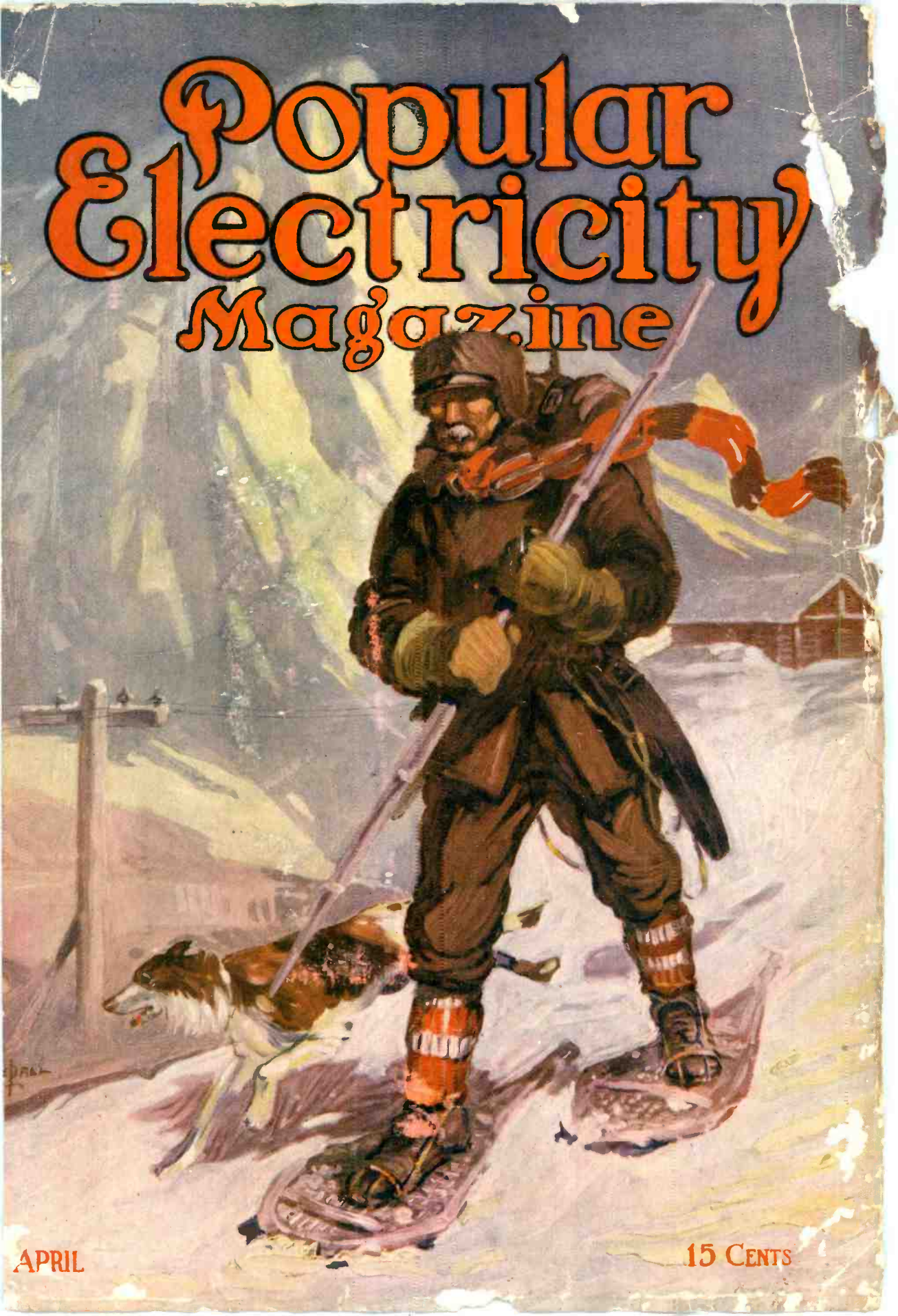
Popular Electricity Magazine



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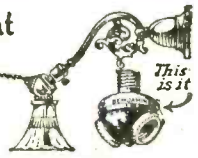

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doubles the capacity of your sockets by doing the work of two. You may attach a portable lamp, fan, cigar lighter, motor-run machine, vibrator, etc., and be able to burn your lamp at the same time.

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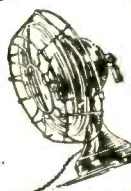

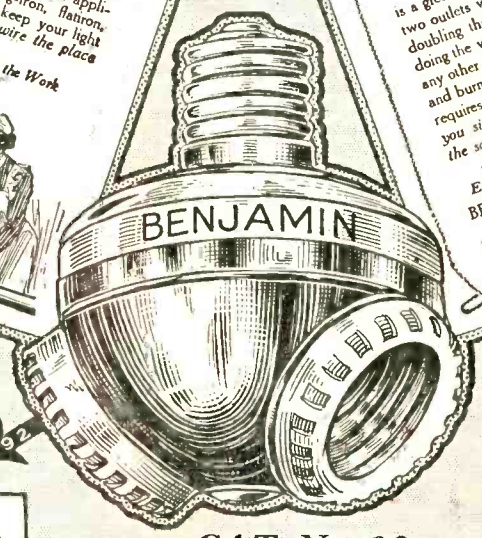

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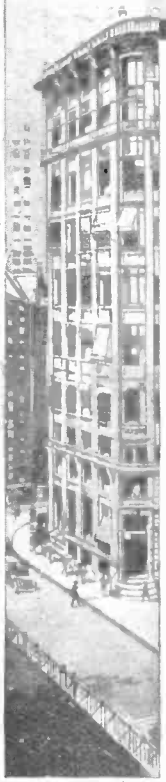
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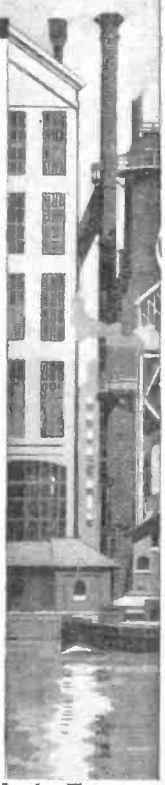
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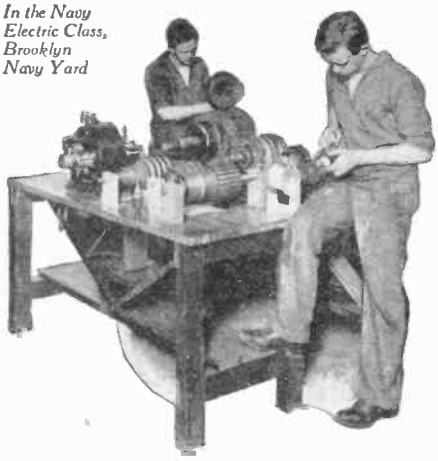

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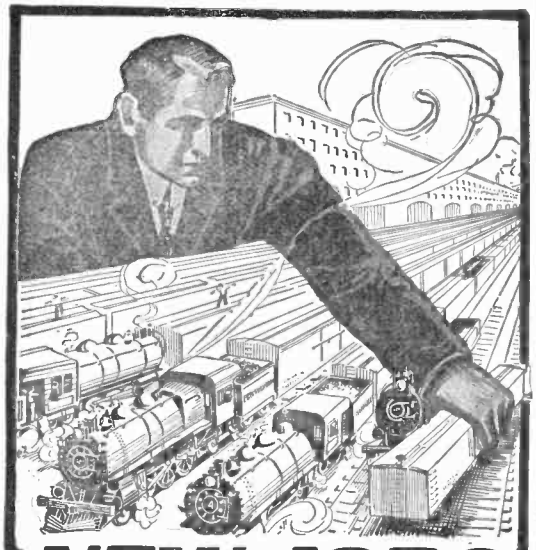

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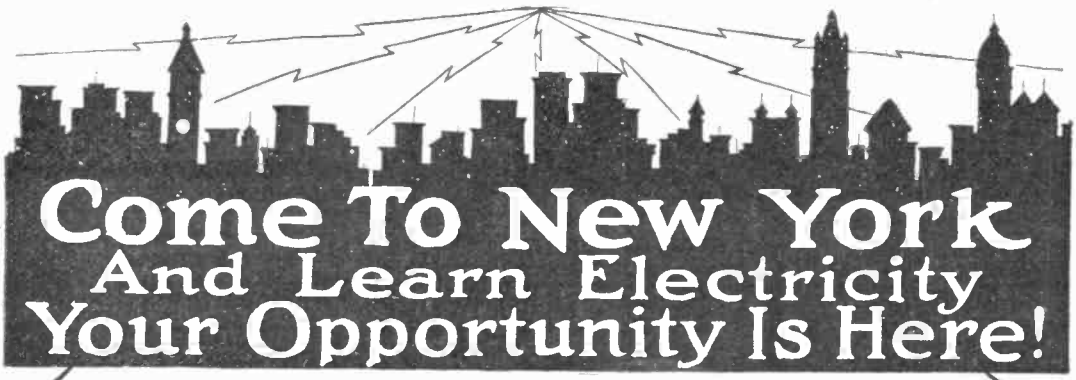

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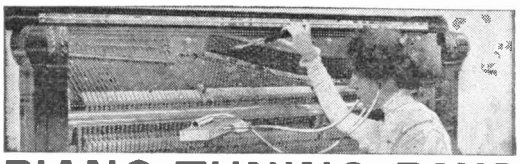

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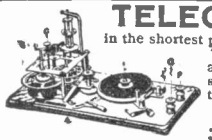

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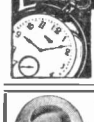

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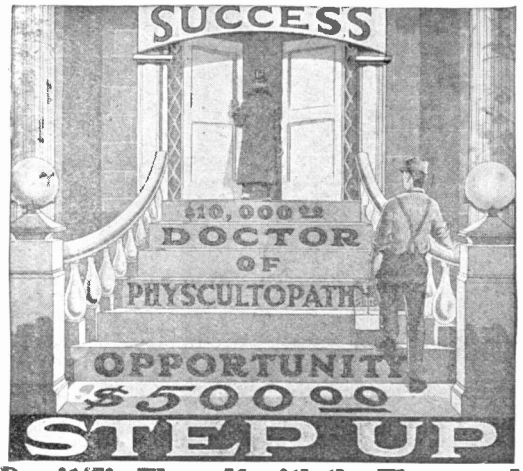

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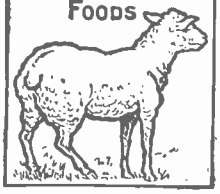

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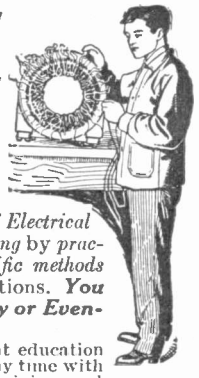

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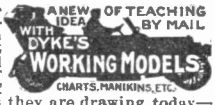

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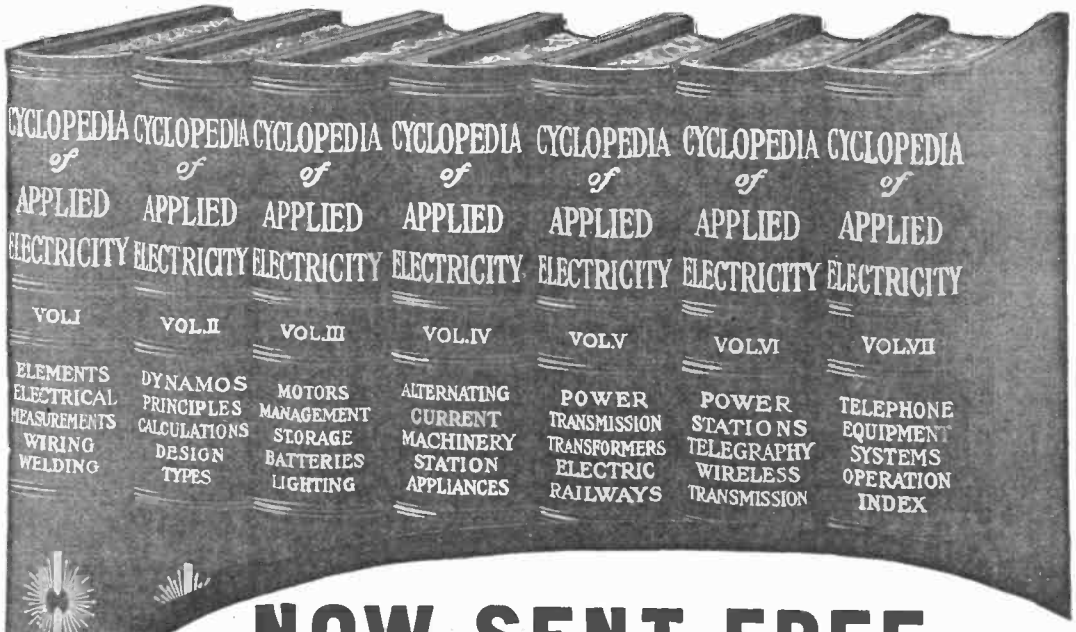

