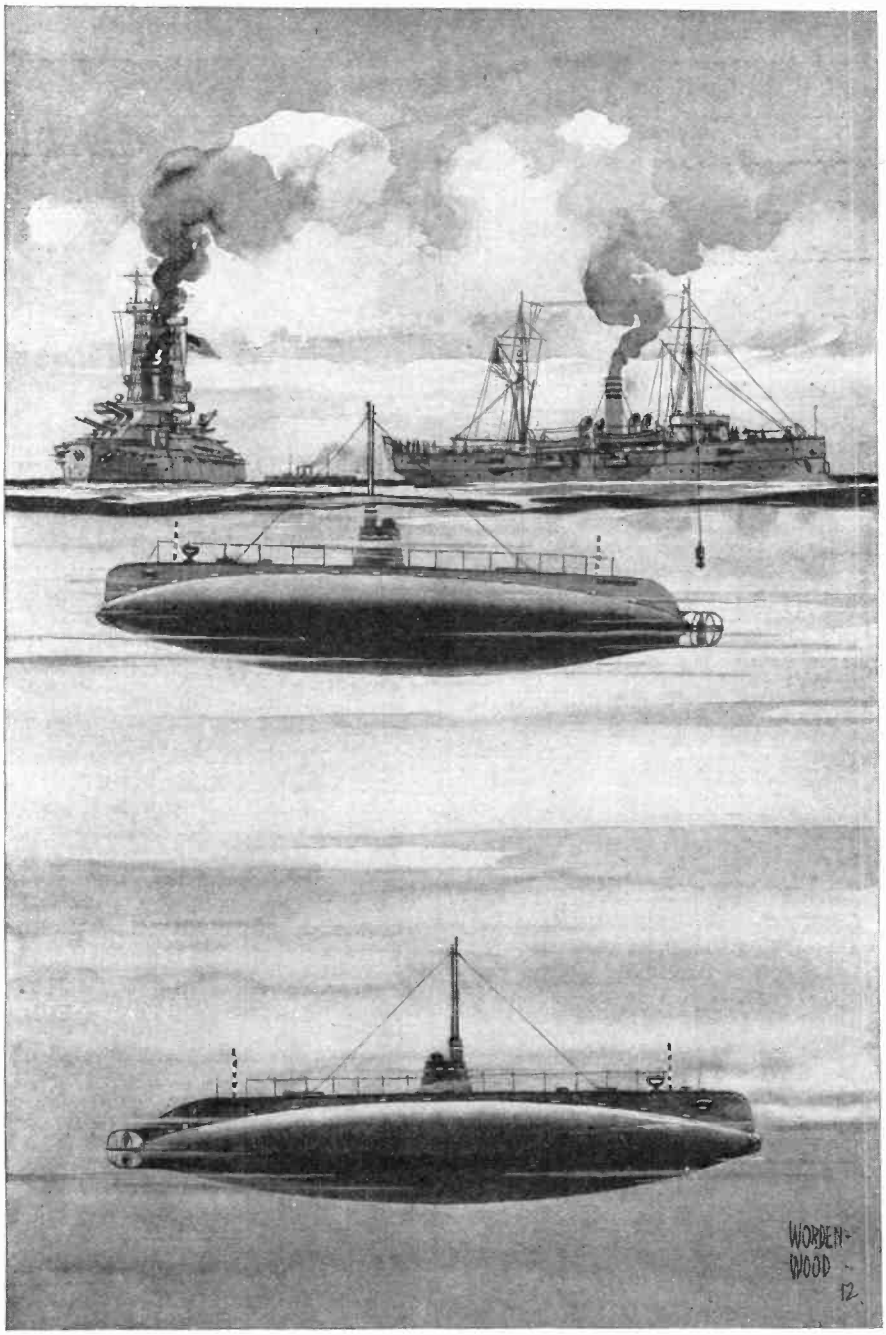


SUBMARINES AND MOTHER SHIP MANOEUVERING BY THE AID OF SUBMARINE SIGNALS

See Page 358

Popular Electricity Magazine In Plain English

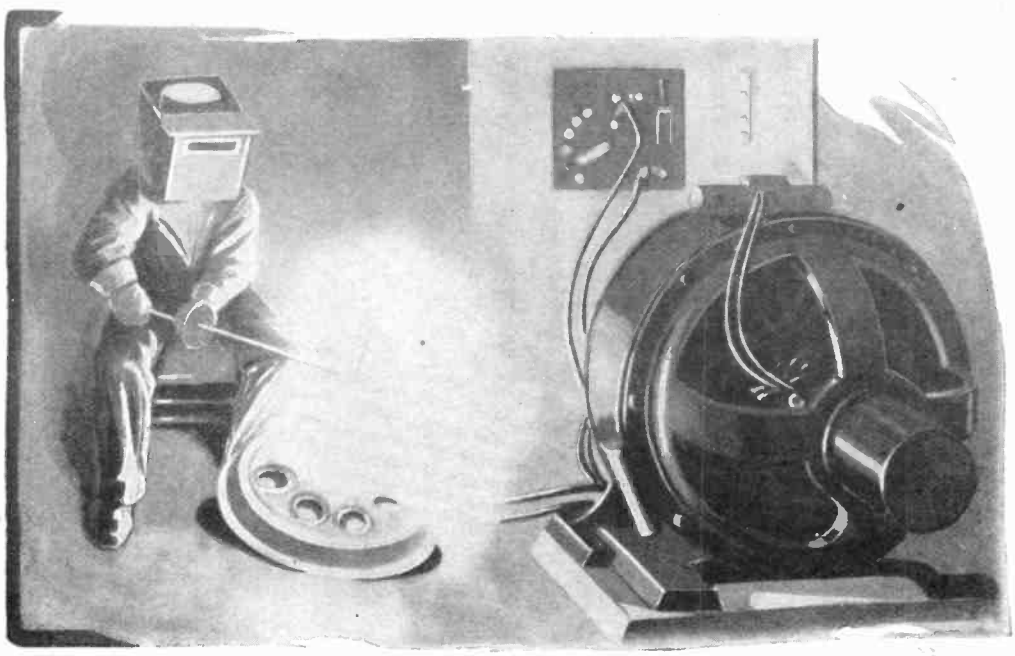
VOL. VI. AUGUST, 1913 No. 4

Welding with the Electric Arc

The picture upon the front cover of this issue is not an artist's conception but a real picture into which the artist has wrought the colors — a machine, a tool, an operator and a defective casting that came from the foundry with blow-holes, cracks or other defects rendering it valueless for the purpose made unless these defects are remedied.

Welding by electricity, or arc welding, is not a patching or doctoring process in results. The defective casting is placed upon a steel plate supported by two wooden blocks. One wire from the machine, which is built to give heavy current, connects to the plate. The other wire passes through a handle held by the operator, whose eyes are shielded from the blinding light, and is attached to a carbon rod.

In operation, the tip of the carbon is applied on and around the defective point of the casting. The arc melts the metal about it and the defective area is really cast again. But this is not all. While the carbon tip is pressing the casting, a wire of soft steel is thrust into the arc and molten metal. This wire melts in much the same way as would an icicle pressed against the top of a red-hot stove,



MAKING REPAIRS WITH THE ELECTRIC WELDER

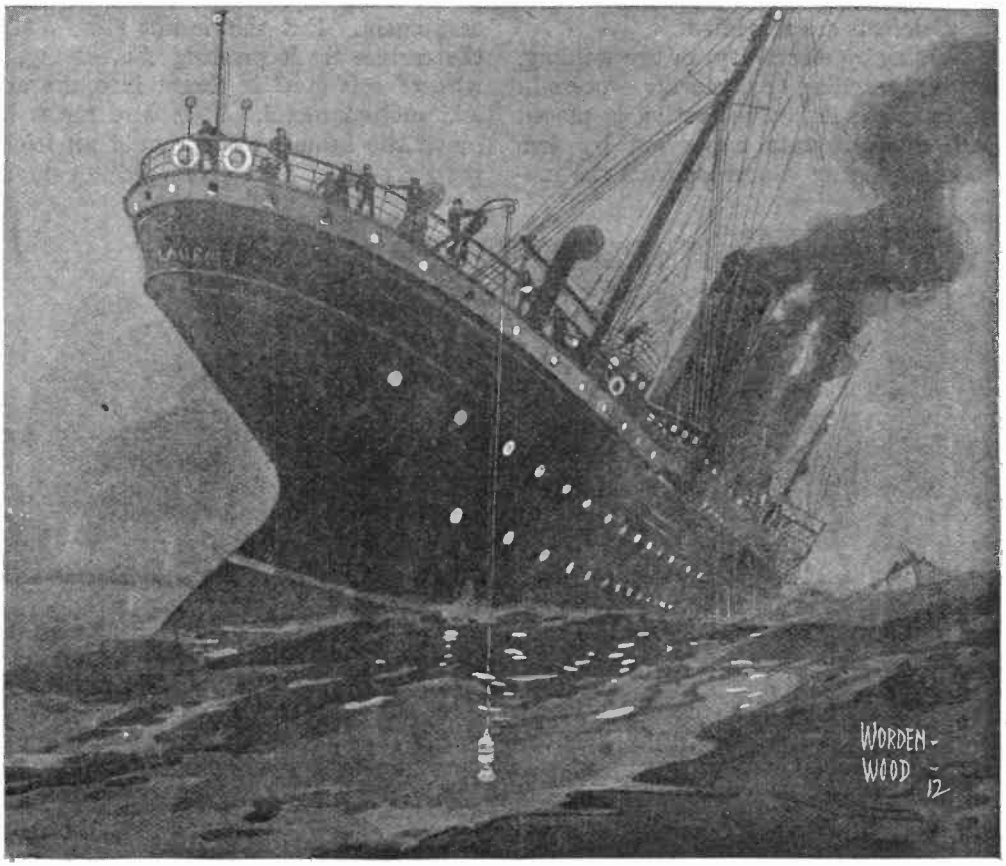
blends with the casting metal and fills up the blowhole or crack and the weld is finished by hammering it while cooling.

Submarine Signaling

In 1826 we find a record that two scientists, Calladon and Sturm wanted to find the velocity of sound in water so they submerged a bell and struck it with a hammer and listened for the sound by placing one end of a common ear trumpet in the water, holding the other end to the ear. Perhaps they knew or had read of a Scotch scientist who, it is said, in 1767 stuck his head into the water of a lake near Glasgow and heard the ringing of a large hand bell submerged 1200 feet away.

This idea, though simple, was not developed commercially until recently. Apparatus is now made such that boats equipped can pick up the sound of a submerged bell and determine the direction from which the sound is coming.

On each side of the ship, near the bow, and well below the waterline, is a small cast iron tank filled with water, in which hang two microphones. The distance of the tank from the stem varies from 20 to 150 feet, according to the shape and size of the ship. Each microphone is electrically connected with an indicator box in the pilot house or chart room. The bell sound, coming through the water, passes through the skin of the ship, enters the water in the tank and is picked up by the microphones, which in turn transmit it to the indicator box. Switches in the indicator box enable the observer to listen alternately to the sound picked up by the



AS SINKING LINER WOULD UTILIZE THE SUBMARINE SIGNAL TO SUMMON AID

port and the starboard microphones and to determine by the loudness of the tone on which side the bell is ringing. In order to get the exact direction from which the sound is coming, the ship is swung toward the side on which the sound is louder, and when it is equally loud on both sides, the ship is pointing directly at the bell.

The bell may be operated by compressed air, by automatic mechanism, by hand or by electricity. With bells submerged off coasts where lighthouses are necessary and with vessels carrying bells and receiving equipment, a range of from five to fifteen miles has already been secured between vessels and between coast bells and vessels. That submarine signaling will do much to diminish shipwrecks and collisions is a fair prediction.

How the Deaf are Taught Tone Values

Monotony in the speech of the deaf is generally noticeable and to overcome this a device called the strobilion is now used to teach the deaf how to regulate the voice tones.

The strobilion embodies a disk consisting of fifteen rings of alternating white and black spaces. The inner ring has eight white spaces, the next has nine, etc. The entire series is 8, 9, 10, 10⅔, 12, 13⅓, 15, 16, 18, 20, 21⅓, 24, 26⅔, 30, 32. These numbers correspond to the relations of vibrations in the diatonic scale. Thus, if "do" is a note having eight vibrations a second, "re," will have nine, "mi" will have ten, etc.

In front of the disk there is a scale marked with the syllables "do, re, mi," etc., opposite the corresponding rings.

The disk is fixed on the axle of an electric motor, whose speed can be regulated by a rheostat. When the motor is set going, the disk revolves and its entire surface appears an even gray.

The disk is illuminated by a small flame from a flame box supplied by acetylene.

When a tone is sung into the mouthpiece of the flame box, the flame vibration produces a series of flashes of light. The disk is illuminated as many times a second as there are vibrations in the tone sung. Between the illuminations there is darkness. If the white spaces of any

SPEAKING TO THE STROBILION

ring of the disk are passing the flame at a rate equal to the number of vibrations of the tone, that ring will split up into a series of white and black spaces that appear to stand still. All of the other rings will remain gray. The reason for this is that the eye sees the disk only by flashes. At one flash of light the white disk of a certain ring is seen, for example, at the top. During the darkness before the next flash it moves forward. If the next flash occurs at the moment the next white space has moved to the top, the eye perceives no movement, and the observer sees the second white space where the first was. At the next flash the third white space has moved to the top, and so on. Consequently the observer sees a white space at the top and other white and black spaces around the ring just the same as if the ring actually stood still. This will be true only of one ring, namely, the one whose white spaces move exactly in agreement with the flashes and consequently with the vibration of the par-

ticular tone emitted by the voice into the mouthpiece. Therefore the deaf person actually sees the effect of his or her voice.— *Volta Review.*

Roller Skating Under Power

There is little doubt but that the roller skate will be the next vehicle to be operated without the use of man or animal power. The accompanying pictures show the work of two young New York City inventors who differ as to whether a gasoline engine or an electric battery motor should be used for this purpose. Each man, therefore, has built according to his ideas. An examination of the pictures would seem to convince one that the electrically propelled skates would be less cumbersome and unwieldy than those operated by a gasoline motor.

Both of the inventors have been seen occasionally on the streets of New York riding their power skates, their odd appearance creating no little excitement.

IN COMPACTNESS AND POINT OF WEIGHT THE ELECTRIC SKATE HAS THE ADVANTAGE

Strong Telephone Work

Recently President Howard Elting, of the Chicago Association of Commerce, wanted to get into touch with William F. Calhoun, who had just landed in New York after his long journey from China. Mr. Elting, failing to discover him by telegraph where it was believed he might be, placed a call for Mr. Calhoun with the Chicago Telephone company at 11:27 A.M. The only information afforded was that the retiring minister to China had just returned to this country and presumably had called upon Mr. Bryan, the secretary of state, at Washington.

With this meager information the company started to work, finally locating Mr. Calhoun at Dover, Mass., and a satisfactory conversation was held at 6:14 P.M.

As explained in *Chicago Commerce*, this efficient telephone search has the following history. The call was first passed to Washington, with instructions to try to locate Mr. Calhoun in care of Secretary Bryan. A report was promptly received that the secretary of state could

not be found at his office or residence, and that his office knew nothing of the whereabouts of Mr. Calhoun. Chicago then requested that the New Willard and Raleigh hotels, Washington, be tried, in the meantime giving the report to association headquarters, which then suggested that possibly some information concerning Mr. Calhourn could be obtained from a party who resided at Old Westbury, Long Island. Following this suggestion, this party was reached. He stated that he believed Mr. Calhoun had gone to spend Sunday with his daughter, a Mrs. Gray, in Brookline, Mass., but could not give Mrs. Gray's initials or address. There are about fifteen Grays listed in the Brookline directory, so the association was again called in order to ascertain if it could furnish the initials or address. It could not, and then followed complicated Chicago telephoning to learn the first name of Mrs. Gray. It was learned that the next try should be made on the phone of Mrs. William Gray, Dedham, Mass.

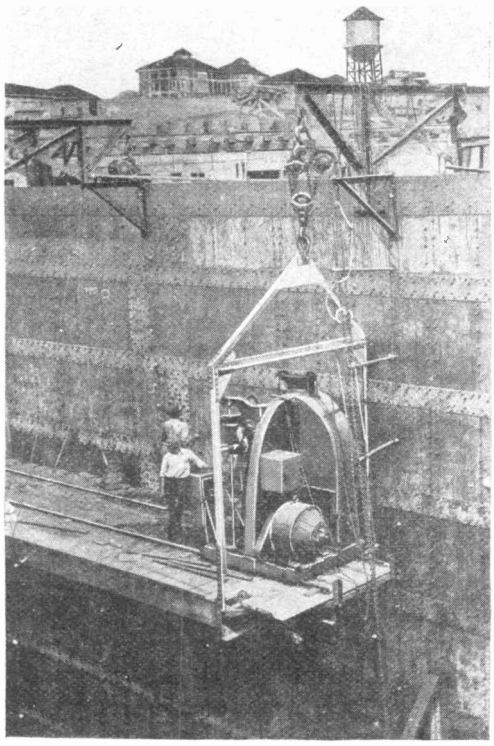
In the meantime the Washington exchange had not been idle, and after trying the Capitol and White House had reached the Bureau of Far Eastern Affairs, where it was stated Mr. Calhoun would probably visit relatives in Dedham, Mass., before going anywhere else. These two clews coming from different sources indicated that the search had narrowed down. In addition, Washington furnished the name of a man in New York City who was related to Mr. Calhoun and might give information.

At 1:30 P.M. Dedham reported that Mr. Calhoun had been there but had gone for an automobile trip. This first definite information was secured after two hours' continuous work on the call. At 2:30 P. M. another report was received from Dedham to the effect that the automobile party intended stopping at a hotel in Dover, Mass., for dinner.

Action was again resumed on the call, and Dover was reached at 5:30 P.M., and a report received that Mr. Calhoun was registered at the hotel but was out. Two more attempts were made and at 6:11 P.M. a welcome "Wh" (we have) was received by the Chicago operator and connection established.

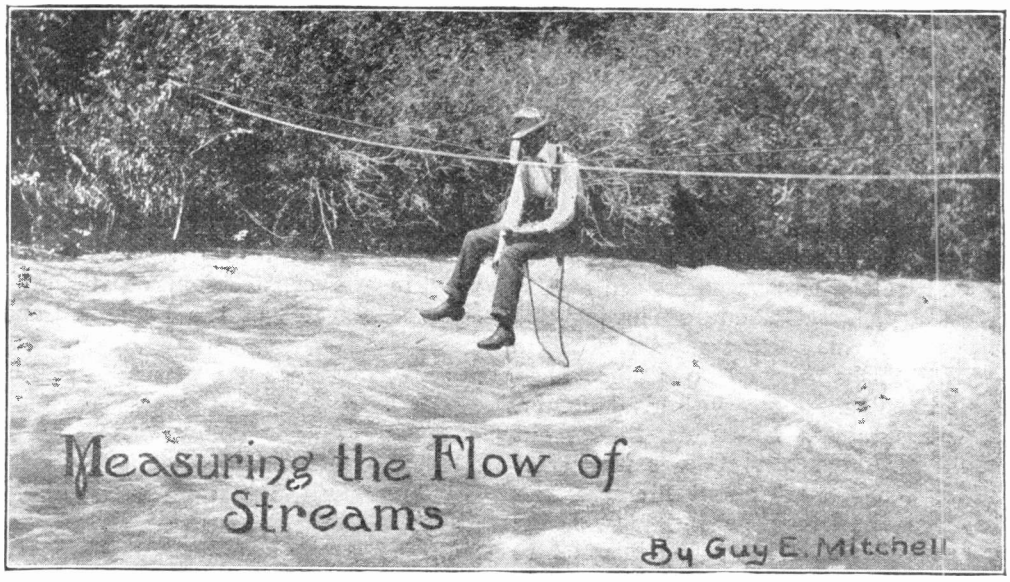
Riveting the Canal Gates

Rivets by the tens of thousands were used in the construction of the great sheet steel gates of the Panama Canal



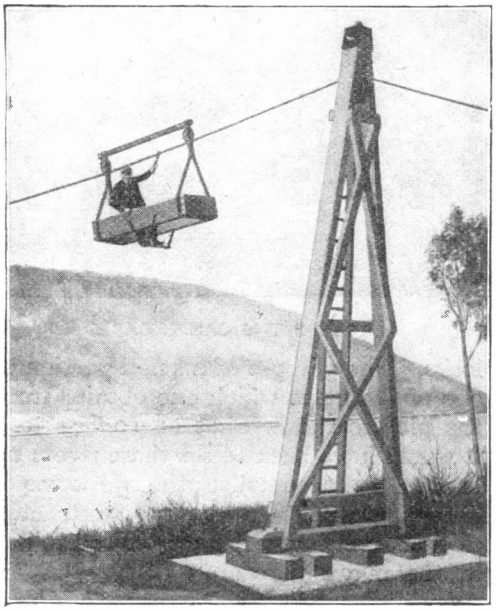
RIVETING THE CANAL GATES

locks. The glimpse of a small portion of one of the gates which one obtains from the picture shows what an endless task it would have been to set these rivets by hand. To accomplish the work expeditiously, several specially constructed electric riveting machines are used to put in the many thousands of rivets. An American made 20 horsepower direct current electric motor furnishes the power.



A UNITED STATES GEOLOGICAL SURVEYOR GAUGING A MONTANA STREAM WITH ELECTRIC CURRENT METER

What is the volume of the river or stream with which you are most familiar? Give a guess as to how many gallons of water it carries by every second. If you live in the Far West where water for irrigation is the life blood of the land, your guess will be fairly accurate, but if you are an Easterner the chances are your estimate will be wide of the mark. Yet water is our greatest and most inexhaustible resource, and really the most vital factor in the development of every section. After you have guessed, you can readily prove it, if the stream is not too large, in this manner.



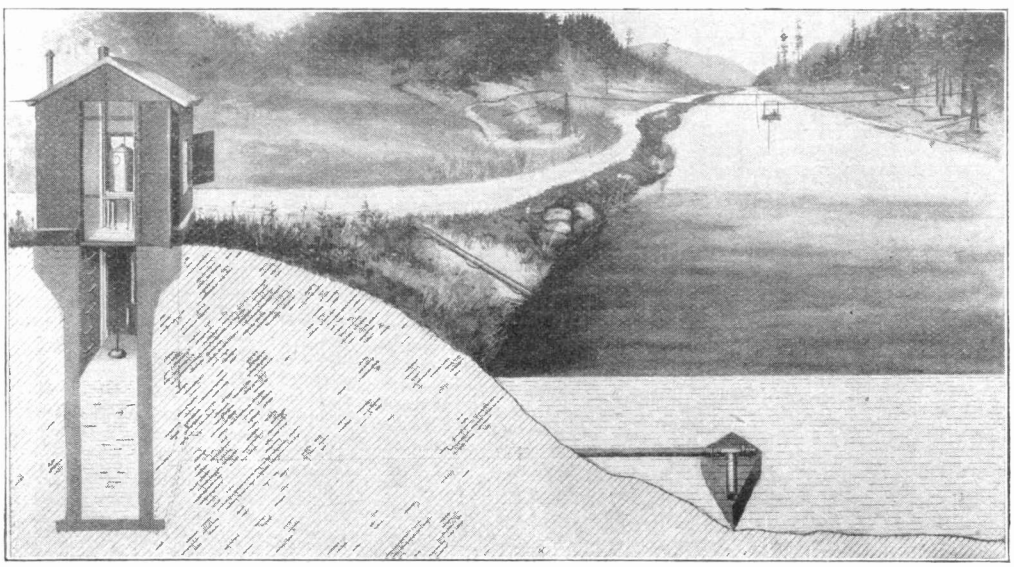
HYDROGRAPHERS' GAUGE CAR SUSPEND OVER THE YAKIMA RIVER IN WASHINGTON

First, make soundings across the stream, say, every ten feet, and from this compute the number of square feet in the cross section. Next, to find the speed of the current, mark off a straight reach of 100 feet and drop a chip near one bank and then note the time it takes to float the 100 feet. Repeat this operation for the opposite bank and again in the middle of the stream. From these compute the average flow per second. Multiply this by the number of square feet in the cross section and the result will be an approximation of the cubic feet of water flowing by each second. A cubic foot equals 7.48 gallons. Thus, for example, a creek 50 feet wide, with an average depth of six feet, has 300 square feet cross section. Suppose the two chips dropped in near the

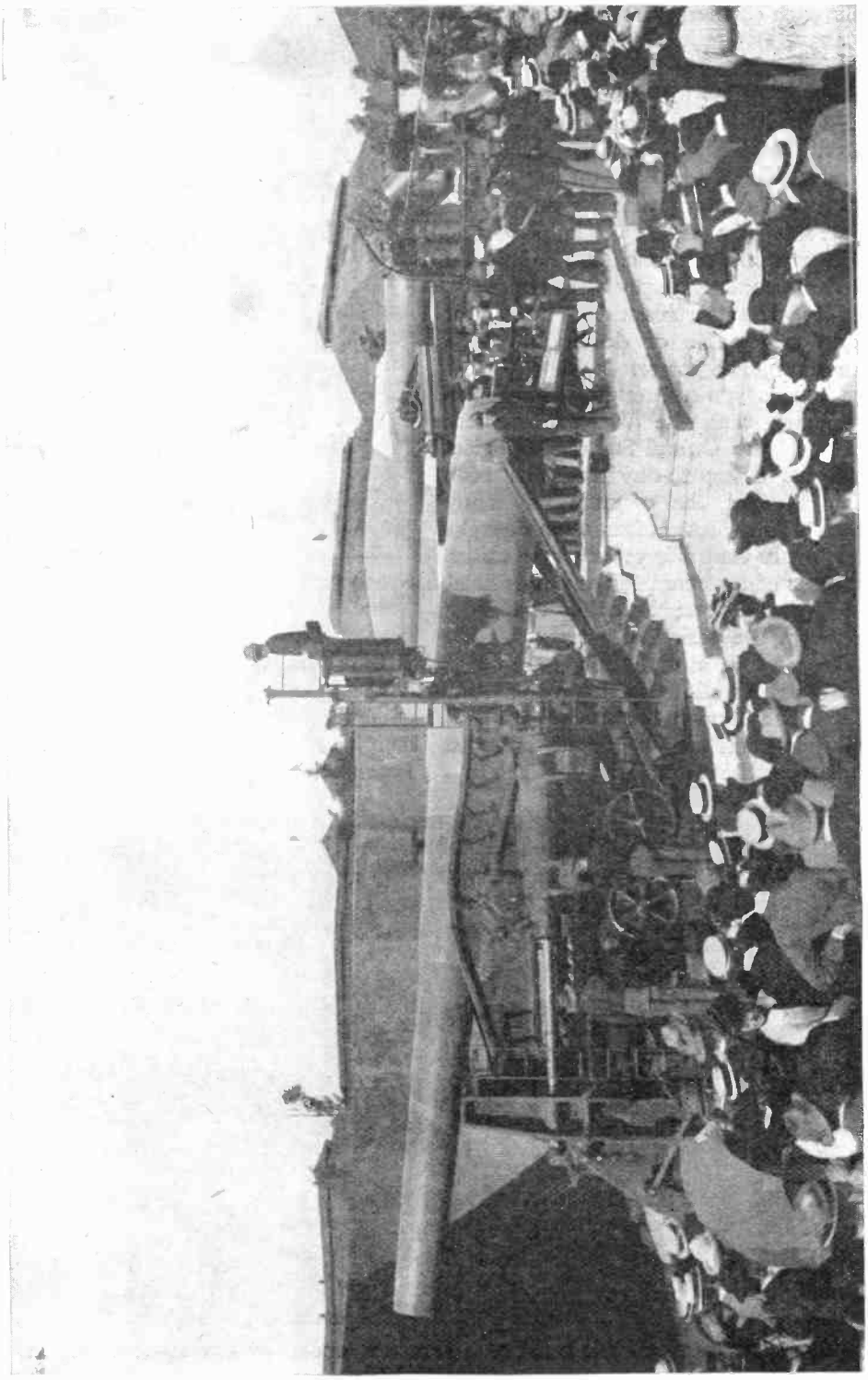
banks each consume 100 seconds in floating the 100 feet while the center chip floats the distance in 50 seconds, an average of 1.33⅓ feet per second. Multiplied by the 300 square feet of cross section this gives a flow of 400 cubic feet per second. To carry the matter a little further and compute the possible water power, multiply this by the fall in feet in the river in a given reach, say, a quarter of a mile, and multiply this result by .909375. If this stream falls 40 feet it would be capable of developing 1455 theoretical horse power.

It is this work, brought down to a refinement, that the Water Resources Branch of the United States Geological Survey is doing to-day and has been doing all over the country for many years. The first information sought immediately that it is proposed to utilize the water of a stream for any industrial purpose is its flow; not what that flow may be at the period of survey but the high water flow and the low water flow and the average flow for months and for years. The concern which is buying a water power certainly wants to know to what extent the stream may dwindle in a year of drouth. The flood flow of the Susquehanna River has been 276,000 cubic feet per second. Its minimum flow has been less than 5,000 feet. The Potomac frequently fluctuates between

HYDROGRAPHIC ENGINEER FREEMAN MAKING HIS DAILY GAUGE RECORD ON THE NORTH FORK OF THE SOUTH PLATTE RIVER



THE MOST EXACT DATA ON THE FLOW OF A STREAM IS SECURED BY A PERMANENT INSTALLATION SUCH AS THIS



DEMONSTRATING ELECTRIC CONTROL OF COAST DEFENSE GUN

100,000 and 2,000 cubic feet per second; the Housatonic between 25,000 and 500; the Savannah between 130,000 and 3,000. Since 1895 Congress has appropriated over $2,000,000 for water resources work and about 1,000 stations are continually maintained by the Geological Survey for stream gauging. They are located in all parts of the country. First the hydrographic engineers make careful surveys of the river beds to get the cross sections at various heights of water and the exact rate of flow is determined by letting down electric current meters into the water both at the surface and at different depths at frequent intervals across the stream. This is done in various ways. The most exact data is secured where a house is built on the banks of a stream over a well connected by a pipe with the river and in which are instruments giving a continuous automatic record of the rise and fall of the river and this in connection with the measurements made by the hydrographer furnishes data for computing the daily flow of the stream not only for every day in the year but for any hour of the day or year.

The easiest of gauging work is where a bridge can be utilized by the hydrographer, flow measurements being made at five or ten foot intervals. In other places wire trolleys are stretched, on which the hydrographer pulls himself in a car, dropping his meter into the water at certain intervals. Some of these trolleys may be close to the rushing water and the others may of necessity be high in the air. One across the Susquehanna is well above the tree tops and about one quarter of a mile long. In other streams the engineers wade across the stream daily, and in some instances it is necessary to cut the ice, for the gauging to be effective must include all seasons of the year.

The Chicago city council has authorized the purchase of 15,000 additional flaming carbon arc lamps, which will make the total lamps of this type in use in the city for street lighting over 23,000.

Control of Coast Defense Guns

Uncle Sam has recently adopted to some extent a new policy with reference to taking the American public into his confidence regarding the utilities of modern warfare. In days gone by everything connected with heavy ordnance on ship and on shore was hedged about with the greatest secrecy and it was almost unheard of for outsiders to be permitted to watch a gun drill or target practice. Lately however there has been a letting down of the bars and this has been particularly notable in the case of the heavy guns of our seacoast defenses.

It has even become the practice to conduct demonstrations of the workings of the big guns for the benefit of delegations of scientists, engineers, etc., in convention assembled. A recent especially interesting demonstration was designed to exemplify the thoroughness and versatility of the electric control of one of the huge disappearing guns such as protect our seaboard. It was made clear to a party of spectators, largely made up of electricians, that not only was the big gun discharged by electrical impulse but all the operations of elevating the gun above the fortifications and returning it to the pit after discharge were performed by electric power. The artilleryman who is seen, controller in hand, is in position to dictate all the movements of the gun.

Lamp Carbons from Tar

Carbons of high grade are now to be obtained from tar, according to a process invented by a Swedish firm. The powdered carbon will be pressed to form electric light carbons or larger sizes for electro-chemical work. The method is based on the fact that finely divided carbon makes up a large percentage of the composition of tar and is what gives the black color, this being due to the carbon particles suspended in an otherwise dense and transparent yellowish brown liquid.

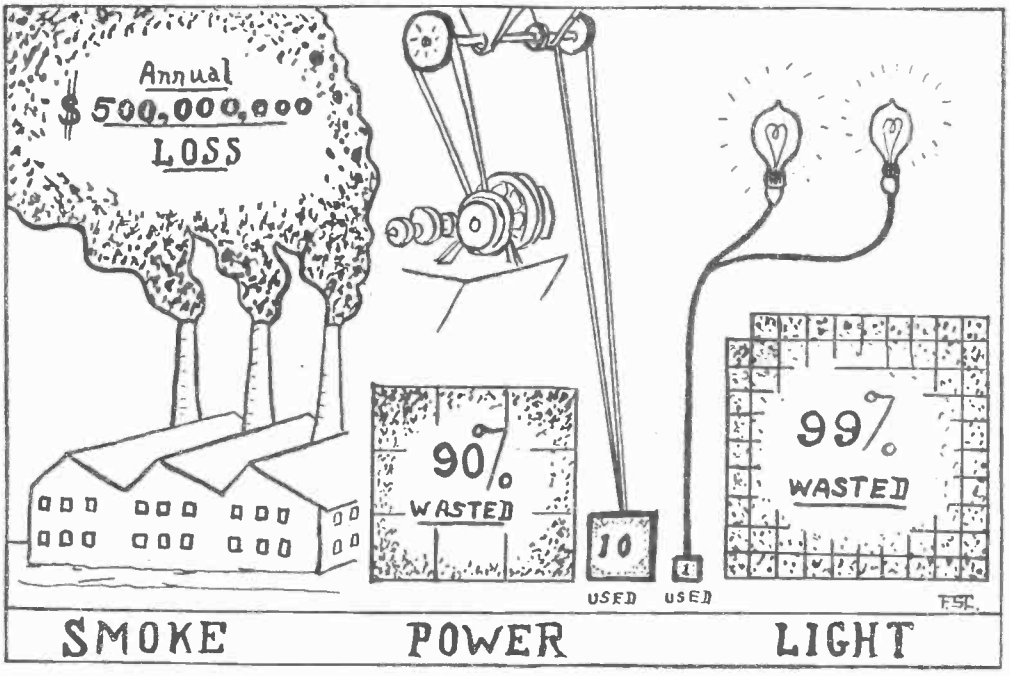
How We Waste Our Coal

How long will coal be available for the use of succeeding generations?

Mr. Gannett estimated on the basis of the amount of coal taken out in the year 1908, that, if the rate continued, the available and accessible coal will be exhausted in 2027; that is, in 114 years; and that the total coal supply will be exhausted about the year 2050, less than 140 years hence!

It has been estimated by mining experts and geologists that for every ton of anthracite taken out of the mines, from one to one and one-half tons have been wasted in the process of mining. For every ton of bituminous coal taken out of the mines at least one-half a ton has been wasted. This means that the waste in mining in the past has run from 100 to 150 per cent for anthracite coal.

When we use coal to fire the boiler of a steam engine we are transforming energy; we expect to get a certain amount of power out of the transformation. Of course there is always more or less loss in any transformation of this kind, but few people realize the tremendous loss in this particular case. President Van Hise (University of Wisconsin) estimates that under the most favorable conditions, with the best firing, we do not get in power more than fifteen per cent of the heat units of the coal. The average steam engine does not develop into power more than ten per cent of the heat energy. This means that 90 per cent of the heat energy of the coal is wasted.



A GREAT PART OF THE COAL GOES UP IN SMOKE, AND OF THE HEAT GENERATED AN OVERWHELMING PERCENTAGE IS LOST IN THE PRODUCTION OF POWER AND LIGHT

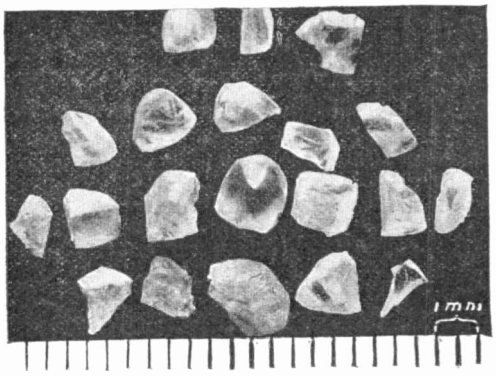
If the loss of coal is great in developing steam power, it is even greater in making light. To transform the heat energy of coal into light, we must consume the coal to make steam, transform the power of steam into electrical energy, and then transform that into light. In this process not one per cent of the energy of the coal is transformed into electric light. This means a waste of over 99 per cent of the energy of coal. The waste in the case of

gas light is not so great. But electricity for obvious reasons is displacing gas as a light. Wherever water power can be used to convert electrical energy into light this should be done.—*F. Stuart Chapin in The Independent.*

Synthetic Diamonds

That real diamonds have now been made by an electric process and that the inventor has every reason to think that he can soon make large sized ones, is certainly a startling announcement, but none the less true. The method is due to a Paris electrical engineer, E. de Boismenu, and has only recently been divulged.

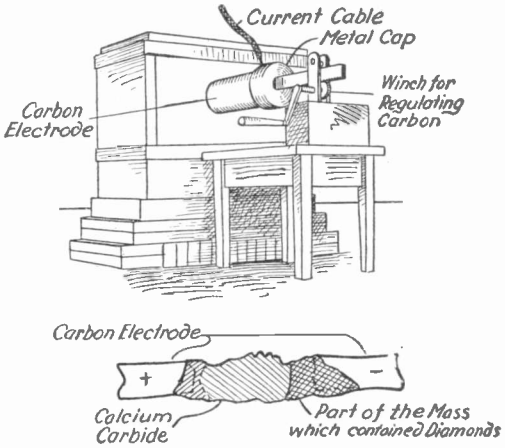
The inventor has on exhibition quite a collection of little crystals, the largest ones being about a tenth of an



MAGNIFIED SAMPLES OF ARTIFICIAL DIAMONDS

inch in diameter. The specimens were certainly diamonds and besides he has had them analyzed officially by two leading Paris scientists and members of the Academy, M. Lacroix, professor of mineralogy at the Museum and M. Maquenne, professor of chemistry at the College de France, who pronounce them to be real diamonds.

"I was led to the present idea," said the inventor, "when at the head of a large carbide works in France. The machines of the plant gave direct current, which was very bad for making carbide but was a fortunate thing for me, as after throwing out quantities of imperfect carbide I then saw that it must have been de-



DE BOISMENU'S APPARATUS FOR MAKING DIAMONDS

composed in the furnace by the electrolysis due to direct current and which other current would not give. My observations led me to think that carbon crystals, or diamonds, might be made in this way, so I set about to realize my theories in a very small experimental plant which I erected at Paris.

"The electric furnace was of the simplest kind, being built up of fire brick and having a square shaped inner chamber of small size. Two inch round carbon electrodes projected into the chamber in the usual way and the idea was to melt up a bath of calcium carbide by the action of the current, then to leave it for several hours to 'simmer' which is the exact word, so that it would be decomposed by the current's action and we would see what next.

"After a few trials I succeeded in producing diamond crystals for the first time in an experiment in which the current was kept on for six hours at a time. When the furnace was cold, there was a peculiar looking mass around the two electrodes, this being made up of carbide of calcium on one side, while around the negative electrode was a black and spongy mass which turned out to be carbon for the most part. When treated

with water this gave a blackish mud and this was dried to powder and spread upon a flat plate. At once the small crystals of pure carbon could be seen and I picked out a considerable number of them.

"To answer the question as to whether the crystals were solid and would stand the cutting process, I took some of the best ones to a prominent jeweler of Paris and he selected one of the handsomest specimens and sent it to Amsterdam to have it cut, for the skilled workers there can produce marvels in this way.

"Shortly after, this diamond came back cut in 32 faces and appeared as a diamond of the first water, even though of minute size."

A New Telephone Transmitter

Professor d'Arsonval has just described a new telephone transmitter before the Academy of Sciences, invented by Dr. Jules Glover, who is associated with the famous Conservatory of Music in Paris.

M. d'Arsonval explained that sound vibrations in coming from the throat are divided by the palate into two groups, the larger number escaping by the mouth, the somewhat smaller group being expelled from the nostrils. These have not been taken into account by the Bell telephone, in fact they are valuable vibrations which are not used in the ordinary telephone transmitter, but in the Glover model they are caught by a second microphone more sensitive than the microphone which receives the vibrations of the mouth.

It is claimed that the new transmitter will make it possible to carry on conversations with much greater clearness than at present. All that is necessary when you talk is keep both your mouth and your nose at the transmitter.