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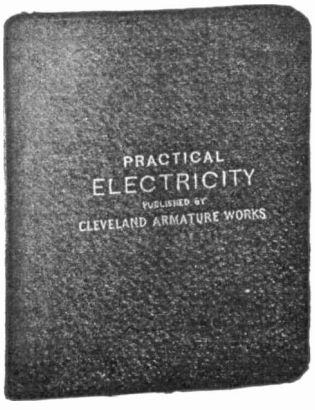

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VIII—Calculation of Size of Wire for Magnetizing Coils.
CHAPTER
IX—Calculation of EMF's in Electric Machines.
X—Counter EMF.
XI—Hysteresis and Eddy Currents.
XII—Armature Reaction.
XIII—Sparking.
XIV—Winding of Dynamos and Motors.
XV—Proper Method of Connecting Dynamos and Motors—Self Excitation.
CHAPTER
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POPULAR ELECTRICITY MAGAZINE

In Plain English

HENRY WALTER YOUNG, Editor

Vol. V | April, 1913 | No. 12

CONTENTS

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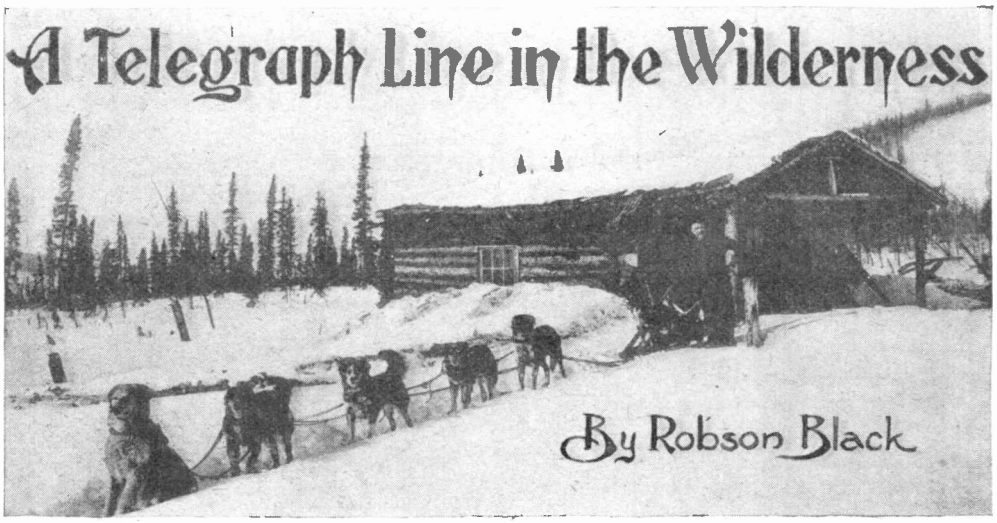
TO THE DWELLER IN THE FAR NORTH THE PITIFUL STRAND OF WIRE, SAGGING DOWN LIKE A CLOTHESLINE AND KEPT IN REPAIR UNDER CONDITIONS OF GREATEST HARDSHIP, SIZES UP AS A STRAND OF GOLD

See "A Telegraph Line in the Wilderness."

Popular Electricity Magazine In Plain English

VOL. V. APRIL, 1913 No. 12

A Telegraph Line in the Wilderness



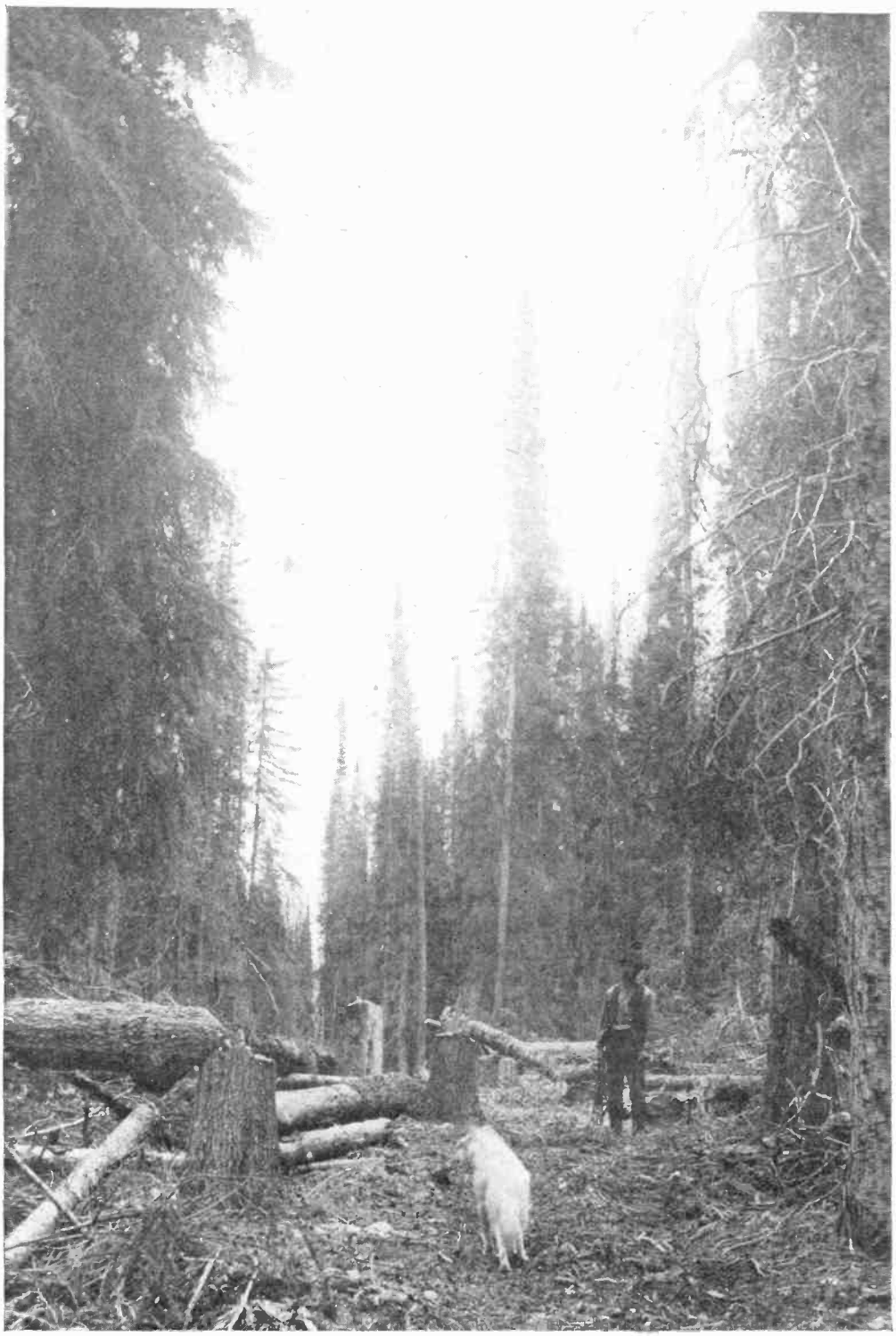
By Robson Black

From Ashcroft on the old Caribou road to British Columbia, winding northward for 2500 miles, runs the Yukon telegraph, the most remarkable and romantic telegraph line in all America. Its origin was like no other; its operation never had and perhaps never will have an analogy; its service to mankind has certainly never been surpassed.

The visitor trailing his goods into the lone north land seeking a gold claim in the bed of a rivulet, or staking his future on a free farm and a muscular back, may jeer at the low straggling poles with the wire sagging down like the domestic clothesline back home. But when he tastes for a month or two the supreme isolation of that infinite silent wilderness, that pitiful strand of wire will size up as a strand of gold.

The Yukon telegraph was born in the feverish days of 1890, when it seemed that half America was turned northward to wrestle with the little god of Chance. In those days it had two kinds of stories to deliver, one of the "lucky strike" transforming a penniless tramp into a millionaire, the other of some mute tragedy of the wayside, wherein a discouraged adventurer wrapped himself and his hopes in the snows by the trailside and left the remainder to Providence.

To-day when the reckless glories of that "wickedest camp on earth" have given way to a standard of respecta-



THE SUPREME ISOLATION OF THE INFINITE AND SILENT WILDERNESS

bility and a firm obedience to law and order, the little Yukon telegraph tirelessly fulfills its duties. Now, however, it flashes a new code of success, the code of the pioneer farmer whose cottages are fast trailing up the northern valleys, searching out the last choice spots in Canada where the speculator has not stuck his signboard. Last year the Dominion Government lost $80,000 on the line, but as an old northern traveler said: "It was the best $80,000 ever invested."

The valleys filling up with pioneers—the Bulkley, the Kispiox and the Naas—are

THE ROUGHLY BUILT OPERATORS' CABINS ARE LOCATED AT INTERVALS OF 50 MILES

tered communities from Prince Rupert to the Arctic Circle, the Government wire forms the link and the only link with the great news events of the outside world. On the occasion of the prize fight at Reno on July 4th, two years ago, when every Anglo-Saxon between the Forty-ninth Parallel and the North Pole was anxiously awaiting the result, the fateful message, "Johnson wins in the fourteenth," was received in Prince Rupert within three minutes of the catastrophe. The same flash was received in Dawson a minute later, the wire having been kept clear for the all-important climax of that interesting event.

A TRAIL IN THE LONE NORTHLAND

those through which the telegraph passes. Up in that land the railway is short, but the telegraph is long—and in the settlement of the earth one seems to balance the absence of the other. For the thousands of white men in the scat-

The route of the line is almost parallel to that weird and abandoned survey of the Western Union half a century ago, when that company after the breaking of the Atlantic cable in 1859 decided to

METHOD OF TRANSPORTING SUPPLIES NEAR THE LOWER EXTREMITY OF THE GREAT TELEGRAPH LINE, IN BRITISH COLUMBIA

lay a land line through Alaska and Siberia to Europe. Over three million dollars had been spent on the line when the company recalled the plans, having in the meantime picked up its Atlantic cable again. Some of its engineers and linemen were then so far inland that it was nine months from the time the order was sent until it could be delivered to them. For many miles, portions of the Western Union wire are now being worked as an auxiliary by the Dominion government.

At intervals of from seventeen to 50 miles the operators live out their lonely and dangerous lives in their roughly built cabins. That each operator should be an expert lineman is a necessity of the task, and those with the long sections located on flat lands are given a horse to assist in the inspections. In the mountain districts, much shorter sections are in an operator's care and in the depth of winter he is called upon not infrequently to tramp on snowshoes across treacherous areas to repair his wires.

In some districts winter departs for only two months in the twelve, so that day and night, month by month, the deadening loneliness of perpetual snow threatens to drive a man into melancholia. It is a heavy test of human endurance, not so much in the times of activity as when the monotony of existence turns a week into an eternity. Twice a year the supplies of food are "packed" in, and then the operator and his visitors exhaust the possibilities of conversation. For the rest of the time, it is only a break in the line that gives a man a chance to meet his comrades. When that significant accident occurs, he loads his tools on his back and marches forth in search of the interruption.

Two of the worst foes of the mountain operator are the forest fire and the avalanche. Again and again their depredations sweep away poles and wires, demanding heroic service of the linemen to restore normal conditions. Sometimes the official reports to headquarters sum up a situation in this fashion: "We had frequent breaks in the line owing to fires on the Yukon River and to storms between Atlin and Dawson, but repairs were quickly effected." An eye witness of one of these storms (scarcely mentioned by the superintendent) described it as an avalanche of ice and snow that had swept great rocks and giant trees like matchwood before it down the mountain side. The slide measured 1,200 feet across and 80 feet deep. It could have buried out of sight a good sized town. Yet when it was necessary to re-establish the wires and poles ripped to shreds in its thunderous course, the linemen took it as "a little incident" scarce worth writing about to headquarters.

Here is a characteristic report as it was handed in by one lineman. Let the reader fill in for himself the ample spaces between the phrases:

"May 5, 1912, 7.30 a. m. started on line north from Maple Bay; removed two trees, replaced wire on four poles two miles north of here; put up quarter mile of wire at camp at Swamp Point; replaced two blocks, two glasses at White Point; replaced wire on five poles; used five blocks, three glasses; removed three trees; fell off bluff here into deep water; lost tool bag with spurs, etc.; had hard time keeping afloat until Dalgleish picked me up, account wearing hip rubbers and raincoat; removed one tree; replaced wire on two poles north of Tad's Cove. Home 2. a. m. 6th."

Most linemen, no matter how devoted, would have postponed work for the day, after a narrow escape from drowning. Here was a worker who again tackled his job, removed one tree, and replaced wire on two poles. Then he went home.

Every year the federal government extends the branch lines, keeping ever ahead of the steady stream of settlers. The main line connects at Ashcroft with the Canadian Pacific Railway system. At its northern extremity it joins the United States signal service on the Alaskan boundry. Its longest branch is 200 miles, from Hazelton, an old Hudson Bay trading post, to Prince Rupert.

Electrolytic Iron.

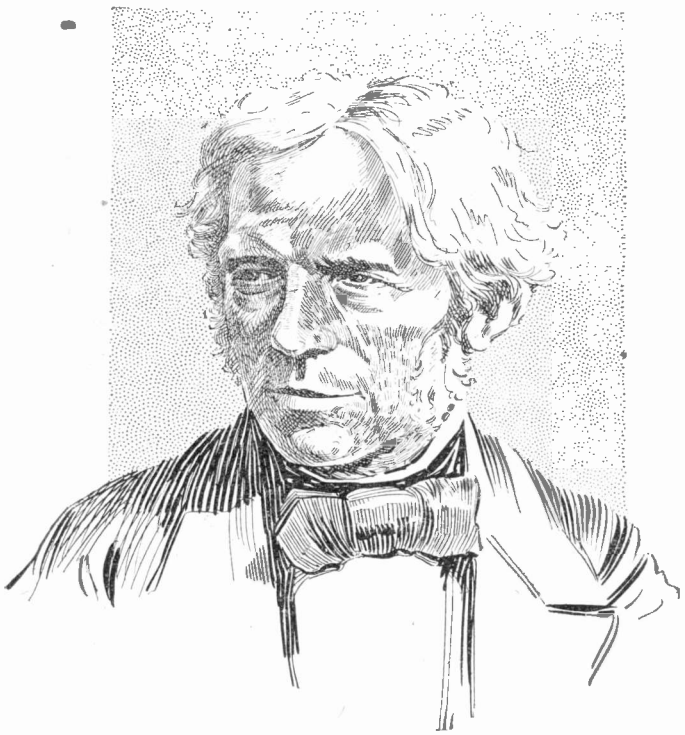
This process for obtaining pure iron is due to M. F. Fischer, and has been put in operation at the Langbein Pfannhauser workshops at Leipsic. The method seems to have reached the stage of industrial application and now electrolytic iron is used for a number of purposes. The metal is obtained by the electrolysis of a solution of a salt of iron; the metal deposited by the electric current by the latest method is perfectly pure and contains no trace of hydrogen. In the attempts made until now by other investigators it has been the presence of hydrogen in the product which, rendering it porous and of no consistence, made it worthless.

The hardness of the iron obtained by M. Fischer is not greater than that of aluminum. It has great magnetic permeability, it magnetizes and demagnetizes much more quickly than ordinary iron and does not retain any residual magnetism. This quality is valuable in the manufacture of electric motors. Usually armature plates are made of steel, but it is found that the substitution of the electrolytic iron for the steel increases the efficiency of the motor by a considerable amount. Two motors of exactly the same dimensions and construction have been tested; in one the plates were of steel and in the other of electrolytic iron. It was found that the power of the second was nearly three times that of the first, which proves very conclusively the value of this new iron in the construction of electrical machinery.

THE FARADAY CENTENARY.

In March of this year, the learned world of England in general, and the Royal Institution of London in particular, will celebrate the first centenary of Faraday's connection with that institution.

Born in 1791, Michael Faraday, the son of a poor blacksmith living near London, was at the age of thirteen apprenticed to a bookbinder. One day a customer took him to hear some lectures by Sir Humphry Davy. Faraday was so impressed by what he heard that he wrote out the notes he had taken and sent them to the lecturer. The consequence of this was that, a vacancy occurring soon afterwards, Sir Humphry Davy used his influence to have the young man appointed his assistant in chemistry. On the first of March, 1813, he began his duties; twelve years afterwards he became director of the chemical laboratory of the Royal Institution.



MICHAEL FARADAY

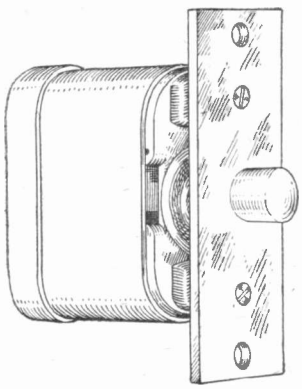
In 1824 Faraday began to suspect that an electric current could be produced in a wire by a current in another wire or by a magnet. But it was not until 1831 that he published his discovery of the principle of induction, upon which the action of all our dynamo-electric machines of to-day depends. About the same time he discoverel a method for the production of a glass of high refractive power, which has greatly increased the scope and value of optical instruments. About the same time he enunciated the laws of electrolytic action and made the first dynamo. In 1845 he sent a report to the Royal Institution on diamagnetism, that property of bodies by virtue of which certain metals, such as gold, silver, lead, mercury, bismuth, etc., will when freely suspended take a position at right angles to the lines of magnetic force, and

consequently at right angles to the direction of the magnetic needle.

Faraday died in London in 1867, after being honored by many of the learned societies of Europe. Shortly before his death he was given a pension of $1,500 a year from the British government, and a residence in Hampton Court. On being offered a baronetcy, however, he refused it, saying that as he could not learn anything from it, he did not want it.

Automobile Door Lighting Switch

Push and pull battery switches are used extensively for controlling the lighting of the head, side and tail lamps, and for lamps used inside limousines and electric vehicles. Another feature has now been added by several automobile manufacturers, which provides for automatically lighting up the running board when the door is opened, either in getting in or out of the vehicle.



AUTOMOBILE DOOR LIGHT SWITCH

Small "slow break" switches have been tried but with poor results because arcing results when the door is only partly ajar. The C-H "quick make-and-break" door switch for automobile use, shown full size in the accompanying illustration, does, however, meet the demand for a switch for this service. The mechanism is so constructed that no half-way position of the contacts is possible, the switch is either positively closed or open. The opening of the door causes the operating bar to spring out, automatically closing the circuit and lighting the foot lamp, while closing the door automatically opens the lamp circuit. A strike plate is placed on the door against which the extending bar strikes.

San Francisco's Electric Service

An electric light and power company drawing much of its current from the watersheds of the Sierra Nevada Mountains in California states a few interesting figures relative to the electric service it renders the city of San Francisco. In the matter of illumination, the Queen City of the Pacific is supplied with 9,500,000 candlepower. She has 600 miles of lighted streets. On all thoroughfares the electric lamps are elevated on large ornamental poles, while on Fillmore Street, the booming White Way after the fire and earthquake of 1906, ornamental arches extend for fourteen blocks. At night, the New San Francisco glows brighter than ever. Her seven hills may be truthfully said to outshine the seven hills of Rome, and an indication of what her coming Panama-Pacific Exposition will be lies in her contemplated plan to use some five billion candlepower in that great undertaking.

Electric Light in Unexpected Places

The catacombs of St. Calixtus, near Rome, were not long ago illuminated with thousands of electric lamps, filling the gloomy vaults and passages with a bright light, whose effect, as it fell upon the rows of bones and skeletons, is described as being startling and almost uncanny. The use of electric lights in the catacombs is perhaps the most unique example of modern practical science brought face to face with antiquity. This, however, would be exceeded by the introduction of the electric light in the galleries of the great pyramids of Egypt. It is reported that the Egyptian government has for some time been considering the feasibility of this.

At least two places within the Arctic Circle have received the electric light. Hammerfest and Tromsö are now lighted by electricity, so that they have an artificial daylight during the long winter darkness.

AWARD OF AMERICAN MUSEUM OF SAFETY MEDALS

In one way or another, electricity, either for the precautions taken to safeguard against its dangers; its application as a means of removing the causes of industrial disease; the development of apparatus to offset its powers, or its actual adoption as an agent for safety, held a prominent place in connection with the award of medals by the American Museum of Safety in New York, on January 23.

It was the development of the pulmotor, a machine for resuscitating persons suffering asphyxiation or from electric shock, that won the *Scientific American* medal for the Draeger Oxygen Apparatus Company. For the precautions it has taken in safeguarding its workers from the danger of electric shock as well as its welfare work, the New York Edison Company received the medal donated by the Travelers Insurance Company. The National Cash Register Company has installed an elaborate system of safety devices for protecting its workers from the dangers of industrial disease and part of this safety system is a motor driven exhaust which carries all the metal filings from the air in which the men work. For this precaution the Louis Livingston Seaman medal was awarded. To Thomas Alva Edison was presented the Rathenau medal in recognition of the part his invention, the portable storage battery, has played in the elimination of danger to underground workers.

Officials of the various companies were present to receive the medals from the hand of Professor Frederick R. Hutton, vice president of the museum. Edison, however, was not present, Mrs. Edison receiving the medal for her husband and explaining that for three months he had been confined to his laboratory, and had declared he would not leave until he had perfected the kinetophone.