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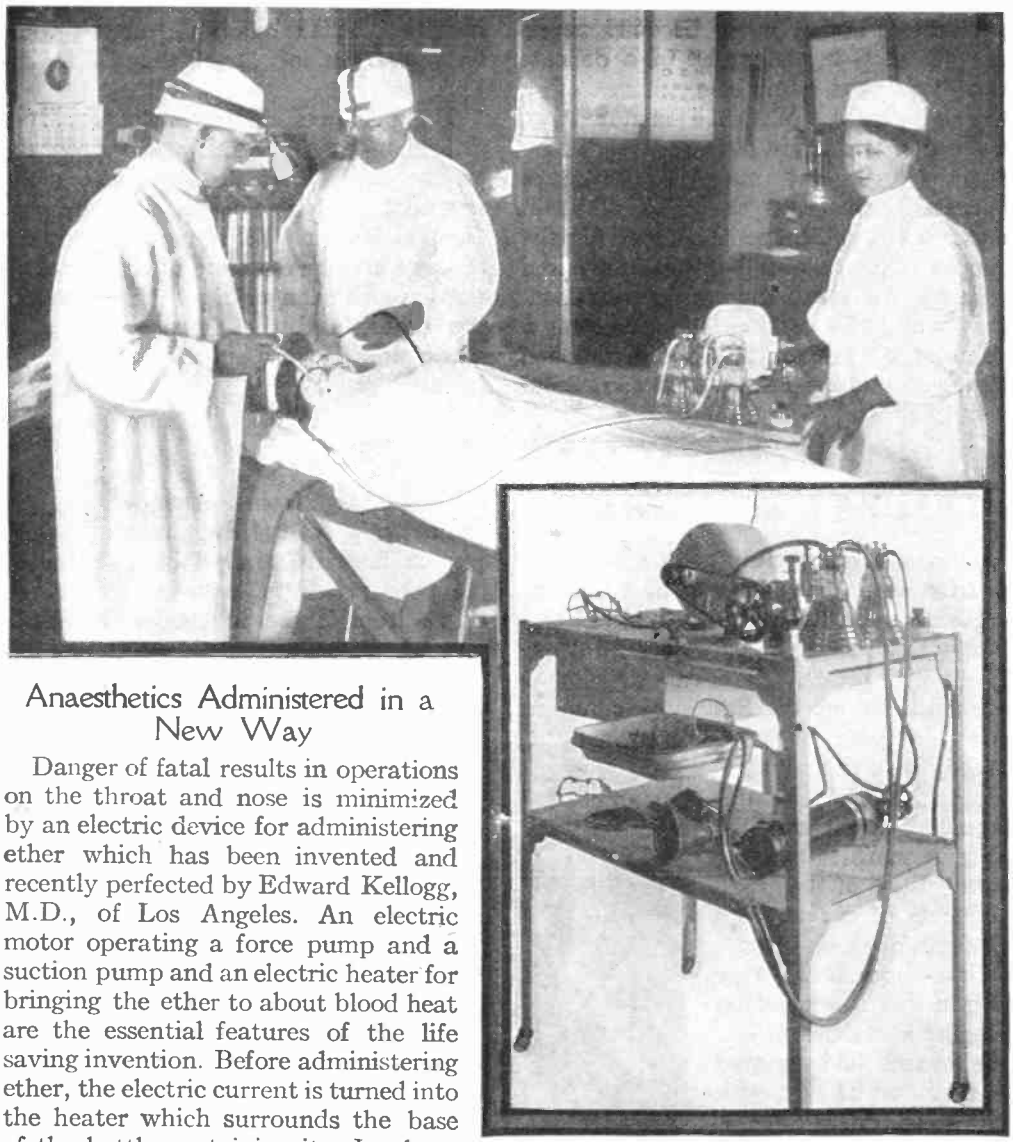
BUTTERCUP FLOAT AT THE CARNIVAL OF FLOWERS

Flower Carnival Opens Coney Island

The Spring Carnival of Flowers this year ushered in the new season at Coney Island with bands playing and flags flying under a sky lit up with thousands upon thousands of electric lights. Great crowds surged through the main street and greeted with enthusiasm the wonderful flower bedecked and electrically lighted floats, of which the one here shown—"The Buttercup"—is an excellent example.



DR. EDWARD KELLOGG (PROFILE) OPERATING WHILE ANAESTHETIC IS BEING DELIVERED BY THE ELECTRIC DEVICE

Anaesthetics Administered in a New Way

Danger of fatal results in operations on the throat and nose is minimized by an electric device for administering ether which has been invented and recently perfected by Edward Kellogg, M.D., of Los Angeles. An electric motor operating a force pump and a suction pump and an electric heater for bringing the ether to about blood heat are the essential features of the life saving invention. Before administering ether, the electric current is turned into the heater which surrounds the base of the bottle containing it. In about five minutes it has reached a temperature of 85 to 90 degrees which results in a warm vapor entering the lungs and removes the danger of chill and pneumonia.

Meanwhile the patient has been brought under the influence of the anæsthetic by inhaling through an ordinary mask, but as soon as the subject is unconscious this mask is removed and a gag and tongue depressor inserted in the throat. Through a passage in the tongue depressor connected by a tube with the ether container the anæsthetic is forced into the throat and nose by action of the force pump, the flow of the warm vapor being accurately regulated by the surgeon or the assistant. This is accomplished by moving the switch that controls the motor.

By this method the patient is kept constantly under the influence of the anæsthetic while the operation is being

performed, and it never becomes necessary to stop in the midst of a delicate operation to administer more ether through a mask. With the usual method, these operations are always attended by some danger and many deaths have occurred due to accumulation of blood clots in the windpipe that strangle the subject while ether is being administered through the mask during an operation. By the use of a suction pump, creating a vacuum in a bottle, the blood is removed through a rubber tube as fast as it accumulates. This is one of the most important features of Dr. Kellogg's invention.

The perfected device is the result of sixteen months of work and experiment on the part of Dr. Kellogg, who made several important changes of his original portable outfit. The most important of these are the encasing of the motor to eliminate the danger of a spark exploding the ether, and the development of a silent pump, as the operating room must be quiet.

The Prison Ship "Success"

Unheralded the strangest of strange appearing craft made its way up the Hudson river recently under its own sail and finally moored at the dock at the foot of Eightieth Street. Nautical men who viewed her from the Battery pronounced her a frigate but discreetly held their tongue when asked about her unusual appearance and the strange markings on her sails. Each of the broad stretches of canvas were disfigured with short stemmed arrows, the prison mark branded on English convicts. After the vessel had moored and Captain D. H. Smith had been interviewed it developed that the strange craft was none other than the Success, the old British Convict Ship which years ago carried prisoners from England to Australia when the island continent was used as a convict colony. The vessel was purchased some time ago by Captain Smith and converted into a floating museum.

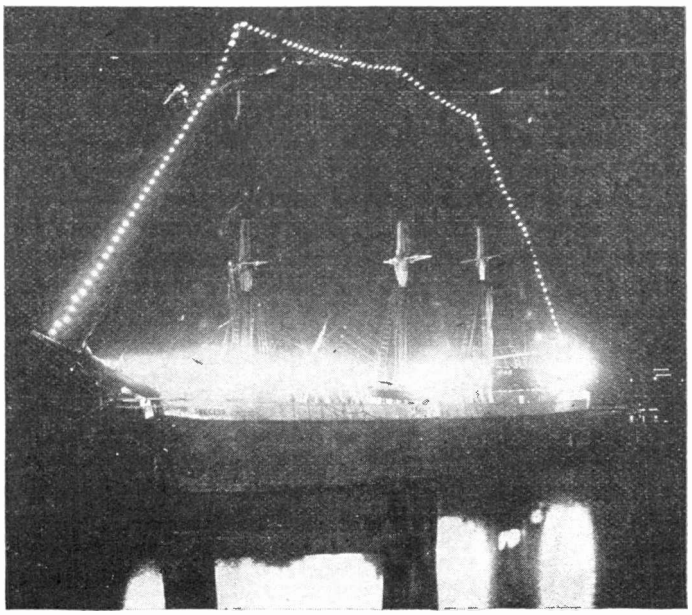


Photo by N. Y. Edison Co.

THE PRISON SHIP ELECTRICALLY ILLUMINATED

It was in 1806 that the Success made her last voyage from Portsmouth to Australia with several hundred men and women crowded aboard her. Some of the poor prisoners were in chains or ship's irons, some in stocks or bilboes and others in iron barred cages like animals in the modern zoological parks. They had been sentenced to a life of exile in the convict colony by English jurists for such petty offences as sheep stealing, apple stealing and fishing in the squire's private trout stream.

As a museum the Success is really a success. Besides the gruesome exhibition of irons, chains, cages, bars and locks there is a collection of old warrants and legal papers, instruments which conveyed men and women into that "floating hell" more than a century ago. There, too, are the confessions of murderers and notorious thugs and criminals of the slums of London of Dickens' time, along with cudgels, black-jacks, brass knuckles, knives and old blunderbuss like pistols, used by the bad men of Revolutionary times. And with this unique collection and looking strangely out of place is bolted to the walls of the cabin an electric service board which controls the five hundred odd lamps and arcs that light the prison ship at night when curiosity seekers swarm through the old vessel feasting their eyes on the gruesome relics of the past.

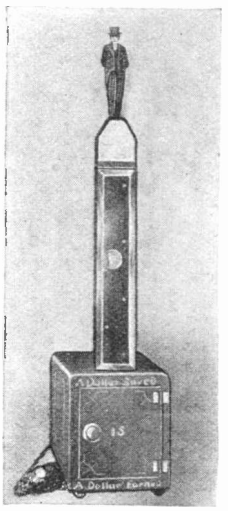
One of the quaintest and most interesting exhibitions on the ship is the prettily carved old binnacle. The instrument seems different than the other exhibitions and like the electric switchboard, strangely out of place there among the uncouth relics of a now famous period in English history.

Nile Power to Make Fertilizer

It is understood that the Egyptian irrigation department proposes to utilize the water which flows through the great Assuan dam for the generation of electric power. For about five months in the late autumn and winter the water is accumulated in the reservoir formed by the dam, and what is allowed to pass the sluices flows through under a large head. It would be possible to develop over 150,000 horsepower. The electrical energy generated is to be employed in the production of chemical fertilizers by the fixation of atmospheric nitrogen. Egypt last year spent $3,250,000 on such fertilizers, 56,000 tons out of the 70,000 tons imported being nitrate.

The Mysterious Dollar

A crowd surrounds the store window in which real money — a silver dollar — moving about is the attraction.



Upon a miniature safe is a glass slot surmounted by a figure of Uncle Sam. The "Mysterious Dollar" suddenly appears at the upper end of the slot and dodges down from one rubber pin which impedes its path to the next until it finally disappears within the safe. Almost immediately it reappears at the top of the slot again and repeats the performance. The electric motor and mechanism which turn the trick are concealed. The current needed to operate the device is taken from an ordinary lamp socket.

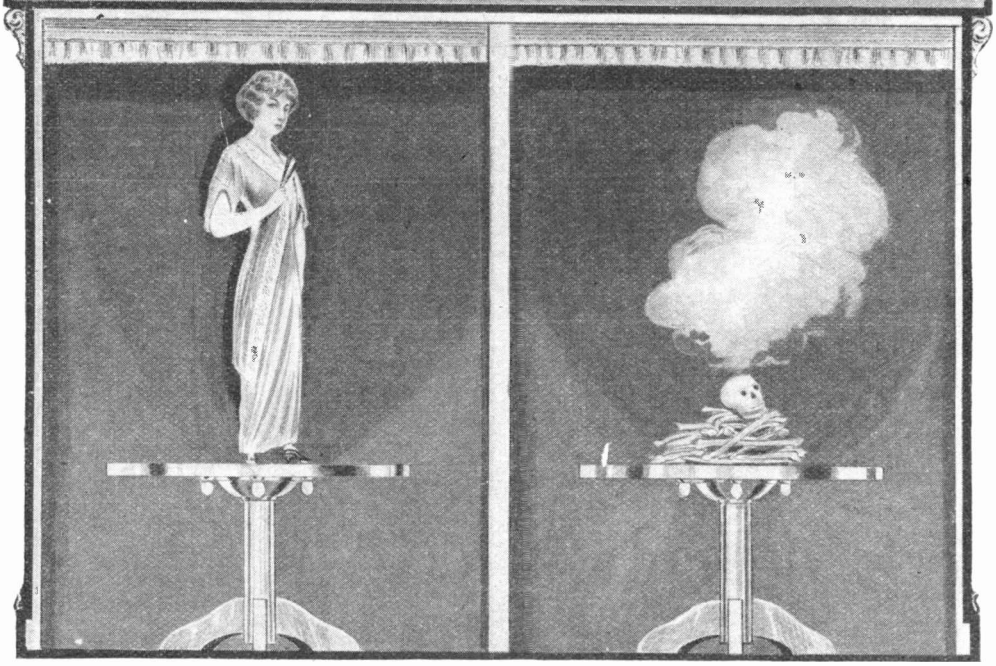
Ironing Architect's Drawings

An architect has found a new and interesting use for the electric iron—that of "ironing" paper.

To writers and others who occasionally find it desirable to remove wrinkles and folds from manuscripts, it is well known that the ironing of paper is a perfectly practical thing and the architect takes advantage of this through the convenience of the electric iron. Plans and other papers which have become wrinkled and folded from handling to such a degree that they have lost their original neat appearance are ironed and made to look practically as good as new. The ironing also appears to stiffen them considerably. He finds that if the paper is very badly wrinkled it is sometimes desirable to run the iron over it while it lies on a cloth that has been dampened very slightly.

"THE MYSTERY OF THE CHAMBER OF DEATH"

BY T. J. NEWLIN



The "Mystery of the Chamber of Death" is sometimes called "Avatar"; others give it the title, "From the Shadow of Death," while others call the mystery, "The Resurrection From the Dead." To begin with, the stage must be set as shown in the diagram, preferably over a trap door in the stage floor, large enough for your subject to disappear and re-appear at the psychological moment to cause the proper climax.

A three sided screen must be built, and hinged as shown (top view) and set to form three sides of a square, but with the front side facing the audience left open. Each of the three flaps of the screen is built about nine feet high and about four feet wide. They can be made of light framework and covered with cloth or muslin and then painted red or black as desired.

Inside of this screen a round top table is set as shown. Upon the side of the table top toward the trap door, is a porcelain fuse block made fast to a piece of sheet iron plate. The fuse block contains a light fuse of about five amperes capacity or a piece of 32 gauge copper wire in order to fire the powder, of which there must be just enough to make the right amount of smoke to be mentioned later. Leading from the fuse block to the stage pocket is a twin wire cable which has inserted in it a double pole knife switch to be thrown by the stage electrician at the right moment and at the cue given.

Underneath the top of the table and directly behind the pedestal, which is gouged out to fit as shown (top view), are two plane mirrors which are set at an angle of 45 degrees and which extend backwards so as to fit into the corners of the screens. These, in accordance with the law that the angle of incidence is equal to the angle of reflection, make it appear to the observer "out front" that the back side of the screen can be seen beneath the table. But this is not the case, for what the observer really sees is the re-

flections of the two side screens, and the triangular space behind the mirrors and below the table top is shut out from view.

Attached underneath the table are three sixteen candlepower incandescent lamps set as shown (front view). They are placed there to create the necessary light required to reflect the images of the sides of the screen as previously explained. They also add materially to the æsthetic effect which must not be lost sight of at any stage of the game while in theatrical work. Running from these lights is a twin wire cable which passes down the pedestal and connects with the stage pocket.

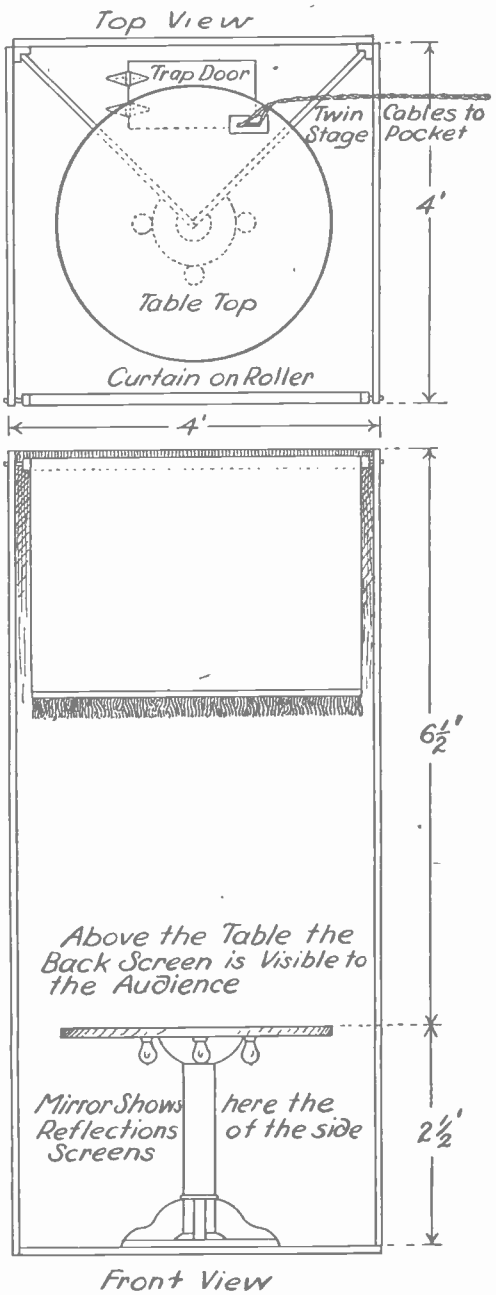
At the top of the two screens a roller curtain is attached and made long enough to entirely reach the floor of the stage as it unrolls, which is done of course to hide the woman and to prevent the discovery of the trick.

Everything being now in readiness, the magician steps forward to the front of the stage and, after making his usual short, laconic remarks, informs the audience he is going to place a young and beautiful woman upon the table which they see before them and, by shooting a pistol at her, make her immediately disappear in a cloud of smoke, leaving nothing but a bunch of bones behind, skeleton of her living self.

The woman appears from behind the scenes, steps forward for the critical inspection of the audience and is then placed upon the table. The curtain is then drawn down fully to the bottom. The magician after pronouncing the magic words, "Presto! Begone! Pass!" fires point-blank at the woman behind the screen.

The shot report is the "cue" for the stage electrician to throw in the knife switch, which blows the fuse and ignites the powder. The smoke arises with a puff, the curtain is suddenly allowed to fly up exposing the skull and bones.

When the curtain was drawn down in front of the screen, the woman simply made her "get-away," as they say in



METHOD OF PRODUCING THE "MYSTERY OF THE CHAMBER OF DEATH"

stagedom, by stepping off the back part of the top of the table and crouching down behind the mirrors. She immediately places the skull and cross bones upon the table where she previously

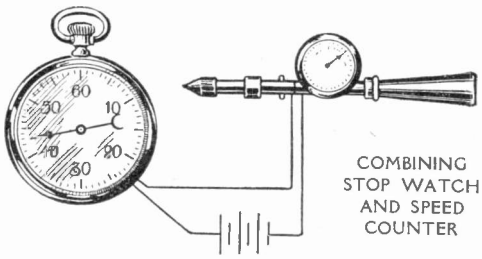
stood, as the pistol shot is fired by the magician.

By the aid of the trap door—which is not essential to the performance of the trick as above explained—other mystifying combinations may be employed.

Speed Counter Starts and Stops Watch

The accompanying illustration shows a stop watch and a speed counter combined in a most ingenious and practical way to prevent inaccuracy such as arises when that human mechanism, the finger, starts and stops the watch in response to a command.

Within the watch is a soft iron horseshoe magnet, not much larger than a

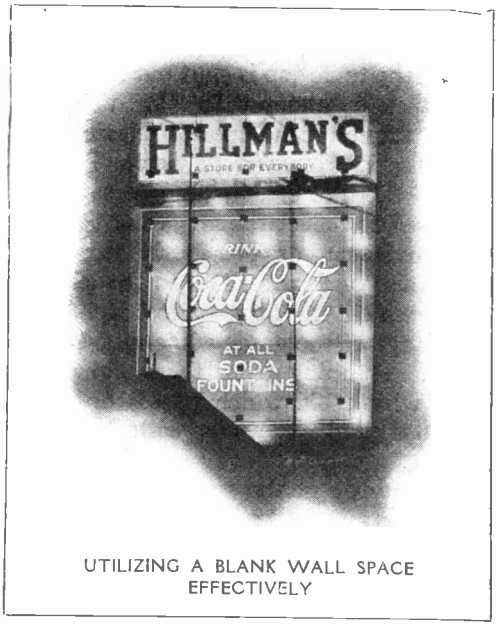


COMBINING STOP WATCH AND SPEED COUNTER

bent pin, wound on each leg with fine wire. The instant the speed counter commences work the electric circuit is opened against the tension of a spring on the counter and the little magnet in the watch lets go its armature which releases the watch mechanism on the instant. The moment the speed counter stops the spring on it closes the circuit energizing the watch magnet which attracts its armature and in that way stops the watch.

Whence the Source of the Light

The illuminated wall reflector is the latest feature in electric advertising. The picture here shown illustrates the power and brilliancy of the new method as used on the wall of a Chicago skyscraper. The round, black marks seen are the hood reflectors, 36 in number. within each hood are four 100 watt



UTILIZING A BLANK WALL SPACE EFFECTIVELY

Mazda lamps. Pedestrians who observe the advertisement are very apt to be mystified as to the source of the illumination, for the painted advertisement on the wall has every appearance of possessing some unseen transparent light quality about it.

"Wired Up" for Life

The Dyaks of Sarawak, Rajah Brooke's remarkable little state in North Borneo, have, in the past, stripped many miles of telegraph poles of their wire in order to turn the latter over to their tribal "modistes" to manufacture into clothes for their ladies.

Long before the telegraph wire came, the principal article of trade with the Dyaks of Borneo was brass wire, some of which was used for the making of bracelets and anklets, but the bulk of which was worked up into a remarkable corset for the women folk. This "garment," beginning a little below the waist—where it fixes the "bedang," a strip of cotton cloth falling to the knees—ascends in broadening spirals to the shoulders. The spirals are connected up with other pieces of wire, which has

DYAK GIRLS WITH JACKETS OF TELEGRAPH WIRE

the effect of depriving them of all elasticity and rendering the contrivance quite as rigid as its modern prototype of the enlightened Occident.

Under foreign influence it is becoming the custom to make these cages so that they may be removed at will, for bathing and even for sleeping, but in the remoter land Dyak villages this reform has not yet begun to make itself felt. There a girl, on reaching maidenhood, has a loose wire corset of fashionable shape built upon her, and to this her figure must grow, whether it chances to be along its natural lines of expansion or not. One sees budding stalks of maidenhood weaving about in their roomy wire boxes like canaries in their cages; blossoming maidenhood swaying gracefully in the comfortably filled confines of the encircling wire; blooming womanhood with indignantly protesting anatomy fighting for freedom above, below, and through the interstices of the rigid spirals; and bloomed womanhood, wrinkled bags of bones, rattling about in the sounding metal as they might in the long burial wooden boxes toward the edges of which they are tottering.

Wire is wire in Borneo, and though brass trade wire was more refulgent and dressy than telegraph wire, as long as the former cost a picul of damar or five piculs of copra for the requisite number of spirals, while a dress length of the latter could often be had at the expense of a little climbing, there was no question which was going to be the more in demand. The flexibility of the telegraph strand admitted of a great variety of treatment, and very *chic* effects in weaves and twists were obtained with it that could never have been approached with the stiff brass trade wire.

Thefts were very frequent and troublesome at first, but by the exercise of the same rare combination of kindness and firmness by which he stamped out head-hunting among his Dyaks, Rajah Brooke has also contrived to put an end to wire-hunting.

Dussaud's "Cold" Electric Light

Considerable comment has been excited over the so-called "cold" electric light invented by Prof. Dussaud of Paris. Briefly stated, his idea embodies the principle of interrupted current. It is well known that electric lamps when subjected to a higher voltage than that for which they are designed are unduly heated and soon burn out and become useless.

Prof. Dussaud found that if a lamp adapted to a certain voltage is subjected to a current of higher intensity during a fraction of a second, and then, by breaking the current, the lamp is allowed to rest for an equal period of time, it not only produces a light of greatly increased brilliancy, but the lamp itself remains cool and does not deteriorate. Working on this idea, he has apparently succeeded in perfecting a system by which, for example, a current at sixteen volts is passed through a lamp intended for eight volts, with sixteen current interruptions per second, with the result that the lamp itself remains entirely cool and incapable of igniting by contact a substance so inflammable as a cinematograph film. What is still more important,

the lamp remains uninjured and produces a light far more intense than could be generated by a lamp designed to be burned on a sixteen volt circuit and consuming the same amount of current.

The fact that the lamp does not overheat is of great importance in cinematograph practice or for other projections, as it permits the light to be safely placed close to the lens, thus increasing greatly the clearness and sharpness of the pictures on the screen.

The idea is now being carried out on a commercial scale by La Societé Internationale de Lumière Froide, whose office is at 27 Rue Mogador, in Paris.

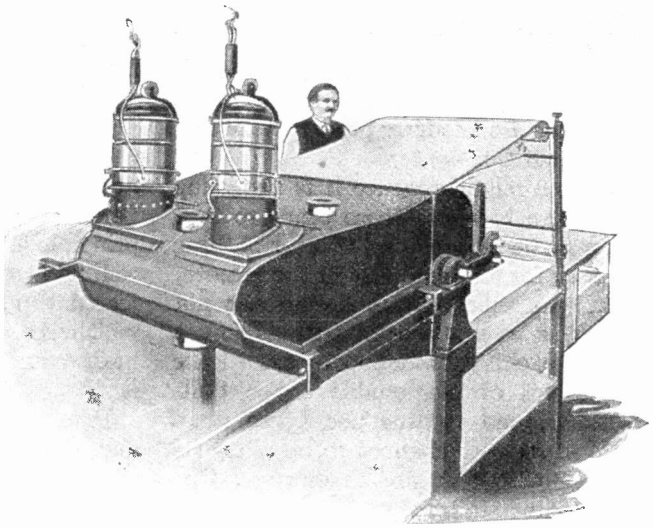
Rapid Blue Printing

Blue prints from drawings can be made at a very rapid rate in the perfected electric printing machines, which are fitted with arc lamps to do the printing while at the same time an electric motor drives the blue print paper along with the tracings so that both move at a rapid rate in front of the powerful arc lights. One of the new Paris machines in use at the offices of the Hennebique engineering firm, is here illustrated. At the top will be seen the continuous roll of blue print paper being fed into the machine while the separate tracings are fed along under it from time to time, and are printed on the sensitized paper

This machine produces about 700 prints a day of three feet width. A still more elaborate device is a combined arc light printer, washer and dryer known as the "hesfel," also a Paris make. From 60 to 400 feet of paper an hour can be turned out in this way, all dried and ready for use.

The Funeral Cars of Mexico City

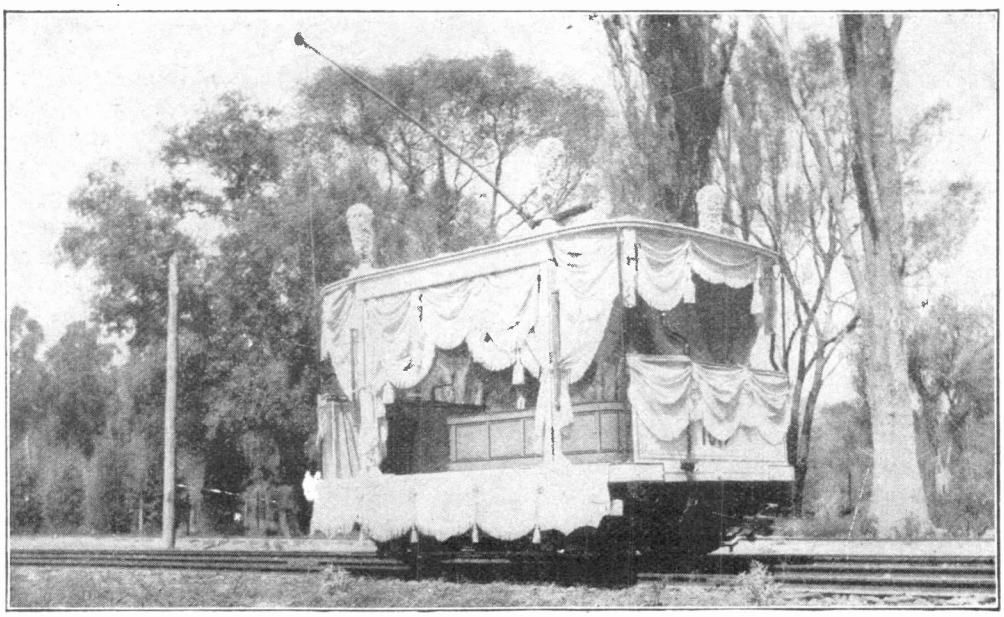
Mexico City, a metropolis in the days when New York was yet a Dutch village and Chicago but a miry swamp given over to the croaking of frog choruses and the mournful cry of waterfowl, presents some striking paradoxes in the matter of modernity, with its century old building wired througout for electric service supplied by the latest type of metal filament lamps; but none of these anomalies seems so incongruous as that of the electric funeral. Let it be here explained that by the term electric funeral is meant the fact that the hearse, the mourners' carriages and all of the accoutrements of that solemn procession referred to by newspaper



RAPID BLUE PRINTING MACHINE

reporters as the funeral cortege, are made up of the tram cars of the Aztec capital.

As the funeral traffic is limited to certain hours of the day, there are times when the residents along Avenida Chapultepec see nothing but long lines of black hearses. To one unaccustomed to it, the continual passing of these trains produces a most depressing effect. Not long since a young electrical engineer was sent to Mexico from Schenectady by the General Electric Company. He secured apartments on Avenida Chapultepec, and



A CHILD'S ELECTRIC FUNERAL HEARSE IN MEXICO CITY

upon returning home during the first days of his stay found his wife in tears. She hysterically insisted upon returning to the United States. The long line of funeral cars that day had made her believe that at least half the population had been carried off by some plague. It is seldom that death is so graphically visualized.

Some 288 cars are operated daily over its 200 miles of track by the Mexico Tramways Company, limited and of this number 45 are funeral cars. They are of various sizes and descriptions, ranging from the magnificent plumed affair to the caged box which carries the pauper dead to the section corresponding to the potter's field. These latter are called gavetas and are built with eight compartments holding as many coffins. The company maintains a separate funeral department, with trained attenddants. Crews on funeral trains are distinctively uniformed. A regular tariff for this service is printed and interments vary in price from $6.00, the very poorest, to a much larger sum for the more sumptuous. It is said that no other street car company in the world has such a department or service.

An Electric Ship for Canada

There was recently launched the first ship for Canadian waters to be equipped with oil engines, generators and motor driven propeller. It is the *Tynemount*, a steel freighter of 250 foot length and 42.5 foot breadth for the Montreal Transportation Company. There are provided two Diesel engines, each of 300 brake horsepower and running at about 400 revolutions per minute. The propeller speed will not exceed 80 revolutions per minute. The electrical transmission system was designed by H. A. Mavor of Glasgow.

Electric Steering Gear for U. S. Warships

"Right" and "Left" will henceforth be the commands given in shaping the course of a U.S. warship, instead of the time-honored "Port" and "Starboard." The Secretary of the Navy has issued a formal order to this effect and although some of the captains in the navy had the temerity to protest against the innovation their protests have been overruled.

The explanation of this new order of things is found in the introduction of electric steering gear on Uncle Sam's fighting craft. Henceforth it is to be the "man at the controller" instead of the traditional "man at the wheel."

The new steering gear has just been given a thorough test on the cruiser Des Moines, which was specially fitted with the apparatus for experimental purposes, and the result has been so satisfactory that it has now been determined to install the apparatus on all our battleships that are building, beginning with the super-dreadnaughts Texas and New York. In addition to its military advantages the new steering gear is favored because of its economy of space and high efficiency.

MINISTER EXHIBITS A DEATH CHAIR AS A WARNING

The Rev. George K. MacDonald of New York, a Baptist clergyman, is now appearing on the vaudeville stage for the purpose of lecturing against capital punishment. To strengthen his argument he uses a death chair similar to that used at electrocutions, and an assistant appears to be electrocuted. The Rev. MacDonald believes that the church sl uld encourage the stage in using its acknowledged power to teach great moral lessons. He hopes by portraying the actual working of the electric chair to so fix it in the minds of the masses of the people that when they are tempted to commit crimes the image of the chair will rise before them as a warning.

Photographs by Underwood & Underwood, N. Y.

Telegraphy and Telephony in Siam

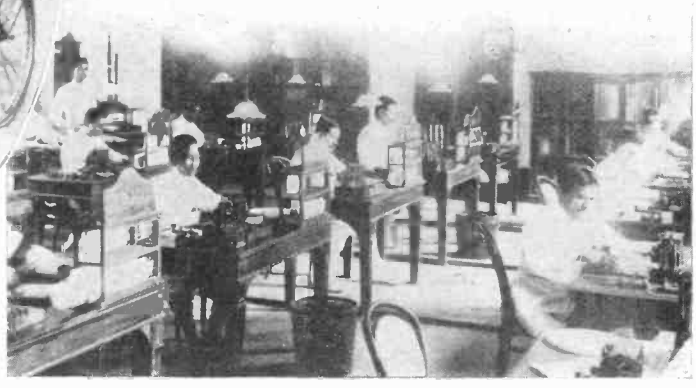
The first telegraph line of any importance which was opened in Siam was that which connects Bangkok with Saigon, the capital of French Cochin China. This line was engineered by the well known M. Pavie, at one time engaged by the Siam Government for this work, and since then one of the first French authorities on Siam, whose studies of the Siamese and explorations of the country have been of immense value to all who are interested in the ethology, archæology, and other scientific aspects of this part of the world. At the present day Siam has two other routes of telegraphic communication with the outside world in addition to that of Saigon, one of which crosses the frontier of Burma, and thence reaches Moulmein, while the other enters the British Malay State of Kedah, and thence communicates with Penang. The inland telegraph lines link up all the more important provincial towns with the capital and the total length of line in the country exceeds 3,500 miles.

TELEPHONE EXCHANGE IN BANGKOK, SIAM

In its early days the Telegraph Department was very badly organized, and a great deal of money was wasted in the purchase and transport of expensive material which was never used. Union with the Postal Department brought better management, but even the difficulties caused by the wild nature of the country to be traversed, the profuse and rapidly growing vegetation, and the excessive heat and alternating humidity and dryness of the climate, delayed the initial construction work and made subsequent maintenance a matter of costly and unremitting labor.

So great were these difficulties that a few years

A SIAMESE MESSENGER BOY



BUSY TELEGRAPH OFFICE IN BANGKOK

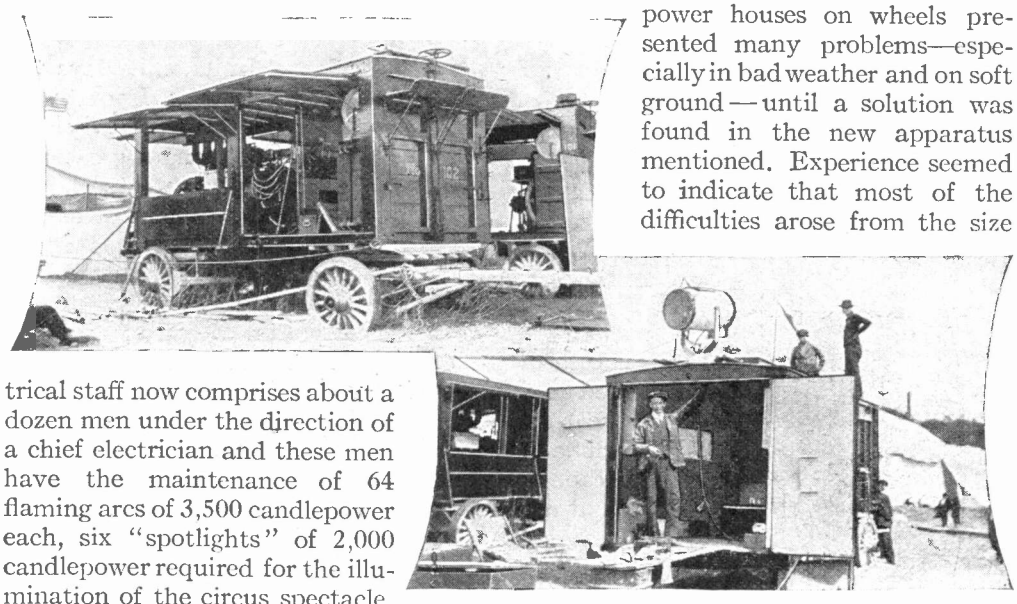
ago they appeared to be overcoming the energy of the department, the lines being permitted to fall into a state of disorder which rendered many of them practically useless. But a remonstrance on the part of the foreign representatives, made in the interest of trade, put the department on its mettle and brought about a great and general improvement, which has since been maintained.

Circus Electricians

Each succeeding year finds an increase in the duties and responsibilities of circus electricians as the big tented show "on the road" adds to its equipment for electrical illumination. The circus electrical staff now comprises about a dozen men under the direction of a chief electrician and these men have the maintenance of 64 flaming arcs of 3,500 candlepower each, six "spotlights" of 2,000 candlepower required for the illumination of the circus spectacle, fifteen reflectors and 200 cage lights for the menagerie, the last named being incandescents of 32 candlepower.

A new convenience for the circus electricians is in the form of a portable workshop. This consists primarily of a huge covered wagon which is virtually an electrical supply store on wheels, and a work bench is thrown out from this when weather conditions permit repair work, etc., in the open air. Mounted on top of this electrical wagon and operated from inside the wagon, is a 10,000 candlepower searchlight—another "new wrinkle"—which is of great value in illuminating the grounds when the canvasmen are taking down the tents and when most of the other illuminants have been extinguished.

The largest traveling circus—a distinctly American institution, by the way—has recently introduced a new type of generator wagon that is a marked improvement over the portable electric light plants heretofore in use by the big tented shows. For some years past the leading railroad shows have been depending upon electricity, generated in portable plants, to illuminate the tents and show grounds; but the transportation of these power houses on wheels presented many problems—especially in bad weather and on soft ground—until a solution was found in the new apparatus mentioned. Experience seemed to indicate that most of the difficulties arose from the size and weight of the twelve-ton generator wagon which was no vehicle for bad roads or swampy show "lots." But all or nearly all of these difficulties have been solved by dividing the weight. The show now carries two generator wagons instead of one. Each wagon weighs complete only six tons and not only are the wagons more easily handled but the electrical machinery is not subjected to such stress and strain.

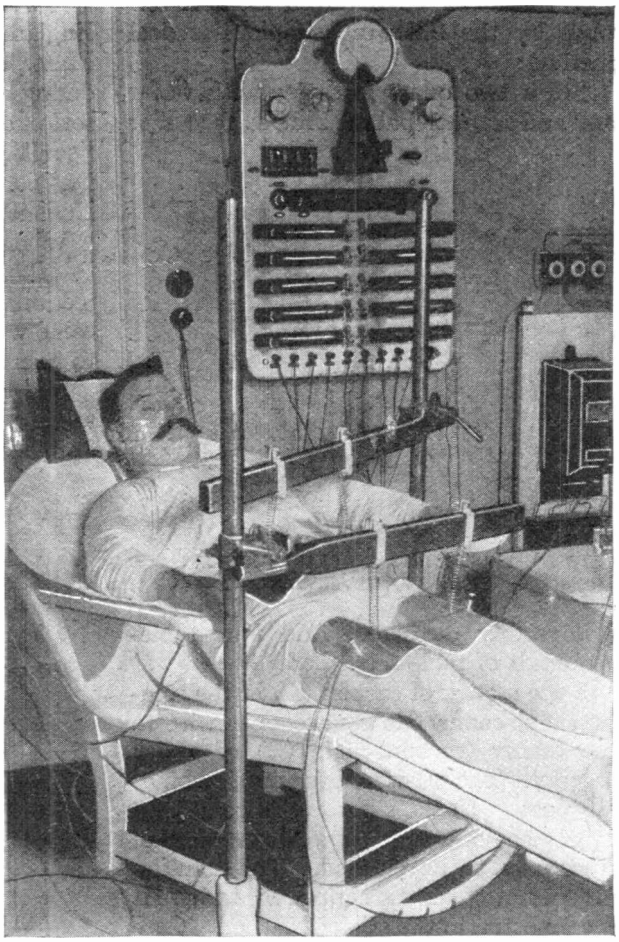


TYPES OF CIRCUS POWER PLANTS

"ELECTRICAL WORK"—A TREATMENT FOR OBESITY

A German practitioner, Dr. F. R. Nagelschmidt, has devised a new electrical method for the treatment of obesity, which compels the patient, by electrically stimulating the muscles, to perform muscular work automatically and independently of his own will. Fatigue is thus reduced to a minimum and much more physical work can be performed than under ordinary conditions.

The apparatus comprises a substantial easy chair with six metal surfaces insulated from one another, which serve as electrodes to apply the current. In the back of the chair there are two electrodes adapted to the patient's back by means of two racks. The seat is inclined backwards and carries two electrodes for the pelvis and two further electrodes (for the legs) are arranged on the adjustable foot rest. Two additional electrodes for the abdomen and two for the upper legs or the breast can be provided on supports installed beside the chair. All these electrodes are joined up to a switchboard and can be connected with the positive or negative terminal of the source of current by means of ten small switches, thus allowing the treatment to be adjusted to individual requirements. Regulating resistances for each switch and for the conductor supplying the current allow the current intensity to be increased or reduced at will. Below the switchboard is installed a "metronome," closing and opening periodically the current to be used for the treatment, and a special commutator operated by a small motor serves to transform the primary current into a rapid sequence of impulses.



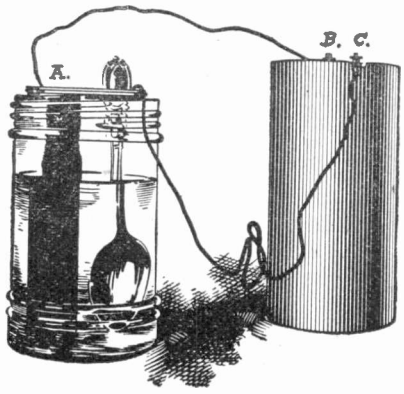
APPARATUS FOR TREATING OBESITY

This form of current is comparable in many ways with the Leduc intermittent current, and like this can be used to produce local or general anæsthesia. The anæsthetic effects of this form of current are always attended by strong convulsions of the muscles, the biceps being able to lift automatically loads of 25 pounds and more. The muscular convulsions of the whole body thus produced are not attended by any appreciable uncomfortable feeling. Under normal conditions, patients, when once used to "electrical work," feel especially well and inclined to further work.

Silverware Cleaned Electrically

Tarnish can be removed from silverware by the following simple electrical method:

Fill a two quart glass jar with water and add as much baking soda as the water



SIMPLE ELECTRICAL APPARATUS FOR CLEANING SILVERWARE

will readily dissolve. Add four tablespoonfuls of table salt.

Place a stick of carbon (A) in the solution and connect it by a copper wire to the center (carbon) pole (B) of a dry battery. The wire from the outside binding post (C) of the battery is connected by a piece of copper wire to the piece of silverware to be cleaned. The solution should not cover the copper wire where it is connected to the stick of carbon. Care should be taken to keep the carbon rod (A) and silverware separated from each other.

After the piece of silver is placed in the solution an electrolytic action is immediately set up in the jar. Allow the action to continue from one to five minutes. Then remove the article from the solution and dry. Rub it vigorously with a soft woolen cloth. The silverware will look like new.