Edison is the first recipient of the Rathenau medal, which is placed at the disposal of the museum by the Allgemeine Electricitäts Gesellschaft of Berlin; to be awarded annually for the best device or process in the electrical industry for safeguarding industrial life and health. The medal was originally presented to Dr. Emil Rathenau of Berlin, by the Kaiser and now arrangements have been made for the striking of one

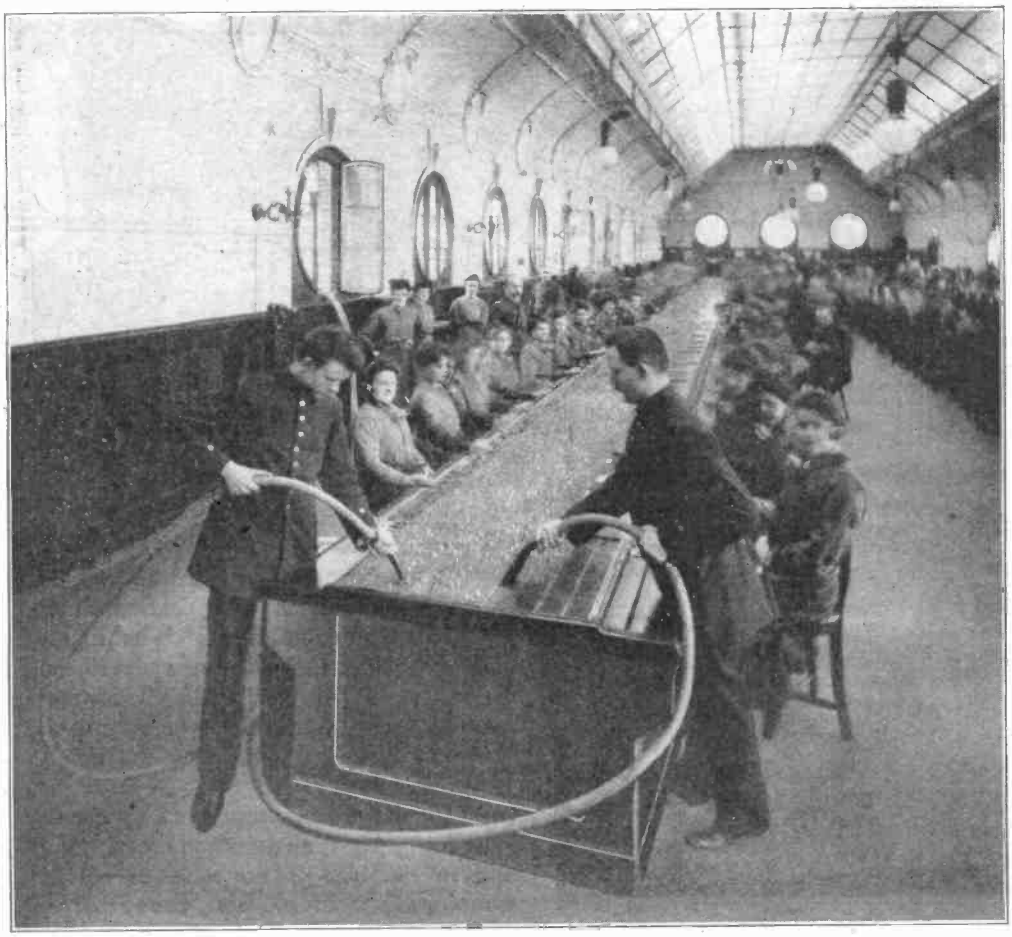
SAFETY ELECTRIC MINE LAMP WHICH WON THE RATHENAU MEDAL FOR THOMAS A. EDISON

medal each year, to be awarded by the museum. In seeking one worthy of the medal the museum has the whole world to select from.

Next year, according to an announcement by President Arthur Williams, the museum will have another honor to bestow, for Mrs. Mary W. Harriman has donated the E. H. Harriman Memorial Gold Medal to be awarded the American steam railroad making the best record in accident prevention and industrial hygiene, affecting both the public and its own personnel.

Horizontal Telephone Switchboard

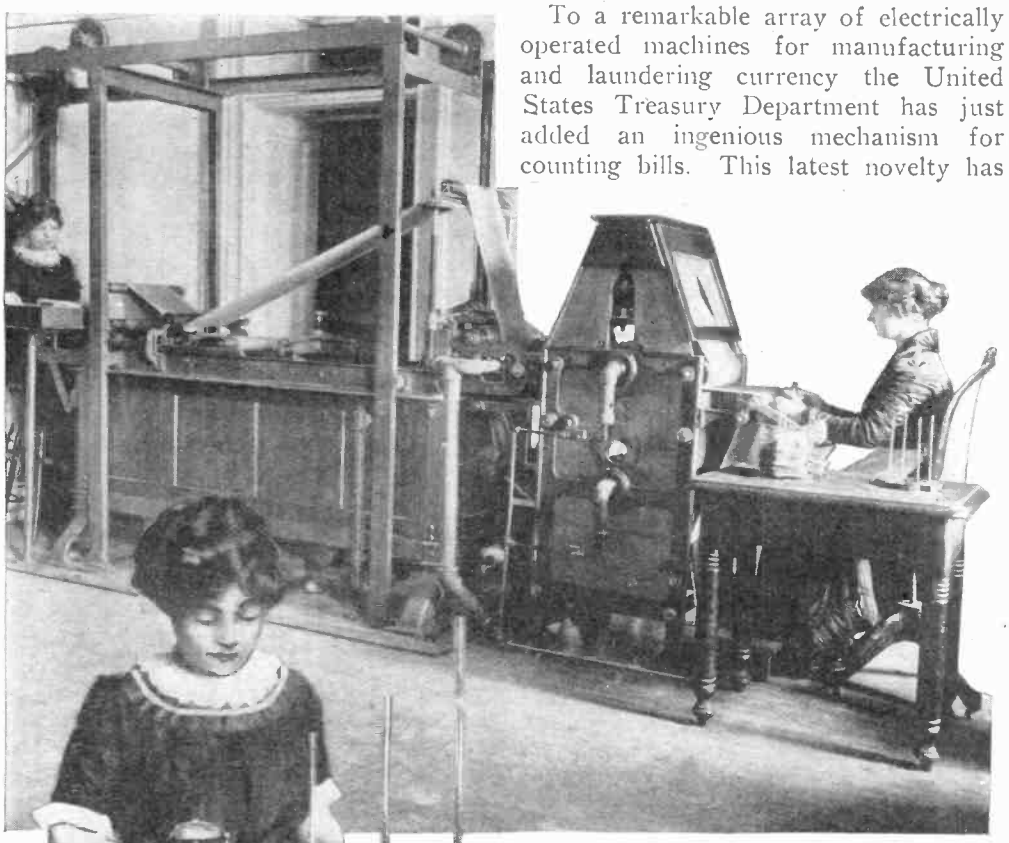
In striking contrast to the vertical panels of the telephone switchboards of the modern American exchange is the horizontal arrangement here shown. This is a picture of a large exchange in Berlin, Germany. The operators sit at both sides of the switchboard and in front of each at the edge of the board are the plugs and keys used in operating. While the horizontal board affords a ready surface for the accumulation of dust it is evident that this is not allowed to gather, the two uniformed employees being shown at work with vacuum cleaners fitted with proper tools for keeping the board dustless.



SOME OF THE TELEPHONE SWITCHBOARDS IN GERMANY ARE PLACED HORIZONTALLY AND ARE CLEANED WITH VACUUM CLEANERS

COUNTING LAUNDERED CURRENCY

To a remarkable array of electrically operated machines for manufacturing and laundering currency the United States Treasury Department has just added an ingenious mechanism for counting bills. This latest novelty has been developed under Uncle Sam's auspices, the inventor being Mr. John P. Buckley, a mechanical expert of the treasury.



LAUNDERING PAPER CURRENCY

Thus far only one machine has been built and that is in operation in the departmental building at Washington, but duplicates have been ordered and batteries of the electrical bill counters will ere long be installed not only at the treasury but in the subtreasuries throughout the country.

MACHINE THAT COUNTS AND WRAPS PAPER CURRENCY

With the machine operated by electric current and a young woman merely feeding in the bills this mechanical money enumerator will readily count 35,000 bills per day, or two or three times the number that could be counted in the same interval by the most expert hand

counter. Ultimately the inventor hopes to perfect an automatic feeding attachment that will run the daily capacity up to 100,000 bills.

However, mere speed in counting is by no means the only advantage of the new invention. Even more important perhaps is the fact that it eliminates all necessity for a certain mental strain that is imposed upon the human money counter when counting assorted bills of various denominations. With this new apparatus in operation all bank notes of a given denomination are fed into one box, boxes being provided for the various denominations of, say, $1 to $20 and thus the liability of mistakes and confusion is reduced to a minimum. Furthermore, this counting machine has demonstrated an ability to handle new or laundered currency with equal facility, although as a matter of fact it was devised primarily for handling the cleansed bills as they come from the lately perfected washing and ironing machine.

The fundamental mechanism of the money counter consists of a number of metal wheels and rolls in contact and under the influence of a half ampere electric current. The feeding of a bill between the brass wheels and rolls breaks the circuit and simultaneously an electro-magnet which has been actuated by the current ceases to act. The effect of this is to give play to springs that by their action raise two doors in the form of flaps that bar the way to the compartment provided for the bills of the particular denomination involved. It is the raising of these little doors by the pull of the springs that operates the mechanical counter which keeps tab on the number of bills passing through.

As the feeding of the bill has had the effect of breaking the electric circuit so, to reverse the situation, the ejection of the banknote by the rolls re-establishes the electric contact, whereupon the magnets draw down the flaps or tiny doors above mentioned and the bill finds its proper destination in the receptacle provided for it.

As each hundredth bill is counted the doors or flaps are mechanically tripped and remain up to bar the passage of more bills until the operator has put in place the marker that is inserted to separate the accumulating bills into packages of one hundred.

An ingenious feature of the machine is that it will not register a count unless a greenback or yellowback actually passes through the rolls. The inventor's latest addition to this seemingly perfect example of the machine that "almost thinks" is a double note detector which automatically prevents the operator from feeding in two bills or notes at the same time. Such a mistake will cause a warning bell to ring and the notes to remain on the flaps instead of dropping into the boxes.

Experiments in Magnetic Action

A very pretty line of experiments is carried out by floating bicycle balls in mercury and bringing a strong magnet near them. They arrange themselves symmetrically under the influence of the stresses, and assume very curious positions, varying with their number and the intensity of magnetization. It is a variation of an old experiment known as Mayer's needles, in which needles are floated in water by bits of cork and are subjected at the same time to the influence of a magnet.

X-Rays and Coal

A French experimenter suggests that the X-ray furnishes a ready means to detect stony impurities in coal. Carbon is very transparent to the Roentgen rays, while silica is opaque to them. Consequently the silicates, which form slag when coal is burned, can be seen like a skeleton when the shadow of the coal is projected upon an X-ray fluorescent screen.

Time Recording Lock

The electric time recording lock gives to the proprietor or manager of any store, shop or establishment, a printed record of the exact times any door to which it is attached is unlocked or locked and who unlocks or locks it. The device consists of a lock and a recorder. With the lock are six keys numbered from one to six.

The recorder is a small automatic printing machine connected with the lock by electric wire. The recorder may be kept in the desk of the proprietor or the manager or placed anywhere in the building. Whenever the lock is turned by anyone entering or leaving the shop, the recorder prints automatically the number of the key, whether "in" or "out" and the time. For example, if the employe carrying key number five opens the store in the morning, the record will show K5 IN Oct. 8 7:00 AM 1912.

A watchman's key may be used if desired that will make a record each time it is inserted but will not turn the lock, recording W Oct. 8 2:50 AM 1912. The record is printed on paper ribbon three inches wide automatically carried forward as needed.

The proprietor may be away from his business a week or a month or a year and returning, unlock the recorder and find the accurate printed record for the entire time of his absence. The recorder is controlled by a master clock. The power is supplied by batteries. The recorder may be attached not only to outside doors but to stock rooms, store rooms or offices. It may also be used to record the opening and closing of desks, show cases, deposit boxes, cabinets or like places on which it is desired that a record be kept.

SPECIAL KEYS ARE USED IN CONNECTION WITH THE RECORDER SYSTEM

THE RECORDER IS A SMALL AUTOMATIC PRINTING MACHINE KEPT ON THE DESK OF THE PROPRIETOR

Liquid Air and Magnetism

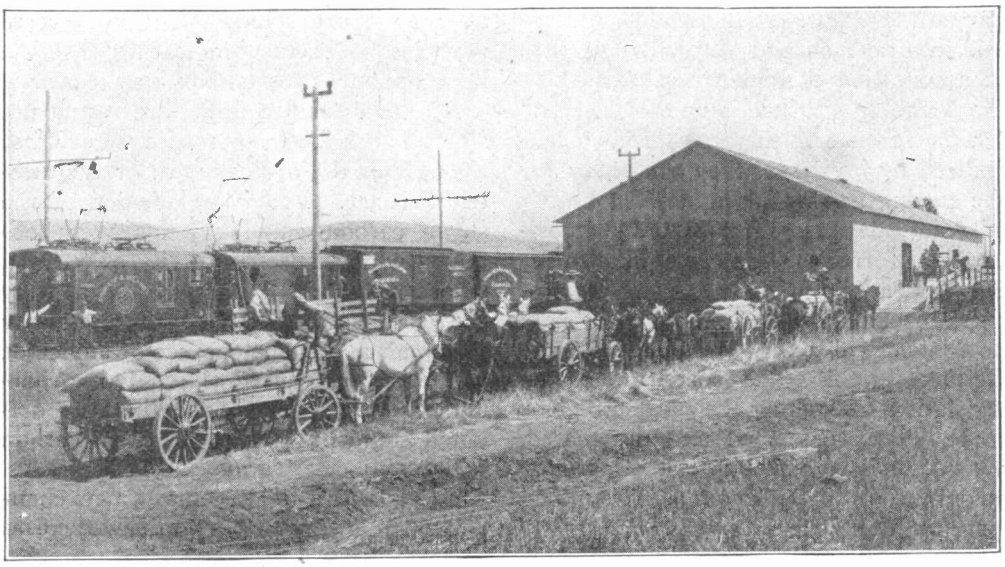
When steel is dipped into liquid air its magnetism is curiously affected. Nonmagnetic nickel acquires magnetic properties after being immersed for five minutes in liquid air. Manganese steel is similarly affected. The density of carbon steel is perceptibly decreased after the immersion.