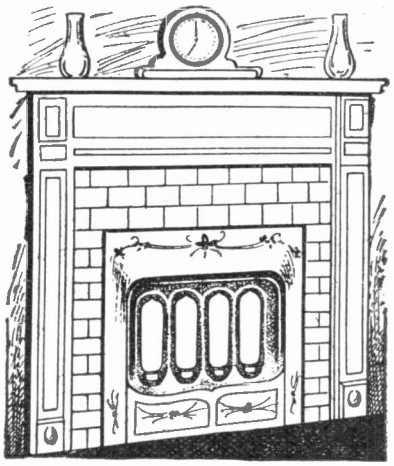
The carbon used can be obtained from an old battery, or an arc lamp carbon will work just as well as a battery carbon. The dry cell used in the circuit need not be a new one since the current required for the action is small.

Remodeling the Old Fireplace

A woman coming from the West to New England and now residing in Newton, Mass., spent just about five years wondering what she could do to add some sort of charm or use to what she terms the "soulless mantelpiece and affected chimney corner" so regularly found in New England homes.

When she finally found herself obliged to take a house having two of these objectionable features, she decided to overcome what to her was their falseness and to turn them into the real thing.

She produced two large sized electric radiators and had them fitted into the fireplaces. She found the completely



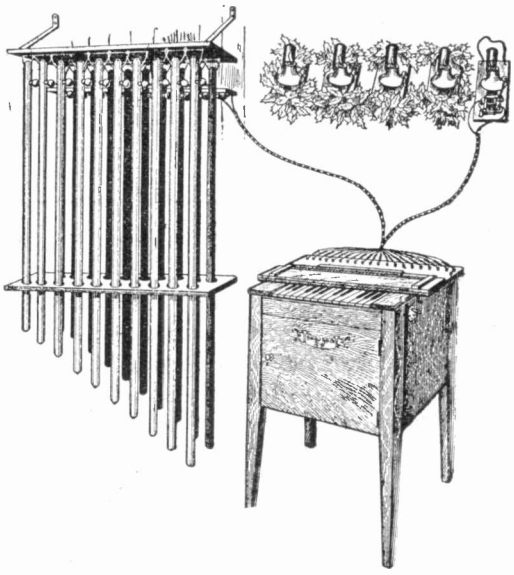
OLD FIREPLACE REMODELED

changed appearance which they presented pleased her fully as much as the real use which she now found for them — namely the function of taking the chill from the living room on cool mornings.

The first wireless message sent direct from the United States to Germany was sent on January 17th from Sayville, Long Island, and received at the Nauen tower near Berlin, Germany. The distance is about 3,600 miles. Heretofore it has been necessary to relay wireless messages to Berlin and other points on the European continent.

Theatrical Bells and Chimes

In the theater the old method of obtaining the chimes effect was to entrust to a "grip", or stage hand the duty of striking steel bars with any tool to hand, and the deep tones of the cathedral's chimes were frequently represented by



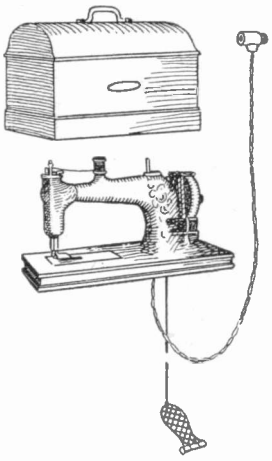
THEATRICAL BELLS AND CHIMES

the irregular strokes of an unskilled laborer, to the detriment of a scene in point of beauty and frequently in point of accuracy, as midnight in the old church tower was as apt to strike eleven or thirteen.

The Yerkes temple bells and chimes have changed this, placing the pianist in charge of this feature. A miniature piano keyboard, in which the pressing of a key closes an electric circuit, operates the chimes and bells. Twenty resonator bells ranging in chromatic intervals from low C to high G, are employed, these bells being mounted on felt covered oak circles, equipped with specially constructed vibrating magnets to which are attached hammers. The chimes consist of eighteen highly polished tubes of bell metal brass, mounted upon a stationary stand to which single stroke magnets are attached.

Traveler's Electric Sewing Machine

The illustration shows a specially designed motor driven sewing machine for use in small apartments and for travelers.

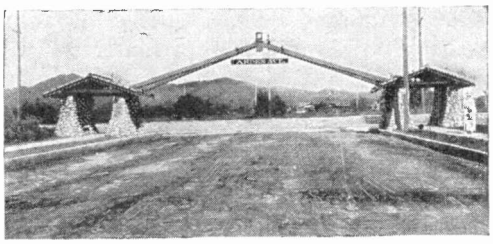


SEWING MACHINE FOR TRAVELERS

Its chief advantage is that it can be packed and carried in a small case like a typewriter, thus affording the woman who travels a sewing machine wherever electricity is available. The machine is fitted to a base and is secured to a table edge when in use. A pedal connected to a spring switch by a strap enables the operator to start or stop the machine by pressing or releasing the pedal. A cord and attachment plug go with the equipment.

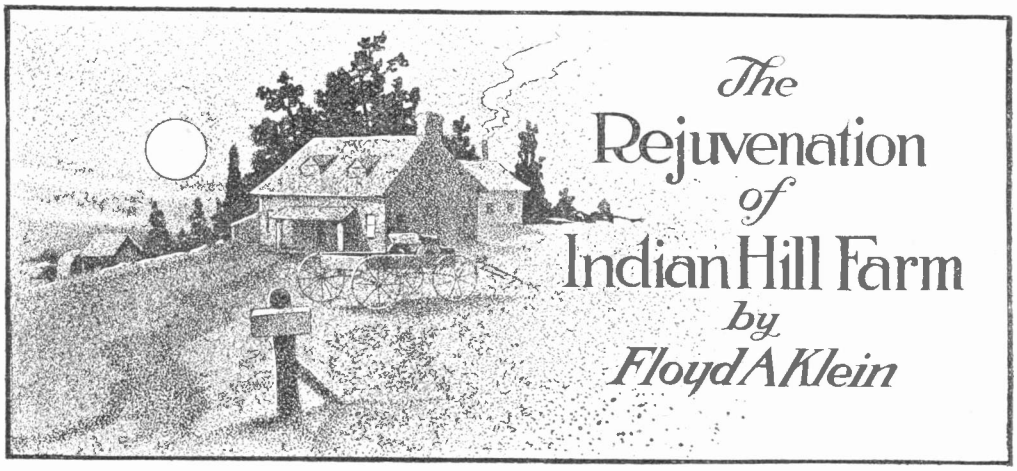
Novel Support for Arc Lamps

An effective and practicable way of suspending arc lights over a street is employed in a California city. Two neat rustic rest stations are located on opposite



NOVEL ARC LAMP SUPPORT USED IN A CALIFORNIA CITY

sides of the road and from them four supports are arranged as shown in the picture, the light being suspended from the apex as is also a sign giving the name of the intersecting street.



The Rejuvenation of Indian Hill Farm

by Floyd A Klein

Bartlett Lynch leaned back in his chair with the air of a man who feels the burden lifted from his shoulders. He was a good looking young fellow, well dressed and neat to an extreme. His unusually bright grey eyes were fastened upon a small picture of an old farm house which hung up over his desk.

Almost as by an inspiration he sat up straight in his chair, and after a second look at the picture, he turned to his secretary. "Gene, I have solved the vacation problem. I am going to run up to Indian Hill and see Uncle Josh. He will be glad to see me and I won't hear a word of business while I am gone. He owns the old place my father used to own—the place where I was born. Gee! How well I remember the old mill and the swimming hole, all the other things that a fellow never appreciates when he is young."

As he finished speaking, the door opened to admit the clerk from the outer office who brought in the morning mail. On top of the pile of letters was an unopened one. The address was written in a cramped hand which a writing expert would have said showed illiteracy and old age. Lynch discarded all the other mail and opened this one with haste. He perused its contents and then, turning to Gene: "Speaking of angels and hearing the flutter of their wings, listen to this."

Indian Hill. July 23, 1910.

Dear Nephew:

I take my pen in hand to let you know that we are all well and hearty except Ma who has the rheumatism just as she always had and I hope you are the same. Things have been goin pretty well here since I wrote you last and I have been able to get a little money in the bank. The girls and Ma are getting tired of the old place and they want to go to the city. They say the work is too hard for any use and I gess maybe it has been. Livin on a farm has never been an easy life for any of us.

George wants to get away. He says a young feller can't do any good on an old farm up here in this country and he is thinkin about goin out west where they run plows with trashin machine engines and cut the wheat with headers, so they tell me. So you beter come out, Bart, and spend a few weeks where you was raised. It would never seem the same to you after Ma and I and the girls get away and the place would get in the hands of strangers. Abe Slocum, you remember Bill Slocum's youngest boy, offered me $65 an acre for the farm if I would take his note for half of it. It don't look like a very good bargain to me but Ma is so crazy to get away that I may take it. You better come up Bart and see us before we move to the city. I have never been to a big city but two or three times and

I do not know just exactly what I will do when I get there. I expect I will be like a spring colt shying at an automobile.

Yours truly,

JOSH LYNCH.

"What do you think of that?"

"Well, it looks to me like your uncle was being forced out of the farming business."

"I do not see," said Bart, reflectively, "what he would do in a city. He isn't up to city ways. It would be the death of him, to sit around doing nothing. Well, no use worrying about the river till we get to it. I guess I will go down to Indian Hill for my vacation. You take care of things, Gene. I do not know just how soon I will be back, perhaps about a month. Good-bye." With this he was off.

One of the secrets of Lynch's success in his remarkable calling of "Business Doctor" was his ability to make up his mind on the spur of the moment, and his almost phenomenal insight seemed to direct him aright in every case. As he passed through the outer office he stopped at each desk and shook hands with its occupant and told him that he was going to take a vacation. "Gene will take care of things while I am gone, and I know you will serve him as faithfully as you do me. Good-bye."

* * *

A turn in the road brought the old water mill with its adjoining house into view. Bartlett Lynch had been born in this house and its dilapidated appearance startled him. The mill and the dam were in the same worn out condition. His father had been one of the influential men of the community in his time and the mill had been the pride of his heart as well as his greatest source of income.

"Another evidence of a lack of progress," he thought. A little farther on he passed through a gate opening into a shady lane and in a few minutes he surprised his favorite girl cousin by the orchard gate, trying to make a young calf drink milk from a bucket.

At the sight of him the calf was forgotten, as with a cry of mingled joy and surprise, she ran into his outstretched arms for an old time hug and kiss. This form of welcome was repeated when they got to the house and he met his aunt and the other two girls. His uncle and cousin greeted him no less cordially, although their display of affection was shown by a hearty handshake and a slap on the back.

After supper Lynch and his Uncle Josh strolled down the hill road again and discussed matters, pro and con. Josh told him all about the girls wanting to leave the farm and the discordant conditions they had brought about in the family. The old man was not critical of any one but himself and he seemed to feel that he was the cause of all the trouble.

Bartlett calmed the fears that seemed to be predominant in him and by skillful questioning ascertained that the old man had considerable ready money and that the sale of the farm and chattels would give him more. It was the thought of giving up the old place that worried him more than anything else. "If I could only use the money I've got to fix up the place so's Ma and the girls wouldn't have to dig so hard I think they would be willin' to stay," the old man said as they reached a point of the hill from which they could look over the valley.

Before them stretched a broad valley dotted with square patches denoting the locations of the different fields; and spots of color which told of homes. Almost below them was the old mill. Bart seemed not to hear the words of the older man as he talked on, but half musingly said to himself, "What a lot of power is going to waste there." With a start he came to himself and quickly grasping his uncle by the arm he said, "There it is. There it is. Don't you see it?"

"What do you see out of the ordinary?" the old man asked.

"The mill stream, that will solve your problem," he said with a laugh. "You

said a while ago that you were willing to spend money on the old place," queried Bartlett.

"Yes, I be," assented the old man.

"Well, I am going to spend it for you."

"Why you came up here to rest."

"Rest? Rest? Who wants to rest when there is a problem like this to be solved and with the answer written in the back of the book. You stand be-

"WE'RE NOT GOING TO THE CITY" WAS HER SHARP ANSWER.

hind me, uncle, and I will make Indian Hill Farm the talk of this country."

"I'll do it, my boy, if it busts the bank," the old man assured him.

A recent newspaper clipping on Bartlett's achievements had reached Indian Hill Farm and the old man had read it over and over. The article dwelt especially upon the fact that Lynch required perfect freedom from explanation of the way he intended to work in solving business difficulties and the old man had learned this lesson well.

The following morning the two men drove to town and while the elder man made arrangements at the bank for Bartlett to draw upon his account whenever he wished, Lynch, Jr., mailed a number of letters he had written and made arrangements with a concrete contractor to report at once with men and machinery at the site of the old mill.

Busy days followed. The old mill was wrecked and the remains of the dam torn away. The stream was diverted from its channel and in place of the old wooden dam a new concrete one was built. By the time this was done machinery had arrived and was being put into place by the electricians Bart had employed in the city. Wires were run from the new building, which took the place of the old mill, to the barn, the sheds and the house.

Finally, all was ready and they had a house-warming so to speak. Neighbors from far and near had heard that Josh Lynch was letting his city nephew spend a lot of money on monkey shines and they were glad of an opportunity to see what Josh was going to get out of it.

Bartlett knew the antagonism of the community to anything that seemed to be up-to-date, and he was glad to have them there when he showed his relatives that he had lived up to their expectations.

At four o'clock the crowd gathered around the site of the dam and Bartlett explained the workings of the small water turbine and its direct coupled dynamo. He then closed the gate which diverted the water through the turbine and the hum of machinery told them that something was happening, though most of them did not know what it was.

Bartlett led them up the hill to the barn, explaining in the meantime how the current was carried by the wires they could see leading to the buildings. Here he showed them how one portable motor could be belted to the feed grinder, corn sheller and threshing machine or moved out into the yard to operate a link belt elevator which carried the ground feed to the silo.

Outside the barn a force pump had been put into the old well and the water was pumped through pipes to the new water tower, 70 feet above the ground. This furnished sufficient pressure to

GEORGE DEMONSTRATED HOW ONE MAN COULD MILK SIX COWS WITH THE ELECTRIC MILKING MACHINE

distribute it all over the place and the farmer's envy of the city man's running water was gone.

In the cow sheds George demonstrated how one man could milk six cows at a time with the electrical milking machine and in the milk house Mary and Bess explained the motor-driven cream separator and churn. By this time it had become dusk and the electric lights were turned on much to the joy of Ma who had been filling lamps since the day candles went out of date.

On the way to the house Josh explained to his friends how the portable motor could be taken from place to place about the farm and work done with it even in the field. He also told them of the electric truck which would from then on do most of the hauling, and of the electric automobile for Ma and the girls, which had not been delivered.

In the house the women chattered over the motor-driven sewing machine, the toasters and irons, the hot plates and coffee percolator, while in the sitting room Uncle Josh turned on the electric radiator and the electric fan for the benefit of the men and showed them how the pneumatic cleaner would pick up the dirt from the floor.

Everybody stayed for supper and everyone had a turn at using the cooking devices. Staid old farmers were as tickled as boys when they were able to brown a piece of bread by simply turning a button.

After the meal all the girls had to use the electric curling iron, while the older women washed the dishes in the dishwashing machine.

The men sat around and smoked cigars which they lighted from an electric lighter Bart had bought as a special surprise for Josh.

All of them were loud in their praise of the new fangled farming and when they found out that the first cost was practically the last cost, they were very

urgent in their demands that Bart do as much for them.

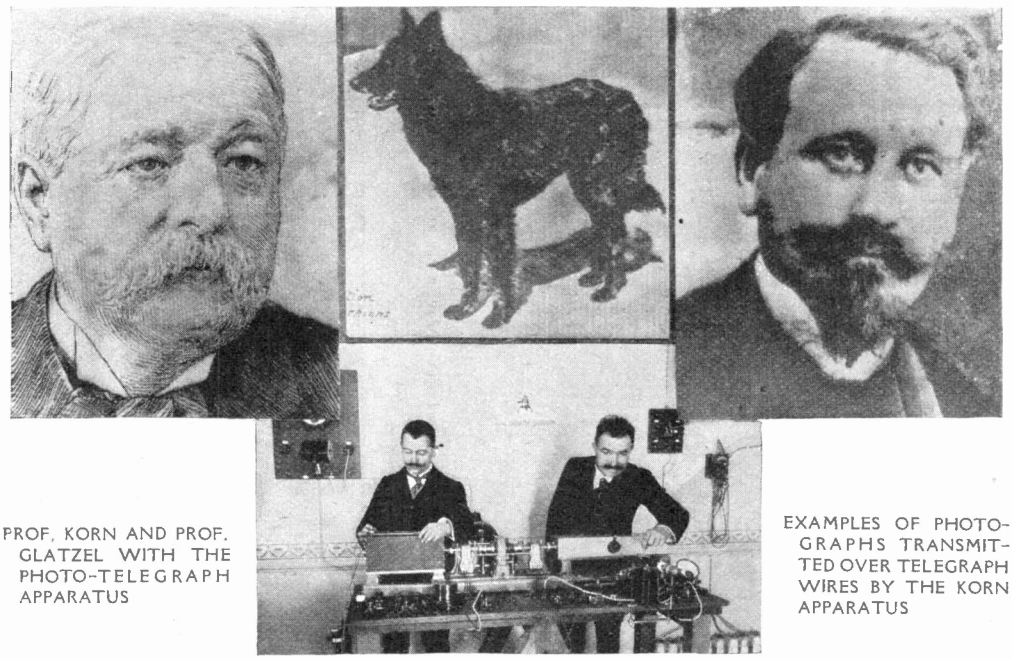
"You see how it is done," he told them, "and I advise every one of you, who has a stream with a fall, to follow Uncle Josh's example. There are men in the business of electrical fitting who would gladly figure out the method and cost for you. As for me, I have more commissions than I can take care of. This has just been a little vacation for me."

"Well, the next time you want a vacation you come to my place," one of the old men said.

"Maybe I'll have to if Uncle Josh moves to the city," said Bart with a sly glance at Ma.

Late Examples of Photo-Telegraphy

Prof. Korn, the inventor of a system of sending pictures over telegraph wires, previously described in these pages, has furnished us with some of the latest examples of his work, together with a photograph of himself and Prof. Glatzel at the apparatus — Prof. Korn is at the right.



PROF. KORN AND PROF. GLATZEL WITH THE PHOTO-TELEGRAPH APPARATUS

EXAMPLES OF PHOTOGRAPHS TRANSMITTED OVER TELEGRAPH WIRES BY THE KORN APPARATUS

One of the photo-telegraph pictures, a copy of a pen drawing, is the face of Camille Blanc, who is the proprietor of the famous (or notorious) gambling establishment in Monte Carlo; twelve minutes were required to send it. The picture of the dog shows the prize winner, "Grand Duc," at the Monte Carlo dog show, and took the same length of time to send. The third picture is that of Mr. Guichard, practically "Chief of Police" of Paris, although under the world famous Lepine, *Prefet de la Seine*. This took fifteen minutes to send from Paris to Monte Carlo; it was received at a quarter before eleven in the evening, and exhibited at once in the "despatch hall" of the Casino; being then of general interest, as Mons. Guichard was charged with unraveling the Garnier-Bonrad case.

Photo by Paul Thompson

NATIVE SONS OF THE DESERT STUDY TELEGRAPHY

The establishment of the new Independent Government of Tripoli by leader Sliman El Barouni has been taken up in a very earnest manner. No detail has been overlooked that is likely to mar the success of the establishment of the government on the basis desired by Barouni Bey, even to the education of telegraphers.

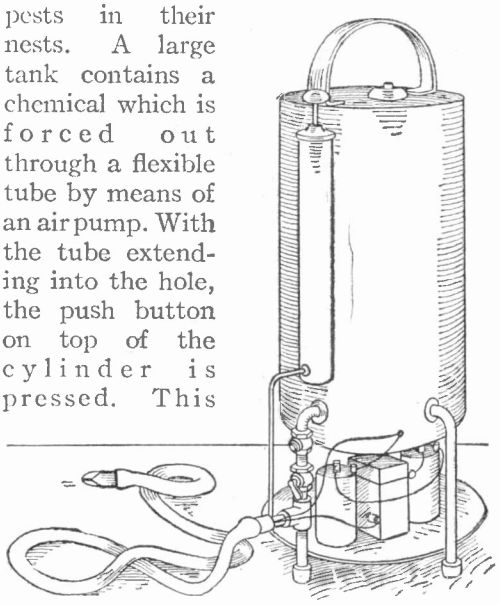
Our photograph shows the training school for telegraph operators for the new Independent Government of Hadji Djemal.

What Electrical Power will do on a Farm

The amount of power required to operate some domestic machines is small. A plant of sufficient capacity to operate one or two machines often makes it possible to use it for other purposes. Six horsepower will drive a grain separator and thrash 2,500 bushels of oats in ten hours; three horsepower will make 6,000 pounds of milk into cheese in one day; six horsepower will run a feed mill, grinding 20 bushels of corn an hour; five horsepower will grind from 25 to 40 bushels of feed, or ten or twelve bushels of ear corn an hour; seven horsepower will drive an eighteen inch separator, burr mill and corn and cob crusher and corn sheller, producing from twelve to fifteen bushels of feed an hour, and from five to eight bushels of fine meal; six horsepower will run a heavy apple grater, grinding and pressing from 200 to 250 bushels of apples an hour; five horsepower will drive a thirty inch circular saw, producing from 50 to 75 cords of stove wood from hard oak in ten hours; six horsepower will saw all the wood four men can pile in cords; twelve horsepower will drive a 50 inch circular saw, sawing 4,000 feet of oak or 5,000 feet of poplar in a day; ten horsepower will run a sixteen inch ensilage cutter and blower, and elevate the ensilage into a silo, 30 feet high, at the rate of seven tons an hour; one horsepower will pump enough water from a well of ordinary depth to supply a farmhouse and all the buildings with water for ordinary uses. The use requiring the largest amount of power must be considered in determining the size of the plant required in any particular instance. —*Water Power Chronicle.*

Rodent Exterminator

An entirely new device for killing rodents seems to have been hit upon by a California man, in that it is used on the pests in their nests. A large tank contains a chemical which is forced out through a flexible tube by means of an air pump. With the tube extending into the hole, the push button on top of the cylinder is pressed. This

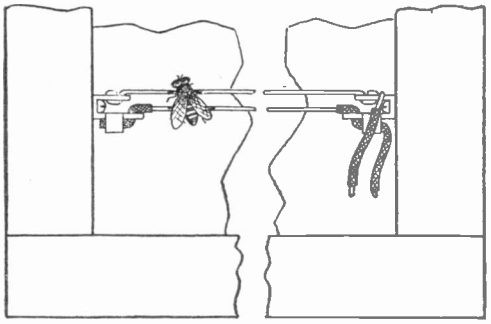


RODENT EXTERMINATOR

completes the circuit of the battery and coil, placed underneath the cylinder, causing a spark to occur at the nozzle tip exploding the mixture as it passes out of the tube and forming a gas designed to kill the rodents.

Window Fly Killer

Flies in a room seek the windows and crawl over the glass. Linking this trait with an idea for "swatting" them electrically an inventor places two parallel wires across and close to the pane and connects these to a strong induction coil. Crawling over the barrier causes the fly to touch both wires, closing the electric circuit upon itself.

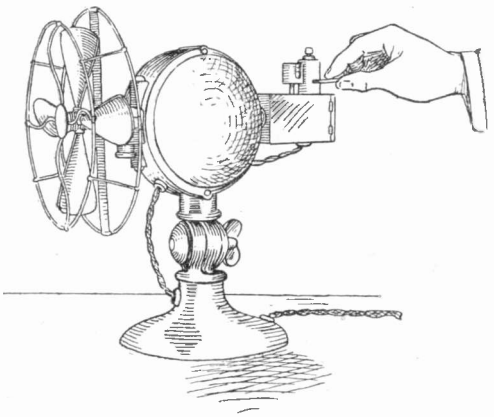


FLY KILLER

Prepaying for a Breeze

A coin-in-the-slot electric fan is the latest idea of an ambitious inventor guided perhaps by the forecast of Edison that we will one day shop by means of automatic vending machines.

The coin placed in the slot closes the motor circuit and remains in the contact jaws until a coin ejector, actuated at the end of a predetermined number of armature revolutions by a worm shaft driven



PREPAYMENT FAN

by the motor, forcibly removes the coin and drops it into the box thus stopping the motor. A means is also provided for the continuous operation of the fan by a coin magazine which automatically feeds the coins by the operation of a plunger as soon as the fan has turned the number of revolutions paid for by each coin.

Telephone Muffler

That the Kracker telephone muffler affords the business man the secrecy of a telephone booth is the claim for this device and it is small enough to be installed on the ordinary desk telephone.

The muffler is made of aluminum and is therefore extremely light.

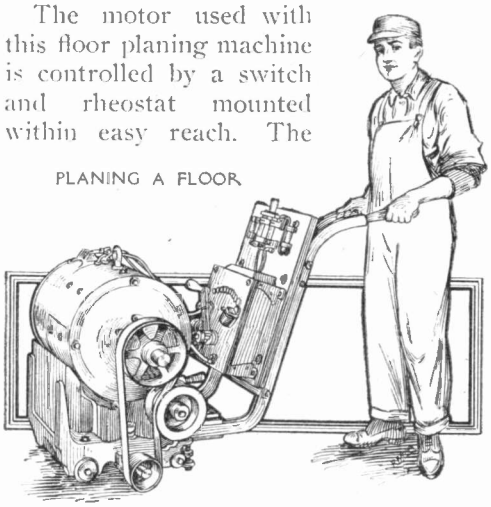
When speaking into the muffler, the sound waves, together with the air

TELEPHONE MUFFLER

expelled from the lungs, go forward, and are carried through a spiral coil of aluminum. This is non-vibrating and effectually prevents a person standing near from overhearing the conversation.

Floor Planning Machine

The motor used with this floor planing machine is controlled by a switch and rheostat mounted within easy reach. The

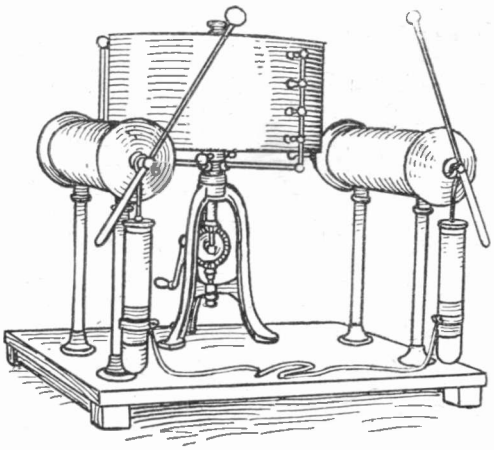


PLANING A FLOOR

motor drives the cutting cylinder containing the knives by a belt and idler and is of the entirely enclosed type sufficiently rugged to withstand the sudden and severe overloads imposed upon it when the knives strike hard spots and knots. The whole machine is mounted on rollers of hardened steel.

New French Static Machine

Most of us are familiar with the ordinary form of static machine embodying the great glass disks which revolve in a vertical plane. But the new form made at the Roy Court establishment, Ave. 'd Orleans, Paris, at first glance would hardly be recognized as a static machine at all. An ebonite cylinder takes the place

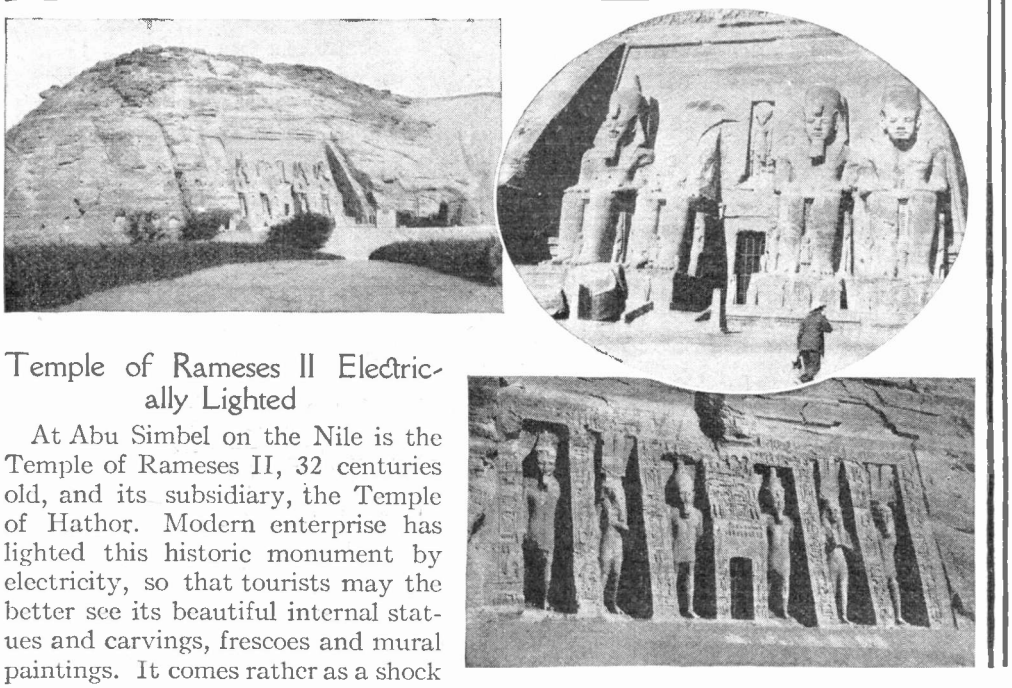


STATIC MACHINE WITH CYLINDER INSTEAD OF DISKS

of the glass disks. It has a large surface so that a powerful effect is obtained. In addition to other desirable features, it is provided with an electric heater, operated from the house wiring circuit, which warms the cylinder so that it can be operated in damp weather.

The Light of London

The location of every great city may be recognized afar off at night by the reflection of the sky, but the distance in the case of London is somewhat surprising. An instance is recorded when, in the spring, there was seen the reflection of the light of the British metropolis at a distance of 50 miles. The glow was rather more than two degerees in elevation, and stretched at least ten degrees along the horizon. It is assumed that it was due to reflection from clouds something over two miles high.



TEMPLE OF RAMESES II SHOWING THE FOUR GIGANTIC STATUES AND OTHER DECORATIONS

Temple of Rameses II Electrically Lighted

At Abu Simbel on the Nile is the Temple of Rameses II, 32 centuries old, and its subsidiary, the Temple of Hathor. Modern enterprise has lighted this historic monument by electricity, so that tourists may the better see its beautiful internal statues and carvings, frescoes and mural paintings. It comes rather as a shock to the sightseers entering this cool temple to face modernism pervading the subdued atmosphere of ancientism; yet without the electric lights much of the beauties of the temple would be hidden.

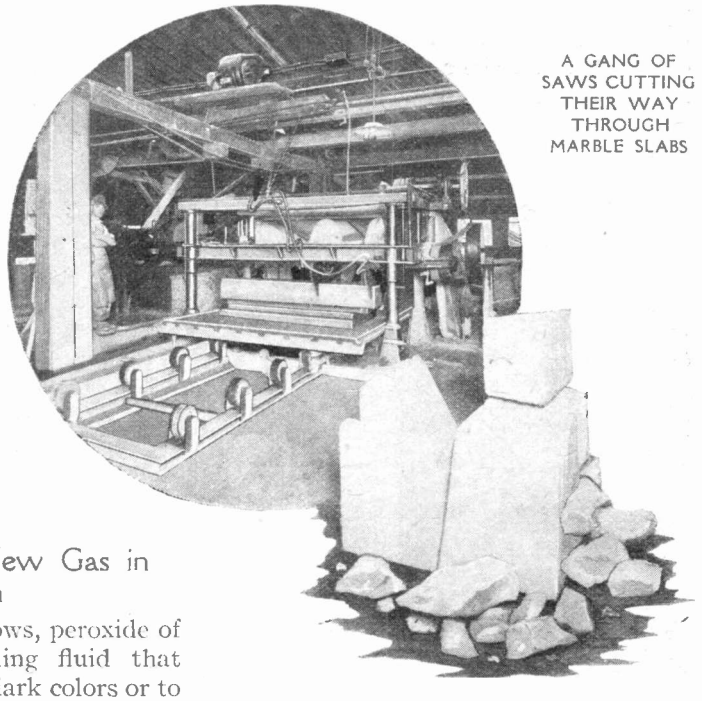
These two temples, built by the great Rameses II, are among the most stupendous monuments of ancient Egyptian architecture and challenge even the Sphinx, the Pyramids, and other gigantic edifices of Egypt proper. The larger temple is entirely excavated out of the solid sandstone rock, being dedicated to Ammon-re of Thebes and Re-Harakhte of Heliopolis, who were the leading deities of Egypt; but Rameses himself was also worshipped here. It was first discovered by Burckhardt in 1812, and in 1817 Belzoni freed it from its covering of sand. In 1844 Lepsius again laid it bare and Mariette in 1869, while in 1892 Captain Johnstone of the British Royal Engineers restored the façade and built two walls to protect it from the sand blown into it by the desert storms.

The terrace of the forecourt is embellished with rows of figures of captives and a cornice, falcons and small statues of kings. The four gigantic statues of Rameses II are hewn out of the cliff against which their backs are placed, and arranged in pairs on each side of the entrance to the temple. Each of the figures is over 65 feet in height and the workmanship is truly admirable, the faces being particularly life like. One of these figures has unfortunately lost its head and shoulders which now lie at its feet.

Inside of the electrically lighted temple are eight square pillars, supporting the roof, against which stand figures fully 30 feet high. The ceilings are adorned with flying vultures and the walls with stars, while the reliefs on the walls are still retaining their beautiful coloring and are of great historical value. This great main hall is 54 feet long and 58 feet wide. Adjoining it are smaller halls and apartments.— W. Robert Foran.

Sawing Marble

The extensive use of marble for lining corridors of office buildings and for other building purposes has brought about the use of modern machinery in the quarries and mills and electricity is largely the motive power. In the picture is a twin saw and table used to cut blocks of uniform size from the rough pieces of marble. The block on the table has already been trimmed to a long rectangular shape and is being cut into blocks of shorter length. The hose running to the edge of each saw carries water which is constantly played upon the part of the marble being cut.



A GANG OF SAWS CUTTING THEIR WAY THROUGH MARBLE SLABS

Electricity Shows New Gas in Hydrogen

As every schoolboy knows, peroxide of hydrogen, or the bleaching fluid that everyone uses to remove dark colors or to make blondes grow where brunettes grew before, differs only from ordinary water by having an extra atom of hydrogen. That is to say, water has two parts of hydrogen gas to one part of oxygen gas, while "peroxide" has an extra part of oxygen gas in its make-up.

Some fifteen or more years ago it was not known that the air contained other gases than oxygen, nitrogen, and traces of water vapor, hydrogen, carbonic acid and the like. But Sir William Ramsay, the eminent English physicist, came along and discovered a half dozen hitherto unknown gases in the air. Their names are argon, helium, Xenon, neon, and so on — none of them overly hard to remember.

Two colleagues of Lord Ramsay now come to the front with a discovery about the presence of the gas, neon, in supposedly pure hydrogen gas. They do not state that they split the element hydrogen up into another element, but they show that by passing an electric discharge through the hydrogen at very low temperatures, neon is evolved.

Professor J. Norman Collie and Mr. H. S. Patterson, the physicists mentioned, conclude that neon cannot be obtained by heating from either the glass vessels in which they found it or in the electrodes used. Nor was the neon found due to the air leaking into the pump or the apparatus in the course of the experiment.

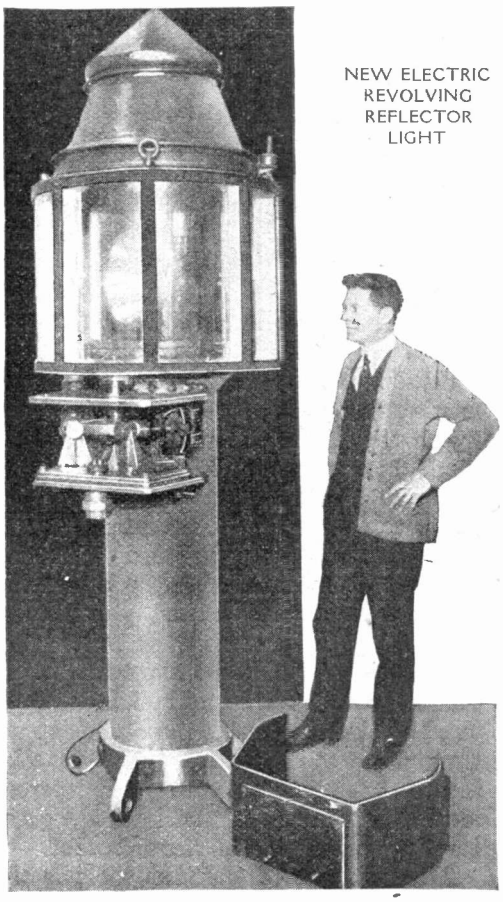
To be sure that the newly obtained neon came from pure hydrogen gas and nowhere else, they heated glass to its melting point, passed cathode rays through it and in various ways tried to find or to force neon and helium through it. Then before passing the electric spark through hydrogen and oxygen—the elements that make up water and "peroxide"—they investigated these gases carefully and found no neon present.

They discovered then, as soon as the

electric discharge was flashed through the glass tube, the presence of both helium and neon. Then they asked themselves the question, "Where in the wide world did these two new gases come from?" And modestly, without guesses or theories, they answer, "We do not know." Whether they are newly found elements, new discoveries about the lack of simplicity or elemental nature of hydrogen, they refrain at this time from saying.

Revolving Electric Reflector Light

We present herewith the first photograph of the electrical novelty, a revolving electric reflector light, the invention of Mr. George Warrington, the superintendent of naval construction, United States Government Bureau of Lighthouses. The first installation has been made on board the Bush Bluff Lightship which is maintained by the Federal Government in the Elizabeth River at Norfolk, Va.



NEW ELECTRIC REVOLVING REFLECTOR LIGHT

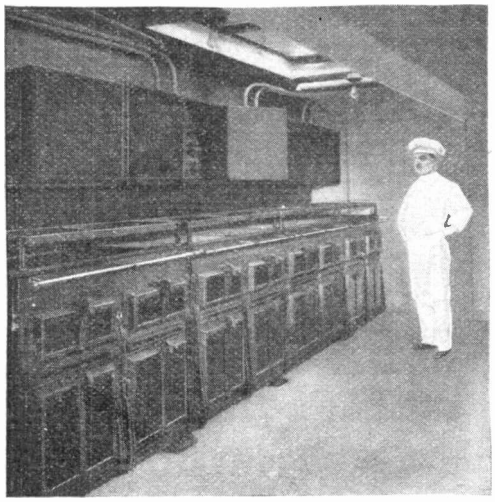
One of the most notable of the several novel features embodied in this new "beacon of the sea" is found in the concentration of the filament in the lamp, which has a mean spherical candlepower of but 30.2. In other words a 30 candlepower lamp affords an illumination that is so concentrated by means of reflectors as to yield an illumination in a certain direction of more than 100,000 candlepower. The lamp, which has a four foot lantern, is revolved (thus making a flashing light) likewise by electric power.

Another distinctly new departure is found in the arrangement whereby the current for both illumination and the operation of the revolving mechanism is supplied from a remarkable storage battery which is of capacity sufficient to enable the operation of the light for 21 nights—averaging ten hours per night—without recharging.

Electric Range for the Galley of a Warship

A new type of electric range has been installed in the galleys or kitchens of the latest United States battleships and is proving so efficient that similar apparatus will be installed in all the battleships now building or projected.

Whatever the increased cost of the electric range, it is more than justified in the eyes of the naval officials by its tremendous advantages. For one thing, the electric range can be placed to better advantage than the coal range, there being no smokestack to be provided for. Secondly, there are no ashes to be disposed of. Then the electric range is only in use when food is being cooked, so that there is less stray heat. Furthermore, there is no "banking" of fires. And, in the case of our newest battleships, which will use oil fuel exclusively, the electric

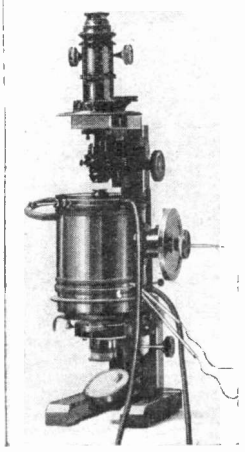


A BATTLESHIP ELECTRIC RANGE

range is almost a necessity, as were a coal range used it would be necessary to carry on board a special supply of coal for this one use. Finally, with the electric range there are avoided those gases given off by coal which mingle with the food and do not help the flavor.

Furnace and Microscope in One

One of the most interesting microscopes ever invented and the only one of its kind in the world has just been perfected by Dr. Wright of the Carnegie Institute at the Geophysical Laboratory near Washington. It is an electrical furnace and microscope combined and was built in the machine shops of the laboratory.



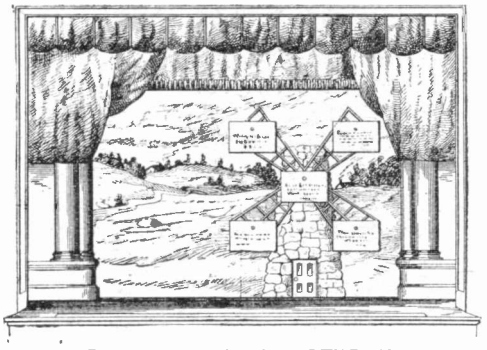
MICROSCOPE AND FURNACE

The object for which it is intended is the examination of metals and rocks at an intense heat, in a condition similar to that which existed at the time of their formation by Mother Nature in the earth.

In order to study the behavior of metals and stones in a molten state it was necessary to subject them to a heat which would melt almost any substance and ruin the microscope itself. Hence a plan was devised by Wright which allows an inconceivable heat to be used, but the machine, other than the oven itself, is kept cool and no high temperature interferes with the microscope. This is done by having a metal hollow jacket, through which water continually circulates, surround the electric furnace. The little furnace is about two inches long and half an inch thick, hollow at each end and with an opening in the center at one side. The furnace, which is made of corundum, is placed within the water, cooled jacket and a temperature of 1,600° C., far above the melting point of gold and silver is obtained.