Electricity Moves Western Bumper Crops

The crops of 1912 were the largest in the history of the country. In many localities electric roads competed with steam in moving the harvest. The illustration shows an electrically drawn train in the state of Washington being loaded with grain, most of which was consigned to Seattle for the export trade. Electric lines are increasing rapidly in the extreme west and are playing an important part in the development of that section of the country.

Electro-Chemistry and Precious Gems

Will prospecting and seeking for the natural gems soon follow those other trades and callings which have been doomed to extinction? Will the successors of these prospectors be found in the electro-chemical laboratories? The idea is fascinating and it is by no means far-fetched. Not only have the purest and finest gems of the earth been duplicated and produced by the disintegrating heat of the electric furnace and blowpipe, but new creations have been evolved and semi-precious products have been treated



ELECTRIC LOCOMOTIVES MOVING WASHINGTON GRAIN

Heat from Electric Lamps

In consequence of certain experiments made in England, shopkeepers are warned of the danger of allowing inflammable goods to get into contact with the bulbs of incandescent electric lamps. The widespread notion that such lamps are practically free from heat is erroneous. A sixteen candlepower electric lamp immersed in half a pint of water will cause the water to boil within an hour. If buried in cotton wool it will set the latter aflame.

to enhance their value. With the investigations that are being undergone in the field of higher temperatures and synthetic productions, many new industrial processes will be eventually established.

In the making of precious gems, the products must not be classed as imitations as these gems of science are identical in all particulars with the purest gems produced by Nature; identical in properties and appearance. The compositions of all gems have been long known to the expert, the problem of fabrication being simply that of melting or fusing thor-

oughly. The base of the ruby, emerald, sapphire, etc., is alumina, whose melting point was above the possible limit of technical application until the high temperatures of the blowpipe and electric furnace were applied industrially.

Taking the ruby as an example, a solution of common alum to which a trace of chrome alum is added as the necessary coloring, a gelatinous precipitate is formed by adding ammonia. This precipitate of the hydrates of alumnia and chromium is evaporated to dryness and calcined-into oxide, ground to a fine powder and the heat applied so that every particle of powder passes through the flame of 2000° C. It fuses and builds itself into pear shaped "bruts" which are in a condition of high strain, similar to the familiar "Prince Rupert's Drops." Once, however, this strain is neutralized by breakage, they are ready for the cutting and polishing, and in beauty of color, hardness, durability, composition and refraction are identical with the purest gems from the mines of Burma.

So absolute is this identity that brokers no longer will accept the ruby and the German jewelry trade has petitioned for legislation compelling the synthetic gems to be so distinguished and designated. This applies also to the other gems of color and truly the doom of the mined gem has been sounded.

The problem of making the diamond is purely one of high temperature and sufficient pressure and when large quanities of material can be handled with the same facility as small amounts, the diamonds produced will be proportionately larger. At present those produced are of microscopical size but nevertheless diamonds.

Sir Wm. Crookes estimates that as the boiling point of carbon is below the melting point, it is necessary to employ a higher temperature than its boiling point of 3,500° C. and a high pressure as well, or a temperature of 4,200° C. By the explosion of cordite in a closed cylinder, Noble has attained 5,200° C. with a pressure of 50 tons and it is probable that the commercial productions will be along these lines. The product and methods are so well understood that it only requires perfection of mechanism to produce them as successfully as the ruby, sapphire and emerald.

The attempts to liquefy carbon at the ordinary atmospheric pressure even in the high heat of the electric furnace has hitherto been unsuccessful. La Rosa has found that with the singing electric arc that higher temperatures could be obtained at atmospheric pressure than were possible with the furnace, and the use of pure sugar carbon as an electrode for the intermittent singing arc showed crust formations formed from the fusion of small particles of carbon, indicating that the liquefaction of the carbon was probable.

An analysis of the arc spectrum showed that the temperature was higher than either the ordinary arc or the electric furnace. From the powder of the sugar carbon small crystals were obtained with a specific gravity of 3.2 and whose hardness in scratching a ruby showed them to be either carborundum or diamonds and as the absence of any silica in the materials used eliminated carborundum the results proved that the diamond could be formed of fused carbon with a normal atmospheric pressure. This leads investigators into a new channel which is sure to develop new theories and processes.

A colorless, transparent crystal of carborundum has been produced as an index of refraction exceeding that of the diamond. The mixture used is pure carbon 30 per cent., silicia 57 per cent., sawdust nine per cent. and common salt four per cent. A special manipulation is carried on in the electric furnace to prevent the formation of an impure product. A small amount of a metallic oxide, such as chrominum oxide in the mass, produces a colorless crystal and a new gem.

Prof. Berthelot has found that it was possible to decolorize certain gems by means of high temperature and subsequently restore their color by means of

radium. With the amethyst he found the color was due to a minute quantity of manganese. Heating the stone reduces the manganese and the color disappears. The action of radium consists in re-oxidizing the manganese with the consequent restoration of the color. A week's exposure to the radium was necessary to complete the restoration. A like change also occurs in plain glass which assumes a deep violet hue when exposed a long time to the action of radium and which may be decolorized by heat. This also opens a new line of investigation which should prove of value.

The influence of radium on the diamond is also marked. After long exposure it takes on a bluish tinge which is not affected by heating with vitric acid, calcium chloride, or heating to redness, and after an influence of twelve months' duration the diamond attains a lasting radio-activity and retains its bluish color. Sir Wm. Crookes is conducting extensive experiments in this direction.

Many mtthods are in use which have as their object the improvement of gems or precious stones and by various methods their colors may be intensified, or coloring matter introduced and flaws removed. The flaws are removed from rubies by packing in reduced iron and igniting. The color of carnelian and pink topaz is also due to high temperatures. Since ancient times precious stones have been dyed or colored artificially and many so treated are in use to-day. In the semi-precious stones the making of onyx from chalcedony is most interesting. Chalcedony is formed of layers of colorless silica of differing degrees of porosity. They are soaked in honey and water at a carefully regulated temperature and then placed in sulphuric acid which chars the sugar in the pores, the carbon thus deposited produces a jet black stone which after a treatment with oil produces a beautiful brilliancy. A red color is produced by soaking in a solution of ferrous sulphate and igniting and blue is produced by copper sulphate and ammonia.

These processes could be improved by an increased use of the electric element to replace the chemical heat of the acids. It is said that a Florentine anatomist discovered a process whereby flesh or any organic matter could be transformed into agate by a siliceous solution but his secret died with him. There is in the San Spirito hospital a table slab polished and showing a human heart, lungs and accompanying organs. The chemical processes will in time be improved by the use of electricity and as the properties and utilities of the combined science become better understood, many new industries will be created from the development of those experiments so far limited to the laboratory of investigation.

Grooming the Horse

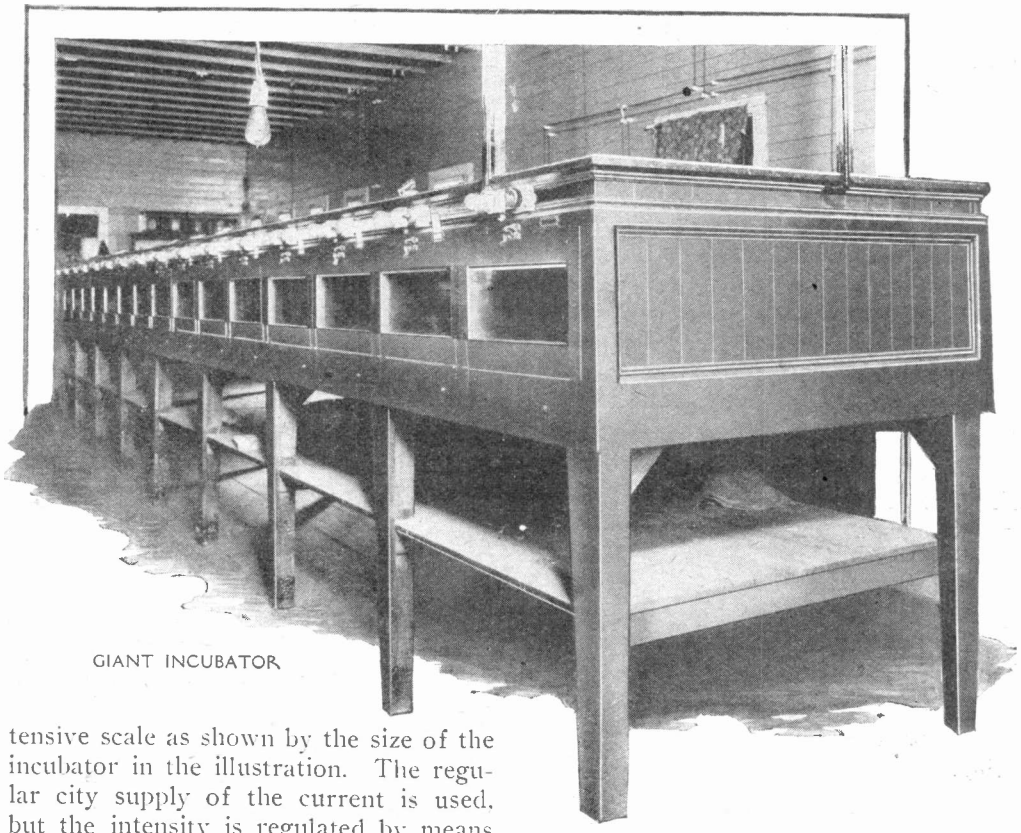
A reader of this magazine after having experimented with several different machines for grooming a horse has settled upon the vacuum cleaner as the most practicable. A currycomb and brush will only take the larger particles of dirt and dust and the smaller particles cannot be brushed out. The operation of the machine for this purpose is simple, all the work required being to hold the nozzle of the cleaner about an inch from the horse's hide. If the nozzle of the cleaner is held too close it will cause an uncomfortable pulling of the hair. When the horse is covered with a thick heavy mud, a currycomb must be used to break it up a little.

Safety from Lightning in Cities

The fear of lightning is almost universal, but the number of deaths caused by it is small. Dwellers in cities are even safer than those in the country, since statistics have shown that on the average, four-fifths of the deaths from lightning occur in rural districts. The innumerable electric wires, the many grounded water pipes and the metal roofs of cities are undoubtedly the chief elements of their safety in this respect.

Giant Electric Incubator

Electricity, it has been discovered, is the best possible medium to use to heat an incubator for hatching eggs. In New Orleans this is being done on a very extensive scale as shown by the size of the incubator in the illustration. The regular city supply of the current is used, but the intensity is regulated by means of a thermostat. Thus any temperature desired can be obtained and held, something practically impossible with the oil lamps formerly used for the purpose. Very little care is required. About all it amounts to is an occasional reading of the thermostat and taking out the eggs once in every 24 hours, so that they may be aired.