Moving Advertisements on Theater Curtain

In order to attract the attention of theater audiences to the advertisements usually painted on the curtain John C. Taylor of Baltimore, Maryland, has designed and patented a motor operated



THEATER CURTAIN ADVERTISEMENTS

windmill upon the vanes of which are hung the "ads." so pivoted that they always remain vertical. The motor is controlled automatically by means of a switch which is operated by the curtain.

Amusing Stunts at

The "Big Circus" was the feature entertainment offered the delegates of the National Electric Light Association during the annual convention, June 2d to 6th, in Chicago.

Under the joint auspices of the Electric Club of Chicago and the Commonwealth Edison Company N. E. L. A. Section, 250 of the Edison employees so perfectly burlesqued a regular circus that many of the spectators asserted that the acts staged must be the work of professionals.

"He must be a real ringmaster hired for this occasion," exclaimed one.

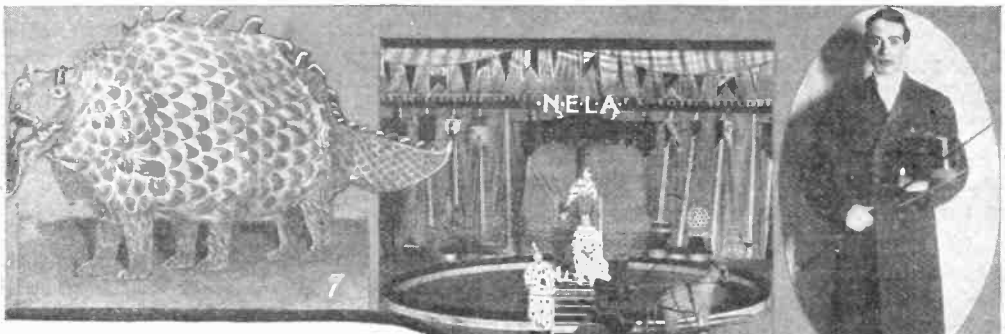
"I can't believe those acrobats are amateurs," said another.

"That slack wire artist is probably with some regular show," confidently remarked a third.

And so thought the larger portion of the spectators and they felt this belief steadily confirmed through to the grand finale, led off by the dancing of graceful Mlle. Edelman, the flower girl.

The fact, however, that all persons connected with the production, from the ringmaster to the 75 piece orchestra, are employees of one organization is a

(1) Clowns and Ponies. (2) Gypsy Maid and Trained Bears. (3) Jumbo, Lady Jumbo and Ditto. (4) Alex - Sam - Dow. (5) Chantecler and Baby Tiger. (6) Convention Camel.



the Electrical Circus

pertinent one and affords the out-of-town visitor a study in loyalty and spirit worth thinking about.

During the day those who took part are scattered miles apart, at work in the various departments of their company. The drill and practice after hours necessary to put on the circus was a voluntary offering of employees that they might show the greatest of national electrical organizations the meaning of the word loyalty—and they did. It was not forced loyalty nor the kind beginning at 8:30 A. M. and ending at 5:30 P. M.—a watch-the-clock sort—but the kind worthy of the best efforts of the management of any company and the best evidence of a company's generous treatment of those it employs.

The menagerie drew heavily upon the dry goods store, the furrier, the feather factory, etc., and there was small doubt in the minds of the spectators that animals sometimes act like humans.

"NELA," the six-legged, fire dragon, probably excited the most interest. The monster, flashing eyes of green, then red, then white,

(7) NELA, Six-Legged, Fire-snorting, Antedeluvian Dragon. (8) Circus Ring. (9) Ringmaster. (10) Bull Moose, Camel and Polar Bear. (11) Signorina Harrietta and Her Ferocious Pets. (12) Indian Maiden, Buffalo and American Indian.

with swaying tail tipped by a red incandescent lamp, would cause the most hardened meter reader to faint if encountered after dark. It was rumored that the beast would be used to draw one of the Specials back to San Francisco.

The whole show was a splendid human-interest thing, act by act, concluding with the pyramid of singers clad in white—unforgettable because of its beauty as the spotlight played everchanging colors upon it.

A Little Madame Curie of the Wireless

During the Ohio floods a little Cincinnati girl, thirteen years old, sat before a wireless apparatus, which she had installed in the kitchen of her home, and received S. O. S. messages from flood-bound cities. The fact became public several days ago when Alice McConaughy, daughter of National Bank Examiner R. C. McConaughy, was officially notified that she had been granted the first license to operate a wireless on the Great Lakes under the new Federal law. The notification, sent by Radio-Inspector Dillon, of Cleveland, was addressed to "Miss Alice McConaughy," whose age was given as eighteen. But there is no Miss McConaughy. There is just thirteen-year-old Alice, pupil of the seventh grade in the Madisonville school.

"Do you think that they will take it away from me again when they find out that I am just a school girl?" queried Alice anxiously when notified of her appointment. "I put down my age correctly on the paper—thirteen. They must have mistaken the figure. It won't make any difference, will it, as long as I can operate all right?"

Reassured, Alice explained how she came to apply for a license. "I wanted to be a regular government station and you can't be that without a license. So I just sent to Cleveland for the blanks and filled out the examination questions. It was easy," she said.

Six months ago the girl installed her

ALICE McCONAUGHY AT THE KEY

wireless outfit, one of considerable size, in the kitchen of her home. Part of the apparatus is an aerial 50 feet high, with four wires.

"Who built that?" she was asked. "I did," was the offhand reply. "I can climb pretty well."

With her apparatus the girl stated that she can reach probably as far as Columbus, 120 miles away. "It is rather hard to tell just how far one can reach," said she, "but I have reason to think that I have gotten to Columbus. I got messages from as far as Xenia during the flood."

Instead of dolls, Alice used to carry around electrical toys when she was still in the doll-baby period. Since then her interest in electricity has strengthened constantly. She expects to elect physics and civics as her preferred studies when she enters high school.

So far Alice has not received the official number of her station. When she does she expects to spend the greater part of her time at her apparatus, receiving and sending messages. "Yes, I would like to be a regular operator when

I grow up, but first I want to see the system further developed. I want to study things out for myself," said Cincinnati's little Madam Curie of the wireless.

Studying European Safety Methods

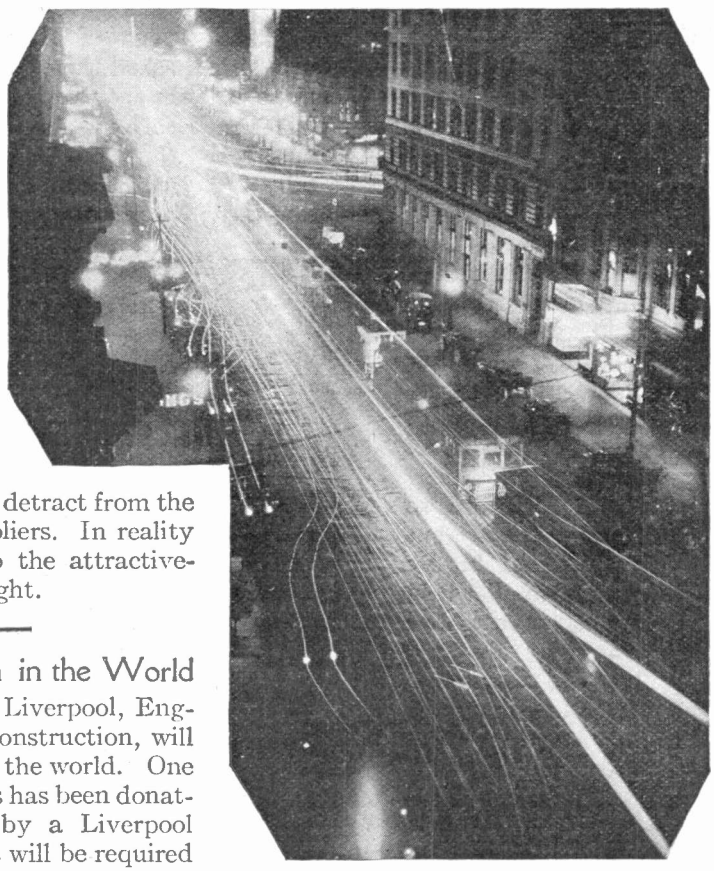
Arthur Williams, President of The American Museum of Safety, was among the passengers who sailed June 5th on the "France." He is visiting the well-known museums of safety abroad to study how the European employers are cutting in two their accident and death rate in industry. The results of his trip will form a noteworthy feature of the first international exposition of safety and industrial hygiene held in America, which will take place in New York City during the latter part of this year.

The Signs of Oakland

In Oakland, Calif., the regulations covering the installation of electric signs are very lenient. The photograph reproduced herewith, through the courtesy of Mr. William H. Gregg, attracted a great deal of attention when exhibited in that city and is an admirable illustration of the fact that signs suspended over sidewalks do not detract from the effect of the street electroliers. In reality they add a great deal to the attractiveness of the street by night.

Largest Church Organ in the World

The new cathedral at Liverpool, England, now in course of construction, will have the largest organ in the world. One hundred thousand dollars has been donated for the instrument by a Liverpool merchant, and four years will be required in which to build it. To its intricate mechanisms electricity will be applied as to no other instrument previously constructed. According to the builders, Henry Willis and Sons, London, organists will find the instrument easier to manipulate than many of half its dimensions. It will have an aggregate of 215 draw-stops; the largest existing organ, except the one at St. Michael's, Hamburg, is in the town hall of Sydney, Australia, and has 144 draw stops. There will be five keyboards and the action throughout will be electro-pneumatic and tubular-pneumatic, with seven separate blowing installations, each electrically operated. Electricity will be utilized to a remarkable degree in replacing former methods of control and in giving the organ additional resources in musical sound, such as have been realized in no other instrument.



ONE OF OAKLAND'S PRINCIPAL STREETS AT NIGHT

The Great Munsterberg and the Telephone

Down in Cincinnati, recently, the renowned Dr. H. Munsterberg was telling of his experiments along the line of what he has predicted as the great science of the future — taking the individual and discovering by simple psychologic tests whether or not he is naturally fitted, or, as one ordinarily puts it, "cut out for," the position for which he intends to apply. Among other vocations the doctor turned to that of the telephone exchange operator. "Undoubtedly," the doctor stated in his *patois* English, "we have a great number of incompetent telephone operators.

"Although you might not, at first glance, consider it such, using the 'phone implies a very complicated piece of work for the mind. In making a single connection at the exchange, the telephone girls have to go through not less than fourteen psychological acts. Despite this, 180 calls an hour is averaged in many cities, and occasionally a girl will handle fully 250 calls during the rush hours of the day.

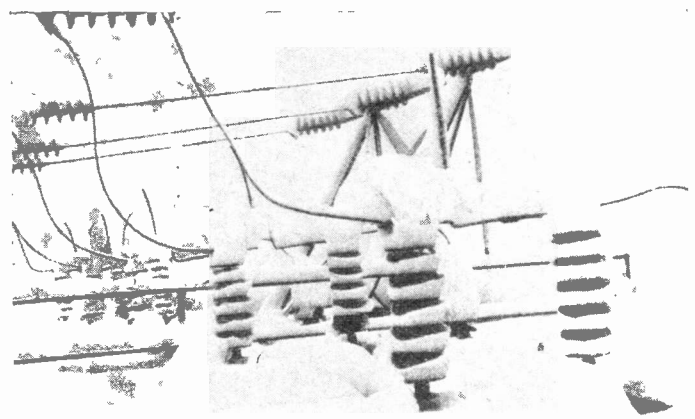
"It is obvious, therefore, that for this kind of work we need a girl of very quick mental activity. Really very few minds are fitted by nature for this sort of work. A very great number of girls are not.

"Which girls are so fitted and which are not is usually found out by entering the applicant in one of the city telephone schools, which are kept up by the company. There, for a given stretch of time, these girls are trained, or taught in the work. If, then, it is found that they can't do it, they are dropped. The training they have received and on which they have wasted their time is of absolutely no use to them in any other line of work. Telephone officials say that about three-fourths of those entering such schools are thrown out.

"Just recently," he continued, "I made experiments in a 'phone exchange with a company of girls, newly entered in the school. I watched the girls at their work and I brought down what seemed one process to eight or nine physchological processes that I could test. I then made several tests and found that what a telephone girl needs most is endurance of attention. Attention must be kept at a high pitch for a long time.

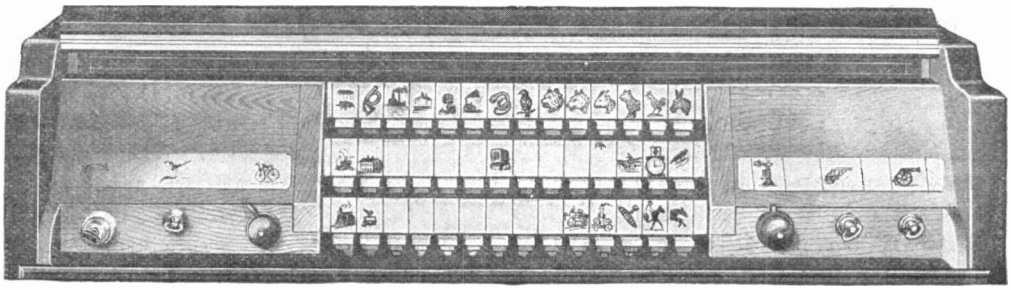
"How then, among a group of novices, would we find which girls were fitted to become telephone operators?

"I gave 30 or 40 of the girls the first page of that morning's paper and I asked them to cross out every letter 'A' in the text, as they read. At the end of each minute a bell signal was given and they put a line mark wherever they might be at that moment. The day's paper was used purposely, since the cur-



SEVERE OPERATING CONDITIONS

Those familiar with the difficulties attendant upon the proper insulation of a 110,000 volt line will be astonished at this picture. It shows a line of the Great Falls Power Company, Butte, Montana, working successfully under the above voltage and with the insulators literally covered and heaped up with snow.



KINEMATOPHONE

If you could hear the singing of the birds, the braying of the mule, the roar of the train and the patter of the horse's hoofs as you gazed at these things in a moving picture show the picture would seem more real. Gaston Anchini, according to *Music Trades*, is the inventor of a machine for getting this realism. There is a keyboard of more than 50 keys. Above each key is a picture representing the sound that particular key will give. By pressing proper keys almost any sound needed in accompanying a moving picture film can be obtained. The machine, called a Kinematophone, is run by electricity and may be so placed that the pianist can operate it.

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rent news in this would be the more apt to distract. At the conclusion of the stated length of time the papers were collected and a count was made.

"The results were interesting:

"Some of the girls, it was found, scored practically perfect during the first or even the second minutes. Beginning with the third minute, however, the attention began to flag, and from then on they began to omit some of the letters.

"In other cases, girls were very poor at the first, but after the third and fourth minute they had grown more used to the work and were splendid workers thereafter, every single 'A' being cared for. Still other girls varied otherwise: for two or three minutes they gave good attention; then for two or three minutes poor. As result, there was a very wide variance in the value of their work.

"Out of all this the investigators made 'inteligence tests'; then tests of the memory and of exactitude. There were other tests as to influence from without and the quickness of mental connection.

"From all these they found how each girl would average on *all* the tests, and this was then taken to represent the standing of that girl and her proper rank among the rest for position."

Price Tags on Motor Board

In the electrical toy department of a large department store is this ingeniously devised board for demonstrating electric motors. In front of each motor is a small, low voltage, incandescent lamp about one inch in diameter with the price of the motor painted upon the glass. A transformer is used and the

A PRACTICABLE COUNTER DISPLAY

lights are kept burning all the time. Push buttons enable the salesman to run any motor and light its lamp.

Interesting Facts About Moving Pictures

By CHAS. E. NIXON

The growth of the moving picture business within its brief life of ten years is something that smacks of magic. It is authoritatively estimated that over $200,000,000 is now invested in the moving picture industry. From merely a crude and simple toy it has eventuated a business vast in its ramifications. It has become in reality a new art and immensely popular as a legitimate amusement all over the world. It lagged through a half-hearted, hesitant stage with much patience, persistence and artistic sagacity back of it, until it emerged successfully into full panoplied life, with business acumen to systematize it and make it a mighty factor in wholesome, diverting amusement and as a medium of education whose potentialities have been barely touched.

Thomas Alva Edison declares it is to be the great future force in molding the youthful mind, and for storing those of older growth with all the things that make the body rich. What the Wizard of Menlo Park and his associates have done toward standardizing the photo-play in the East, William N. Selig and his associates have done in the West.

Five years ago the picture play was a raw product, a flickering crudity, painful to the eye, palling to the imagination. Just as Elias Howe put an eye in the business end of the sewing machine needle, so the genius of Edison perforated the edge of the picture film to keep the plane of its moving surface taut before the electric arc and banished forever the hateful blotching and blurring of the moving picture, that almost made it die a-borning.

Mechanically this was a most vital improvement. While the makers of films have expended vast sums experimentally to perfect every detail of the work mechanically both in the mirroring, the making and the protection of the pictures, they have been equally assiduous in bettering the product to make it conform with the strict letter of the law vested in the National Board of Censorship (the only form of art commercialized or otherwise that voluntarily submits to such dictation), and have been liberal in expenditure to enlist the best pens of the time to provide scenario subjects, together with the best histrionic and pantomimic talent to illustrate them under the judicious guidance of the greatest producers. Public prints have harped continually upon the profits derived but they seldom take into account the enormous expense involved in the building of new plants all parts of which must of necessity be newly created to meet growing emergencies.

Ten years ago there were a few traveling companies working fairs and carnivals with moving pictures of civic parades or crude comedy scenes and distorted attempts at drama, all having about the same relation to art that the poor players had in the Elizabethan age when actors were set down as strollers and "vagabonds." Then the picture films were flickering uncertainties ranging from 50 to 300 feet in length at most.

Five years ago there was a change for the better in the multiplied activity and artistic values of the photo-play, but it was a sort of miscellany unsatisfactory to the public and constantly encountering criticism of the press for its offenses.

The organization of the Motion Picture Patents Company enlisting the largest producers of the country for intelligent, serviceable co-operation, brought order out of chaos, eliminated the meretricious elements and established a status for the business that was joyously recognized and highly approved by the public. Great plants were erected with all the involved and expensive appurtenances for getting and giving the best

scientific results for pictorial representation or instruction.

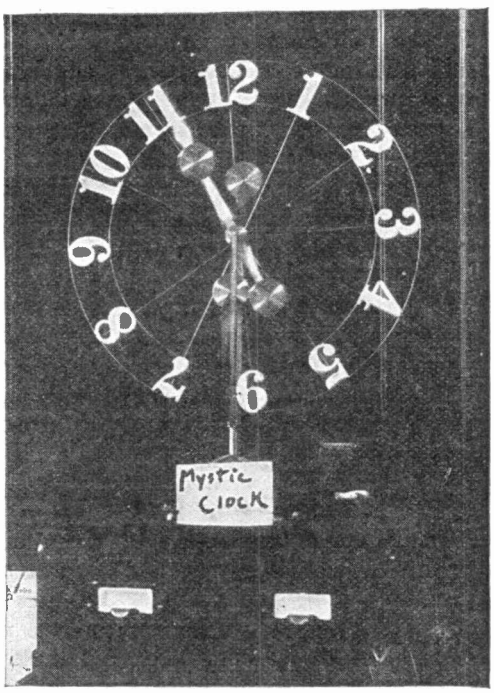
Where there were dollars invested ten years ago, they had increased to thousands a few years later, and now they have multiplied to millions. The few operators of the primitive period have become magnates, and their traveling companies and experts are working all over the world.

There are many processes for developing and treating these films. They can be tinted but retouching is next to impossible. All films are made in duplicate. In the Selig plant three pictures are made of the most important scenes by three instruments working simultaneously, and the greatest care is exercised to have these pictures free from mistakes and from the accidental "butt in's" of outsiders. Inaccuracy in photography cannot be rectified. The film must be used as taken. As previously remarked, films varied from 50 to 300 feet in length. The standard footage of a film is 200 feet, but the majority of picture subjects occupy at least a thousand feet or five film lengths spliced together.

The average cost of an ordinary film is reckoned at about a dollar per foot, but in the making of special subjects in three reels the cost sometimes advances to from $8.00 to $10.00 per foot. The "Coming of Columbus" reached the latter figure. The reproductions of "The Two Orphans," directed by Kate Claxton, and the great fairy play of Harry E. Webster, "Cinderella," with Mabel Taliaferro in the title rôle have been most expensive. The Selig Company for example, has several animal plays in which valuable lions, lionesses, leopards and tigresses have been vicariously sacrificed to meet the demand for realism. "Alone in the Jungle," "Back to the Primitive," "Captain Kate" and "Kings of the Forest" are all admittedly great animal pic-pictures and vast distances are traversed. many people employed and great expense is involved in securing all such productions.

A Mystic Clock

This mystic clock has no face, gears, nor visible works of any kind. The numbers for the different hours are supported by a light brass framework, with no connection to outside works. The hands of the clock are perfectly free to revolve about on the pivot to which they are hung. Being unobstructed by the usual gears, the hands can be spun about like a band leader's baton. And unlike the usual geared timepiece, the hands

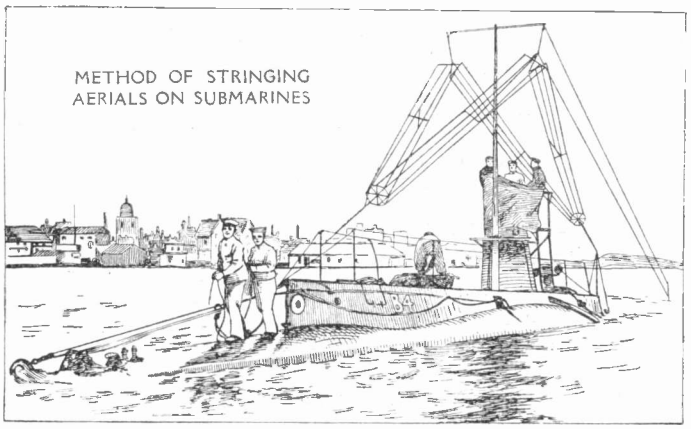


THE MYSTIC CLOCK

when undisturbed for a short time will invariably indicate the correct time. It makes no difference whether the hands be set for the right or wrong hour, as invariably they soon right themselves automatically.

Many explanations have been suggested to account for the operation of the hands, but the most probable one seems to be in the presence of an electro-magnet that exerts an influence on magnets enclosed in the brass counterweights on the hands.

Wireless on Submarines



METHOD OF STRINGING AERIALS ON SUBMARINES

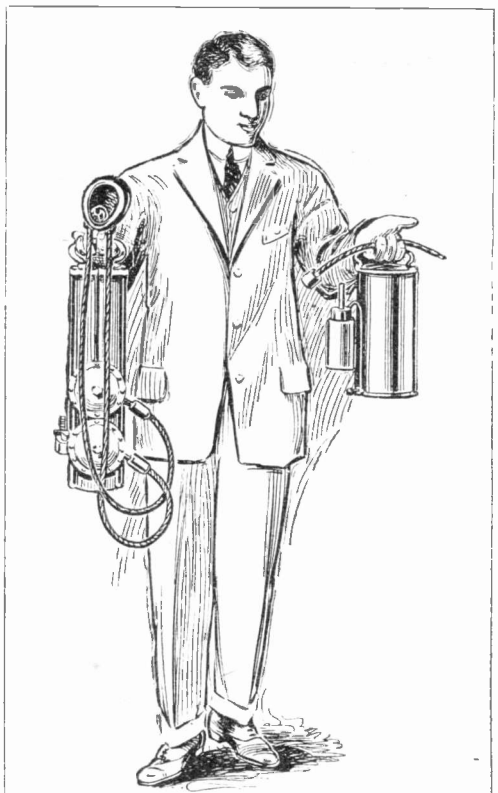
No little ingenuity is necessary in disposing of the aërials on a submarine owing to the restricted space. It is desirable to get as much capacity at the top as possible in order to give the waves a good send-off. An inverted V-shape has been adopted by the British navy as shown in the accompanying sketch, being supported at the apex by a mast and attached to end posts at the bow and stern.

Every ship in the British navy is now fitted with wireless. The Admiralty has an antenna and station above the building at Whitehall, by means of which the movement of the war fleet can be controlled without any delay whatever. All the submarines have been included in this scheme and are now fitted with the latest wireless apparatus on the Marconi system.

The Lungmotor

The Lungmotor is one of the most recent devices for saving life in cases of electric shock, asphyxiation by gases, etc., by producing artificial respiration. It is a manually operated, two cylinder, air pump, and with it is supplied an oxygen generator. An upward movement of the handle of the Lungmotor fills one cylinder with air or oxygen or a mixture of both according to the setting of a valve in the base. At the same time the other cylinder fills with the expired air drawn from the lungs of the patient. With a downward movement of the handle the air-oxygen is forced into the lungs and the expired air in the second cylinder is discharged into the open.

To make the Lungmotor available for persons of all ages and varying lung capacities an adjustment for different air volumes is placed on the top of the device. The respiration per minute can be varied and the proportions of air and oxygen regulated at will. Also inspiration may be caused without forced expiration and expiration without forced inspiration.



SHOWING THE COMPACTNESS OF THE LUNGMOTOR

Oxygen compound in cans is placed in water inside the generator and oxygen is produced somewhat as acetylene gas is generated by placing carbide in water.

Curious Experience with an Electro-magnet

A curious incident occurred recently in a German workshop. A chain fastened firmly to the ground and having at its free end a ball of iron came within the influence of a large lifting magnet attached to a crane. The ball at the end of the chain was lifted from the ground and when the magnet was raised sufficiently to leave the ball suspended in the air, the chain was found to be so rigid that a workman was able to climb the full length without bending it in the least.

CHAIN AS RIGID AS A BAR

The Optophone

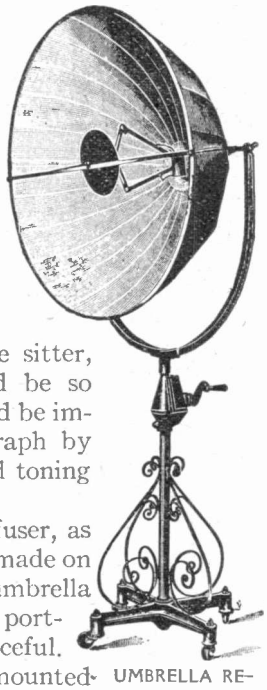
An instrument has been invented in Germany which gives to the blind the power of distinguishing, by means of the ear, differences in the intensity of the light. Its principle is as follows: Two selenium elements are connected with two graphite resistances, and the whole is arranged as a Wheatstone bridge. A regulating resistance of manganin, which is an alloy of copper, manganese and nickel, is inserted between the two graphite resistances, permitting the equilibration of the two arms of the bridge. A current passing through the arrangement is interrupted ten times per second by a clockwork mechanism; it can consequently be observed by means of a telephonic receiver.

As soon as one of the selenium elements receives an increased quantity of light, the fact is immediately indicated by the receiver.

With a tension of about four volts the sensibility of the instrument is sufficient to enable the user to distinguish the ordinary changes in the intensity of daylight. During the night the flame of a candle or of a gas burner can be detected at a distance of 60 feet. Experiments made at the Royal Institution for the Blind at Birmingham, England, have demonstrated the practical utility of the instrument.

Umbrella Reflector for Photographers

The "umbrella" electric light reflector apparatus is a recent English production. Every photographer, owing to the increased application of the electric light in his manifold operations, is now well aware of the powerful photo-chemical properties of the arc light, which is the best substitute for daylight. Should the rays be allowed to fall direct upon the sitter, the shadows would be so intense that it would be impossible to photograph by them and they need toning down.



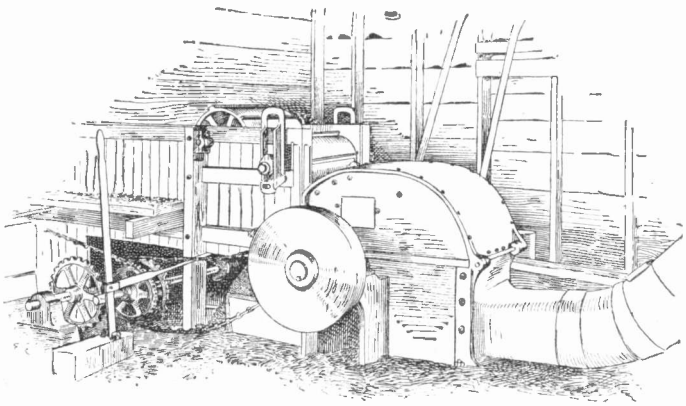
UMBRELLA REFLECTOR

The umbrella diffuser, as its name implies, is made on the principle of the umbrella and is thus light and portable as well as graceful.

The arc lamp is mounted at the center, and opposite the arc is a round shield for cutting off the direct rays, so that only the reflected light is used.

Cutting Alfalfa by Electricity

Alfalfa, because of its value as a stock food and because it can be cut two or three times a year, has become a most important crop. It is generally used as a basis for stock food, often cut small and mixed with waste syrup and beet pulp from sugar factories, or with grain or other ingredients.



A TYPICAL ALFALFA "CUSTOM" MILL USED THROUGHOUT THE WEST

Throughout the West there are a number of "custom" mills that cut and mix the alfalfa food for farmers, a certain percentage being retained by the mill owner to pay for the service.

The illustrations show a typical motor driven "custom" alfalfa mill. The use of Westinghouse motors instead of steam engines reduces the attendance required, the cost of power, and the fire risk. The motors also require much less floor space, when compared with that required by a gasolene engine equipment.

Green alfalfa is brought to it on the conveyor shown at the left. After the alfalfa is cut, it is blown by means of a fan through the piping shown at the right into storage bins above, or into the farmer's wagon.

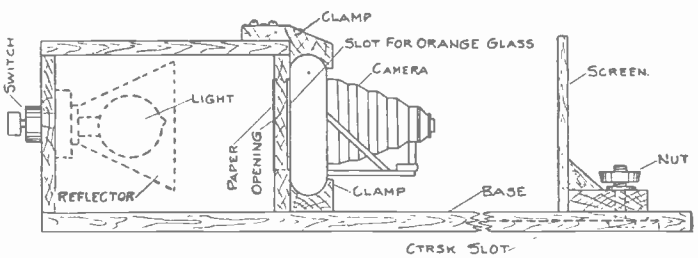
Operation of the machine is so rapid that by the time the farmer has unloaded at the receiving end and driven around to the discharge end, his alfalfa is already coming through.

Photograph Enlarger

Any person who has an ordinary camera with adjustable focal length can easily construct this enlarging apparatus. The accompanying drawing shows the general arrangement. The box contains the electric lamp and reflector. Two clamps are made to hold the camera on the box as shown. An opening is cut in the box directly behind the camera and has a piece of tissue paper fastened over it so as to diffuse the light. Cut a slot so that a piece of orange glass can be introduced between the negative and the light, and removed at will.

The screen is arranged as shown and slides forward and backward and can be clamped with the thumb screw which works in the countersunk slot in the base. A snap switch is fastened on one end of the box, and connections made with a plug and flexible cord. A sixteen candle-power tungsten light will do.

Fasten a sheet of the sensitive paper on the screen with thumbtacks and focus the image. Be sure the orange glass is in place. Remove glass, expose the print and replace glass.



SIMPLE APPARATUS FOR ENLARGING PHOTOGRAPHS

The Making of a Half-tone

(Photos by Courtesy of R. R. Donnelley & Sons Company)

The reader who looks at the pictures with this article, for example, may wonder how the plates—the half-tones, as they are called—that printed them are made. Here is the story in brief:

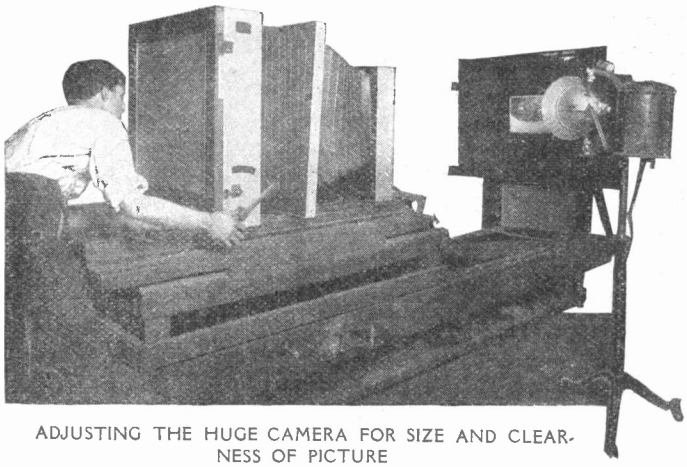
When a photograph is received in the office of the engraver a ticket is made out for it giving directions, size of picture wanted, etc., then the photograph goes to the photographic department. If we follow it we will usually find ourselves upon the top floor of the building, if the plant is not modernized. If it is a modern equipment we may find the photographic department upon any floor or even in the basement, for modernizing means that electric light will have taken the place of daylight. But wherever the gallery is located our attention will be promptly centered upon probably as large a camera as we have ever seen—one six or seven times as large as that used by the family photographer around the corner. The big machine rests upon a sliding stand so that it can be readily moved toward or away from the "copy" (the picture to be reproduced) which is placed upon a board a short distance in front of the lens. Before the "copy" is photographed the image is reduced to the size required by adjusting the camera. The size is ascertained by measuring the image on the ground glass of the camera.

Upon each side of the camera as shown is a powerful arc lamp, for the lighting of the copy is important. The better the illumination the snappier will be the negative. Arc light illumination for this purpose we are told is practically as good as daylight and in one way better. The light upon the photograph can be judged more accurately than that from a skylight, especially on a changeable, cloudy day. And electricity is used not only in the gallery but all through the up-to-date engraving plant.

With the copy on the board ready to be photographed, a "screen," as it is called, is placed between it and the negative in the plate holder. These screens are made by ruling parallel lines on the surface of a glass plate, one way only, and a like set of lines are made on another plate. The grooves are then filled with a black opaque substance and the two plates are fastened together face to face, so that the lines on one plate cross those on the other.

The screens are made in various rulings from 50 lines per inch to 400 lines per inch. In newspaper work 65 lines per inch is generally used. Magazines generally use 120 or 133 line screens; the half-tones with this article are made with 120. The screen lets through about the same amount of light that it shuts out. The object of the screen is to secure upon the negative the lights and shadows of the photograph in the form of dots. These dots will be small in diameter where the photograph is dark and large where the white portions reflecting most light through the screen are present in the original photograph. As the dots in the whites become larger the space between the dots become correspondingly smaller until the dots occupy all the space making pure white spaces called "high lights." As will be seen later, the dots are what really take the ink and do the printing. By examining the pictures they can be seen without the aid of a magnifying glass; by looking at them with a glass, however, this explanation will be made clearer.

The next step is to take the negative from the camera and develop it. The negative is now "stripped" as it is called. The sensitive film upon it has received the lights and shadows of the original picture but to transfer this impression to a plate of copper the negative is washed and the film is removed (stripped) from the glass and placed upon a piece of

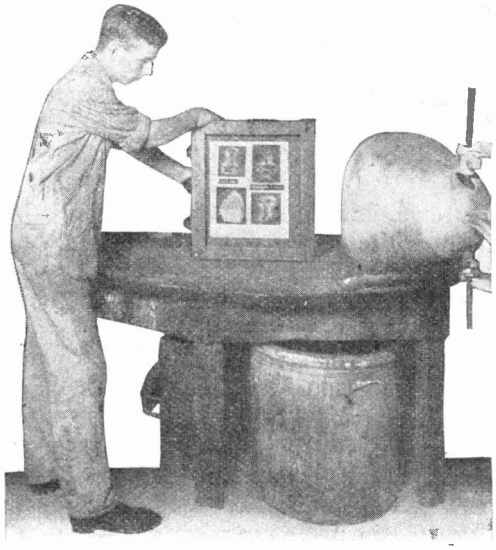


ADJUSTING THE HUGE CAMERA FOR SIZE AND CLEARNESS OF PICTURE

heavier glass, usually 11 by 14 inches. Sometimes several small negative films of different illustrations are brought together upon one large glass.

The copper plate is next prepared. It is thick enough to be strong and is carefully polished upon the side to be used and over this smooth surface is flowed a sensitive printing solution. With a pair of pincers the operator holds the copper over a slow heat in a moderately darkened room. When the solution is thoroughly dry the heavy glass with the several negatives upon it is placed in contact with the sensitive side of the copper and together they are put in a printing frame and then subjected to a strong light from an arc lamp. To develop it, the copper is taken from the frame and placed under a tap of water, the water being allowed to dash thoroughly against the printing surface. Wherever the light has penetrated through the negative, the solution adheres to the copper and where it has been protected by the negative, the water washes it away. The developed plate is now held over a strong, steady heat

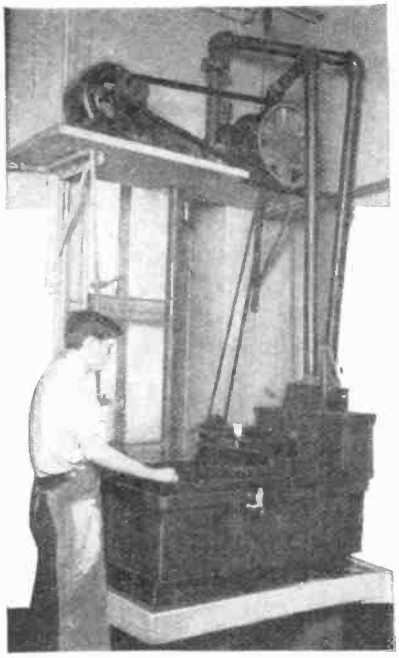
"FLOWING" THE COPPER PLATE



PRINTING THE COPPER PLATE WITH A POWERFUL ARC-LAMP

until the coating left becomes a dark brown and forms an enamel. This enamel is the protecting surface when the copper plate is immersed in the etching solution, or acid bath, which is the next operation.

The first thing the etcher does is to look carefully over the plate with a magnifying glass for bad spots or dust particles. The plate is now placed in the etching machine. In the one shown the acid is sprayed by small nozzles up against the plate held face downward and here is where we find the effect of the screen, for the tiny spots where light struck through are eaten away by the acid, leaving more or less projecting printing dots, according to the shading of the picture, to carry the ink against the paper. The eye of the

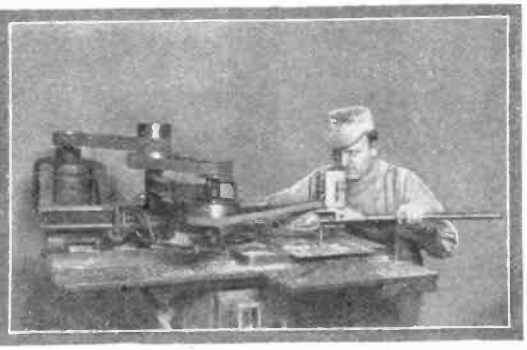


ETCHING TANK

away the dots entirely, and frequently place black in the plates by burnishing or rubbing on top of the dots with a small, smooth tool which spreads the dots out. The finisher works in a good light,

PROTECTING PLATE BEFORE ETCHING

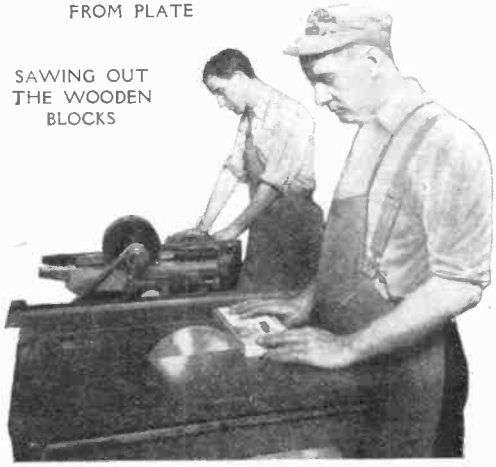
THE FINISHER REMOVES SMALL IMPERFECTIONS



ROUTING MACHINE REMOVES SURPLUS METAL FROM PLATE

etcher must be a trained one capable of telling how much eating away is necessary to produce a good plate. Sometimes one part of the plate is etched enough while another portion must be further treated. The re-etcher accordingly takes the original copy and from it protects with etching ink the finished portions and again places the plate in the etching tank.

After the etching has been properly completed, the plate is sent to the finishers. These men handle the little tools to clean out any of the imperfections that may have arisen during the process. They put in the extreme highlights by cutting



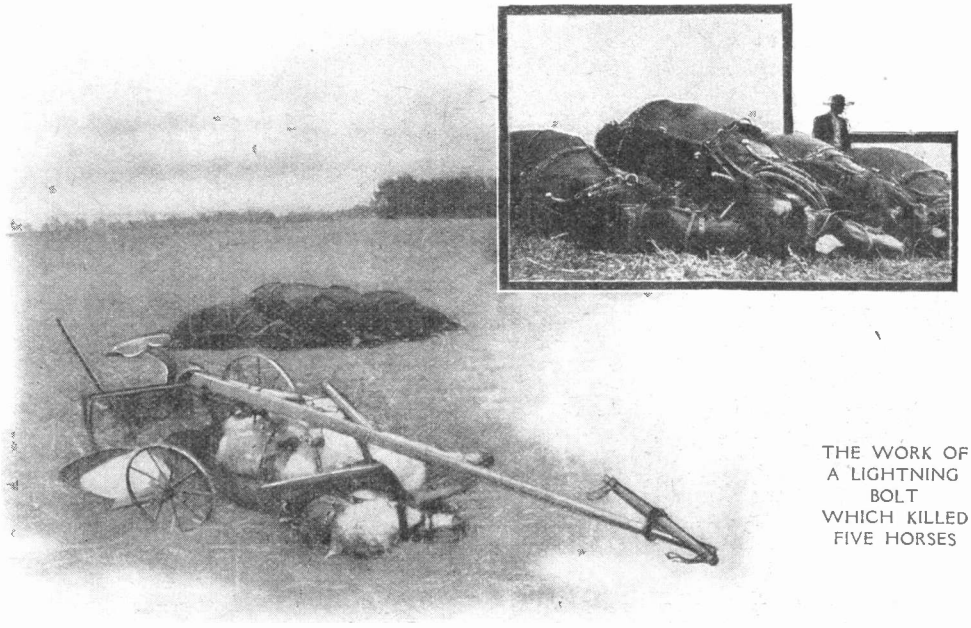
SAWING OUT THE WOODEN BLOCKS

uses fine tools and employs a microscope of the pocket type to make sure his work is perfect, for he can readily undo all of the careful work of photographers and etchers.