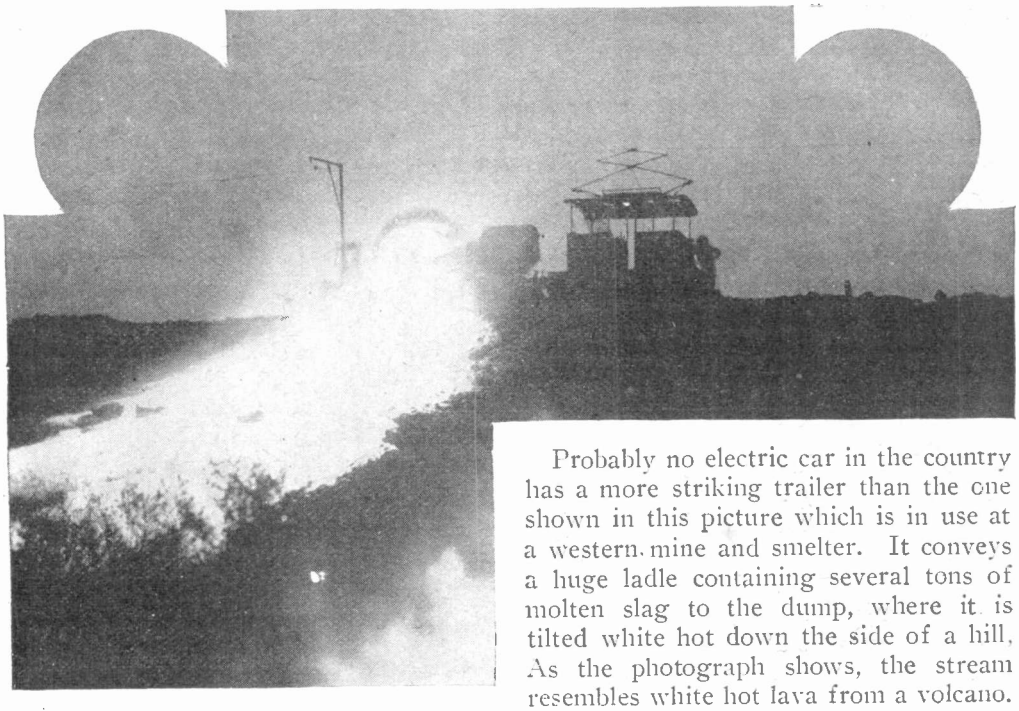
GIANT INCUBATOR

The course of the blood vessels in dead animals or birds is now examined by the X-rays. In order to make the arteries, etc., give a photograph, or "radiograph," they are first injected with mercury.

Electro-Plating Aluminum

Aluminum has, since its production been so enormously cheapened, come into general use for a multiplicity of purposes. For a long time one great drawback to its use was the rapidity with which its surface became dull and leaden in hue owing to rapid oxidation. This characteristic prevented aluminum from being easily electro-plated with gold or silver as is the case with copper; but this difficulty has been removed by the discovery of a method by which aluminum can be given a coating of any desired metal. The film of oxide which covers the surface of the aluminum is removed by adding to the plating bath a small quantity of soluble fluoride and the metal then receives a superficial coating of zinc or copper upon which silver or gold can be subsequently deposited.

STARTLING TRAILER FOR ELECTRIC CAR



Probably no electric car in the country has a more striking trailer than the one shown in this picture which is in use at a western mine and smelter. It conveys a huge ladle containing several tons of molten slag to the dump, where it is tilted white hot down the side of a hill. As the photograph shows, the stream resembles white hot lava from a volcano.

Automatic Tunnel Lights

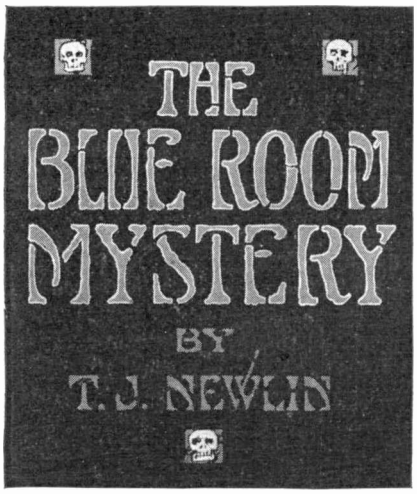
In the Batignolles tunnel, near Paris, incandescent electric lamps, arranged in rows along the tunnel walls, are automatically illuminated and extinguished by passing trains, the rims of the car wheels operating the electric switches. The lamps, being each of ten candle-power, and placed at the height of the car windows, serve to illuminate the interior of the passing coaches, thus superseding the use of lights in the train.

Electrical Oddities

A Belgian writer describes an electrically driven machine for felling trees. By means of a reciprocating steel wire making 1,500 oscillations per minute a tree one foot in diameter can be felled in two minutes. An apparatus for the electrocution of insects in soil or on trees by a 0.5 micro-ampere current at 500,000 volts, is also described.

Effect of Magnetism on Watches

Some experiments have been made by members of the Royal Astronomical Society, England, to ascertain the effect of magnetism on watches and chronometers. It was found that a field of one unit would change a chronometer's daily rate by one second, the change being temporary and vanishing on removal of the field. The change altered in sign when the watch was turned round in the magnetic field. The so-called "nonmagnetic" watches were very satisfactory, the change being negligible for fields up to 20 units. When placed directly between the poles of an electro-magnet, the change in the daily rate was less than two minutes. Iron box shields were found to be very efficient protection against magnetism. The experiments taken as a whole show that the changes in the rate of watches are due to the magnetization of the steel of the balance.



That the eye can be deceived, and readily so, is very easily substantiated. One has only to refer to my former article on the Black Art illusion, in the November issue. The line of demarcation between black art and the blue room illusion, however, is almost absolute. The great blue room illusion is directly and decidedly opposite to the black art, inasmuch as the black art is produced by interposing a series of incandescent glare lights before the eye beyond which you are physically unable to penetrate, whereas in the wonderful blue room illusion, this imponderable trick of legerdemain is performed upon an open stage; right before your very eyes and with the electric light turned on.

To prove how easily the eye can be deceived, as is done by these optical electrical illusions, I will ask you to observe the peculiarity of the cube puzzle, as shown in Fig. 1. When you first gaze at this miniature optical illusion you will notice what will appear to be seven cubes. After gazing at them for a few seconds you will notice there are but six. Watching them intently, they again go back to seven in number. You may see six to start with but the number will be changed after a few seconds.

Now what becomes of the elusive cube? This is a simple deduction if you understand the explanation of "scotoma" and the interpretation of white and black. The phenomenon which causes the cube to appear and disappear is what is known as "retinal fatigue." That is to say, the constant stimulation of the retina by the light has caused an insensitiveness for that part of the retina previously occupied by the white color until it has grown tired of the sensation of white and seeks its opposite or complementary color, while the part occupied by the black or negative color has received no stimulation; and the eye, fatigued as it is, always seeks and accepts a rest by exchanging the black or the white field for its respective opposite.

After thus illustrating the manner in which our eyes may fool us in spite of ourselves, and utilizing the phenomena, I will show you the important use of the incandescent lamp by magicians. And I will reveal and unfold to you the guarded secret of one of the greatest and most mysterious illusions of the present day.

The mystery of the blue room is a trick of legerdemain which was produced by the world-famous magician, the late Mr. Kellar. With one simple little incandescent lamp and a mirror he baffled and mystified the whole world. You can do it also. Mr. Kellar laid great stress upon the arrangement of the insignificant yet significant little lamp. It must be placed just so, burning to proper brightness.

In this blue room illusion I am expounding I will show you how, by the use of electricity and the science of optics, you will be able to place a bare plant upon the stage and make it grow leaves, then follow this up by making the same plant grow real oranges before your very eyes, all of which you can pluck and can pass out to the audience for them to eat. Or, in turn, should you wish you can place a bony skeleton there instead of the plant, and make the clothes appear upon it; then cause the whole thing to turn into a real, live human being, man or woman, who will step down and walk out among your now completely mystified audience.

To begin with, your stage should have a front opening about fifteen to 20 feet wide and about ten to fifteen feet high. The depth of the stage should be slightly greater than the breadth, say from five to ten feet. This should be done in order to allow you to work behind your mirror when making the magic changes. The entire stage must be lined or draped with a warm blue colored draping composed of gingham, muslin or other soft material. Arrange as shown in the plan, Fig. 2. At the front of the

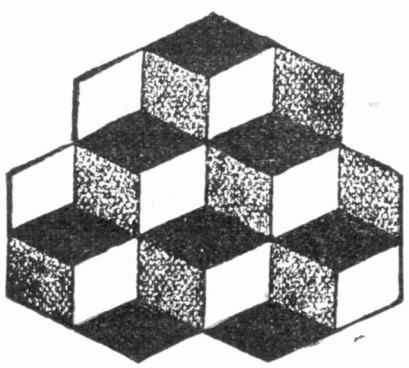


FIG. 1. LOOK INTENTLY AT THE MIDDLE CUBE FOR A TIME. SEVEN CUBES WILL APPEAR: THEN SIX; THEN SEVEN AGAIN, AND SO ON AS LONG AS YOU CONTINUE TO GAZE

stage opening two small wings (A), extending outward toward the center of the stage should be built. Extending from the center of the stage opening to the proscenium arch (P), hung from the poles or wires above your stage opening, are blue plush drapery curtains with numerous convolutions in them in order to gain the æsthetic effect. When the stage is in operation, as when producing the illusion, the draperies were drawn back from the center of the stage opening to the edge of the mask wings (A), as shown in Fig. 1.

Behind one of these mask wings is hidden from view the chair (C'). At the back (or "up stage" as the stage electricians call it) is a large mirror (M) to which are attached the rubber tired wheels (W). The mirror is so arranged that it can be pushed and pulled back and forth on a grooved wooden track, the soft, rubber tired wheels acting as a cushion against possible noise or vibration which may lead to possible detection should a sudden jar occur. The mirror must move very slowly and steadily and should be in careful hands, as one careless jolt or a too quick shove may be seen by the audience which is ever critical and on the alert.

The top of the mirror is made to run in a corresponding wooden grove as an auxiliary guide to hold it steady and to prevent its toppling over; and should be set in a corresponding position to the wooden track, only directly above. These tracks are set at an angle of about 45 degrees to a plane running parallel to a line of vision of your audience. In other words to the left side of the stage the large mirror should be placed which extends clear to the top of the stage opening to prevent detection and set at such an angle that at the very moment this mirror (M) passes the edge (X) of the chair (C), which is set at the back part of the stage and facing the audience, it will immediately reflect the outer edge (X') of the chair (C') which is hidden from the view of the audience by the mask wing (A).

In Fig. 3, a full view of the stage as viewed by the audience is shown in perspective. You will observe the large

mirror about to pass in front of the chair which is set up stage, and about to reflect the edge of the chair behind the wing into the eyes of the audience.

By the arrangement of the peculiar blue lighting and the hazy reflection of the blue draperies, the audience fails to

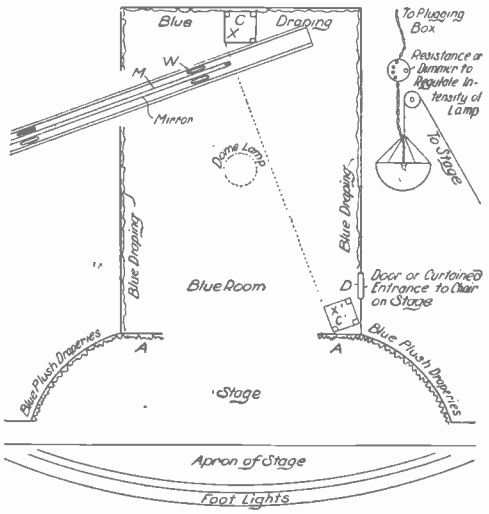


FIG. 2. PLAN OF THE STAGE AS ARRANGED FOR THE BLUE ROOM MYSTERY

see the ponderous mirror which silently and gradually passes in front of the eyes in this visible, yet invisible manner.