The plates now go to the blocking room. The routing machine here is easily the most interesting. The copper plate is placed upon it and by means of a small rapidly rotating tool all surplus metal is cut from the face of the plate as the operator pushes the electric-driven tool about. Over at one side of the room is a motor driven saw which cuts out the wooden blocks upon which the plate is mounted and near it is the beveling machine which makes a bevel along the side of the finished plate for nailing it to the block. Finally the trimming machine puts on the finishing touches before the plate goes to the printing department to be set about with type. Then the whole page, including the type and half-tone, is electrotyped, and from this electrotype the actual printing is done.

Freak of the Lightning

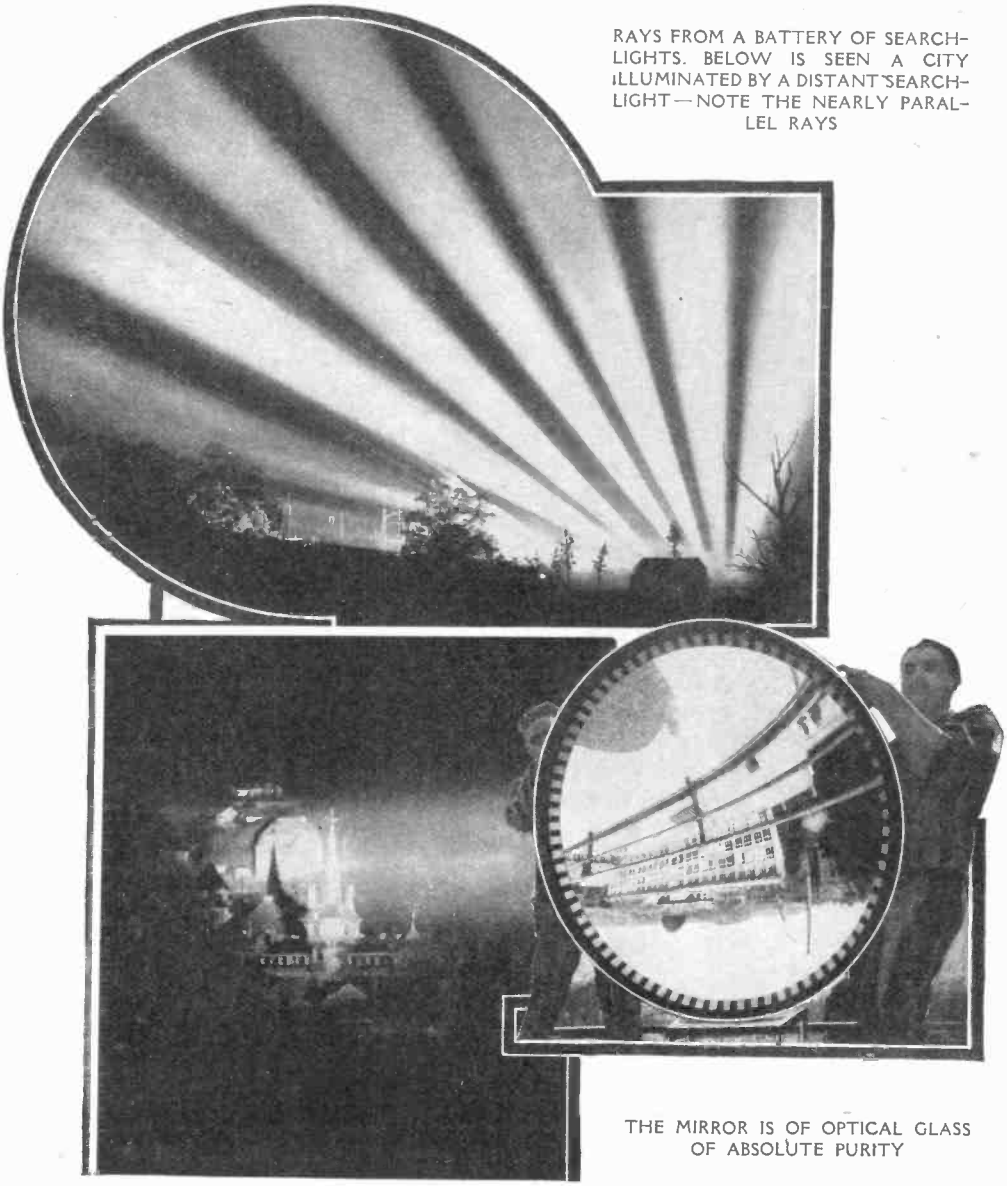
The photographs show in part the peculiar work of a bolt of lightning which killed five horses and stunned a man and boy driving them. Mr. Philip Maser and his thirteen-year-old son, who live near Metamora, Ill., were driving their horses to the barn on the morning of May 20th to escape an approaching shower. In their hurry, they did not unhitch the horses from the plows. Mr. Maser was in front, driving three horses, and the boy about 50 feet behind with four horses attached to a gang plow. The lightning killed the four horses driven by the boy, instantly, all falling in their tracks, as seen in the photograph. Only one of those driven by Mr. Maser was killed. Mr Maser was directly between the four killed at the boy's plow and the one killed at his plow, but beyond being thrown from his seat and rendered unconscious for a few minutes, he escaped entirely. The boy suffered severely from the electric shock.



THE WORK OF A LIGHTNING BOLT WHICH KILLED FIVE HORSES

Marvelous German Searchlights

A powerful beam from one of the great modern electric projectors illuminating the darkness of the night is certainly an impressive sight and this becomes more so when there are a number of projectors working together, such as one of these photographs shows. The new projectors made at the Allgemeine establishment in Germany are among the finest in Europe, and the largest ones use arc lamps which produce hundreds of millions of candle-power, for all the light from the arc is concentrated into a single beam instead of being scattered, as usual. Where the beam is quite straight, or at least but little scattered, it will carry for several miles, as another of the photographs represents—a beam from one of the great searchlights directed upon buildings on the side of a mountain. The light given by such a



RAYS FROM A BATTERY OF SEARCH-LIGHTS. BELOW IS SEEN A CITY ILLUMINATED BY A DISTANT SEARCH-LIGHT—NOTE THE NEARLY PARAL-LEL RAYS

THE MIRROR IS OF OPTICAL GLASS OF ABSOLUTE PURITY

projector is so intense as to allow of reading and writing comfortably at two miles distance from the apparatus.

Much care is given to making the concave reflecting mirror quite true, for were it not so it would scatter the light instead of giving an exactly straight beam, and the carrying distance is lessened. The present mirrors are in optical glass of absolute purity, cut and polished on both faces.

Two horizontal carbons of large size serve for the arc, and to keep their distance exactly regulated it is required to use an electric motor operated by a sensitive electro-magnet device acting as a relay, and a hand control is also added, while an image of the carbons is thrown upon a ground glass pane in order to observe their position. An interesting point is the shutter which closes off the whole front, and it is made in some cases as a large iris diaphragm, such as we see in camera lenses, or in others as a set of slats which open and close all together. Although this latter does not shut off the light as wholly as the first kind, it works quicker, and is quite valuable in making Morse signals which can be seen for miles distance, so that telegraphing can be readily done.

In the base of the searchlight is an elaborate device with electric motors and magnets, for revolving the projector all around the horizon and for raising and lowering the beam; also for working the shutter. Electric cables run to an ingenious lever controller, so that all that is needed is to move the lever about in just the same directions as we wish the beams to be turned, and the searchlight follows the movement exactly.

Artistic Signboards

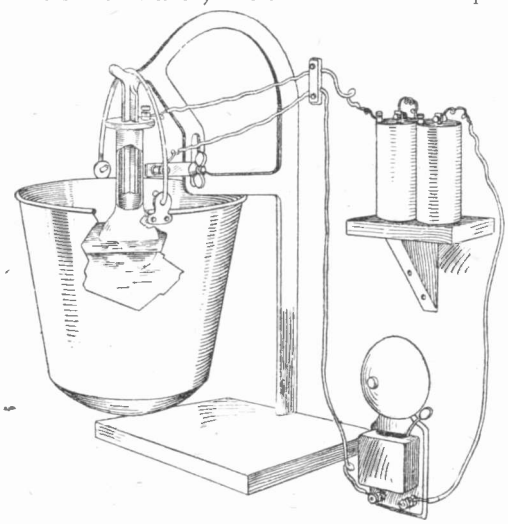
The agitation for artistic signboards along the streets has at length borne fruit. The accompanying picture shows a new type of electric lighted signboard known as the "semi-spectacular sign." The display is 170 feet long and 27 feet in height. There are electric globes on Grecian-like columns at each end of the board and green latticework under the sign adds to the neat effect. The upper portion of the sign is tastefully equipped with electric bulbs, some 150 in number, which are artistically arranged. At night this illuminated signboard presents an exceedingly brilliant and attractive display, lighting up the street in the vicinity for a considerable distance.

Father of the Trolley

Stephen D. Field, who died May 18th last, at his home, Stockbridge, Mass., was widely known among electrical men as "Father of the Trolley." In 1879 and 1880 he applied for patents on an electric railway, including a stationary generator, trolley wire, electric car, under running trolley and bonded rails for return circuit. In August, 1880, he built an experimental line, using one car carrying two persons and operated it upon his lawn in Stockbridge. Cyrus W. Field, who laid the Atlantic cable, was his uncle and Stephen gave considerable attention to telegraphy, bringing out a number of inventions. He died at the age of 67, in the town where he was born.

Fire Pail Alarm

The bright red metal pails marked "Fire" that you have seen hanging on hooks at the walls or set on a shelf within reach are useful just as long as they are filled with water, but on account of evaporation they are frequently empty when most needed—that is, in case of fire.



FIRE PAIL ALARM

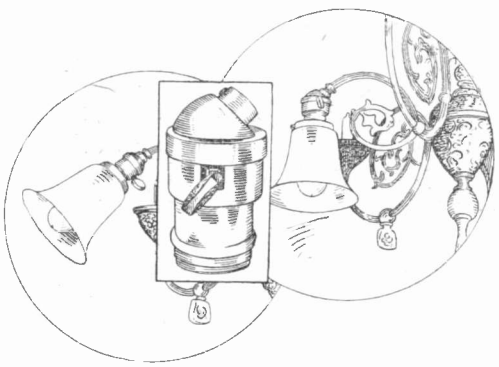
A New Jersey man seeks to guard against there being no water in the pails by an alarm device consisting of an electric bell and battery and a float on the water. The float is attached to a slidable rod in guides on which are contacts that close when the float lowers with the water and rings the bell at any predetermined point.

Hunting Fortune with a Magnet

By means of an electric magnet, Captain T. P. H. Whitelaw of San Francisco will attempt to raise an iron chest which contains $65,000 in gold ingots from the bottom of the bay off Angel Island. The safe was dropped from the hold of the steamer Corcoran, which was rammed and sunk in a collision with the steamer Seminole in a dense fog some months ago. When the vessels parted, following the collision, a section of the hold of the Corcoran broke through and the cargo sank. The huge iron chest proved very difficult to find but has been definitely located. A portion is covered with drifted sands and it is claimed that the ordinary methods of salvage would be unable to lift it. A huge magnet is therefore being constructed so that with the generation of electricity on board ship the enormous lifting power of the magnet will be exerted, which, it is anticipated, will drag the precious cargo to the surface.

Modernizing Old Fixtures

In thousands of homes there are in use old, antiquated electric fixtures much too costly and beautiful to discard. The only objectionable feature of most of these old fixtures is that the lamps are held at an angle. Experience has shown that the distribution of light is greatly improved if lamps are installed in a vertical position. Therefore all modern fixtures are provided with vertical outlets. By the use of what is called the angle cap socket the old angle fixtures may be made to hold the lamp in a vertical position with a marked increase in lighting efficiency.



OLD FIXTURES MODERNIZED

When the telephone first came out, a noted professor considered it a joke. He was induced to try it. With a grin of incredulity he shouted into the mouthpiece, "Hi diddle diddle—follow that up." Then he listened. "It says—'The cat and the fiddle,'" he gasped and forthwith he was no longer a doubter.

SATURDAY EVENING SHOPPING SCENE IN ACCRA

Wireless on the Gold Coast

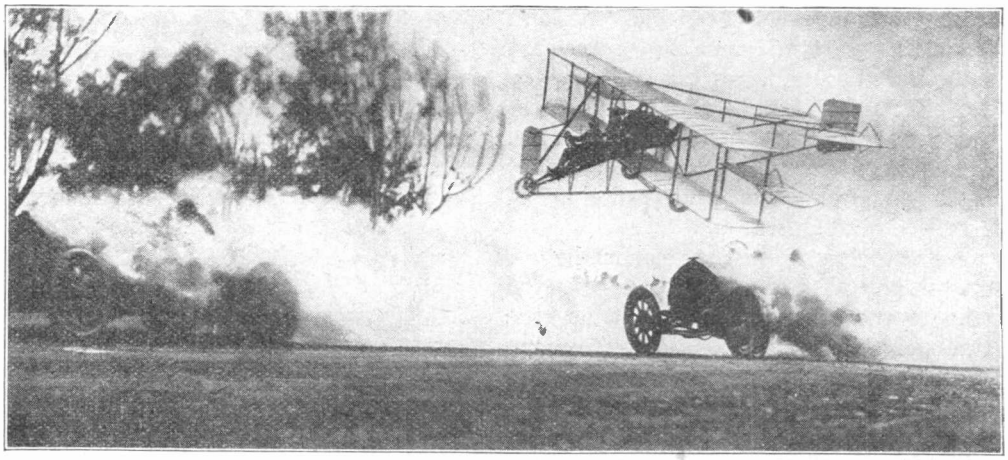
Speaking of life on the Gold Coast, progress in this remote region of Africa is slow, to say the least, but the erection of a wireless telegraphy post at Accra seems to be waking things up somewhat. Outside of army use, the Accra post will give the greatest aid to shipping. The coast surf is so heavy that communication between ship and shore is often impossible for long periods, during which business men became very impatient. Where yellow fever cases forbid vessels from landing, wireless will be the only way of making connection.

In building the Accra Marconi station care had to be taken to use timber very sparingly, for the white ants demolish everything in the nature of wood. The steel mast is 200 feet high and the building is of concrete bricks. The main aerial is of the umbrella type, the second being a twin wire type aerial. In the station is a five horse power oil engine group with direct current dynamo, besides 54 accumulator cells.

There are in the colony 1,424 miles of telegraph line and 50 offices, also telephone exchanges at Accra, Cape Coast and three other places, but there is great difficulty in laying such lines through the bush. Tornadoes with heavy lightning discharges and a deluge of rain often cause "disturbances" in the line. Perhaps a tree will fall and break the cable; then we have to combat the extreme humidity of the air and ground. Another and more humorous foe is found, as the natives cut from 20 to 40 feet lengths of the wire, and the material is twisted up into bracelets and necklets for the decoration of dusky beauties.

The Faithful Magneto

Depending absolutely on the faithfulness of a small magneto for safety, Glenn Martin, the California aviator, recently put his biplane to a really novel and



HAD THE LITTLE MAGNETO FAILED, THE INTREPID AVIATOR WOULD HAVE BEEN DRAGGED DOWN BY THE AIR EDDIES

extremely hazardous use. In the Owensmouth Road Race, near Los Angeles, Aviator Martin was appointed official Referee of the Course, with Frank Garbutt, a prominent Los Angeles automobile man. From the time that Martin and Garbutt left the hangars at Griffith Park for the Owensmouth Course, 30 miles away, their safety was constantly at the mercy of the little generator that furnished "juice" for the ignition in the aeroplane engine.

Flying sometimes with Garbutt, and sometimes alone, Martin constantly risked death as he swept about the six mile race course to insure fair play among the competing automobile drivers. At times the intrepid aviator referee was in extreme danger, when he would swoop low down over the race course. Had Martin's generous auxiliary planes failed to grasp the eddying air currents, or the electric spark stopped in his motor for but a few seconds, the consequences would have been almost unavoidable.

Traveling about 40 miles an hour, with no altitude from which to "volplane" off the course, if Martin's magneto had failed he would have been dragged down by the powerful eddies of the air that followed the racing cars, which traveled at a speed approximately twice as great as that of the aeroplane.

Trolley Car Conductor Studying for Grand Opera

Barnard Wasserman, a young trolley car conductor of Brighton, Mass., a suburb of Boston, is a rare example of the wonderful combination of ambition and heroic peristency which we occasionally, at prolonged intervals, actually stumble upon.

Coming to Boston as a poor emigrant

BARNARD WASSERMAN

from Germany, this boy had the aim from the start to somehow, someway, sometime, become an opera singer.

Think of it! A poor, foreign lad, without money, without friends or wealth, dreaming of becoming a performer in that most comprehensive and exacting of arts — Grand Opera.

Nevertheless, from the moment he got on the pay rolls of the Boston Elevated (the corporation which controls the transportation system of Boston), young Wasserman began his unyielding efforts toward fitting for his exalted goal.

He is only 21 now, but for five years — five long, patient years — he has been studying. He has taken a thorough course in a Boston conservatory; has also taken careful and long training in elocution and dramatic diction; a course in acting; a course in stage technique; he has repeatedly had offers of good salary to go on the stage as an actor or singer — but this remarkable boy has had the wonderful foresight to resolve upon sticking to his trolley car work until, as he phrases it, "I get what I started for!" Thus, his next step is to study abroad. That done, he now has the absolute assuredness of a place with a professional Grand Opera company.

Buzzer Reminds to Turn off Lights

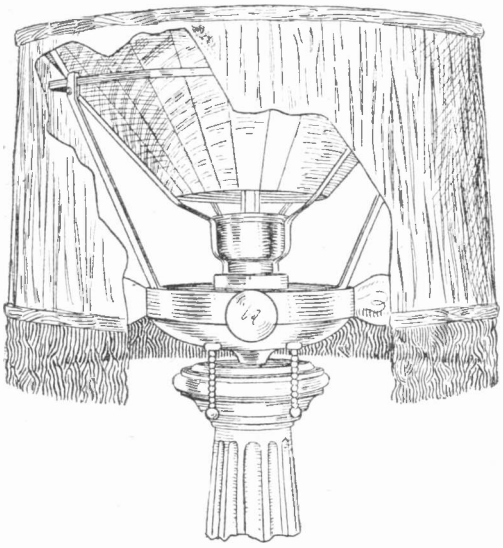
Through forgetfulness lamps are left burning in the cellar, attic or closet, and current is wasted.

How often have you glanced at the house as you left and noticed that the attic light was working overtime and then tried to remember whether it had been burning a few hours or a few days? The amount of current thus wasted cannot be expressed in actual figures but it is certain that in a year it is considerable.

This waste of electricity can now be effectually prevented by a switch and buzzer now on the market. Both are mounted on the same base. When the switch which controls the lights is on, the buzzer furnishes a gentle though insistent reminder that the lamps are burning.

Portable Lamp Combines Direct and Indirect Lighting

Somewhat of an innovation in the use of direct and indirect lighting systems is a combination of the two in a portable lamp. The illustration serves to show the location of the reflector pointed towards



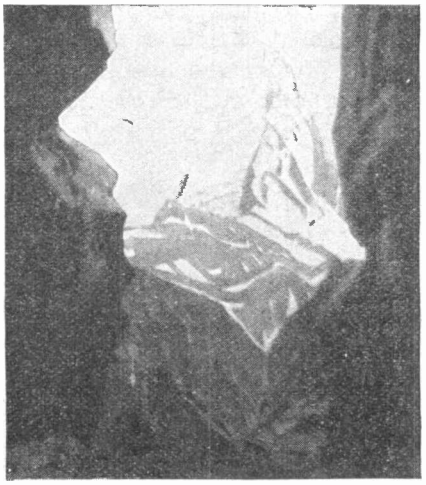
PORTABLE DIRECT AND INDIRECT LAMP

the ceiling and the incandescent lamps for direct lighting arranged horizontally on a circle beneath. The lights in both cases are concealed by the shade, which is usually either silk or art glass.

Most Modern Part of the House Least Expensive

A great many people would be surprised, says Mr. F. B. Adams, an authority on electrical construction costs, to learn that in building a home the electrical equipment need not be more than one and a half per cent of the cost of the house. That is, in an $8,000 house the wiring would cost about $120—to include a very complete system of ceiling and wall outlets and baseboard receptacles.

The many different places and positions in which lights are used nowadays makes it very desirable that baseboard plugs be given due consideration.



THE SAME PAINTING ILLUMINATED BY LIGHTS OF DIFFERENT COLORS

LIGHT—THE SOUL OF ART

That the color of an object is not inherent in the object itself is a fact not realized by many. In other words, the appearance of a colored fabric or a painting depends greatly upon its environment and almost entirely upon its illumination. Roughly speaking, the color of artificial light is as different from daylight as ordinary artificial light is from a ruby red lamp. These differences cause great variations in the appearance of colored objects.

All are familiar with the wonderful lighting effects produced upon the stage. These effects are the result of varying the color of the light which illuminates the colored costumes and scenery. But Mr. M. Luckiesh, physicist for the National Electric Lamp Association, has extended the effects of stage lighting to the field of fine art. Under the title of "Light and Art" he has given a lecture-demonstration before various scientific bodies illustrating the wonderful effects obtained by controlling the color of the light which illuminates paintings. These same effects are useful in a practical way for attractive window displays and the like.

By actual demonstration it is shown possible to paint two pictures on one canvas the color of the light which illuminates the canvas determining which picture is visible. While the color effects are very striking and cannot be readily produced in the accompanying illustrations, the latter will illustrate feebly what wonderful effects can be produced.

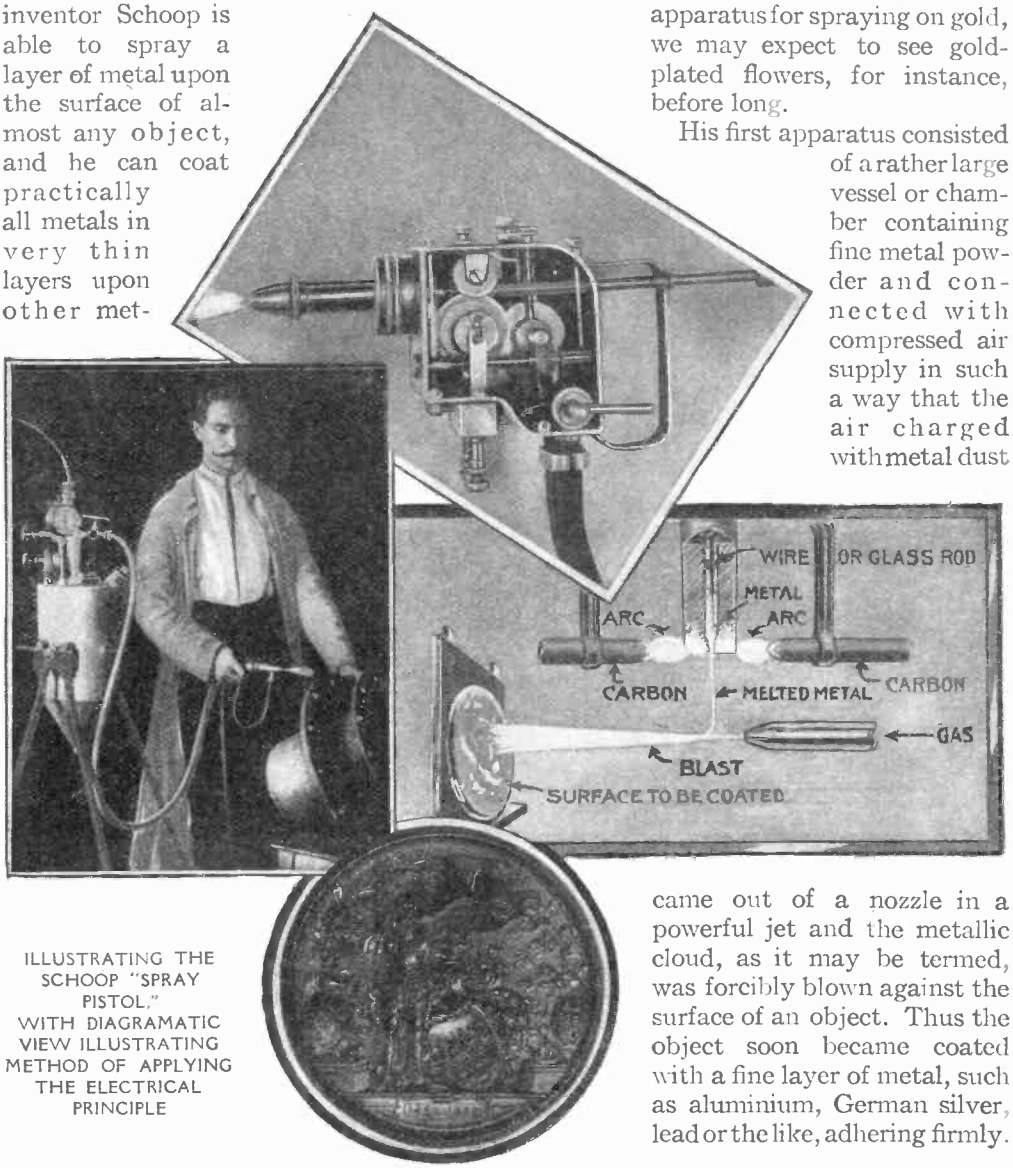
The painting illustrated here shows a mountain rising in the distance between two cliffs near the observer. The colors are carefully chosen so that some will appear colorless under a certain illumination. For instance, the view at the left shows the appearance of the painting when illuminated by an orange-red light. It is seen that the mountain and valley in the distance do not appear in the picture at all. The reason for this is that the yellow, orange and red tints all reflect the orange-red light equally well. And when the actual brightness of the colors apart from their color are kept equal the appearance is as shown. By varying the color of the light illuminating the painting from the orange-red to yellowish-white the mountain and valley in the distance seem to grow on the

picture. This is shown at the right. This opens an attractive field for the use of colored lights controlled by rheostats. For experimental and demonstrating purposes red, green and blue lamps controlled by variable resistances are used in a black booth in which are hung the paintings and other objects. The latter are viewed to advantage through an opening in the front side.

The Schoop "Spray Pistol" for Metal Plating

A great future is certainly in store for the little device by which the Swiss inventor Schoop is able to spray a layer of metal upon the surface of almost any object, and he can coat practically all metals in very thin layers upon other metals, stone, plaster and the like and even upon glass, celluloid, wood and paper. Even such delicate objects as fruit and flowers can be made to receive a coating of metal, and by using his newest apparatus for spraying on gold, we may expect to see gold-plated flowers, for instance, before long.

His first apparatus consisted of a rather large vessel or chamber containing fine metal powder and connected with compressed air supply in such a way that the air charged with metal dust came out of a nozzle in a powerful jet and the metallic cloud, as it may be termed, was forcibly blown against the surface of an object. Thus the object soon became coated with a fine layer of metal, such as aluminium, German silver, lead or the like, adhering firmly.



ILLUSTRATING THE SCHOOP "SPRAY PISTOL," WITH DIAGRAMATIC VIEW ILLUSTRATING METHOD OF APPLYING THE ELECTRICAL PRINCIPLE

In his new "spray pistol," which we illustrate here, he uses a metal wire, and it is fed forward through an oxy-hydrogen gas flame so that the flame melts the wire and drives the fine particles upon the surface of an object, the result being the same. He also intends to make the device do the melting by the electric arc, and to use a hollow carbon through which the gold wire, for instance, is fed down from the top and comes to the bottom where the carbon is forming an arc with other carbons, so that the great heat melts the wire and the metal drops down in a fine stream upon a powerful air jet. The air thus drives the metal forward in the shape of a fine spray upon the object to be plated.

The compact little device is held in the hand and it is an easy matter to spray almost any object with metal. By using a small air wheel, which is turned by the incoming gas itself, the metal wire is fed forward automatically as fast as it is burned off.

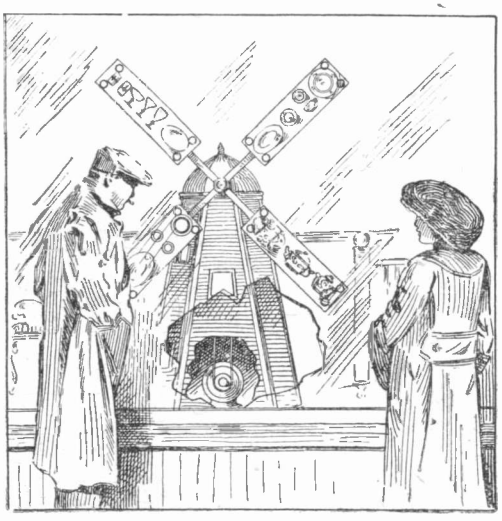
By filling up molds with metal, and it is possible to separate the metal by a proper treatment of the surface before coating, there is an endless field of usefulness in making reliefs, such as medals or artistic plates from plaster molds. We illustrate a medal of this kind, and all the finest details of artistic work are faithfully reproduced. Mr. Schoop also makes aluminium postal card plates with very handsome relief designs.

Deflated Tire Alarm

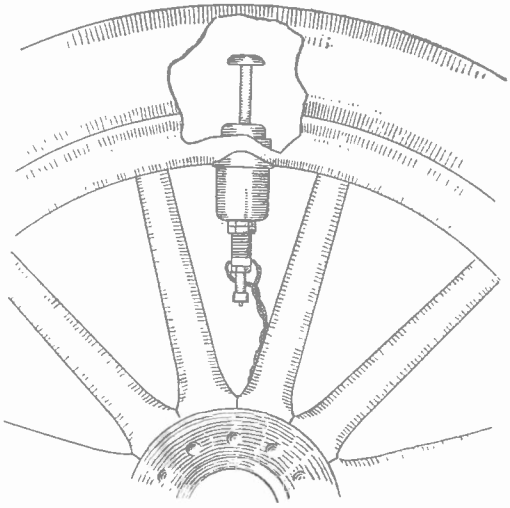
The device illustrated may offer a solution of the automobilist's worry lest he may be running with a soft tire. A plunger is constructed within the air valve stem and the foot of this is adjustable so that it may be set to sound an alarm at any degree of deflation. At the outer end of the plunger are a pair of electrical contacts that close when the soft tire presses the plunger foot. These contacts are wired to ring a warning bell in the machine.

Dutch Windmill to Display Crockery

Carrying out the motion idea for show windows, a very simple device, which has attracted considerable attention in a crockery store window, is a Dutch windmill. The vanes are covered with cloth and upon them are fastened dishes. A small motor is used to run the mill very slowly. Electric lamps also are attached to the blades of the mill, showing the dishes up to a better advantage in the evening.



UNIQUE CROCKERY DISPLAY



ALARM TO INDICATE ANY DEGREE OF PARTIAL DEFLATION

Electrical Men of the Times

JOSEPH B. McCALL

With the election of Joseph B. McCall, of Philadelphia, as president of the National Electric Light Association at the recent convention of that organization in Chicago, there came into national prominence a man who, forced to leave school at the age of thirteen, by pure grit pushed himself to the topmost pinnacle in his profession.

When it became necessary for him to take up a man's burden though but a boy, Mr. McCall entered a lawyer's office in his native city, and for the next three years his time was divided between the study of law and of stenography, for thus early in life he made up his mind to be proficient in his chosen profession and to be an expert stenographer as well as an attorney of the highest class.

But destiny had better things in store for him and at the age of sixteen he laid aside dusty tomes and pothooks and entered the employ of the Pennsylvania Globe Gas Light Company in Philadelphia. Here his energy brought him to the attention of the president of the com-

pany, Martin Maloney, who soon found he could trust the tactful and silent lad. Advanced from time to time as the years went along he attained a position to assist in the organization of the Pennsylvania Heat, Light and Power Company, being its first secretary and treasurer. When this corporation was absorbed by the Pennsylvania Manufacturing, Light and Power Company he became president.

In 1899 came the consolidation of practically all the electric companies in Philadelphia under the name of the Philadelphia Electric Company. President McCall was placed at its head, which office he has filled so acceptably ever since that there has been no thought of a change in the office. At the time, at the age of but 29, the youthful executive found himself at the head of a concern with practically a monopoly for supplying electricity for lighting and power to a city of a million and a half inhabitants.

Three years ago Mr. McCall was elected president of the Association of Edison Illuminating Companies, an organization composed of the original companies receiving licenses from Thomas A. Edison to use his patents in the industry. He had been active in the association since its formation and the honor that it bestowed upon him, like that given him by the largest technical organization in the world at Chicago recently, was a recognition of the ability of a man who has proved that it was not necessary to spend half a lifetime in schoolrooms.

Automatons in War

According to press reports a Danish engineer has invented an automaton capable of firing 400 shots per minute by electricity. The invention might be utilized to reduce the mortality of war. Given the requisite number of quick-firing automatons on each side, the battle might be fought out on that line if it took all summer, to the complete satisfaction of manufacturers of war material and with a minimum of casualties.

Non-Magnetic Watches

Many are the owners of good watches who have found that stray magnetic fields around electrical machinery have put them out of commission, temporarily at least. The reason for this lies in the fact that a portion of the works of the ordinary watch is made up of steel, a magnetic material. But there are watches on the market in which the main spring, balance wheel, hairspring, escapement and in fact all the parts are made of non-magnetic materials which are absolutely unaffected by the magnetic fields which one is likely to encounter almost anywhere in this electrical age. Moreover, these watches are made with handsome thin model cases and are high class timekeepers.

Power Plant at the Mouth of a Coal Pit

What is claimed to be the only plant in America distributing electricity from the mouth of a coal pit is located at Chignecto Mines in Nova Scotia, Canada, now operated by the Canada Electric Company, Limited. The idea of linking up the coal beds by machinery with an electric generator came from Thomas A. Edison. Coal from the shovels of the miners is carried in cars up a sloping shaft where six trucks containing 1500 pounds each are drawn by cable. When the trucks reach the surface they continue the journey until they reach the top of a bankhead. Here an elaborate system of tracks and switches sends each car exactly where it is wanted and its contents are mechanically dumped into rockers and over screens which accomplish the curious feat of automatic selection. The best coal continues on its way into the railway cars waiting below. The balance of the mine product, minus the slate, which is removed by hand, is carried to the boiler room by endless conveyors and enters the mechanical stokers without the aid of a fireman, there to generate electric power.

Electrical Interests of Women

EDITED BY GRACE T. HADLEY

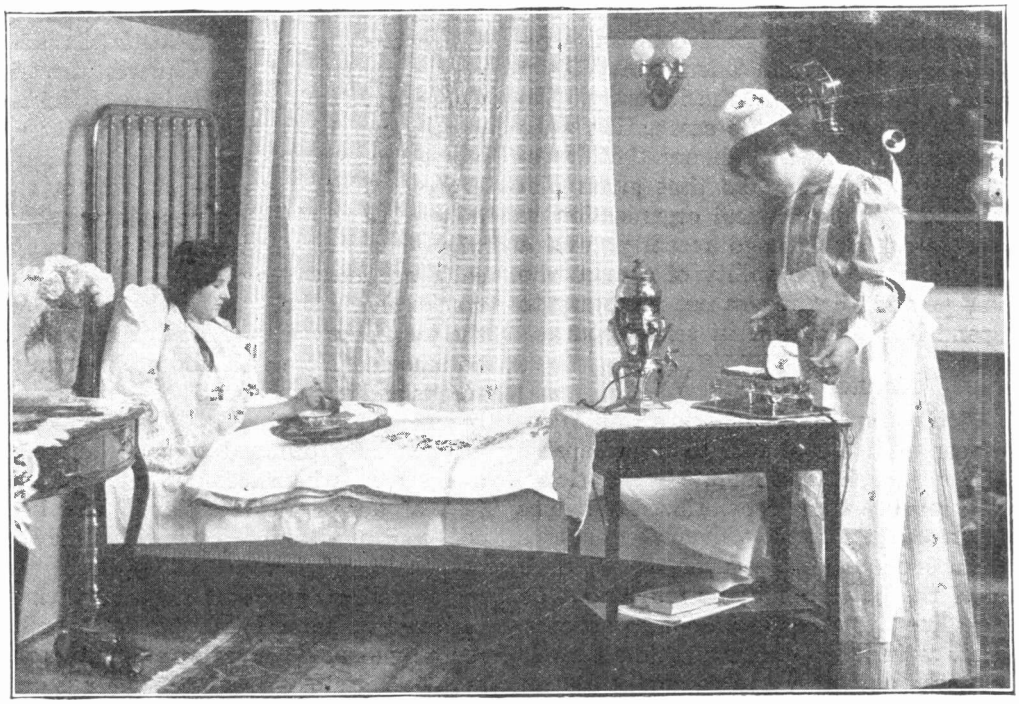
Electricity in the Sickroom

Perhaps electricity is nowhere more directly useful than in the sick room, especially in warm weather. Invalid cookery is an art in itself and it is often a problem to prepare food that is appetizing for invalids. Electric utensils solve this problem most satisfactorily. They are not only clean and sanitary but highly ornamental. Toast made on the electric toast stove is so crisp and hot and the coffee is so delicious that invalid cookery becomes a pleasure and the nurse is saved many tiresome steps.

To make good coffee in the electric percolator, use one heaping tablespoonful of ground coffee to each cup of water and one extra spoonful of coffee. Turn the current on to full heat. It will begin to percolate as soon as the water boils. Allow it to continue to percolate for about eight minutes. It is a good plan to pour the first cupful back over the grounds, although that is not necessary.

A Tea Seller of Bagdad

Bagdad, the capital of the caliphs, has no right to be anything but interesting and prosperous. The mere mention of the name conjures up visions of the



INVALID COOKERY IS AN ART IN ITSELF

Thousand and One Nights, noble relics of past glories, mosques, minarets and Oriental mysticism, but present day Bagdad is not to be compared with the Bagdad of the remote past. Perhaps the most brilliant day of the year is Easter Sunday, or day of the silk mantles, so called on account of the gorgeous garments worn at that time by the Christian women.

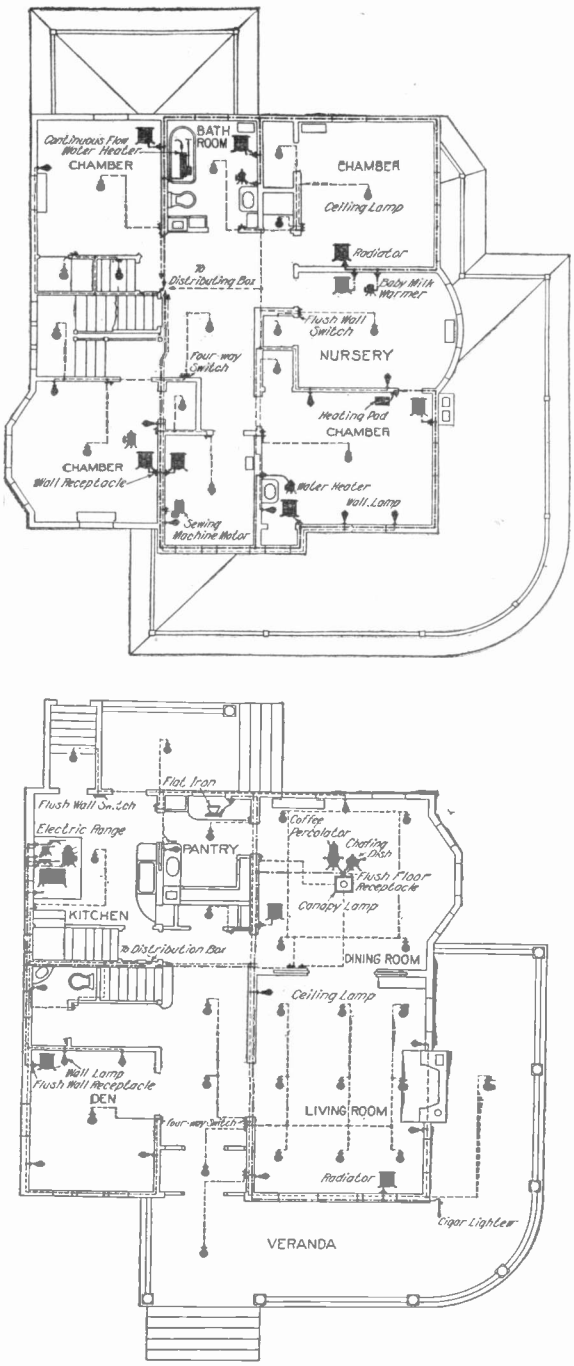
Now and then one runs across a tea seller

A BREAKFAST IN BAGDAD AS CONTRASTED WITH MODERN, ELECTRICAL WAY

of Bagdad who offers a picturesque reminiscence of the real Orient. A breakfast in Bagdad consists of a piece of bread and a glass of tea and may be had from the street vendors equipped with their Russian samovar. The passer-by stops at the open air tea room amd imbibes a glass of tea. The photograph shows a tea vendor drawing a cup of tea for a customer who is much interested in the process, while near by is another customer who evidently enjoys the brew as he drains the last drop.

In decided contrast to this is the modern tea table and the electric samovar which operates on the same principle as its illustrious ancestor, the Russian samovar. In the electric samovar, tea can be made of any desired strength by raising or lowering the teaball which is attached to the cover by a chain. The heating element is a plain cylindrical plate for immersion in the liquid. Due to the fact that the heater is wholly immersed, very quick results are obtained, therefore the samovar is economical as well as convenient. The heat is always under control. The modern electric samovar is made of heavy copper and the handles are of ebonized wood. This samovar holds six cups of tea.

Orange Hearts. Roll paste to one-fourth inch in thickness and shape with a small heart shaped cutter, first dipped in flour. Arrange in an unbuttered tin sheet and bake until delicately browned. Split, fill with orange marmalade, frost with orange frosting and sprinkle chopped candied orange peel around the edge.—*Fannie Merritt Farmer.*



Plans by Courtesy General Electric Co.

PLANS FOR A $10,000 HOUSE

Wiring a $10,000 House

The house of J. E. Davidson of Montpelier, Vt., is a specific instance of that class of wiring for heating devices using several heating circuits as well as many outlets on the lighting circuits. The wiring plans of this residence are shown in the accompanying illustrations. The main supply wires for both heating and lighting for the house enter the attic, where is located a main double pole switch and 100 ampere fuses. Two circuits lead from this point, one for heating and one for lighting, each fused for 75 amperes.

Branching from the lighting mains are two sets of wires, one to the Edison plug cut-outs, which control the five circuits for the second floor, the other to the distribution for the first floor and basement lighting.

One receptacle is wired in the baseboard of each of the following rooms: Living room, dining room, den, sewing room, all bedrooms, nursery and bathroom. Into these receptacles any sort of an electrical appliance can be plugged, as a common plug is used throughout. In the sewing room there is an extra circuit, on which may be used a sewing machine motor, or a flatiron for pressing.

Near the beds in the two front bedrooms, flush plug receptacles are wired in, so

that electric heating pads may be connected for use in cold weather for warming the beds, or in case of sickness may be used instead of the heavy and leaky hot water bag. To the extra receptacle in the bathroom can be attached electric devices for heating water for shaving and other purposes.

One circuit with a capacity of two kilowatts runs to the laundry, to be used for either heating water or for a motor to furnish power to a washing machine or ice cream freezer. The common plug and receptacle is an invaluable convenience, as any appliance can be used in any room; for instance, the chafing dish in the dining room, den or the bedroom. The receptacles are installed, generally, so that a radiator can be attached to take the chill or dampness from the rooms when the furnace is not running, but they are of course often used for other purposes.

The flexibility of the electric service lends it to many purposes in this modern house and various heating outlets have been located in the most convenient positions with reference to the service they perform. A flush Edison plug, located in the floor beneath the dining table, can be used for connecting heating devices, such as the coffee percolator or chafing dish, when it is desired to use them on the table. Similarly in the den two flush floor receptacles are installed, one being used for a cigar lighter and the other for a portable reading lamp. These wiring plans illustrate the excellence of the electrical arrangements and the unobtrusive way in which both lighting and heating by electricity have been combined.

A Woman Delegate

Mrs. Anna B. Stoops of Stuttgart, Ark., enjoyed the unique distinction of being the only woman delegate at the Chicago Convention of the National Electric Light Association last June. She manages the electric light plant at Stuttgart and was appointed a delegate to the national convention by the Arkansas Association of Public Utilities Operators.

"You see," explained Mrs. Stoops, "I attended the state convention in May and was then appointed one of the delegates to come to Chicago in June, and, best of all, a check was given me to pay my expenses. Do you wonder I think the Arkansas men are the finest in the country? They don't hold any grudge against a woman because she has entered their field. I had to take hold of our plant, because after we got it my husband was sick and could not do much, so I went in to do the office work; then I just kept on doing more and more until I now manage everything. My husband became quite deaf and often said "No," when he should have said "Yes," and of course that mixed things up, so I had to take hold and run the plant. We have 4,500 sixteen candlepower lamps going in Stuttgart."

MRS. ANNA B. STOOPS, DELEGATE TO THE N. E. L. A. CONVENTION

The Social Side of the Convention

The Ladies' Committee of the National Electric Light Association provided a beautiful entertainment for the visiting ladies during convention week in Chicago, June 2 to 6. This included a reception and dance in the auditorium of the New Medinah Temple, Monday evening, June 2; a musicale and tea in the Crystal Ballroom of the Blackstone, Tuesday afternoon; a matinee performance at the Auditorium Theater on Wednesday for the "Pageant of Darkness and Light," and an automobile tour on Thursday, starting from the Art Institute and ending in Highland Park. The route was along the north shore of Lake Michigan, through the picturesque suburbs of Evanston, Wilmette, Kenilworth, Winnetka, Glencoe, Ravinia, and Highland Park, arriving at the Hotel Moraine for luncheon.

The recital in the Crystal Ballroom of the Blackstone Hotel was very artistic. The beautiful ballroom formed a pleasing and harmonious setting for a musical program that was enthusiastically applauded and enjoyed by about 200 of the visiting ladies. Madame Rosa Olitzka, the prima donna contralto, and William Morse Rummel, violin virtuoso, and Mr. A. Leon Bloom, accompanist, rendered an excellent program. Mr. Rummel is a son of the late Franz Rummel, pedagogue and pianist, and a grandson of Morse, the inventor of the telegraph. Refreshments were served after the recital in the ballroom and a number of the ladies lingered for a social chat.

The Pageant of Darkness and Light on Wednesday afternoon was an effective presentation of missionary work in different parts of the world. It consisted of four episodes showing the great need of the light of Christianity in the dark portions of the world.

The automobile tour was an enjoyable outing long to be remembered. The Lake Shore Drive, Lincoln Park, Sheridan Road, the spacious summer residences, Hubbard's Woods, Ravinia Park, and Highland Park were at their best during this season of the year. Thanks are due Mr. Homer Niesz and his able committee for the excellent entertainment of the visiting ladies. All of the automobiles were donated for the drive and many of

GUESTS OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION

the cars were driven by members of the N.E.L.A. committee. Mr. J. H. Goehst scattered the confetti along the road to blaze the trail for the cars following, and often the wind took a hand in the scattering, but all the cars finally arrived at the Hotel Moraine in plenty of time for luncheon.

Daughters of Minerva

Mrs. Mary Pinckard of Chicago has made the suggestion that the wives of the Jovians, and other women allied with the electrical interests, organize themselves as the Daughters of Minerva, and the suggestion meets with such favor that it is quite likely that definite steps will be taken to organize the first chapter in Chicago this fall.

"I so admire the brotherly spirit of the Jovians," said Mrs. Pinckard, "that I very much wish that we women had a similar organization. I am sure it would bring us together in a way that would be interesting and enjoyable. As it is, our husbands get together at these Jovian rejuvenations and have a good time and become better acquainted, but we women are too stiff and offish. We should be more friendly, sisterly and social, and I believe that we could accomplish this through a similar organization. Now I have been going to these conventions with my husband, W. R. Pinckard, for many years, and while the entertainment committee always provides for us beautifully, still, if we had a chapter of the Daughters of Minerva in every large city, it would be more interesting if we women could have our rejuvenations too."

"Do you think the Jovians would loan us their manual?" she was asked.

"I think we could get something original ourselves," said Mrs. Pinckard, "something secret and original, and it would not be necessary to borrow anything from them."

How the Electric Fan Happened

A mechanical engineer was engaged in mounting a marine propeller. It was a hot summer day and he perspired freely while working. Having attached the propeller to the shaft, he started the engine and stood behind the propeller to observe its motion. The thrust of the

rapidly revolving blades forced a current of air against him, causing a quick evaporation of the moisture of perspiration.

He felt cool and comfortable. Incidentally he realized the possibility of a revolving fan. The propeller was the model. He changed the curvature and form of the blades to suit the more tenuous element, air; attached the propeller to the shaft of an electric motor, and thus produced the electric fan, an epoch making device.

Electric Reed Lamp

The electric reed lamp is a simple, inexpensive lamp that is especially desirable for the summer bungalow, the porch of a suburban cottage, or for the parlor. The shade and the standard are of hand woven reed—both lined with cretonne, but this material may be easily removed and a lining substituted to match the furnishings of the cottage or bungalow. The standard is hollow and 22 inches high; the shade 22 inches in diameter. The lamp is equipped with two pull chain sockets, eight feet of silk cord and an attachment plug which makes it possible to place this lamp in any corner of the porch or in any part of the living room. It is a genuine knockabout lamp, safe to handle and convenient and light to carry. Many housewives are particular in the matter of having their furnishings harmonize and this lamp appeals to them.

The real comfort of an electric fan is never appreciated so much as at meal time, especially if you are entertaining guests. How foolish not to enjoy this comfort when its cost for a whole day is less than the price of an ordinary loaf of bread.

A New Electric Range

For electric cooking, self contained electrically heated utensils are manifestly more efficient than ordinary utensils used with hot plates. A new range embodying this principle and with improved materials for thermal insulation attracted considerable attention at the recent convention of the National Electric Light Association. A new discovery has been made of an extremely light, refractory insulating material with the remarkable characteristics of a higher thermal resistivity than has ever been reached and a very low capacity of heat absorption or thermal lag. The results achieved in this new range are not due to the new insulating material alone, but also to the methods with which this new material has been applied to minimize heat losses.

ELECTRIC RANGE EMBODYING NEW FEATURES

The efficiency of the new range may be better appreciated by comparison with

some of the old types. The connected load of the new model is 3,600 watts as compared with 6,300 watts; the oven takes 1,000 watts maximum as compared with 2,800 watts; the hot plates each take 1,000 watts as compared with 1,500 watts; the broiler takes 1,000 watts as compared with 1,400 watts. The operating consumption of this new range is 60 per cent of the watthours of the old type. In keeping with the advanced electrical and thermal features is the appearance, giving the impression of substantial construction guaranteed to carry conviction to the heart of any housewife.

Other unique features are the vegetable steam compartments of which, ordinarily, there are three, taking 200 watts each. These compartments have all the advantages of so-called fireless cookers, but they cook as rapidly as hot plates; the compartments can also be used for slow cooking if desired, and the hot plates and vegetable compartments are interchangeable and can be varied in position on the stove top. It is possible to start the vegetables to cooking on the hot plates and then transfer them to the fireless cooking compartments, thus saving current consumption.

The Passing of the Punkah

'Twas near the close of a sultry East Indian day. Bombay had sweltered and slept through the long hot afternoon, and now as the sun like a purple globe sank beyond the Isles of Elephantus, the thoroughfares resumed the weird hum so peculiar to Oriental city streets. The night promised to be as sultry as the day, and finding that the punkahs merely stirred the atmosphere into active whorls of heat, Sterling started toward the quays hoping to find some relief from the languid breeze moving gently inland from the murmuring Arabian Sea.

As he pushed his way through the throng of turbaned natives, helmeted Europeans, horses, bullocks and dogs, and all manner of wheeled vehicles that crowded the esplanade, the hand of one of the occupants of a passing auto slapped him on the shoulder and shouted: "Jump in, Sterling—come on; we are out for a breeze. Lots of it here—plenty more at the bungalow."

Dawson owned a bungalow almost 20 miles down the beach. About two miles out of town they left the esplanade and drove the machine along the curving beach, running about 30 miles an hour. The breeze certainly was delightful and the motion of the car over the hard, wetted sands was as smooth as the rhythm of an Indian epic. In fact, it was over all too soon. A sudden slowing down and a short, laborious drag over loose sand heaps under the fringing cocoanut trees carried them to the portico of the bungalow. The brilliant light streaming through the wide open doors betokened little of a cool interior; and more disconcerting still, Sterling noticed the entire absence of the familiar swinging punkahs of red turkey cloth, either on the verandas or in the inner rooms.

Ere he could be questioned, Dawson passed into the brightly lighted drawing room exclaiming: "Never mind the punkahs, shipmates! I have found something better for the punkah boys to do than to pull the punkah strings. Come into the coolest house in or out of Bombay." And so it was.

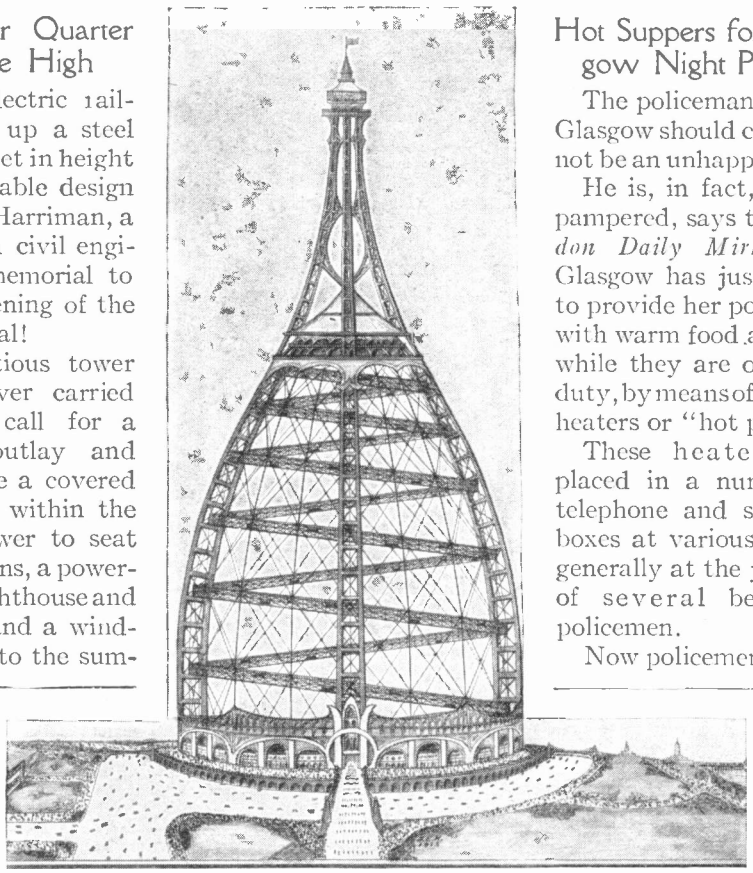
Dawson's bungalow was equipped with an engine driven electric light plant, which not only furnished all the light for the house, go-downs and garage but also for running the electric fans installed at many points throughout the spacious rooms. The punkah boys now attended to the engine and generator equipment, a job much easier than sitting on the veranda like so many question marks and drowsily pulling the punkah strings attached to their big toes. They really had nothing to do: the plant operated automatically, running lights and fans during the evening and fans during the day without requiring practically any attention.

Junior Section

Tower over Quarter of a Mile High

A spiral electric railway winding up a steel tower 1,513 feet in height is the remarkable design of J. Emery Harriman, a noted Boston civil engineer, for a memorial to mark the opening of the Panama Canal!

This ambitious tower project, if ever carried out, would call for a $1,000,000 outlay and would include a covered amphitheater within the enormous tower to seat 100,000 persons, a powerful electric lighthouse and searchlight, and a winding footwalk to the summit, aside from the spiral electric railway.



TOWER PROPOSED TO COMMEMORATE THE OPENING OF THE PANAMA CANAL

Hot Suppers for Glasgow Night Police

The policeman's lot in Glasgow should certainly not be an unhappy one.

He is, in fact, almost pampered, says the *London Daily Mirror*, for Glasgow has just begun to provide her policemen with warm food and tea, while they are on night duty, by means of electric heaters or "hot plates."

These heaters are placed in a number of telephone and signaling boxes at various points, generally at the junction of several beats for policemen.

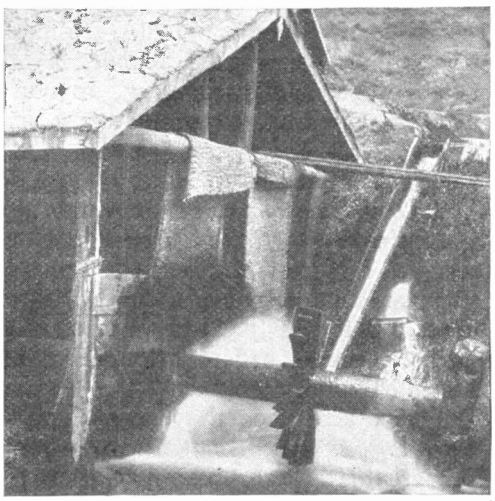
Now policemen will be able to make their tea for themselves. "Twenty minutes is alotted for a supper of ham and eggs," as one constable remarked, "and the 'hot plate' would be quite equal to the making of such a meal."

"Electricity is the most powerful agent in the world, but it cannot get along without cotton. Millions of miles of copper wire annually owe the perfection of their insulation to cotton yarns or tape of cotton cloth. It is estimated that the sales in New York market alone amount to 400,000 pounds of yarn weekly."

Sir Henry M. Pellatt, president of the Toronto Electric Light Company was, in 1879, the fastest "miler" on the continent of North America, defeating the famous Duffy in 4.32.

Thibetan Prayer Wheels Replaced by Motors

Prayer wheels of all descriptions are by no means uncommon amongst the Himalayan Buddhists, and there would be nothing especially remarkable about the one here shown, in a tiny Ladaki village, but for the fact that, in conserving



A THIBETAN PRAYER WHEEL TO BE REPLACED BY A MOTOR

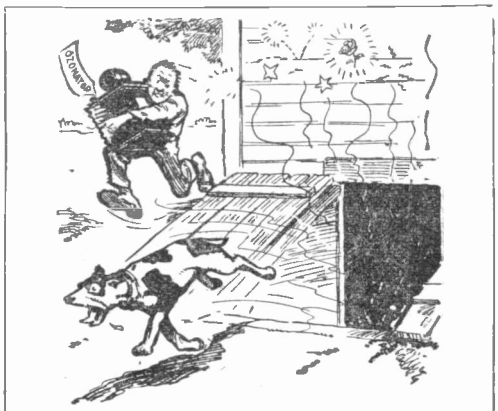
the flow of a mountain river in connection with the hydro-electric project that is shortly to furnish light and power for Simla, it appears likely that the flow of a number of little streams which are drawn on for water to drive the rice and prayer wheels of several small villages will be, for a part of the year at least, entirely cut off.

So the Government of India, ever scrupulously careful to avoid interfering with the religious practices of any of the numerous peoples of that Empire, has decreed that where the owners of water wheels whose power will be interfered with by the Simla project do not elect to accept a money compensation for their loss, a motor shall be installed for them and power furnished free of charge. So it would appear likely that the wheel in question will send up the first electrically driven prayers to Buddha in Nirvana.

Ozone Routs Skunk

A few weeks ago a large and healthy specimen of the skunk family took up his residence in the basement of a home near Schenectady, N. Y. It was not until he knew he was discovered by an overbold fox terrier that the family knew that the skunk was there at all — but oh! they knew it then. When the terrier had finished with Mr. Skunk the whole house was so filled with the horrible odor that the family thought of moving out for the winter. Airing the house did little good and only seemed to spread the trouble around the neighborhood.

The owner of the house had been reading about the wonderful deodorizing qualities of the new electric ozone producing machine. He knew that he was tak-



WHEN THE TERRIER HAD FINISHED

ing an unfair advantage of any machine to ask it to tackle the odor of a skunk, but it was his only hope. The cellar doors and windows were closed. The little machine was installed and started on its Herculean task. In a few hours the odor of the skunk was no more and every trace of the odoriferous animal was completely obliterated, and at a cost of but a few cents.—*Southwestern Electrician.*

Thirty thousand books and pamphlets, two-thirds of which relate to electricity, have been recently added to the library of Massachusetts Institute of Technology.

The Yellow Streak

By F. H. M. RILEY

It was during his senior year at college that King succeeded in making the Norbridge football team, and it was in the game with James, the most important game of the season, that he first exposed his weakness. He was playing a great game and his team had secured a lead of one field goal on its opponents. With two minutes to play, Smith, the right halfback on the James team, received the ball from the quarter-back and started around the Norbridge end, almost straight into King. The latter should have made a desperate attempt to stop the flying James halfback, but Smith was coming down the field like a cannonball. King stopped—afraid. It was the yellow streak and the swiftly galloping Smith carried the ball down the field for a touchdown. Of course Norbridge lost.

King claimed that his ankle turned. Nearly every one believed him, and the few who did not, said nothing. To say that King, apparently one of the gamest men on the team, had proved a coward, would have been looked upon as rank knocking. He graduated as being one of the best football players that Norbridge ever had.

About three years later, Thomas, the boss in the testing laboratory of the Great Northern Power Company, rushed out of his office one morning and whispered a few words to Roe, the foreman. Turning to King, Roe snapped out:

"King, I want you and Newson to go over to Central Station immediately. They are having some trouble with one of the 6,600 volt lines out of the station."

The erstwhile football player, now considered one of the best high tension men in the employ of the company, took his hat and coat, slung his tool bag over his shoulder and called to Newson, his helper, who was busily engaged in placing an instrument on the board for repair. They started out together for the station.

"I tell you, kid," said King, as they were riding to their destination, "there is nothing like being sure of yourself, in a business like mine. A man never knows when he is going to get it. Still, I never worry, for if I ever stopped to think of what might happen if I touched a hot bus-bar, I would have been lying in a little three by nine excavation some time ago. That's the secret of the whole game, never be afraid."

Thus the conversation was carried on the entire length of the journey, for Newson was a tyro in the business and was very much interested in the work he had chosen. He was pleased to think that he had been picked to help one of the best men on this job.

After a short ride they arrived at the station. It was a monstrous plant. The great alternators roared and vibrated as they rotated ponderously.

Following the operator down the narrow iron stairs into the "hot-room," directly beneath the alternators, King was told where to look for the trouble. The man in charge returned to his comfortable seat near the entrance of the

"BETTER LOOK OUT KING—THIS LADDER MAY SLIP"

plant, leaving King and his helper to remedy the difficulty.

The whole place was teeming with harnessed power. The transformers, huge and formidable, buzzed and hummed sullenly, as the current was sent hurtling through their coils. All around was an apparently chaotic tangle of wiring. But the high tension buses in their concrete casements were marked plainly, and the danger signs were placed at frequent intervals, that the unwary and forgetful workman might have as much protection as possible.

At intervals along the copper bus-bars a small transformer was tapped on, and a line sent up to the voltmeter or ammeter on the switchboard above. At these points the bars were exposed.

King took out a few necessary tools from the bag, bit off a chew from a dirty brown plug and said, "Well, this is what I like. I tell you, kid, there is nothing like being sure of yourself in this business. I never was afraid of anything, and as for worrying about a few thousand volts or monkeyin' around these little transformers—nothing to it at all."

After delivering these remarks, he mounted a short ladder which his helper had placed for him, and proceeded to his work, leaving Newson to hand him any tools he might need.

He worked away diligently and with considerable profanity, for the problem of locating the trouble was a little more difficult than it had promised to be at the start. Pausing a few moments, he wiped his grimy face with a still grimier handkerchief and spat viciously on a nearby transformer. Leaning a trifle closer to the exposed bus, he resumed his work.

Newson, watching him closely, ventured a remark. "Better look out, King, you're standing pretty close to that bus, and this ladder may slip."

King laughed nervously—possibly derisively. "Don't worry about me. I tell you when you have been in the game as long as I, you'll—"

He did not finish the sentence, for the

KING LAUGHED NERVOUSLY—POSSIBLY DERISIVELY —"DON'T WORRY ABOUT ME"

short ladder upon which he was standing slipped from under him, in spite of the desperate attempt of Newson to hold it. King grabbed wildly at the bus to save himself from falling. He clutched it convulsively and with a low moan drew himself up rigidly and then dropped to the floor, where he lay quite still.

The operator came down quickly as soon as the terrified Newson could make him understand what had happened. Together they turned the prostrate figure over. Placing his hand over King's heart, the operator looked up at Newson.

"Dead." Examining the hands more closely he said quietly, "Not a burn on him. What do yuh know about — what's that? He grabbed that Smithville bus? Why, man, that bus has been dead for the last two hours!"

"And to think," mused Newson after the operator had left to call the office, "that he always said he 'never was afraid of anything.'"

Radiograms Audible to a Number of People

Who is the wireless operator who has not often regretted his inability to make a number of friends hear the wonderful sounds which he hears in his telephone? He must pass the receiver from hand to hand, and each one catches only a fugitive fragment of the precious radiogram. With the use of the following apparatus it is possible to make any messages received audible to a room full of people.

The simplest method is to fix a large horn of stout paper upon the telephone receiver. With this one can hear ordinary radiograms at a distance of ten or twelve feet. But a more striking result is obtained by taking a small microphone, such as is used with ordinary telephone transmitters, and placing its bell against the bell of the receiver, which is connected with the detector. The experiment succeeds very well if the receiver is placed on a table or other flat surface, and the bell of the microphone placed above it.

The microphone is put in the circuit of two or three Leclanche cells or dry batteries in series, in which is an ordinary telephone of small resistance. The receiver may be attached to a wall, and is furnished with a large accoustic horn.

If a still louder sound is desired, place in contact with the bell of the telephone a second microphone. Place this microphone in circuit with a second group of cells and a receiver furnished with a horn. The result thus obtained is extraordinary.

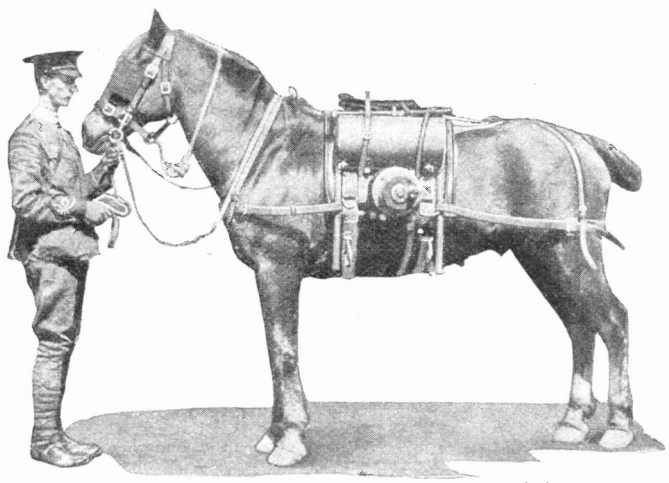


Photo by Paul Thompson

MARCONI'S LATEST "PACK STATION"

Wireless by Horseback

The first of a series of experimental tests with the new Marconi wireless "pack station" were made at Saffron Walden, England, recently, under the superintendence of Major J. E. Cochrane.

The new pack station consists of a small petrol motor and dynamo, transmitter and receiver and sections of aërial masts, which reach to a height of 30 feet, all fitted for easy conveyance upon four pack horses and it is claimed that the station can be erected and put in working order in six minutes. The station at Saffron Walden was erected upon the common and wireless messages were transmitted and received from Chelmsford, a distance of 25 miles.

A Double-Rectifying Detector

In the detector described there is reason to believe that both sides of the cycle of the alternating current received by the aërial is rectified and applied to the receivers.

The action will be more easily understood by considering an analogous example, that of a step-down transformer, the secondary current of which is used for charging storage batteries by the interposition of a suitable rectifier. In Fig. 1 we have a step-down transformer with a secondary winding of, say, 100 turns, and a voltage of about 20, between the terminals (C) and (D). The terminal (E) is taken at the middle or 50th turn. The aluminum plates (A, A_1) are placed equidistant from the central lead plate (L) and the whole set is placed in a solution of sodium phosphate. (C) and (D) are connected to (A) and (A_1) respectively. When current is turned on the transformer, we obtain a pulsating direct current, + at (L) and — at (E). This current is represented graphically by Fig. 2. The alternating current, represented by Fig. 2 (a), has been rectified, for, since the current is able to flow from the aluminum to the lead plate but cannot flow from the lead to the aluminum; when (C) is +, (D) is —, and the current flows from (A) to (L). At the next alternation, (C) is — (D) is + and the current flows from (A_1) to (L). It will be noticed by comparing (a) and (b), Fig. 2, that in (b) only one half of the current represented at (a) is rectified while in (c) all the current represented at (a) is rectified. This principle of double rectification may be very easily applied to a wireless receiving set as indicated in Fig. 3. Referring to Fig. 1 we have an ordinary step-down transformer with the electrolytic rectifier employing two aluminum plates; in Fig. 3 we have an air core tuning transformer (omitting sliders, etc.) and a detector with two separate silicon elements. By comparing the operation of the apparatus of Fig. 3 and that of Fig. 1, we see that the current flowing to the telephone is as represented graphically by (c), Fig. 2. If either detector is used separately results are secured similar to those obtained from a simple detector and tuning transformer.

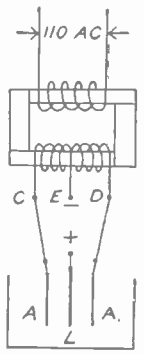


FIG. 1. TRANSFORMER

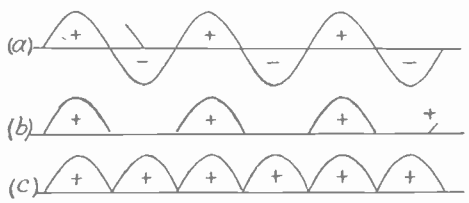


FIG. 2. ALTERNATING AND RECTIFIED CURRENT WAVES

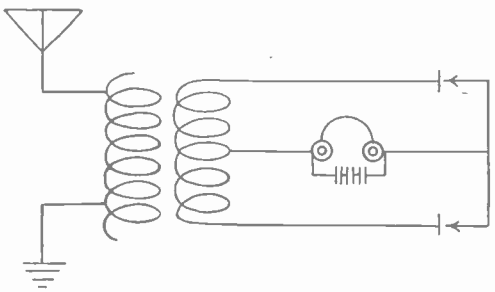


FIG. 3. CONNECTIONS WITH TWO PLATE RECTIFIER

The tuning transformer and detector are mounted on a board 10 by 16 by ¾ inch of any suitable hard wood. The ends of the tuning transformer are of oak 5 by 5 by ¾ inch. Two 7½ inch lengths of slider rod ¼ inch square will be required, also five binding posts and eight switch contact points. The primary of the loose coupler is wound on a paper tube six inches long and four inches in diameter, and consists of about 180 turns of No. 22 enameled wire—about six ounces. The secondary is wound on a similar tube which is five inches long and 3¼ inches in diameter and consists of 200 turns of No. 26 enameled wire. About four ounces of No. 26 wire will be sufficient for this winding. Taps are taken out every 25

turns on the secondary winding. Although the secondary coil may be made to slide on suitable rods as is customary, a stationary one is perfectly satisfactory. By taking out taps every 25 turns there are four taps on each side of the hundredth turn.

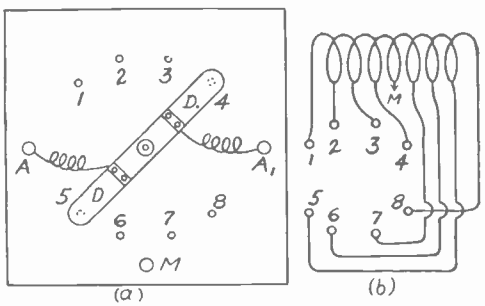


FIG. 4. SWITCHING ARRANGEMENT

The switching arrangement will be understood by referring to Fig. 4, (a) and (b). Switch points (1, 2, 3, 4) are situated on the arc of a three inch circle which has as its center the center of the tuner end, and on the other side of the circle the points (5, 6, 7, 8) are situated diametrically opposite (4, 3, 2, 1) respectively. The center of the switch lever is a piece of fiber ¼ inch thick and ⅜ inch wide by 1¼ inches long. The spring brass pieces (D, D_1) are attached to the ends of this fiber piece so that they bear on the contact screws (1, 2, 3, 4, 5, 6, 7, 8), when the fiber switch lever is rotated. Short flexible leads are taken from the pieces (D, D_1) and are connected to the binding posts (A, A_1) respectively. Fig. 4, (b), gives proper connections for the secondary taps. After these leads have been connected up the ends are attached and the slider rods and sliders put in place for the primary tuning.

A general idea of the detector is given by Fig. 5, (a). The hard rubber standard (P) carries the brass piece ½ by 4 by ⅛ inch thick with the adjusting screws (A, A_1) which bear on the spring brass piece (D) which carries near its extremities the screws that make contact with the silicon in the cups (C, C_1). Two single point switches are mounted on the base and also two binding posts in order to receive the telephone cord tips. A complete diagram of connections is shown in Fig. 5, (b).

To operate the set connect the two primary sliders, one to the aërial and one to the ground. A small condenser of about 20 square inches of tin foil separated by mica may be bridged across the receivers. Adjust each detector separately, using switches (S) and (S_1) until the buzzer test gives a maximum sound in the receivers. When the two detectors have been adjusted, close both switches and put the switch of the secondary in such a position that, say, 50 turns are being used for each detector, i. e., contact points (3) and (6) are connected up. Adjust the primary sliders till the maximum result is obtained, then change

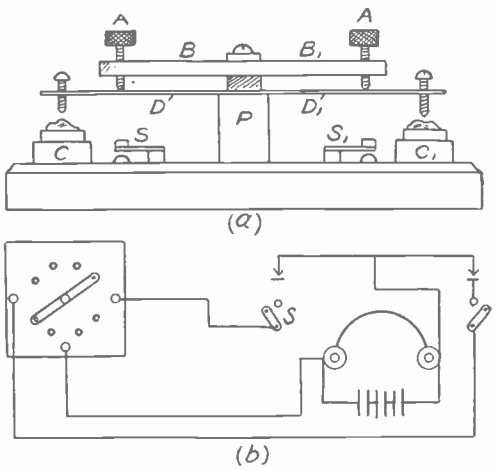


FIG. 5. COMPLETE DETECTOR AND CONNECTIONS

the position of the secondary switch till a maximum result is obtained again. It will be advisable that each switch be opened occasionally to see that both detectors remain in adjustment.

I have been able to receive while the phones were at least three feet away from my ears. I would like to hear from any who try this set as I am anxious to know how it works where the interference is greater than in Winnipeg.—ALEX. POLSON.

Experimental 200 Meter Wave Sets

By PHILIP E. EDELMAN

PART 6

WAVEMETER

A wavemeter is an instrument comprising a known inductance and capacity so that its wave length may be adjusted to a definite value, and to an indicating means such as a telephone receiver or vacuum tube so that the point of resonance may be determined. There are various forms and modifications, to be sure, but in each case the instrument depends on the fact that the circuit to be measured has the same wave length as that indicated by the wavemeter when the latter is in resonance with the given circuit. The chief object of a wavemeter is thus to measure the wave length of an unknown circuit.

In practice the chief uses are (1) to measure the wave lengths of the primary and secondary circuits of the transmitter and (2) to measure the wave lengths of stations which are received. Other less common uses are the determination of curves showing the relation between the capacity, inductance, coupling, wave length, damping and adjustment of both the sending and receiving sets.

Indeed there is nothing mysterious or complicated in a wavemeter. Every reader who has made, owns, or operates

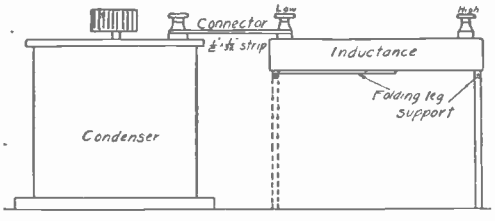


FIG. 11. WAVEMETER

an average station can make and use this instrument without much difficulty.

A form of wavemeter in general use and one which is sufficiently accurate for the chief purposes just mentioned may be constructed by referring to Figs. 11, 12 and 13.

THE CONDENSER

Almost any form of condenser in which a uniform variation of the capacity is possible is suitable. The maximum capacity need not exceed .001 mf. and may be less. If you already have such a variable condenser it will not be necessary to make another. The type of condenser illustrated in Fig. 12, even if a little difficult to construct, is best adapted for the present purpose. The dielectric being air, there is practically

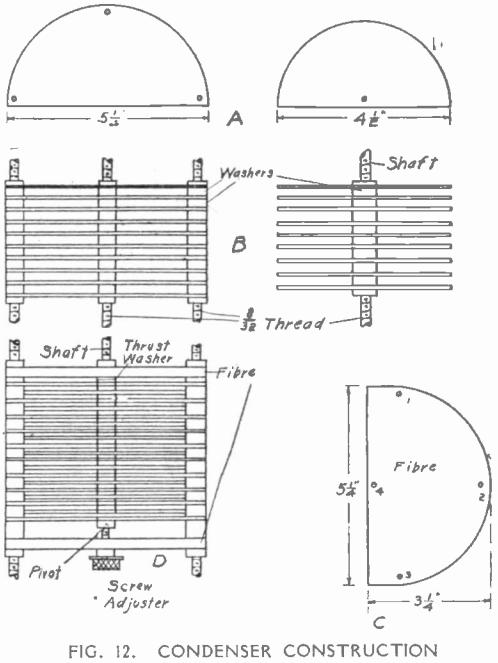


FIG. 12. CONDENSER CONSTRUCTION

no loss in the condenser and in case of a breakdown no harm is done.

Ten stationary and ten rotary plates of No. 20 B. & S. gauge brass or aluminum and with dimensions as shown should be obtained perfectly flat and even. The ten large semicircles should be placed together and three $\frac{5}{32}$ inch holes should be drilled near the edge as shown at (A). The nine small plates are placed in a

similar manner, and bored, except that only one $\frac{5}{32}$ inch hole is needed as shown. These plates or similar ones can be had from supply houses ready cut for about 75 cents. Brass or copper washers $\frac{5}{32}$ inch thick, $\frac{3}{8}$ of an inch in diameter and with a $\frac{5}{32}$ inch hole at the center, also some $\frac{5}{32}$ inch brass rods, are needed.

The assembling will be clear by referring to the figure (B and D). After the holes have been smoothed and burrs removed, a piece of the $\frac{5}{32}$ inch rod is alternately passed through a plate and then a washer. The ends of the rod should be threaded with an $\frac{8}{32}$ die and the rod cut so short that a short extension is left beyond the plates, for a handle in one case and supports in the other. Tightly turned nuts $\frac{1}{2}$ inch in diameter, $\frac{9}{32}$ of an inch thick, and threaded $\frac{8}{32}$ serve to hold the plates in alignment so that they cannot be moved or shifted. Obtain two pieces of fiber $\frac{3}{16}$ of an inch thick and cut out two pieces with the shape and having holes as shown at (C). The holes (1), (2), (3) correspond to the holes of the large plates and the hole (4) is bored so that when the shaft of the movable plates is in place in it and the fiber is assembled on the rods, the brass washers of the movable plates will not touch or make contact with the fixed plates. Unless this point is observed, there will be a short circuit. One half inch will be sufficient for the extension of this hole. The lower fiber piece is held in place on the rods by $\frac{8}{32}$ nuts and is preferably spaced a little distance from the lower plate by washers. The upper fiber piece is similarly placed after the plates have been in position.

The assembled plates must not rub or touch each other and must be brought into alignment, the adjustable screw bearing at the bottom, shown at (D), being a suitable means. The rotary plates can then be raised or lowered and should be adjusted so that the air spaces between the plates are uniform. Moving washers should be provided at the upper bearing to take up the thrust. The condenser should be mounted in a dust proof box or case. Connections are taken, one from a washer on the fixed plates and one from a brass strip or brush bearing on the rotary shaft near the top or else from a short piece of flexible wire soldered to this shaft, and these leads should be brought to binding posts. A scale and pointer may be arranged on the cover to suit. A brass protractor may be used, in which case the rotary plates should be entirely out of the fixed plates when the pointer reads zero and entirely within the fixed plates when the pointer reads 180 degrees. The pointer can be cut out of a strip of brass or aluminum and an insulating knob may be used as a handle.

Inductance Coils

The inductance coils may be of various sizes. Two coils are generally provided for this type of instrument, one for short wave lengths (those less than 300) and one for longer wave lengths (those from 300 up). This classification is arbitrary

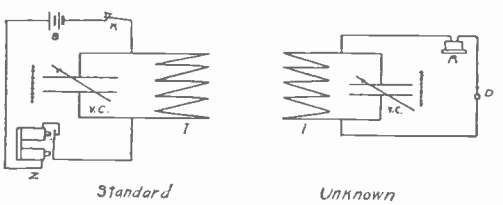


FIG. 13. CALIBRATION

and can be varied but serves for convenience. By remembering that the wave length of the circuit depends upon the product of the capacity and the inductance, it is evident that the same capacity will serve for both long and short wave lengths provided that the inductance of one coil is made with a larger number of turns than the other. The inductance coils should be wound on forms or hoops, a diameter of six or nine inches being suitable. Both coils may be wound on the same form if desired, the terminals being brought out to separate binding posts, and the two coils well insulated from each other. The coil for low wave

lengths may have one dozen evenly wound turns of No. 18 or 20 insulated wire and the large coil may have twice this number or 24 turns of the same wire wound as before. The coil should be provided with a mounting similar to that shown in Fig. 11. The inductance in this case is turned around so that the high binding posts are connected to the condenser for high wave lengths and vice versa.

Calibration

This form of wavemeter is best calibrated by comparison with a standard wavemeter. One method of doing this is shown in Fig. 13. The standard wavemeter is used with a buzzer as a sending station and the wavemeter to be calibrated is used as a receiving station, and the two are compared. Thus, if the standard wavemeter is set at 150 meters, the condenser of the unknown wavemeter is adjusted until the loudest sound, or point of resonance, is indicated in the receiver.

The wave length of the unknown circuit, the new wavemeter, is then the same as that in the standard circuit and should be so noted. Other points are found in the same manner, the usual method being to find the standard wave length corresponding to that of the unknown wavemeter when the condenser of the latter is set at certain points, as 15°, 30°, 45°, 60°, 75°, 90°, etc., or more often 30°, 60°, 90°, 120°, 150°, 180°. (These points on the condenser are often numbered 5, 10, etc., instead of 15°, 30°, etc.) The points thus obtained and the corresponding wave lengths, found by adjusting the condenser of the standard wavemeter to produce resonance in the new wavemeter at these equidistant points, are then plotted. A smooth curve is drawn through the points found.

When two coils are used for short and long wave lengths respectively, the operation is repeated with the other coil in circuit. This calibration will be done for you for a nominal sum by the Bureau of Standards at Washington, D. C. Schools will, in many cases, do the work for little or nothing. A five point condenser determination, that is one in which the wave length is found for five points in the condenser adjustment, is sufficient for the purposes to which this article is limited. It is then assumed that other wave lengths found by comparing the distance up and distance out of other points of the curve will be substantially correct.

The curves for the two inductance coils are plotted separately and must be used independently even if plotted on the same sheet of paper. Whether you have a wavemeter calibrated in this way or purchase one already calibrated in this manner, the curves or plotted points furnished apply only to the particular instrument and are useless for an instrument with different dimensions. Indeed, if the capacity or inductance of the same instrument is accidentally altered so that the pointer does not indicate the same adjustment as at the time of calibration, the calibration must be done over again.

Figure 14 shows such a curve for a particular wavemeter. The reading of the condenser is plotted up and down against the corresponding wave length. Thus for a reading of 75° on the condenser when the small coil is used, the wave length is 220 meters, while the wave length with the larger coil is 458.3 meters. Any wave length can be found in this manner, by running the eye over from the point corresponding to the condenser reading to the curve and then down to the wave length scale.

Operation

As has already been indicated this article is limited to the chief uses of the wavemeter, the uses which concern the average reader. The following methods are the simplest forms for the purpose indicated, and should be familiar.