At the center of the stage, in a dome-like canopy, is the all important feature of this illusion—the electric lamp. This lamp is hung at the extreme top of the dome and is a sixteen candlepower having a frosted bulb. The lamp proper is enclosed in another cover which is also frosted and is properly speaking an actual dome light casing as shown in the detail, Fig. 2, and must be set just so in order to give the desired lighting effect to the blue room. If it is too dull it will spoil the illusion by allowing no reflection of the subdued rays from the mirror and if too bright it will expose the whole trick. In order to secure the right mixture of the soft blue lighting the lamp should be made to raise and lower and should be placed on a small dimmer.

Personally you should stand out front, where your audience must needs be and have your assistant raise and lower the lamp until you secure the proper mixture of lighting.

Do not fail to notice if you can observe the mirror, as you have him run it back and forth across the stage. Particularly notice if you can observe any escaping rays from the incandescent light in the dome stealing through the apertures or interstices of your curtain or otherwise masked stage.

Have the assistant push the mirror across the stage until it is about to cross the point (X) on chair (C) Fig. 2. Then observe by changing the chair (C') if they exactly coincide. That is, at the very moment that the point (X) on chair (C) is crossed by the mirror see that the latter reflects the point (X') of chair (C'). If it does not, see that it does actually take in the whole chair as it slowly cuts from view the one set up stage while gradually passing before it, and takes on and reflects the one down stage.

In trying out this illusion, have your house lights entirely out or dimmed down low on the resistance and have the lighting set just as you would if your audience were present and the show was on. Then again see to it that that little incandescent lamp in your stage dome is just right. Furthermore the electrician should always be prepared and see to every detail before starting the illusion.

Mr. Kellar, the late magician, was known to change his lamps again and again and have the stage electrician almost distracted, so great a stress did he lay upon the detail of his lighting. The perfect finesse with which the great magician would go about this illusion was wonderful. He never failed to let the electrician distinctly understand that the whole scheme depended upon the proper lighting and the mixture of the blue color. Never was a more nervous or more strenuous man seen about the stage as regards the lighting.

After ascertaining that everything is in readiness the magician now prepares to

go into the illusion. After a laconic speech stating he will make a plant grow from a sprout, and leaves grow on the stem, after which he will make oranges break out before your very eyes or a woman appear from a mass of human bones, he proceeds to go into this gigantic trick of legerdemain. At the cue or signal the blue plush curtains are drawn back and after uttering a short incantation and making a few magic passes or gestures, the magician has you fix your attention upon the sprout on the stage, far back, resting on a chair amid the soft blue lighting.

As you steadily watch the sprout it gradually grows larger and larger until it suddenly breaks forth into leaves. After taking on the leaves so mysteriously and while you are held transfixed by the seemingly impossible, lo and behold, from behind this phantom mass of leaves break forth a number of oranges.

Of course they are not real, and you whisper to your neighbor in the adjacent seat that it is only a trick. And that is what the magician said, only you have forgotten for the time that you are being imposed upon. You fail to realize as you sit spellbound that the magician—having divined this very question—is asking you: "Beg pardon, did you say they were not real?" And before you have "come out of it" he is far away up stage breaking off one of the oranges. As you continue to watch him, still in a trance, you can just realize he is appearing to you again from a distance. Coming toward the footlights he singles you out and with a knowing wink and a cynical smile he deftly casts you one of the oranges for inspection.

It was all very simple, as you can readily see. While you were gazing intently at the setting on the chair (C) in Fig. 2 far back up stage, you did not realize that the soft blue color vibrating in your eye held your vision in check so that you did not perceive that the ponderous mirror was being slowly made to travel past the chair.

Two flower pots are used up to this juncture. The pot at (C) contains a small sprout, whereas the pot at (C′) has a stem and leaves. So, as the mirror is silently pushed across the stage on the rubber tired wheels, it gradually cuts from view of the audience the up stage pot as it gradually takes on the reflection of the stem and leaves of the down stage plant.

The mirror is now in front of the chair (C) and the latter is hidden from the audience, which is gazing intently at the leaves and stem that have grown from the sprout. The assistant now gets busy. He takes from behind the mirror the pot with the sprout in it and replaces it with a third pot containing a full grown plant,

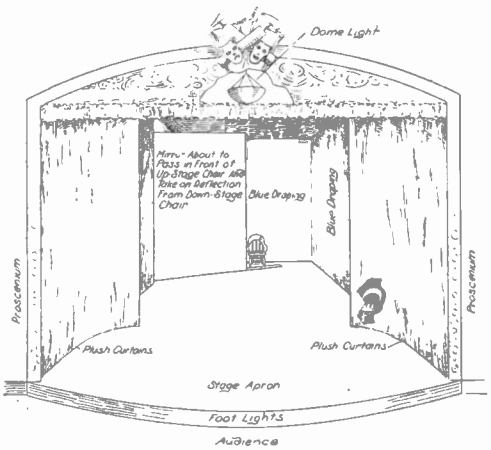


FIG. 3. FULL VIEW OF THE STAGE

arranged the same in size, shape, etc., as the one at (C′) now being reflected into the eyes of the audience. In this third pot the leaves and stems have fastened to them real full grown oranges. After placing the plant so as to coincide as heretofore, the mirror is slowly withdrawn from the stage as previously described. As it gradually passes from in front of the pot on chair (C), the oranges are slowly brought into view, and, as the reflections of the leaves from the pot at (C′) are gradually cut off by the action of withdrawing the mirror, the full-grow plant containing the real oranges is

in turn exposed to the critical view of your spellbound audience. Stepping quickly up stage now, the magician can readily pluck some of the oranges to pass out.

If this trick of legerdemain has mystified you, the one following will more than do so. The magician is now seen placing a weird and bony skeleton of a human being in the "up stage" chair. Then he comes down and steps forward to the apron of the stage and explains, in his suave manner, that he will endeavor to make this inanimate mass of human bones turn into a real, live, beautiful woman; and this he proceeds to do.

In causing a real, live man or woman to appear, the same *modus operandi* is followed.

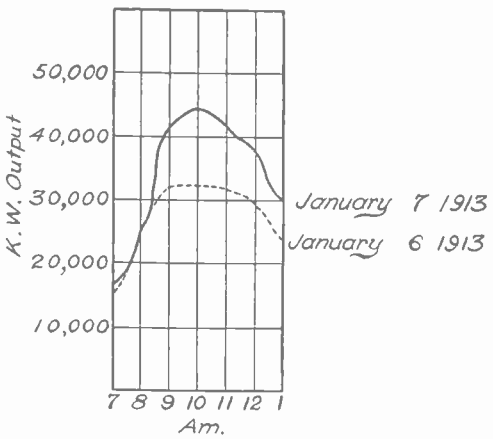
In transforming the skeleton into a man or woman or in changing the man into a woman, or vice versa, they must both work their arms briskly in a zigzag or circular motion while the transformation is taking place in order to give an out-of-focus or dissolving effect. By doing this, one form seems to gradually dissolve and fade away as the other mistily comes into view.

So great an effect did this illusion create upon the minds of the Hindus when the late Mr. Kellar performed it before them while in India, that they believed him to be supernatural. They asked him to stay, offering every inducement, which he refused. They then attempted to force him to do so and it was only after threatening that he would turn all their rivers into blood and wine—a trick they had seen him do with water in glasses—that they, through abject fear of his great power, allowed him to go.

It is a truth that no other illusion so simple, yet so comprehensive and so astounding, has ever been produced, or has given rise to such general appreciation on the part of the theater-going public. It has shown and proven to the "men behind" the value of proper —I might say—exact lighting to the mysterious art of the magician when backed by his elusive mirrors and electricity, and lastly but not least the skill of the stage electrician.

The Weather and the Output Curve

An interesting example of the dependence of a large city community upon electric lighting is illustrated in the accompanying diagram showing the amount of energy required at the South Boston station of the Boston Edison Company at



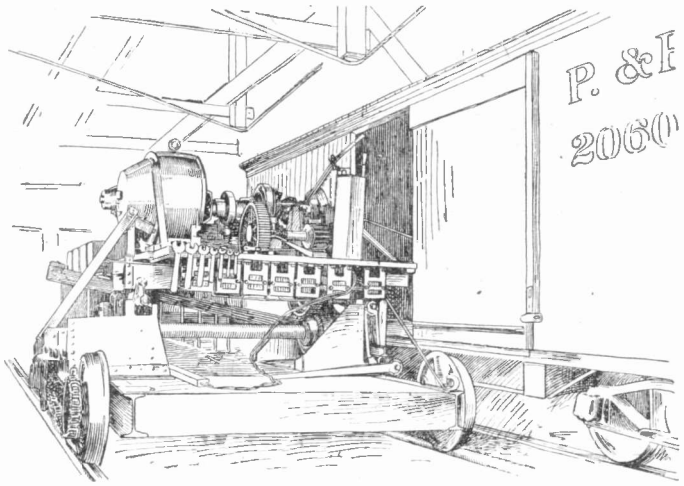
OUTPUT CURVES FOR TWO SUCCESSIVE DAYS

the same hours on two recent successive days, one of which was characterized by one of the darkest mornings in the history of the city. About 8:30 a. m. a sudden pall of fog and darkness settled upon the central portion of the Boston district, and inside of an hour the consumers of electric lighting service called for the equivalent of 480,000 tungsten incandescent lamps of 20 candlepower rating. The company met the demand upon its great turbine station with comparative ease, although the output suddenly required was larger than the total capacity of the next largest installation in the state. About 16,000 horsepower was required in excess of the amount needed at the same hour on the previous day.

Box Cars Loaded by Motor

While freight houses and large shipping concerns usually load and unload heavy freight on flat cars and gondola cars by the use of overhead cranes, box cars must usually be laboriously loaded and unloaded by men.

A large manufacturing company which daily receives and sends out a number of box cars of heavy pieces of freight has recently installed a novel and efficient loading machine for handling box car freight. As the illustration shows, the machine is on wheels that run on tracks between the cars and the shipping and receiving platform. A motor operated gear controls a long arm of structural steel which reaches into the car door; to this arm the pieces of heavy freight are attached, or if the pieces are small, a large scoop or platform can be attached.



MOTCR DRIVEN BOX CAR LOADER

The Bothersome Ohms

It is related of a certain man who had purchased an electrical machine, that not being able to put it together, he telegraphed to the manufacturer: "Machine shipped carelessly. One hundred and ten volts missing." A similar ignorance of electricity was exhibited by a passenger on a trolley car not long ago.

The car stopped in the middle of a field, early in the afternoon of a blazing hot day. Both motorman and conductor tried in vain to find out what the trouble was. At last they gave it up, and the conductor started down the track to the nearest telephone.

"What do you suppose is the trouble?" asked a passenger of the man next to him.

"Well," said the other, "I don't know much about electricity, but I should say it was the ohms. You see, they get into the wires every little while and cause an awful lot of damage there. Technically, I believe, it is called resistance, but all it amounts to is stoppage—like eels in water pipes, you know. I never saw an ohm myself—they're microscopic, you know."