With the transmitter. For all determinations in which ½ kilowatt or less is used at the station a telephone receiver and detector must be used as an indicator

as the radiation is ordinarily too weak to operate a vacuum tube, and the average reader does not have access to any other indicator. The inductance coil for either the short or long wave lengths as the case may be is connected in series with the condenser while the telephone receivers and detector are shunted about the two as shown. Series connections may also be used but are less desirable. The detector and phones used may be the same as for any receiving set, a crystal detector being preferred. Having tested the detector as for regular receiving, place the wavemeter a few feet away from the sending helix or oscillation transformer and while the sending key is depressed adjust the variable condenser until the indication is loudest in the telephone receiver. The wavemeter should be moved far enough away to allow this point of resonance to be distinguished by a weak sound. A poorly tuned set will give several loud points. Even a tuned set will appear to give several points if the wavemeter is too near. A shunt around the phones will cut down the sound to a point where it can just be heard. The wave length is then found from the particular curve as has been explained.

To find the proper connections of the transmitter for desired wave lengths, measure the transmitter first with the aërial and ground disconnected so that only the primary circuit is energized and then measure again with only the aërial and ground in circuit, the condenser being out of the circuit. Vary the number of turns of the inductance in each case and note the readings. To get a certain wave length, as 200 meters, it is then only necessary to connect the number of turns in the circuit found for a 200 meter wave length and to connect a corresponding number of turns in the aërial circuit which were found for this wave length when the condenser was not in circuit. Thus if the condenser circuit gives 200 meters with one turn of the primary inductance and the aërial gives this wave length when 4¼ turns are in circuit, the connections should be made in this ratio.

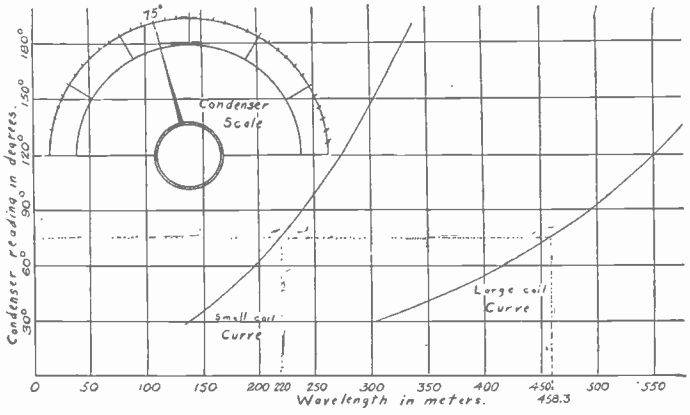


FIG. 14. WAVEMETER CURVES SHOWING WAVE LENGTH READING WHEN CONDENSER SCALE INDICATES 75°

In order to determine whether or not the other crest of the emitted wave, or the second hump, is over 200 meters and if so whether or not it is more than one tenth of the principle hump in intensity, the wavemeter should be removed as far away from the transmitter as is possible without making the received impulses non-recording. The relative strength or intensity of the signals, received at the two adjustments of the condenser indicating resonance with the two humps, must then be judged. If both waves are equally loud or if the high wave is the louder and is considerably over 200 meters, the set requires better adjustment.

This is but an approximate method but serves nearly as well as a resonance curve plotted with the aid of a commercial wavemeter having a finely adjustable potentiometer. The potentiometer is used for the determination of the relative intensity. This point is generally determined by the radio inspectors at the time of inspection, the usual method being similar to that just described.

With the receiver. In order to determine the wave length of a station from which signals are being received, it is only necessary to place the inductance of the wavemeter near to the primary winding of the tuning inductance so that the two coils are parallel and form a kind of loose coupler themselves. The regular receiving circuit is then tuned to get it in the best possible resonance with the incoming waves and the wavemeter is used as described for the transmitter, its condenser being adjusted until the point of resonance is found. Another method for this same purpose is to use a buzzer with the wavemeter in a manner similar to that which has been described for calibration.

In order to determine whether the received impulses are coming in on the short or long waves either in the case at hand or in the calibration of another wavemeter by the method already described, the coupling is reduced so that the signals are just audible. In the case at hand, an increase in audibility with an increase in the primary wave length (that is, an increase in the primary turns of the tuner or a shunt capacity) means that the long waves are being received. If on the other hand the intensity of the received signals increases when the primary wave length is lowered (that is, when less primary turns are in circuit or less shunt capacity is used) the lower wave is the one that is received.

With a wavemeter one can find the wave length of all the stations within range and tabulate this information for ready reference with the following plan:

WAVE LENGTHS

Stations	Operator	Date	High Wave	Low Wave	Note
2DA	Berri	6/1	...	200	
2GK	Hubbard	6/1	380	195	High faint
2JV	Lent	6/2	390	205	High faint
NAH B'klyn. N.Y.		6/2	780	...	Special
2IA	Royce	6, 3	...	200	High not found.

NOTE. Above figures are assumed and used for illustration only.

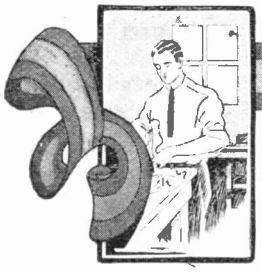
(*The End*)

The Siege of Adrianople

The siege of Adrianople will go down in history not only as a fine example of a gallant defense by Turkish soldiers against the attacking armies, but it will secure a special niche because there, for the first time in warfare, wireless telegraphy played a notable part in aiding the brave defenders of the besieged city. The story of the siege, when it comes to be told, will be one of absorbing interest, and it is impossible not to contrast this siege with others of which one reads in military history or which are within the recollection of older persons.

Adrianople enjoyed a great advantage by the use of wireless telegraphy over, for instance, Paris during the last siege, when that city could only connect with the outside world by balloons and carrier pigeons. Sixty-four balloons ascended from Paris during the siege of 1870-1871, and two of these were blown out to sea and were never heard of again; several on their descent were captured and a good many were fired at with more or less damage while in the air.

Adrianople was not dependent on this unreliable method, for by the use of Marconi wireless stations the government at Constantinople was kept in touch with all that took place in and around the city. No one knows the value of a wireless station more than Shukri Pasha, who with his gallant Turks kept his flag flying over Adrianople during 153 stubborn days. Although the city possessed only one small portable post, he communicated daily with the capital. Situated at a commanding point on a hill by the clock tower, the little station did its work well and encouraged the commander in a defense that won the admiration of the whole world. Constantinople was kept constantly informed of the city's losses during the bombardment and at the end it was with a pang of regret that one read his message determining, ere he surrendered, to blow up the wireless telegraph station.



For Practical Electrical Workers

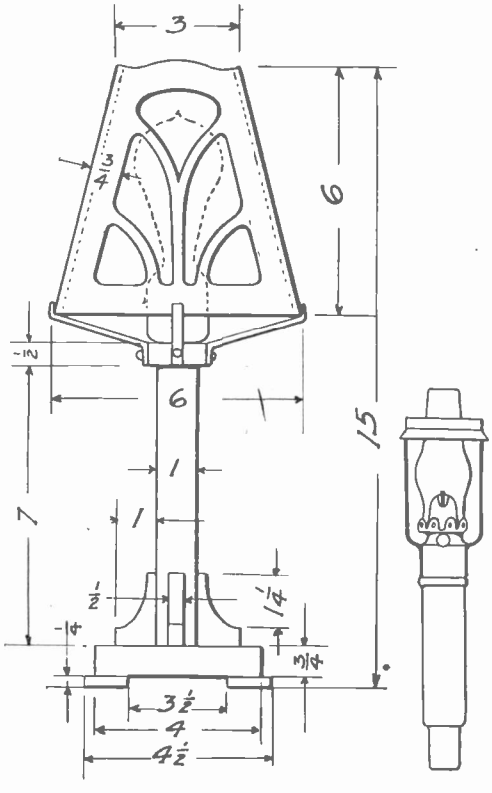
Homemade Artcraft Fixtures of Wood

By JOHN D. ADAMS

PART II

DESK LAMP

Although primarily intended for use on the writing desk, this little lamp will find several appropriate nooks and corners about the house where its presence will be welcome. The general illumination is rather faint as most of the light is thrown downward. A small eight or ten candlepower electric globe is about the correct strength, but if no current is available an "oil candle" may be used. This is nothing more than a kerosene lamp burner having a tubular reservoir as shown in the accompanying sketch. These may be had for 50 cents and can be substituted for the electric globes in most of the lamps of our series.

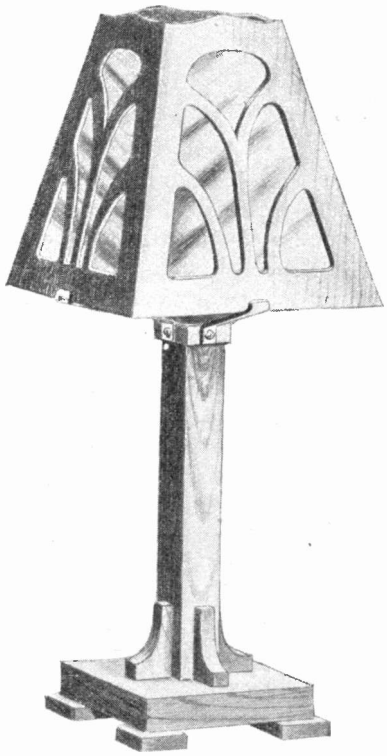


DIMENSIONS OF DESK LAMP AND ALSO AN OIL BURNER THAT MIGHT BE USED IF CURRENT IS NOT AVAILABLE

OIL BURNER

The constructive features are a combination of those met with in the candles and the hall light previously described. The four thin hardwood boards for the shade will first be trimmed up to size and planed off on their edges so as to make a perfectly close fitting corner seam. Mark off the design on a piece of paper and then transfer it to each of the four sides. Saw out with a fine scroll saw, and file the edges smooth. With glue and very fine wire nails put the four sides together. Generally it will be found advisable to glue small strips along the inside lower edges to prevent warping. The base block and the four small blocks at the corners are now in order and must be finished with almost mathematical accuracy or the effect will be entirely lost. Mortise a square hole in the center of the base for the lower end of the post which must now be prepared. Tenon the lower end and build out the top with four small pieces fitted on with bevel joints at the corners. A hole about the size of a lead pencil should now be drilled clear through the center of

the post and the upper end hollowed out slightly so that an ordinary brass socket will set in snugly. As soon as the four small angle blocks are made ready, the putting together may commence. Use glue and a few small wire nails set in from below. Be sure that the post is



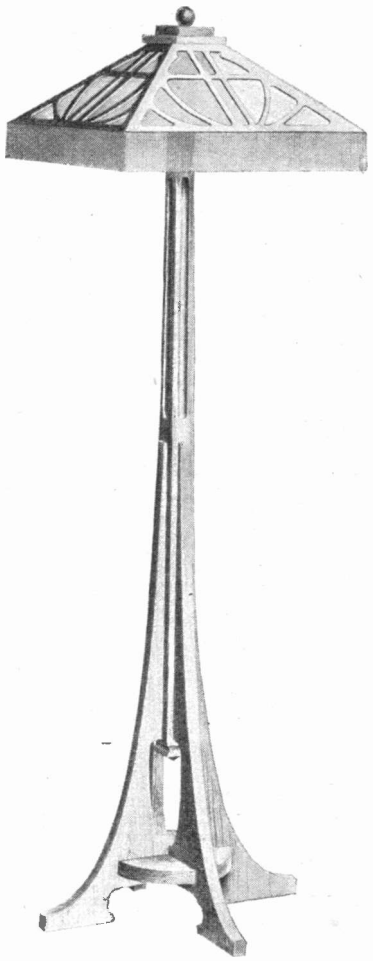
DESK LAMP

square with the base. Procure four pieces of heavy copper wire or strip brass and bend them to form the projecting arms that support the shade. The woodwork should now be stained and finished, the brackets screwed on, the electric cord run down the center hole and out to one side below the base, and the socket fitted in place. The socket should be of the kind operated by a small hanging chain. It now only remains to place the fancy glass or colored paper in the shade and the lamp is complete.

PIANO LAMP

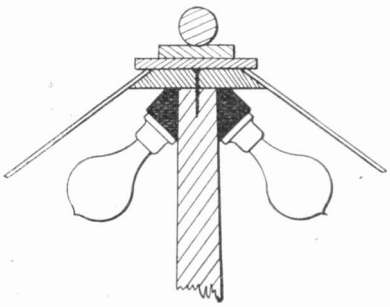
A most practical and artistic source of light for the piano is the tall, portable, piano lamp. In the accompanying design a very graceful standard and base is secured by a simple combination of a few pieces of wood. The shade, which is rather large to construct of wood, is made from a very heavy brand of cardboard used in building, instead of lath and plaster. This material is about three-sixteenths of an inch thick and can be worked just like wood, except that it has no grain.

The dimensions of one of the four sides of a shade having a slight angle

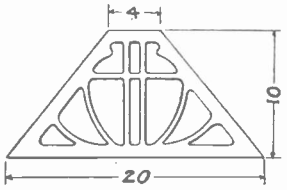


PIANO LAMP

such as this one are rather misleading as will be seen from the small diagram giving the dimensions and pattern for one

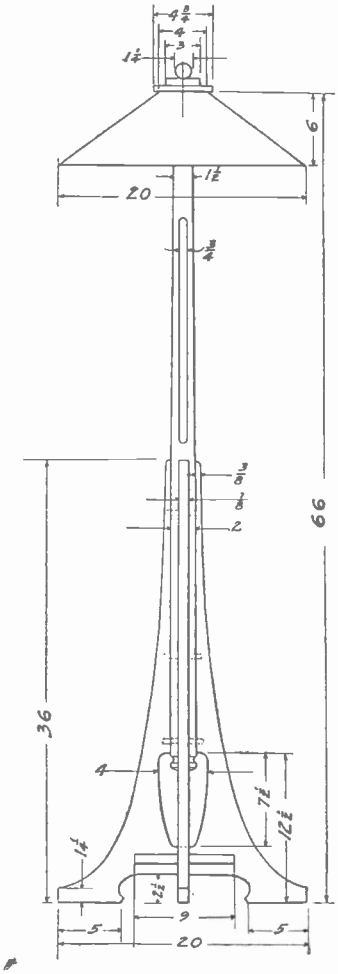


DETAIL OF PIANO LAMP



SIDE OF PIANO LAMP SHADE

CORNER STRIP OF PIANO LAMP SHADE



DIMENSIONS PIANO LAMP

side. Saw out the four pieces to the proper form and plane the slanting edges off at an angle that will form good close corner seams. The pattern should first be drawn out full size on paper and then transferred to each of the four sections. Saw out with the scroll saw and sandpaper the edges smooth. Touch them up with a little black paint and when dry, sand again. We must now make four triangular corner strips of wood to fit into the four inside angles of the shade. The shape of these strips will prove very deceiving as will be seen from the small sketch which gives the proper cross section. The four sections of the shade are then nailed or screwed to these strips, after which the corner seam on the outside may be bound with passe-partout tape. A block with beveled edges should now be fitted into the top of the shade, and the entire structure gone over with a dull black paint. Usually a little very fine sandpaper can be used to advantage and also a second coat of paint. Either silk or colored paper will give excellent results as a lining. Bead fringe may be purchased by the yard in almost any color and adds considerably to the general appearance of the lamp.

Start the woodwork with the center post, trimming off the top perfectly square, as upon this depends the setting of the shade. Plane the sides tapering above the tops of the four long brackets and then work out the fluting with a sharp gouge, finishing with sandpaper wrapped around a piece of round wood. The lower end is to be finished with a half-round groove and a dull point.

As so much depends on having a graceful curve for the four long brackets, secure a large sheet of paper and lay out the entire bracket full size. Transfer the pattern to the wood which must be thoroughly seasoned and then saw out, leaving a liberal margin for finishing down to line. Too much attention cannot be given to this feature of the work.

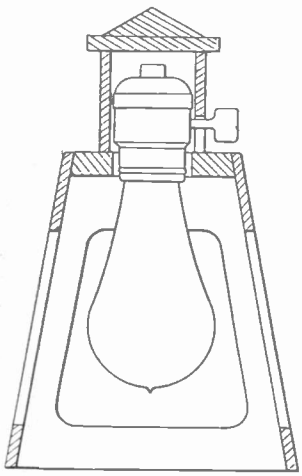
These brackets may be secured to the post by means of wooden dowel pins and glue, which method permits the entire fitting to be tested before applying the glue. The four sections of the circular shelf which it will be noted are not full quadrants, are now to be prepared and attached with glue and nails set in from below.

Two or four lights may be arranged as shown in the sectional sketch. Ordinary porcelain outlets are attached to triangular blocks to give them the proper angle. The electric cord may be permitted to drop directly to the floor or can be concealed within the post if a sufficiently long boring bit is at hand.

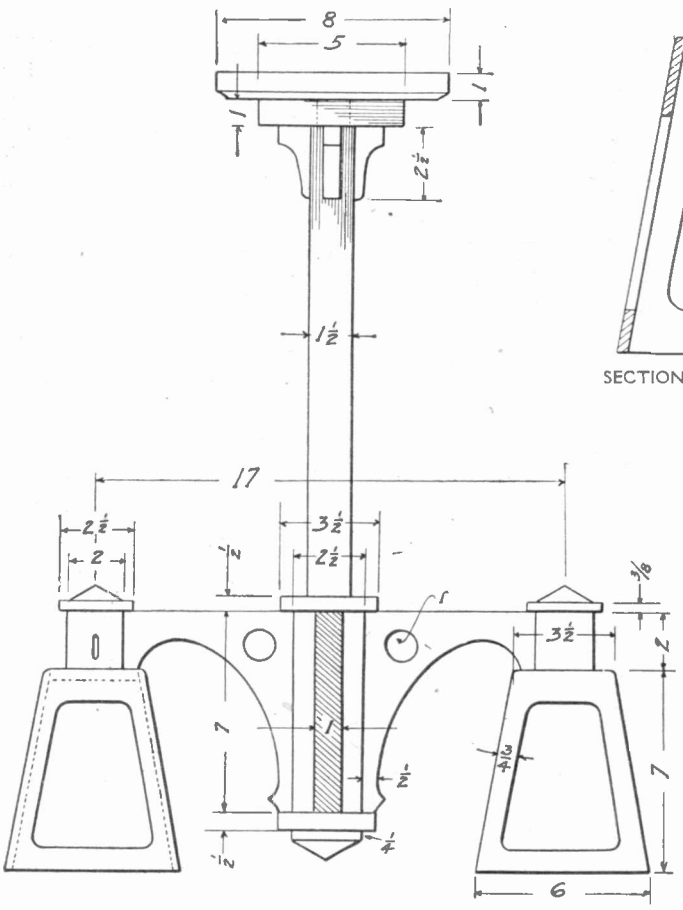
Stain as desired, apply a suitable filler, rub off the surplus and when dry sandpaper lightly. Finish with a good rubbing of wax. Attach the shade with a long screw, place the top decoration, and the lamp is complete.

CHANDELIER

It is admitted that the chandelier that forms the subject of the accompanying illustration looks like a rather formidable task for home construction. True enough, the amount of labor is considerable, but there are really no structural difficulties that have not already been met with in this series.



SECTION OF CHANDELIER SHADE



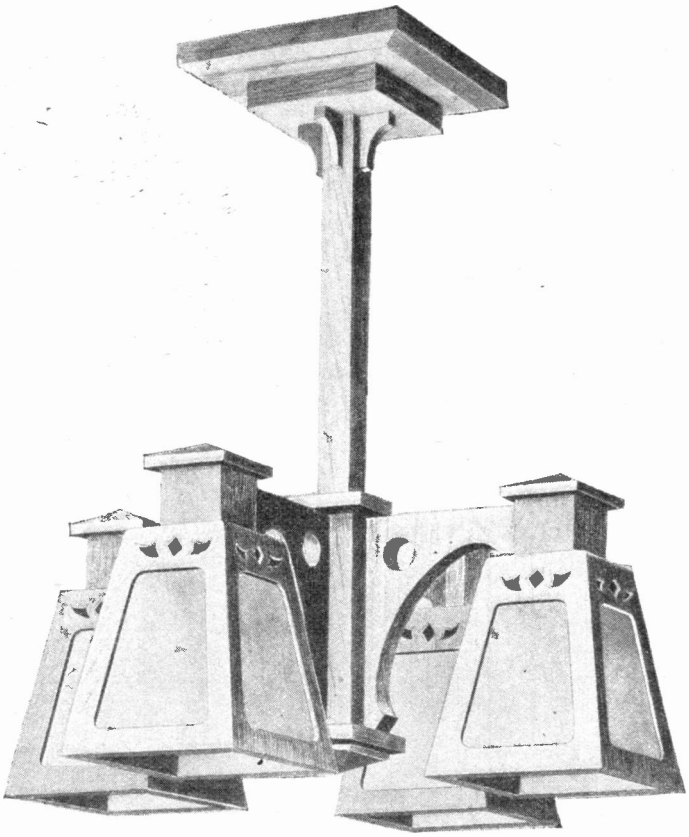
DIMENSIONS OF CHANDELIER

There is always more satisfaction in making something that looks quite difficult and if the reader will observe the following he will be amply rewarded and agreeably surprised. First make the four shades, and while working on them forget all about the rest of the job. Concentrate on having all four exactly alike. Next get out the four curved brackets, and have no other thought than that of making four brackets that will be identical in every

respect. In other words subdivide your work, and then concentrate on each subdivision.

The bodies of the shades are made in exactly the same manner as those previously described. Fit the four sides closely together, and then saw out the openings with the scroll saw. Smooth the edges and join up with glue and fine wire nails. Next fit in the tops, providing a round opening in each for the socket. Four small wooden boxes should now be made to enclose the sockets as shown in the accompanying sectional view. See that the sockets have real long keys, and cut a slot in one side of each box so that the key may project through. Do not fasten the pyramid shaped tops just yet.

The four brackets are now in order. Make a full sized paper pattern and saw each one out therefrom. Smooth up the edges while all four pieces are clamped together, and cut a narrow slot in the top of each one for the wires. The length of the center post must be determined from the height of the ceiling. Build out the lower end by the addition of four half inch pieces, fitted around neatly with beveled edges. A hole for the wires should now be drilled down the center to a point where the brackets connect. If a long bit is not at hand take the piece to some electrical shop where one will be found.



CHANDELIER

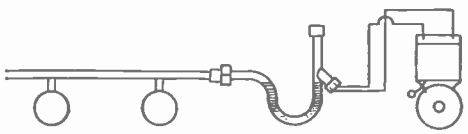
The two small blocks on the lower end of the center post should now be prepared and attached, after which the ceiling plate is in order. The larger block should be neatly beveled around the four

edges and the smaller one mortised to receive the end of the center post, which is then to be tenoned to match. After making the four small blocks, fasten the two larger ones together, fit in the post and glue on the small blocks. The four large brackets are now to be attached, care being taken that they all set square with the centerpost. The four shades are now to be connected to the ends of the brackets, using glue and a few nails set in from the inside of the small boxes surrounding the sockets. Run the wires from the sockets along the grooves previously made, connect them properly and then run them up the hole in the center post. It may be that the reader will again find it necessary to have recourse to the local electrician for help with the wiring.

Air Pressure Fire Alarm

If the air in a closed vessel is heated it expands and in case it cannot get out, pressure is exerted upon the walls of the vessel.

The accompanying illustration shows a fire alarm device having hollow vessels



AIR PRESSURE ALARM

located along a pipe which at one end has a U-shaped bend containing mercury. A pocket in which terminate two wires is provided so that when pressure of expanding air in the pipe forces the mercury over into the pocket an electric circuit is closed and an alarm sounded. A patent upon the device has been issued to Alexander Allen and Thomas Bowling, Wellington, New Zealand.

Polarity Indicator

Perhaps no question is asked more often by amateur electricians than this: How do you find the polarity of a pair of terminals or a feeder? The little instrument described here is for that purpose although it can be used for many other purposes. Of course, there are many ways for finding the polarity of a

FIG. 1. SHOWING DIRECTION OF FIELD WHEN CURRENT IS FLOWING IN A WIRE

line, but this one is easy to carry out and the instrument can be converted into an ammeter or voltmeter, a battery tester, etc., providing the user knows the elementary principles of electro-magnetism.

When a wire is carrying a current it is surrounded by a magnetic field, the magnetic lines of force being concentric with the wire. If a small compass needle be held close to the wire it will point

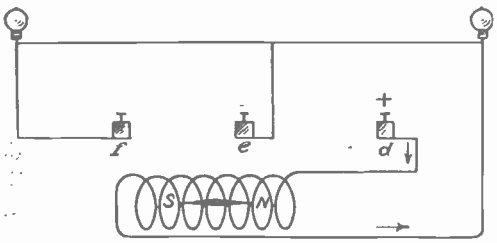


FIG. 2. DIAGRAMMATIC SKETCH OF THE POLARITY INDICATOR

in a definite direction at any position. The direction of a magnetic field is always assumed to be coincident with the direction the north-seeking pole of the needle. Thus in Fig. 1 is shown the direction of the field when current is flowing away from the observer along the horizontal wire shown in cross section at (a) and also when it is flowing toward the observer along wire (b). From the observer's point of view (b) is the positive wire. If we did not know the direction of the current the compass needle would indicate the direction of the field around the wire.

If we imagine that we are turning a right-handed screw in the direction of the lines of force the direction in which

the screw moves is also the direction of the flow of current. This simple law is the basis of a full understanding of the direction of rotation of a motor, the polarity of a generator and many other electro-magnetic phenomena.

If current was always flowing in a wire its polarity could always be deter-

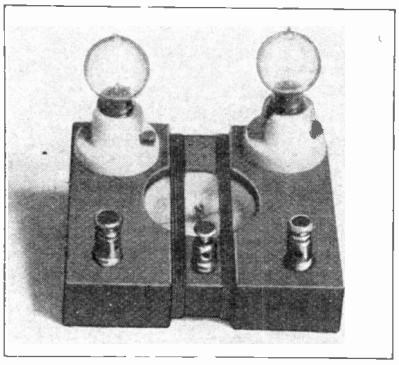


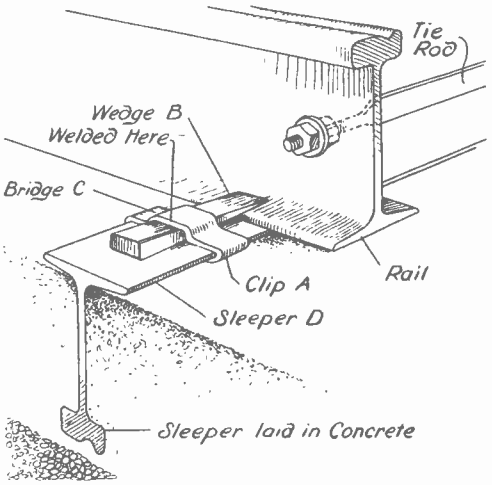
FIG. 3. POLARITY INDICATOR COMPLETE

mined by means of the compass needle. Sometimes however we are obliged to determine the polarity when no current is flowing.

The instrument here shown was devised for that purpose. Fig. 2 is a diagrammatic sketch of it. The lamps are 110 volt with carbon filament. If a 110 volt circuit is to be tested use terminals (d) and (e). If 220 volts are to be tested for polarity use (d) and (f). Mark terminal (d) positive and note in which direction the north pole of the needle points when (d) is connected to a positive terminal. It will point in the opposite direction if (d) is connected to the negative pole. By short circuiting the lamps, a dry cell can be used to determine which direction the needle points when (d) is connected to the positive pole (the carbon of the battery). By experimenting with the number of turns of small wire to be used in the coil a battery tester can be made by comparing this instrument with an ordinary tester and making a scale to fit. An ingenious amateur can make this instrument answer many purposes while it has the advantage of being small. The complete instrument is shown in Fig. 3. Here the coil consists of eight turns of No. 18 wire.

Laying Tracks in South Africa

The corporation of the Borough of Durban, South Africa, has adopted a new process for laying the car rails of the municipal system. Instead of laying the rails on a bed of concrete and keeping them parallel to one another with light steel ties screwed to the web of the



METHOD OF LAYING STREET CAR TRACKS

rails, sleepers made of old car rails are inverted, and laid in a bed of concrete.

A piece of iron, technically termed a "clip," of the shape shown at (A) is now slipped along the sleeper (D); the rail is put into position and a wedge-shaped piece of iron (B) is driven under the bridge (C) of the clip and above the flange of the rail, thus holding the rail firmly down to the sleeper. The whole job is now welded into a solid mass.—H. Sinclair.

Just 161 years and two months ago the fifteenth of this month Benjamin Franklin went forth with his kite and proved that lightning and frictional electricity are identical. The date of this epoch making experiment according to the best authority was June 15, 1752.

Elementary Electricity for Practical Workers

By W. T. RYAN

Chapter V — Fundamental Laws and Equations

Ohm's Law. We often hear the expression, "We do not know what electricity is." This statement is misleading, for while it is true that we do not know what its ultimate nature is, we do know a great deal about the laws which govern the action of electricity. For example, we know that the strength of a continuous current varies directly as the electromotive force and inversely as the resistance of the circuit, or using our usual units, the amperes (current) flowing through a circuit are equal to the volts (electromotive force) divided by the ohms (resistance). This may be written:

$$I = \frac{E}{R}$$

where,

I = current in amperes.
E = electromotive force in volts.
R = resistance in ohms of the whole circuit.

As an illustration, let the electromotive force of a dynamo be 110 volts, its resistance 0.1 ohm, and the external resistance 1.0 ohm.

$$E = 110$$
$$R = 1.0 + 0.1 = 1.1 \text{ ohms}$$
$$I = \frac{E}{R} = \frac{110}{1.1} = 100 \text{ amperes.}$$

Ohm's law may be written thus:

$$R = \frac{E}{I}$$

or it may be written:

$$E = IR.$$

The left hand side of the last equation is the voltage of the source of supply, while the right hand side is the voltage necessary to send the current, I, through the resistance, R.

Ohm's law may be applied to each individual part of the circuit as well as to the whole current.

If, in Fig. 9, the voltages between the terminals of the resistances R_1, R_2, and R_3 are represented by E_1, E_2, and E_3, and a current, I, is sent through the circuit, it is found experimentally that:

$$E_1 = IR_1,\ E_2 = IR_2 \text{ and } E_3 = IR_3.$$

$$I = \frac{E_1}{R_1} = \frac{E_2}{R_2} = \frac{E_3}{R_3}$$

The equation $E = IR$ enables us to understand the difference between ammeters and voltmeters. An ammeter (or the ammeter and its shunt) carries the whole current and as a rule is similar to a voltmeter except that it is provided with a shunt, whereas a voltmeter is provided with a high resistance in series and is then connected across the line instead of in series with it. See Fig. 10.

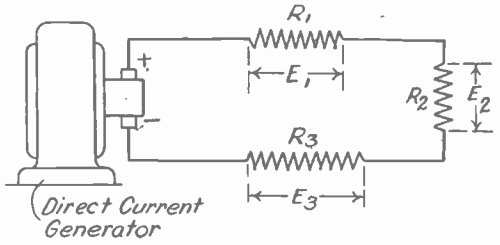


FIG. 9. RESISTANCES IN SERIES

The current which flows through the voltmeter is a loss to the supply. The object of the resistance is to keep the current as small as possible. The instrument acts really as an ammeter, in that its deflection is caused by the current flowing through it. This current multiplied by the resistance of the voltmeter gives us the voltage, therefore the scale may be marked in volts. That ammeters and voltmeters work on the same principle is shown by the fact that many instruments may be used for both purposes. If for example, .01 of an ampere will cause a full scale deflection and external resistance be added bringing the total resistance up to 10,000 ohms, then a full scale deflection would be (.01) x (10000) = 100 volts.

Some instrument makers accomplish the same results by using on their ammeters just a few turns of heavy wire and on their voltmeters a large number of turns of very fine wire.

From the above it is evident that to compare two or more ammeters they

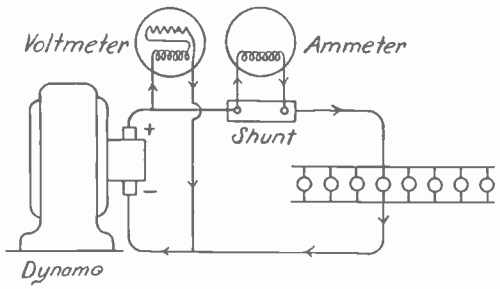


FIG. 10, CONNECTIONS OF AMMETER AND VOLTMETER

should be connected in series; if two voltmeters are being compared they should be connected in parallel.

Resistance. The resistance of a conductor depends upon its length, its area, and upon the material, and to a small degree upon its temperature. Resistance of a wire in ohms equals its length in feet divided by its area in circular mils and this result multiplied by the resistance of a wire of like metal one circular mil in diameter and one foot long.

This statement is sometimes written in abbreviated form as follows, the Greek letter ρ being used to represent the resistance of the circular mil-foot of wire:

$$R = \frac{L}{A} \times \rho$$

The resistance of all metals varies with the temperature, the variation of pure metals being about one per cent for 2½° C. The temperature coefficient of a material is defined as the increase in resistance for a temperature rise of one degree C., the increase being expressed in terms of the resistance at 0° C. This may be reduced by combining different metals. The temperature coefficient of manganin, for example, is zero.

Table of Specific Resistances and Temperature Coefficients

Material	Resistance of a wire one foot long and .001 in. diameter at 0° C	Temperature coefficients
Copper (annealed)	9.529	.00428
Aluminum (annealed)	17.48	.0039
Iron (pure)	60.00	.00453
German Silver	125.70	.00044
Manganin (approx.)	300.00	.00000
Lead	115.10	.00387
Mercury	565.9	.00072

If the resistance of the shunt field of a dynamo at 20° C. (68° F.) is 100 ohms, what is its resistance if the temperature of the field increases to 60° C.?

The resistance at 0° C. is:

$$R_0 = \frac{100}{1 + (.00428)\ (20)} = 92.1 \text{ ohms.}$$

The resistance at 60° C. would be:

$$R_t = 92.1\ [1 + (.00428)\ (60)] = 115.45 \text{ ohms.}$$

Under working conditions the temperature of electrical machinery rises about 40° C., which causes a considerable increase in the resistance. The increase in resistance may be used as a measure of the temperature of those parts inaccessible to a thermometer by reversing the above process.

In contrast to the metals, the resistance of liquid conductors and of carbon decreases with increasing temperature, therefore we say they have a negative temperature coefficient. The resistance of a carbon incandescent lamp, for example, at its normal burning temperature is less than one-half what it is at 70° F.

Resistance in Parallel. The resistance of several conductors connected in series is, of course, the sum of their individual resistances. The resistance of two or more resistances in parallel, as shown in Fig. 11, is the reciprocal of the sum of the individual reciprocal values, that is:

$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}}$$

Kirchhoff's Rules. (1) The sum of the currents flowing toward any branch point in a network is equal to the sum of

the currents flowing away from that point. (2) In any closed circuit the sum of the products of current and resistance taken all the way around the circuit is

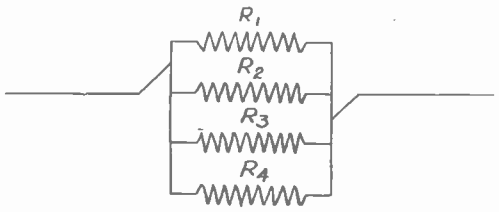


FIG. 11. RESISTANCES IN PARALLEL

equal to the sum of the voltages in that circuit.

Kirchhoff's rules are required for solving a network of wires, as, for example, the one shown in Figure 12.

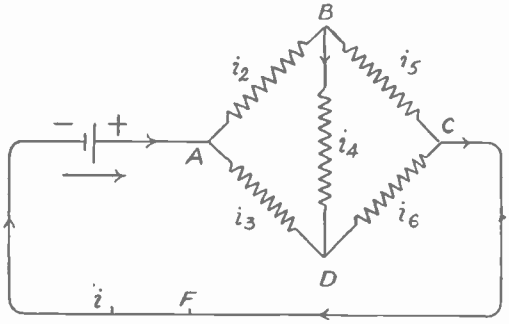


FIG. 12. ILLUSTRATING KIRCHHOFF'S RULES FOR SOLVING A NETWORK PROBLEM

At the point A we have,

(1) $i_1 - i_2 - i_3 = 0$

At the point B we have,

(2) $i_2 - i_4 - i_5 = 0$

We do not know whether the current, i_4, is flowing up through BD or down as indicated. I have assumed that it is flowing down. If this assumption is wrong it will be indicated in the final solution by the obtaining of a negative value for i_4.

At the point C we have,

(3) $i_5 + i_6 - i_1 = 0$

Considering the closed circuit ABCF

(4) $E = i_1 r_1 + i_2 r_2 + i_5 r_5$

Considering the closed circuit ADCF

(5) $E = i_1 r_1 + i_3 r_3 + i_6 r_6$

Considering the closed circuit ABD

(6) $0 = i_2 r_2 + i_4 r_4 - i_3 r_3$

If E and r_1, r_2, r_3, r_4, r_5 and r_6 are known the values of i_1, i_2, i_3, i_4, i_5, and i_6 may be found from the above equations.

Example illustrating the application of Kirchhoff's rules. A 120 volt dynamo, Fig. 13, and a storage battery are connected in parallel to a number of lamps whose combined resistance is one ohm. The voltage of the battery is 116 and the resistance of the battery circuit is 0.1

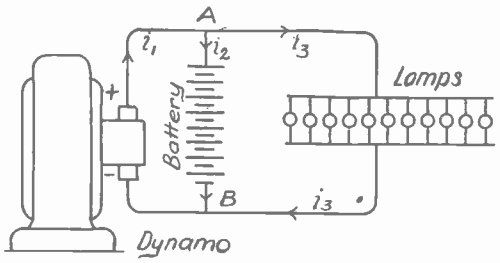


FIG 13. APPLICATION OF KIRCHHOFF'S RULES

ohm. The resistance of the dynamo circuit from (B) to (A) is 0.1 ohm. Will the battery be charged or discharged and what will the current be in the battery circuit, the lamp circuit, and the dynamo circuit?

We will assume the battery is being charged. If it is discharging we will get a negative value for i_2. Considering the point (A) we have

(1) $i_1 - i_2 - i_3 = 0$

Considering the dynamo and battery circuit we have

(2) $0.1\ i_1 + 0.1\ i_2 = 120 - 116 = 4$

Considering the dynamo and lamp circuit we have

(3) $0.1\ i_1 + i_3 = 120$

Transposing equation (2) and multiplying by ten we get

(2^1) $i_2 = 40 - i_1$

Transposing equation (3) we get

(3^1) $i_3 = 120 - 0.1\ i_1$

Substituting the values of i_2 and i_3 from (2_1) and (3_1) in (1) we get

$$i_1 - 40 + i_1 - 120 + 0.1\ i_1 = 0$$
$$2.1\ i_1 = 160$$
$$i_1 = 76.19 \text{ amperes.}$$

The current taken by the lamps is found from equation (3^1):

$$i_3 = 120 - (0.1)\ (76.19) = 112.38 \text{ amperes.}$$

The current through the battery circuit is from equation (2^1),

$$i_2 = 40 - 76.19 = -36.19 \text{ amperes.}$$

The battery is therefore being discharged, instead of charged, and supplies 36.19 amperes to the lamps. The remaining 76.19 amperes of the 112.38 amperes taken by the lamps is supplied by the dynamo.

There are two great and fundamentally important differences between electric circuits and magnetic circuits in that electrical resistance depends simply on the length and area of the wire, whereas magnetic resistance depends also upon the degree of saturation of the iron; and in that work must be done to continue sending a current through a resistance, the energy appearing as heat, whereas in a magnetic circuit once a field is established the maintenance of the field represents no expenditure of energy. Not even a trace of the energy expended in the field coils of a dynamo is transformed into magnetism, but is all transformed into heat in the resistance of the field coils and may be calculated from the formula, $\text{Watts} = I^2R$.

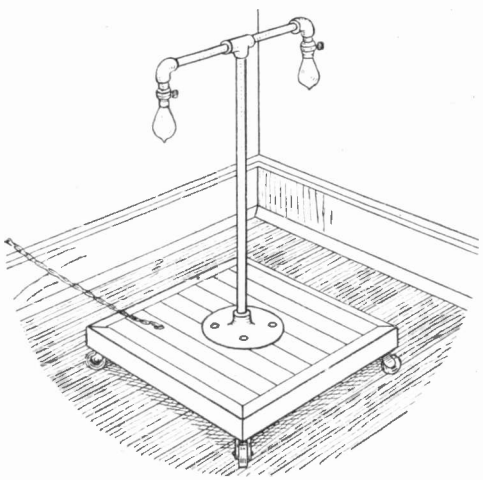
Hysteresis. If a piece of iron is magnetized and the magnetizing force be removed, the iron does not become completely demagnetized. A certain magnetizing force in the opposite direction must be applied in order to reduce the magnetism to zero. This property of iron is called hysteresis and the energy required to reduce the magnetization to zero again is termed hysteresis loss.

Eddy Currents. When a mass of iron is subjected to a constantly changing magnetism, as for example the armature of a dynamo or the core of a transformer, electromotive forces are set up in the iron which produce currents at right angles to the direction of the lines of force. They are called *eddy currents.* They represent a loss of energy which appears as heat in the iron. This loss is reduced to a very small value by laminating the iron circuit so as to make it continuous in the direction of the lines of force but discontinuous in the direction in which the eddy currents flow. From his experiments Dr. Steinmetz also evolved expressions for the power loss due to eddy currents.

The armatures of direct current dynamos have projecting teeth, therefore the flux density between the armature and the pole faces is greatest opposite the teeth and is very much less opposite the slots. As the armature revolves this causes some eddy currents in the pole faces. To reduce this loss, the pole faces in addition to the armature are sometimes made of laminated iron.

Portable Floor Light

To save lighting expense in large theatres and auditoriums during cleaning operations, there are provided floor and baseboard outlets to which portable fixtures constructed as shown, may be attached. With casters screwed on the bottom the lights are moved from place to place within the length of the extension cord.



PORTABLE FLOOR LIGHT

The school department of Boston is to inaugurate a school of practical arts in the Roxbury district in which electric apparatus and appliances will have a conspicuous part.

The Architect and the Electrical Contractor

Three architects at lunch the other day were discussing the relative merits of certain electricians. Said one, "Collins is a tip-top fellow, as honest as the day is long. He has every intention of following specifications and his men are thoroughly reliable, yet do you know, I believe I'll have to stop his figuring in my office." "Why so?" said the second. "He's so careless," replied the other. "Now here's a sample—I go on the job and discover that four or five wall outlets in a room which is to be paneled are set so low that when the carpenters come along to put in their panels, the outlets will have to be moved. Collins very good naturedly moves them after considerable delay. Then I find the wrong kind of switches being put in and an outlet or two left out in one room and a couple more located in the wrong place in another, notwithstanding that the plans and specifications are correct and specific.

"Now," he went on, "Collins doesn't do these things intentionally. The whole trouble is caused by his not watching the work himself, to see that it is right. He seems to think that it is the place of an architect to see that the wiring is correct; he thinks he can fall back on me—that I will keep his work straightened out."

"You will find Henderson a dandy electrician," said the third architect, "and I advise you to have him do some of your work. Here's the way he handles mine: To begin with, when I ask him to figure he always gets in his bid promptly; it is typewritten and clear so you don't have to take a day off to ferret out what he is driving at. Next, if he is awarded the contract, he sees that a set of plans and specifications is given him and these are studied until he knows the job from beginning to end.

"His next move," the architect went on, "is to find out exactly when I want him to begin work and he is careful to make an appointment with me in advance at the building to check over every outlet show on the plan.

"Now the next thing on the program is entirely original with this man; I never saw it done before though I wonder why other contractors do not adopt the same custom. After approving the location of every outlet, Henderson has his foreman mark their position on the building with blue chalk, then I chase the owner around to approve them and the job is ready for his man to start work. You have no idea what a help this chalking up of outlets is to owners who do not sense their location until they see them marked in this manner. Often it saves many changes.

"I went to a building recently to start the electrical work and there wasn't a sign of either plans or specifications on the job. The foreman asked me to locate the outlets for him. Where are your plans? I asked. He had none. How do you expect me to remember where outlets are and locate them without plans? Well he didn't know, but his boss had told him that I could show him where the outlets were to be. This is a thumb-hand way of doing business and bound to annoy any architect. There is often so much trouble over the little details of electrical work that by the time the architect gets his building finished, and the owner has moved in, the architect is about ready to give up his profession and go into some other business.

"After a contractor is known to be thoroughly reliable, it isn't price that counts. Many an electrician is paid more than his competitors, because he is known to be 'on the job.'"—*L. R. Christie in Electron.*

The choice between two kinds of street lighting was left to 29 trolley car motormen in a test made in Switzerland. One street was lighted by arc lamps and another by metal filament lamps. The metal filament lamps were considered the better by 25 of the men, the chief reason assigned being that these were least irritating to the eyes.

SCIENCE EXTRACTS FROM FOREIGN JOURNALS

Auction Sales in Holland.—Auction sales can now be carried on by electricity, according to a new method which has been introduced in Holland. The proverbial quietness of the people in that country accounts for the success of the method there, and no doubt most people would be glad to do away with the objectionable noise which prevails at auctions. In the present case, the method is applied to selling eggs in the weekly markets which are held in the agricultural districts. The eggs are sold in lots of 2,500 in this case. Each bidder has a numbered seat provided with a push button and electric wiring which goes to the seller's stand. A large dial is set up here and it contains figures around it ranging from lowest to highest prices. Near it is a board with corresponding sets of figures and each one of these can be lighted up by an electric lamp. The seller explains the nature of the goods and then makes a contact to a motor device so that the hand moves very slowly over the dial. When at a certain figure, a bidder presses his button and this lights up the corresponding figure on the board and the hand stops. Then it goes on again and a second bidder can indicate a larger figure, and so on. The board shows at once which is the highest figure bid and an electric register also indicates the number of the seat occupied by the bidder.—*l'Electricien, Paris.*

Steam Turbine Explodes. — The explosion of a steam turbine dynamo set in an electric station is a rare occurrence. This happened in the Essen station belonging to the Rhine-Westphalia Company, on the 8th of March. Shortly after 11 P.M. the No. 4 turbine, which is of the Zoelly type direct coupled to a 5,000 kilowatt alternator, began to emit peculiar rising and falling sounds and the current fluctuated widely. The dynamo was at once unloaded and the main switch opened, but shortly afterward, while the main steam valve was being closed, the whole machine burst. Wreckage flew in all directions and caused much havoc. One piece of the stator of some tons' weight went through the wall of the power house and having damaged the railroad track, rebounded and damaged some buildings on the other side of the street. Five of the dynamo pole pieces of 2,000 pounds' weight were hurled through the roof, and the remaining seven poles were found all over the power house. Two of these pole pieces were thrown 100 yards from the building. The engine room was strewn with splinters of iron and wood after the accident, but with the exception of the next machine which was set on fire, there was no damage done to the rest of the valuable plant in the building, although the walls and roof suffered much. Fortunately there was no injury done to anyone in the station. The cause of the accident is unknown.—*Electrical Review, London.*

Japan to the Front Electrically.— The development of electric stations for the supply of Tokio is now under headway. In fact, there are plants with a total of 225,000 kilowatts starting up, building, or projected. The power lines are 60 or 70 miles long in some cases and are mostly to be operated at 66,000 volts. Steel towers are used as poles on the longer lines. The Sagami Waterpower Company is just placing orders for 12,000 kilowatts in electric machines for use in two power houses in order to supply Yokohama over a 45 mile line at the voltage mentioned above. At an annual meeting of the Board of Trade at Yokohama, the chairman spoke of the great progress made in organizing electrical enterprises in Japan and the total capital subscribed to the various com-

panies is now as much as $125,000,000. The good supply of current which Japan is soon to have will be a stimulus to many industries which are struggling against the hardships of dear fuel. Water power is abundant in this country owing to a good rainfall for one reason so that electric current can be cheaply supplied before long.—*Electrical Review, London.*

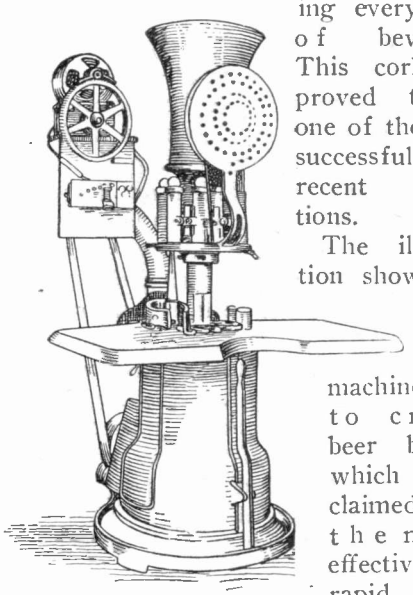
Electrified Roads for Berlin.—Concerning the scheme for electrifying the railroads in the city of Berlin, it is announced that the lower house of the Prussian Diet voted in favor of the bill by which the government is to spend $5,000,000 in preparatory work for applying electric traction in the Berlin city and on suburban railroads. The Prussian Minister of Public Works, Herr von Breitenbach, states that on account of the very great increase in traffic upon these lines, the number of passengers has more than doubled since the year 1895 and the city railroad is now running practically at the extreme limit of its carrying capacity. Electricity is therefore called upon to cope with the problem and it will be $1,500,000 a year cheaper than steam to run the trains. With electric traction there can be run 40 trains an hour instead of 24 as is now done, and passenger accommodations can be increased probably 100 per cent.—*Electricien, Paris.*

Curious Method of Mine Telephoning — A very curious method for telephoning in mines is described by O. Dobbelstein, and it appears to be used in one of the German mines near Bochum. The telphones in the mine and at the surface have one wire connected to such metal parts as air and water piping, cables, rails and the like, and the second wire is connected to ground. According to the author's statements, the metal parts as well as the earth act rather from their electric capacity than as true conductors, and in short, the ensemble of the metal work acts as a vast antenna for directing the current from the underground post to the surface. Only a small current is needed, such as is given by twelve volts from a battery, using a transformer in the telephone circuit, while the receiver is an ordinary telephone. A battery current cannot be sent over such a system in order to ring a bell, as only telephone currents will work upon it, but a call can be made by using a "mono-telephone" relay, which is a special telephone so designed that its disk vibrates and this action sets a lever arm working so as to make a contact for a local battery, as in the Mercadier telegraph system.—*Glückauf, Berlin.*

Water Power Plant to Operate Under More than a Mile Head.— One of the Swiss lakes near Lake Leman is to be made use of for supplying a hydraulic plant which presents considerable interest, as it will have the highest fall yet to be employed in Europe. In fact, the fall will be no less than 5,500 feet, and it was even thought in engineering circles that this was too high to succeed in practice. None the less, a Swiss engineer, A. Boucher of Lausanne, who is an expert in designing plants for very high water falls, is engaged upon the plans for the new plant, as one of the head officials in an electro-chemical company whose headquarters are at Paris. Water for the electric machines will come from Lake Fully, which lies near the town of Martigny in the Wallis canton. The piping for the penstock which is to take the water from the mountain lake, lying at such a high point and bring it down to the turbines placed 5,500 feet or over a mile in vertical distance below, is of great interest in its design, as it must stand an unusually high pressure given by the water, especially in the lower part. A good portion of the penstock is made up of piping which is welded together by a special process in order to lessen the number of joints. The turbines for driving the dynamos will be of the 15,000 horsepower Piccard-Pictet type, of Swiss build.—*Electricien, Paris.*

How Crown Corks are Put on Bottles

Everyone is familiar with the Crown cork, the little metallic cap with a corrugated skirt that tops bottles containing every kind of beverage. This cork has proved to be one of the most successful of recent inventions.



CROWN CORKING MACHINE

The illustration shows the machine used to crown beer bottles, which is claimed to be the most effective and rapid bottle stopping machine in the world. It is driven by a small Westinghouse electric motor and will crown 88 bottles per minute.

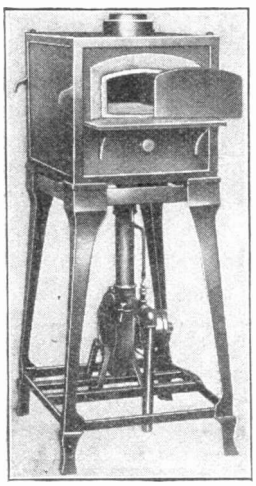
The essential parts of the machine are eight bottle rests, eight crowning heads and a hopper which holds the crowns. The bottle rests and crowning heads revolve around the central shaft eleven times a minute, and the bottles are fed with liquid while the machine is in motion.

The bottles are put into the rests at the right, at which point the rests are level with the table. The rests then rise as they revolve and the heads of the bottles enter the throats of the crowning heads, where the crown is crimped on. The rests then descend to the level of the table and the bottles are automatically discharged. The crowns are fed in bulk into the hopper and are automatically distributed from there to the crowning heads.

Electric Blower for Gas Furnaces

An improvement has recently been made in gas furnaces by forcing the air into the gas by means of a motor driven blower instead of merely allowing the air to flow in through valves as with the familiar Bunsen burner and gas stove.

This forced draught permits a much higher heat, thereby increasing the efficiency of the furnace, extending the range of work it can handle and making its production more rapid. It is claimed, for example, that a temperature of 2500° F. can be obtained with an air blast furnace, whereas 1800° F. is about the maximum for a similar furnace without the blast.



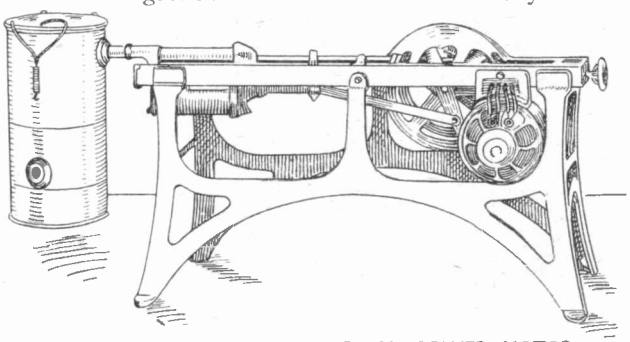
GAS FURNACE BLOWER

This principle has been applied to furnaces for many lines of industry, such as candy furnaces, rivet heaters, muffle furnaces, etc.

A Multi-Duty Motor

The usefulness of the small electric motor for doing many of the hard tasks around the home has become so well recognized that one suction cleaner manufacturer has designed his machine so that full advantage can be taken of the motor's power when the cleaner is not in use.

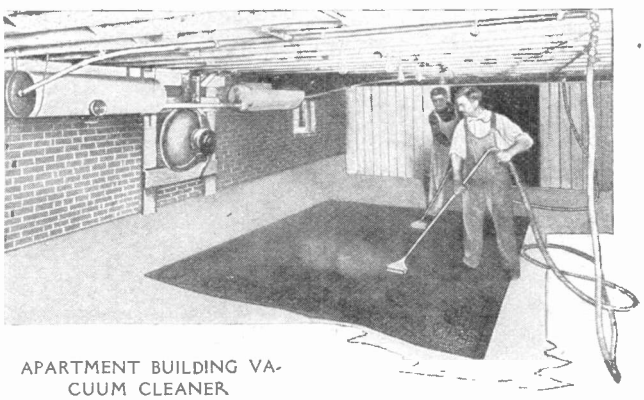
The illustration shows the cleaner (which is known as the Multi-Duty) with a Westinghouse motor. When the motor is driving the cleaner, a pinion on the inner end of the motor shaft meshes with the large gear wheel, which operates the air pump through a connecting rod. To make the motor available for other purposes, the hand-wheel on the end of the cleaner frame is turned, which draws the motor forward and disengages the pinion; a pulley on the outer end of the motor shaft provides means for belt drive to any other machine such as a grinder, washing machine, tire inflater, water pump or shop tool.



COMBINED SUCTION CLEANER AND POWER MOTOR

Cleaning Rugs the Modern Way

The old familiar joke and picture in the funny papers about the tramp earning a meal by pounding the dirt and quite often a part of the fabric itself out of carpets and rugs hung on a line in the background must gradually pass. The electric driven vacuum cleaner is responsible and in apartment buildings where janitor service is furnished something similar to the illustration may be found. Piping from a stationary vacuum cleaner terminating in flexible hose and tool makes the rug cleaning possible in all kinds of weather.



APARTMENT BUILDING VACUUM CLEANER

Latest Automobile Self-Starter

One of the biggest drawbacks to electric self-starters for automobiles has been the great amount of current necessary to turn the gasoline engine shaft to a point where the explosion will occur and the engine run itself.

An Indiana inventor has solved the problem in an interesting way. By the use of a small motor, such as could, if needs be, run on a set of common dry cell batteries, a spring is wound. While this little motor is running quite rapidly, the spring, which is very strong, is wound up slowly. When it is desired to start the car, the spring is released and the shaft is turned a number of times very rapidly and in the meantime the motor is at work winding the spring for the next start. The winding process requiring something less than five seconds, this time is hardly noticeable when the self-starter is being operated.

EDITORIAL ANNOUNCEMENT

Beginning with the next issue of this magazine a number of changes will be evident in its editorial policy. Not the least among these will be the addition of some material each month, which, although non-electrical in itself, will be indicative of the progressiveness — the intensiveness — of the age in which electricity is the dominating influence. While departing from the rigidly drawn lines of the past, the electrical tone of the magazine, nevertheless, will be preserved, and the larger portion of its pages will be devoted to the subject of electricity. At the same time there are so many elements of human appeal in the modern advances in science, industry, agriculture, city building, railroading, automobiling, travel, art and in innumerable other directions that we believe our friends will agree that in giving some space to these features, the popularity of the magazine, as a vehicle for the distribution of electrical knowledge, will be increased.

For instance, motion pictures, directly dependent upon electricity, are one of the great developments of the times — how tremendously great few of us fully realize, although twenty million people watch the films. It is our desire to take you through and beyond the purely electrical phases of the subject, out with the camera man, back into the laboratories and the manufacturing places, so that finally before the screen itself you can watch with keener intelligence the marvel that is spread before you.

In other directions, also, the broadened lines upon which the magazine will be conducted will make it appeal to you even more strongly. Important events all over the world will be presented to you pictorially. In this electrical age the world is making a most remarkable kind of history and some of it we intend to present as it goes along.

Announcements do not make a magazine. On the other hand, opinions expressed by its readers do help greatly. When the September issue is out we desire your frank opinion upon the results of the changes above referred to, and others which will be manifest when you read it.

Co-operation the Keynote

Twenty-eight years ago the National Electric Light Association was organized — in fact, the association is almost as old as the art of incandescent lighting itself. Its membership has now reached 11,115, 846 per cent of this gain having been made in the last five years. The first convention was held in Chicago in 1885. In 1908 the convention came again to that city, as did also this years' convention, held June 2nd to 6th. At this last convention over 4,000 delegates were registered. Under the guidance of President Frank M. Tait, of Dayton, another successful year has been concluded, and the incoming president, Mr. Joseph B. McCall, president of the Philadelphia Electric Company, is already directing his efforts toward a continuance of the success of his predecessors.

If any one word can express the tone — the "atmosphere" — of this meeting it is the word "co-operation." The engineers and plant managers were talking co-operation, so were the commercial representatives, the accountants, the manufacturers, and all the way through to the very broadest questions of public policy it was the keynote of the proceedings. To establish these co-operative relations, both within the membership of the association, which represents upward of three billion dollars of invested capital, and with the great public served by this capital, is what brings men from coast to coast, from Canada to Mexico, to attend these conventions.

Waiter (observing diner's dissatisfaction) — Isn't your egg cooked long enough, sir?

Diner — Yes, the trouble is it wasn't cooked soon enough.

* * *

Solicitor (endeavoring to discover client's legal status) — But, madam, how long is it since you heard from your husband?

Client — Well, yer see, 'e left me the day 'e was married, and truth is I ain't 'eard nothin' of 'im since, nor wanted; leastways, I did 'ear casual-like that 'e were dead, but it may be only 'is fun.

* * *

"Now, Mr. Fresche," said the professor, "can you demonstrate that X equals zero?"

"Sure," said Mr. Fresche. "I write home asking the governor for an X, and get nothing."

"Excellent," returned the professor. "I'll give you the same for your mark."

* * *

"Why is Reginald capering about in that extraordinary fashion? Has he stubbed his toe?"

"No. He has thought of a good name for a new dance and is trying to invent a new step to fit it."

* * *

The late Judge Gary, of Baltimore, who, in his younger days, was a member of the state legislature, was noted for his quickness at repartee. On one occasion he had introduced a bill that proved very obnoxious to several members of the opposing faction. After adjourning, one of the discontented came rushing up to him in a great state of excitement.

"Look here, Gary," he exclaimed, "I'd rather blow my brains out than advocate such a measure."

"My dear sir," replied Gary, with a twinkle in his eye, "you flatter yourself on your marksmanship."

* * *

A funny old bird is the pelican.
His bill can hold more than his belican;
He can tote in his beak
Enough food for a week,
But we don't understand how the helican.

A bald-headed lawyer came into a downtown barber shop and took his accustomed chair.

"Hair cut, Joe," he said.

The barber looked at him, slapped the nude white dome of his skull with mock tenderness, and gave a loud laugh.

"Why, man," he said, "you don't need no hair cut. What you want's a shine!"

* * *

"Did youse git anyt'ing?" whispered the burglar on ground as his pal emerged from the window.

"Naw, de bloke wot lives here is a lawyer," replied the other in disgust.

"Dat's hard luck," said the first; "did youse lose anyt'ing?"

* * *

Mary had a little lamp,
'Twas full of kerosene;
One day the lamp it did explode,
Since then she's not benzine.

* * *

Jenkins, a newly wedded suburbanite, kissed his wife good-by, telling her he would be home at 6 o'clock that evening, got into his auto and started for town.

Midnight arrived and no hubby. She could bear the suspense no longer, so she aroused her father and sent him to the telegraph office with six telegrams to as many brother Elks living in town, asking each if her husband was stopping with him overnight.

At dawn a farm wagon containing a farmer and the derelict husband drove up to the house, while behind the wagon trailed the broken down auto. Almost simultaneously came a messenger boy with an answer to one of the telegrams, followed at intervals by five others. All of them read:

"Yes; John is spending the night with me."

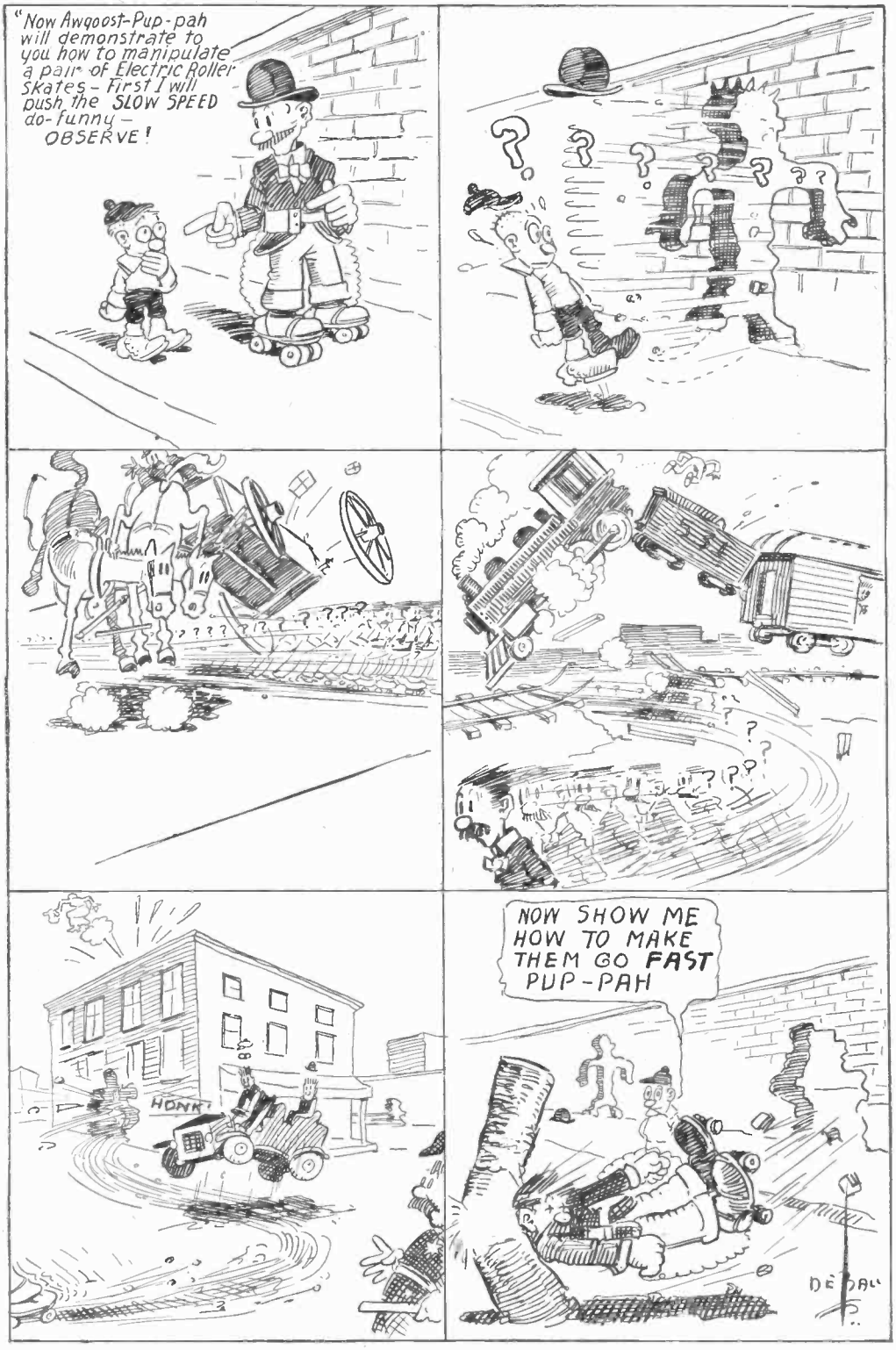
* * *

The train robber suddenly appeared as the passengers were retiring for the night.

"Come, shell out!" he demanded, as he stood towering above an Eastern clergyman, who had just finished prayer.

The minister looked at him sadly, then said:

"If I had such energetic fellows as you to pass the plate now and then, I might have something to give you."


"Now Awgoost-Pup-pah will demonstrate to you how to manipulate a pair of Electric Roller Skates - First I will push the SLOW SPEED do-funny - OBSERVE!
HONK!
NOW SHOW ME HOW TO MAKE THEM GO FAST PUP-PAH

Porch Meals Cooked on the Westinghouse Toaster-Stove

IF you do not already own a Westinghouse Toaster-Stove get one at once for the porch breakfasts, lunches and suppers which are so popular this summer.

This little stove will cook almost anything that can be cooked on the top of the kitchen stove.

The idea of the porch meal is to cook something light and dainty right on the table where it can be eaten before it cools off.

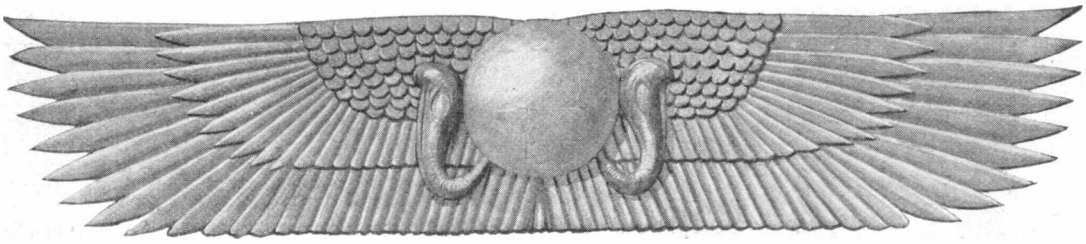
The Westinghouse Toaster-Stove is a wonderfully successful type of electric stove. You attach its cord to any lighting socket or outlet and it heats in a few seconds upon the turn of the switch. The cost of the current used is very small.

The Westinghouse Toaster-Stove can be depended upon to serve you many years. In most families it gets daily use.

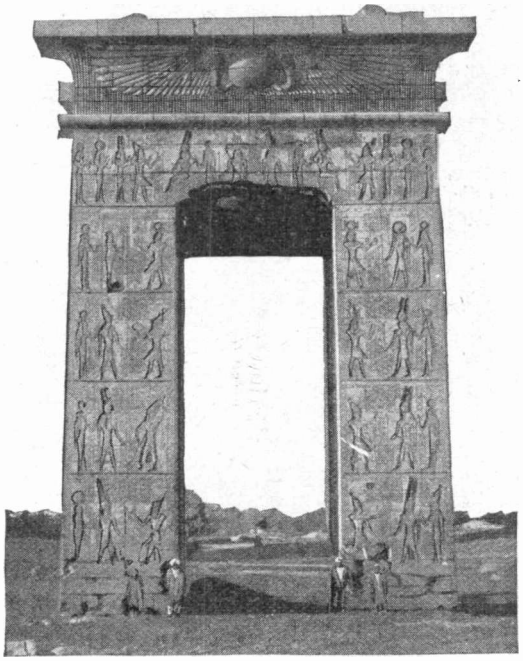
You can buy a Westinghouse Toaster-Stove wherever the best in electrical devices are sold.

Westinghouse Electric & Mfg. Co.

East Pittsburgh, Pa.



Symbols of Protection



Ancient Egyptians carved over their doorways and upon their temple walls the symbol of supernatural protection; a winged disk. It typified the light and power of the sun, brought down from on high by the wings of a bird.

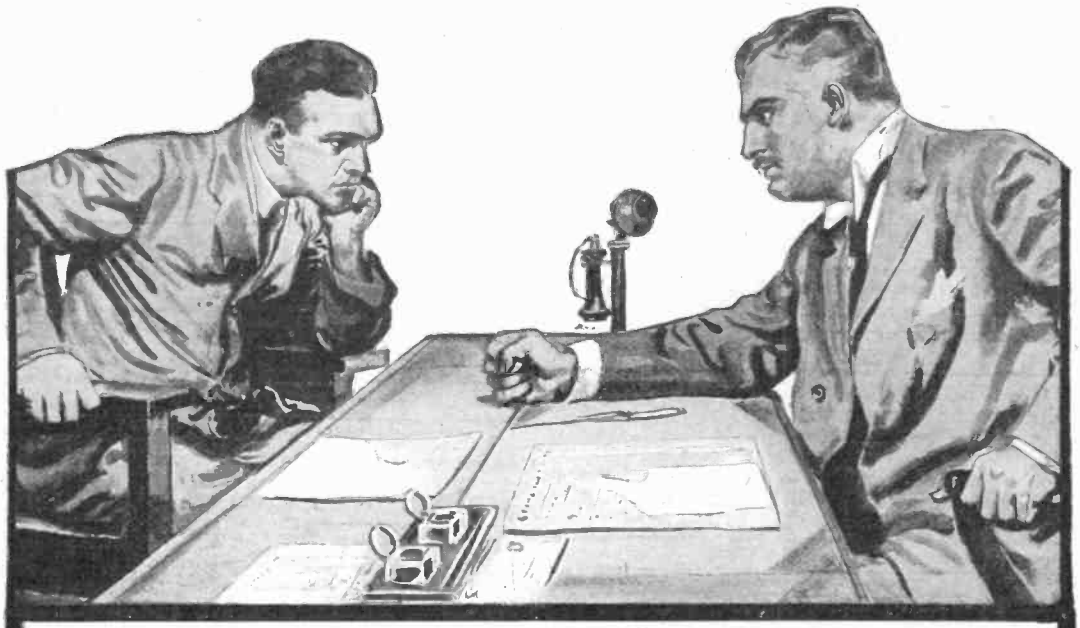
Mediæval Europe, in a more practical manner, sought protection behind the solid masonry of castle walls.

In America we have approached the ideal of the Egyptians. Franklin drew electricity from the clouds and Bell harnessed it to the telephone.

Today the telephone is a means of protection more potent than the sun disk fetish and more practical than castle walls.

The Bell System has carried the telephone wires everywhere throughout the land, so that all the people are bound together for the safety and freedom of each.

This telephone protection, with electric speed, reaches the most isolated homes. Such ease of communication makes us a homogeneous people and thus fosters and protects our national ideals and political rights.



DO Something! BE Somebody!

Train Yourself for a Larger Salary

Don't be content to grind out a few dollars a week and miss all those comforts and pleasures that make life really worth living. *Do* something worth while—train yourself to earn a salary that will enable you to "BE Somebody."

Every normal man possesses the elements of success in *some* line of work. Some men are born with a natural inclination for mechanics. Other men are natural builders. Still others achieve their greatest success in the world of business.

Success depends largely on getting into the right occupation. *YOU* have natural ability for *some* line of work. Find out what your natural ability is—*and then DEVELOP IT.*

For 22 years the International Correspondence Schools have been helping men to find and develop their natural ability. Every month over 400 I.C.S. students report promotions or salary increases as a direct result of this I.C.S. training.

What the I.C.S. have done for these men *they can do for YOU* right in your *own home* during your *spare time*. No matter where you live or how little education you have—if you can read and write—the I.C.S. can help you.

Just mark and mail the attached coupon—it won't obligate you in the least—and the I.C.S. will show you how they can train you for a good job and a big salary in the occupation for which you are best suited.

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Wireman	Architectural Draftsman
Mining Engineer	General Illustrating
Telephone Expert	Chemist
Surveyor	Bookkeeper
Automobile Running	Advertising Man
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THE COST OF ADVERTISING IN THIS SECTION IS 5 CENTS PER WORD

Remittance must accompany order, or advertisement will not be inserted.

Forms for the September issue close August 1st.

AERONAUTICS

COMPLETE PLAN, DRAWN TO SCALE, with concise Instructions for building a 3-foot Nieuport Monoplane, 25c. Other Plans: Bleriot, 15c, Wright, 25c, Curtiss, 35c, "Cecil Peoli" Champion Racer, 25c. Set of five, $1.00. 40 pp. Model Supply Catalog, 5c. IDEAL AEROPLANE CO., 86B West Broadway, New York.

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AGENTS SEND FOR FREE SAMPLES. Joseph Duoba, 2409 S. Hoyne Ave., Chicago, Ill.

SEE WHAT I SAY UNDER "TYPEwriters." ATCHISON.

SEND FOR SIP'S RAZOR SHARPENING outfit. Introductory sample 10 cents. Sip Manufacturing Co., Jersey City, N. J.

STOP HERE! AGENTS', SALESMEN'S SIDE line; get agency for best yet pipe reamer; sample 15c. P. Fisher, 1359 Shawmut St., Louis, Mo.

SMALLEST ALARM CLOCK, BIBLE AND telescope, 10c each, prepaid. W. H. GARNER, B-1408 W. 22nd St., Los Angeles, Cal.

AGENTS — SEND 10c FOR SAMPLE AND selling plan. No talking required. It's all in the plan. Bradford Supply Co., Bradford, Ohio.

150% PROFIT SELLING NEW TIME AND labor saver for lawn and garden. Gates Manufacturing Co., 286 Parker Ave., Detroit, Mich.

AGENTS—MALE AND FEMALE. ONLY odorless glue on market. Big seller. Sample 10c. Tenexine Co., 394 Atlantic Ave., Boston, Mass.

Agents—COST 3c, SELL 25c. SIGN LETters put on with roller. Samples free. Embossed Letter Co., 237 West Illinois St., Chicago.

HOME BUSINESS — COLLECT NAMES, Information, etc., for business concerns. Steady income. Instructive booklet for stamp. Information System, 415, Marietta, Ohio.

AGENTS — STOP SELLING OLD WORN out lines. Something new — Good for $50 a week and more. Write for our proposition to exclusive agents. A. S. Shuh, Sales Mgr., 1652 Sycamore St., Cincinnati, O.

AGENTS WANTED FOR ORIENTAL NOVelties, never before introduced. Quick sellers. Repeaters. Immense profits. Particulars free, or samples 25c. Kanematz, Box J-529, Portland, Oregon.

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ATTENTION AGENTS "MOP, VACUUM, Crew Managers, etc.," Our indestructible cleaning, polishing, and dustless mop just patented sells at sight, pays 150% profit; make $10 to $15 per day easily. Exclusive territory to business producers. Wonderful opportunity. A record breaking proposition. Act at once. Duncan Bros., 2906 N. Troy St., Chicago.

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DON'T ACCEPT AN AGENCY UNTIL YOU get my samples and particulars. Money makers. Address SAYMAN, 706 Sayman Bldg., St. Louis, Mo.

SELL HOSIERY; GUARANTEED AGAINST holes or new hose free; build a permanent trade; big profits; experience unnecessary. INTERNATIONAL MILLS, Dept. 2, West Phila., Pa.

AGENTS — IF YOU ARE MAKING LESS than $30 a week, write for our proposition. It's a sure winner. Thos. Mears, Mfgr., 1148 La Salle Ave., Chicago, Ill.

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AGENTS MAKE BIG MONEY SELLING our new gold letters for office windows, store fronts and glass signs. Anyone can put them on. Write today for a free sample and full particulars. Metallic Sign Letter Co., 400 N. Clark St., Chicago, Ill.

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AGENTS — POSTAL BRINGS FREE "MONthly directory" (illustrated) contains details newest, best selling specialties and money-making proposition of responsible concerns. B. Publishing Co., 113 Cedar St., New York.

AGENTS—WOULD YOU TAKE A STEADY Job where you can clear $20.00 to $30.00 weekly and work up to yearly profits of $3,000.00 or more? My line is snappy household goods. Quick sellers. Get busy with postal asking particulars. E. M. Davis, G51 Davis Block, Chicago.

AGENTS SELL RICH LOOKING IMPORTED 36x68 Rug, $1. Carter, Tenn., sold 115 in four days. Profit $57. You can do as well. Write for selling plan. Sample offer. Exclusive territory. Sample rug sent by prepaid parcel post 98c. R. Condon, Importer, Stonington, Me.

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Small Ad Department

We Have Paid Thousands of Dollars to Amateur Song Writers. You may be able to write a steady seller and share in future profits. Send us your poems or melodies for only **Original** square deal offer. Acceptance guaranteed if available by **Largest, Most Successful Music Publishers** of the kind.

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We arrange music, publish, advertise; secure copyright in your name and pay you 50 per cent of profits if successful. Past experience not necessary. Hundreds of testimonials from delighted song writers. Don't delay—write today for subscription to our big Song Writer's Magazine—valuable illustrated book on song writing and examination of your work FREE.

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Our entire stock is offered at below-list-prices for the summer only. All trade-marked and guaranteed for one year like new machines. Buy *now* and save as much as $75. Branch stores in leading cities.

Write for Summer Price List and Catalog.

AMERICAN WRITING MACHINE CO., Inc., 119 Broadway, N. Y.

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DOUBLE WEAR—HALF COST

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to check mental calculations. For General Office or Personal Desk. **Over 60,000 in use**—mostly sold thru recommendation. Guaranteed—money refunded if not satisfactory after 10 days trial.

Buy from your stationer or order direct. Agents Wanted.

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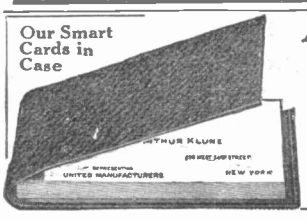

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Just what the name implies—Peerless, unapproached, unequaled, unrivaled, is an accurate description of the **Peerless Patent Book Form Cards**

They are more than a card; they are an expression of personality, individuality. They are not only better, but they represent actual economy, because they eliminate waste. Being in book form, every card is used just when detached. They are always flat, unmarred and clean, and all the edges are perfectly smooth and sharp. They can only be appreciated by being seen and used. Send today for a sample tab and detach the cards one by one as you would use them. Their perfection will thrill you.

Established 1857 **The John B. Wiggins Company**

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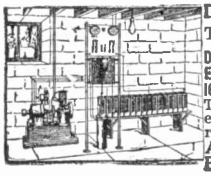
ELECTRIC LIGHT AND POWER



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The Junior No. 1 Equipment
Direct Connected Dynamo, Gasoline Engine Set. Complete Switchboard, 16-Cell "American" Storage Battery } $265
The most complete, reliable equipment ever offered at this price. We want a representative in every county.
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For Homes, Farms, Motion Picture and Vaudeville Theaters, Hotels, Summer Resorts, Buildings, Stores, Schools, Factories and Towns, Motion Picture, Massage, Ozone, Shocking and Tatto Machines. Hunting, Fishing, Bicycle, Carriage, Automobile, Musicians, Flash, Necktie and Decorative Lights. Mazda and Flaming Arc Lamps, Sewing Machine and Power Motors, Laundry Irons, Heating Pads, Telephones, Engines, Generators, Hydro-Electric Dynamos, Meters, Rheostats, Storage and Primary Batteries, Charging Rectifiers, Transformers, Railways, Hand Lanterns, Belts, Bells, Books.
Catalogue 3 cents. OHIO ELECTRIC WORKS, Cleveland, O.

MECHANICS AND HANDY MEN
BUILD YOUR OWN 2 H.P. WATER COOL GASOLINE ENGINE
OTHERS HAVE BUILT THEM. WHY NOT YOU?
WE SELL COMPLETE SETS OF ROUGH OR MACHINE CASTINGS
SEND 10c FOR PHOTO, BLUE PRINT AND CATALOGUE
VIGNEAU MANUFACTURING CO.
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Used for VACUUM CLEANING, brazing, annealing, soldering, forging, wireless telegraph, assaying, melting, sandblasting, whistles, milking, agitating, testing.
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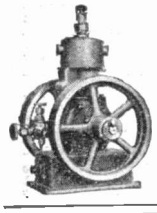
Largest Builders of 2-cycle Motors in the World. Over 1000 responsible dealers.
3 H.P. with Complete Outfit ready to install $55
ALSO 4 TO 36 H.P.
Guaranteed by a big responsible concern. Write for big catalog—*tells* and *shows* you all about these high grade motors and how they are made.
GRAY MOTOR CO., 894 Gray Motor Bldg., Detroit, Mich.



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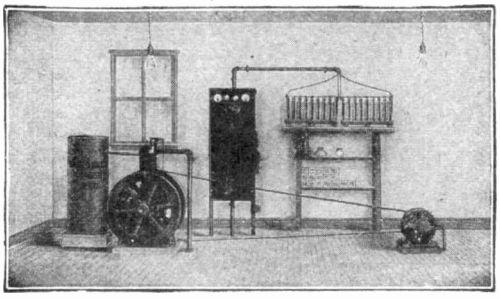
¼, ½ and 1 H. P. Air and Water Cooled
Unsurpassed for laboratory, experimental work and for operating washing machines and light machinery. Can be used for small individual electric light plants. Complete circular for stamp, als big catalogue of steam engines, boilers, pumps, electrical goods for 10 cents (coin preferred). Refunded first order. If in need of an engine write today.
AMATEUR MECHANICS SUPPLY CO.
860A Monadnock Block, Chicago

Electric Light and Power Anywhere



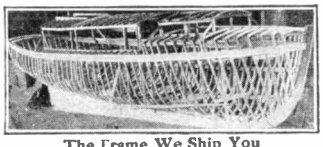
Fairbanks-Morse Electric Plants

Make it possible for every one to enjoy the benefits of electric lighting and power. Location makes no difference. Fairbanks-Morse plants are complete, independent units of ample capacity to light fully any ordinary home and will also furnish power for doing the odd jobs, such as running the cream separator, churn, washing machine, etc. Complete outfit with 2 H. P. engine, dynamo, storage battery, switchboard and 50 Mazda lamps and fixtures furnished. Safest, best and most reliable lighting and power system.

Write for Catalog No. 1163TQ

Fairbanks, Morse & Co.
900 S. Wabash Ave., Chicago, Ill.
Electric Motors, Water Systems, Oil and Gasoline Engines

Build Your Own Boat



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from our patterns or knock down frames. You save ¼ the cost and enjoy the work.
Patterns and frames for boats of all types and sizes, from the canoe pattern at $1.75 to the 65 ft. yacht frame at $350, and a full line of heavy built commercial boat frames.

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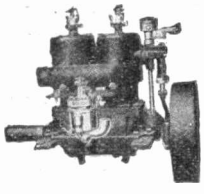
which tells you all about it. You can build a 20 ft. launch for $30 from patterns, that you could not buy at any factory for less than $150, or you can buy the complete frame and build this 50 ft. cruiser shown in the picture for less money than you would have to pay for the cheapest 25 ft. finished cruiser you could buy.

The Boat You Build

DEFOE BOAT & MOTOR WKS., 3211 State St., Bay City, Mich.

Roberts Motors
For Boats and Flying Boats

Roberts Motors in Both Outfits



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