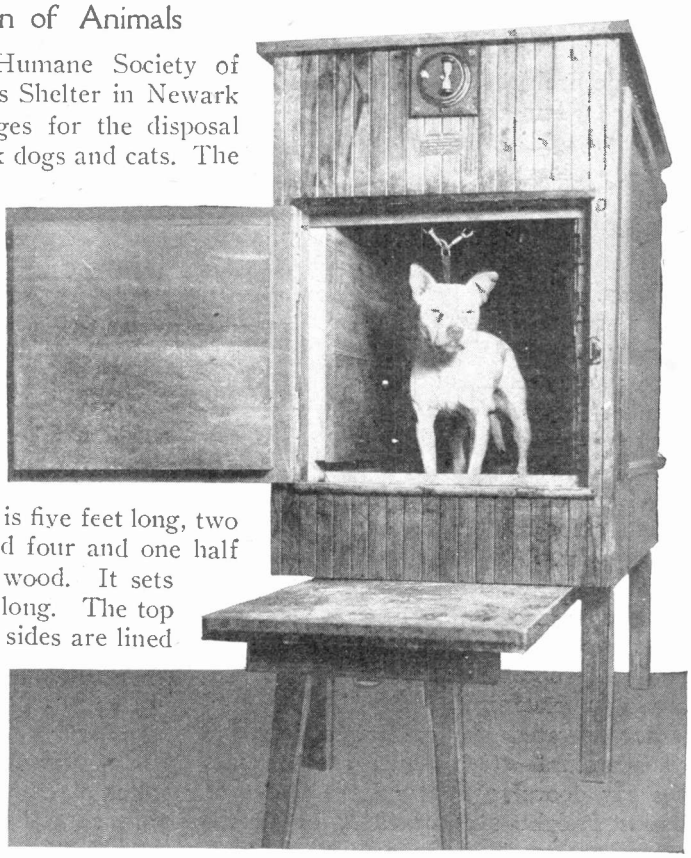
Ignition of Fire Damp by Breaking Incandescent Lamps

The English Bureau of Mines has been making experiments to discover whether fire damp can be ignited by the breakage of the bulb of a small incandescent lamp. The matter is of importance on account of the number of small portable electric lamps with tungsten filament which are now being used in mines. In the experiments the lamps were broken in a mixture of natural gas and air in the proportion of 8.6 per cent of gas, and 91.4 per cent of air, which is the most explosive mixture. The report states that in the majority of cases ignition did not occur, which would lead to the belief that ordinarily the filament will not retain its heat long enough after the breakage of the globe to ignite the surrounding gas.

Humane Destruction of Animals

Six months ago the Humane Society of New Jersey installed at its Shelter in Newark two automatic electric cages for the disposal of stray, homeless and sick dogs and cats. The fact that these devices seem to represent the most humane method of destroying life that is so far known should commend their use to every humane society and humane worker.

One of these cages is for destroying dogs, the other for disposing of cats. The dog cage or box is five feet long, two and one half feet wide and four and one half feet high and is made of wood. It sets upon legs eighteen inches long. The top of this box is of glass, the sides are lined with wood, and on the the bottom is a metal pan connected to one side of the circuit. To a metal bar on each side of the inner cage is connected the other side of the electric circuit. From these metal bars depend two strong spiral springs with metal hooks at the lower ends. The current is controlled by means of automatic contacts when the door is opened and closed.



ELECTRIC CAGE EMPLOYED BY THE HUMANE SOCIETY OF NEW JERSEY FOR DESTROYING DOGS

In operation a metal collar is put about the dog's neck, he is placed in the cage and the hooks are snapped into rings in the collar and the door closed. Instantly the dog drops unconscious, while a sand glass on the outside of the cage marks the time. No one can touch the inner cage when the door is closed but the whole operation may be watched through the glass top.

The time usually found necessary for the destruction of life in dogs is 30 seconds. If any signs of life appear the animal is immediately put back and current again turned on. Experts say, and this is verified for the Humane Society by its president, James C. Corlies, D. V. S., that unconsciousness is instantaneous, and, as the inventor affirms, "unaccompanied by surprise, fear or pain."

The cat cage is smaller—27 by 16 inches—and set at table height for convenience. The outer box is of wood and inside is a box of slate insulated from the outer box. The inner box has electrodes on the bottom. The current here is also controlled by opening and closing the cover. The operator can lower and lift this by foot action by means of a treadle, pulley and cord. The cat is placed in the box, the fore feet on one electrode, the hind feet on the other, and the cover is quickly dropped.

While in the case of the dog, uncon-

sciousness is instantaneous, the time allowed for destroying cats is one minute. Just why a longer time is necessary for the cat than for the dog is not known. Perhaps it is greater inherent vitality, differences in contact caused by density of fur, or greater body resistance to the electrical current.

Animals electrocuted show no appearance of having suffered as in the case of most other methods. They lie relaxed and as if asleep except that their eyes are open, and a return to consciousness will never take place if the apparatus is properly handled.

The Humane Society of New Jersey is one of the first societies to use the automatic electric cages and gives its hearty endorsement to them.—ELLA SKINNER BATES.

Copper Refining Plant in Montana

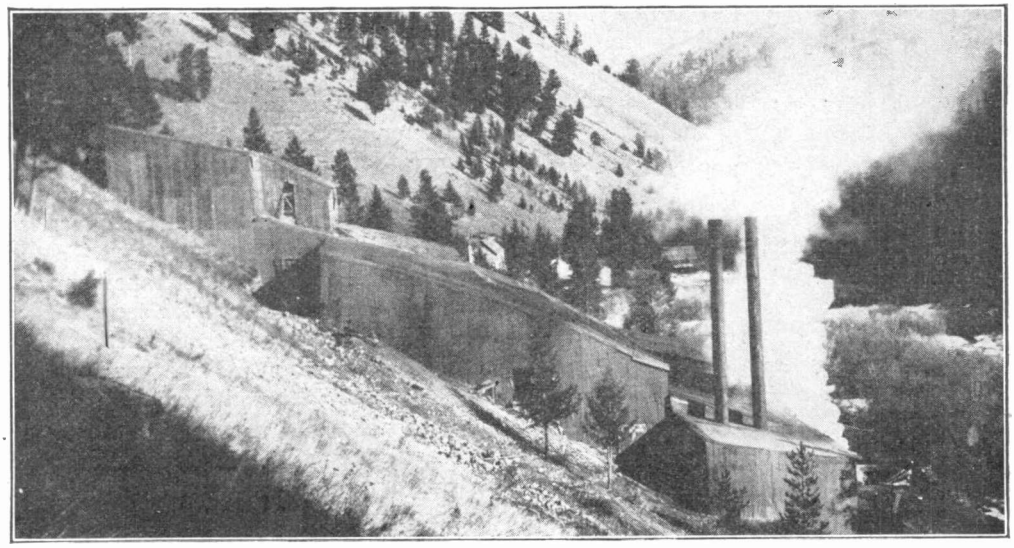
Near Phillipsburg, Mont., there is a little copper refining plant tucked away in the hills that is daily extracting copper from the crude ore by practically the same process as that employed at the Aamdal works in Norway, described in the January issue of this magazine. In addition there are now two other plants being constructed at Butte, Mont.

The carbonate ores are mined far up on a steep side hill from whence they are sent down a steel lined chute to crushers which crush the ore to an average diameter of three quarters of an inch. The ore is then dumped into large shallow tanks where sulphuric acid and water are poured on it. The resulting solution is tapped off at the bottom and runs to temperature tanks where it is heated to about 40° C. From thence it goes to the electrolytic tanks where a current of 9,000 amperes is passed through it using lead anodes and copper cathodes.

The solution runs from these tanks to a large receiving tank from whence it is pumped up and passed over the ore to gather more copper.

Every receptacle the solution comes in contact with must be lead lined, and the pump is of hard rubber.

The electricity is generated by three generators of five volts, 3,000 amperes capacity and driven by steam power, coal being hauled by teams from the railroad station 3½ miles away.—H. H. HANSEN.



AN ELECTRIC COPPER REFINING PLANT IN MONTANA

Copyright by Walden Fawcett

FALLS OF THE RIVER ERNE AT BALLYSHANNON—A TYPICAL SOURCE OF WATER POWER IN IRELAND

Bright Future for Electric Power in Ireland

That the dormant electrical resources and opportunities of the Emerald Isle have not been more fully taken advantage of heretofore does not indicate any lack of appreciation of the possibilities, but rather the handicap of adverse circumstances. Until within the past few years Ireland, through no fault of her own, has suffered from commercial and industrial blight, but now a brighter era is dawning and one of the first manifestations of the regeneration of Erin is found in the inceptions of projects to utilize Ireland's splendid water power for the generation of electrical current.

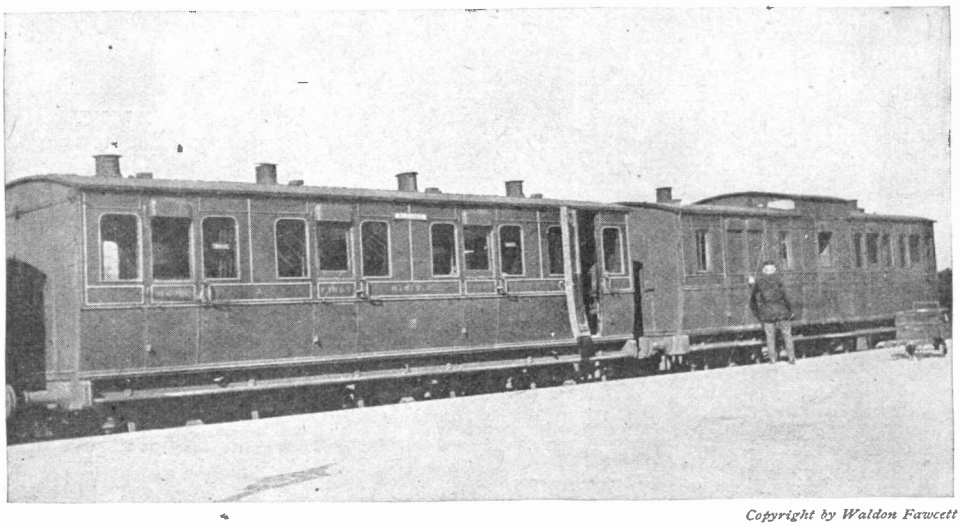
The land of the shamrock is the natural storehouse of deposits of peat that would afford fuel for generations for all the electrical power plants that the island could be expected to require, but such is Erin's prodigality of resources that it will not be necessary to rely upon the turf fuel to any extent. Water power Ireland has in abundance and it is so distributed that there need be no long transmission of the electrical power generated. The whole country is a network of streams and rivers and lakes and a considerable portion of the island is mountainous with the result that the streams have a fall that renders them specially well adapted to generating electric power. This is the situation in the southwest of Ireland and all along the west coast where electric power is to be introduced in the famous marble quarries of Connemara.

A typical example of the transforming power of electrical energy is seen at the town of Ballyshannon in the west of Ireland. Ballyshannon is not particularly advantageously situated from a commercial standpoint, but she enjoys the boon offered by the falls of the River Erne, a cataract 150 yards in width and sixteen feet in height, and the result is a progressive, up-to-date industrial town with the prospect of rapid progress in future.

This northwestern section of Ireland in which Ballyshannon is located offers another rich opportunity for electrical power in the narrow gauge or so called "light railways" which are the sole means of transportation in this district. These railways are at present equipped with steam locomotives, but it is predicted that at no distant day the entire system will be electrified.

In this connection it may be noted that the larger Irish cities such as Dublin, Belfast, Galway, etc., are well provided with electric railways, the double-deck cars being the approved form of rolling stock. It may be of interest to add that in Belfast, where the tramways are owned and operated by the city corporation, the municipality builds all its own cars but the trucks and electrical equipment are imported from the United States. In the south of Ireland, notably in the Lakes of Killarney district, there would appear to be a harvest awaiting the promoter who will build electric scenic lines such as the Gorge Road at Niagara. Until recently the beauties of this Killarney fairyland could be enjoyed only by means of a coach tour. Within the past year or two sightseeing automobiles have been introduced but they are not an emphatic success nor can they handle the increasing traffic as could an electric line.

And speaking of electric railways in Ireland, although advance has been slow in an electrical sense, she claims the distinction of possessing one of the first successfully operated electric railroads in the world. This pioneer line is several miles in length and connects the town of Portrush in northern Ireland with the Giant's Causeway, one of the wonders of the world. This Irish electric road was built in 1883 and was designed by the late Sir William Siemens, the famous German electrical engineer and manufacturer. It has been in practically continuous operation ever since, but its original primitive and picturesque third rail installation has long since been replaced by an ordinary overhead trolley. Electrical engineers with imagination claim that the road at the Giant's Causeway ought to be extended all the way to Belfast along the Antrim coast route, thus affording another scenic ride that would rival any of those which may



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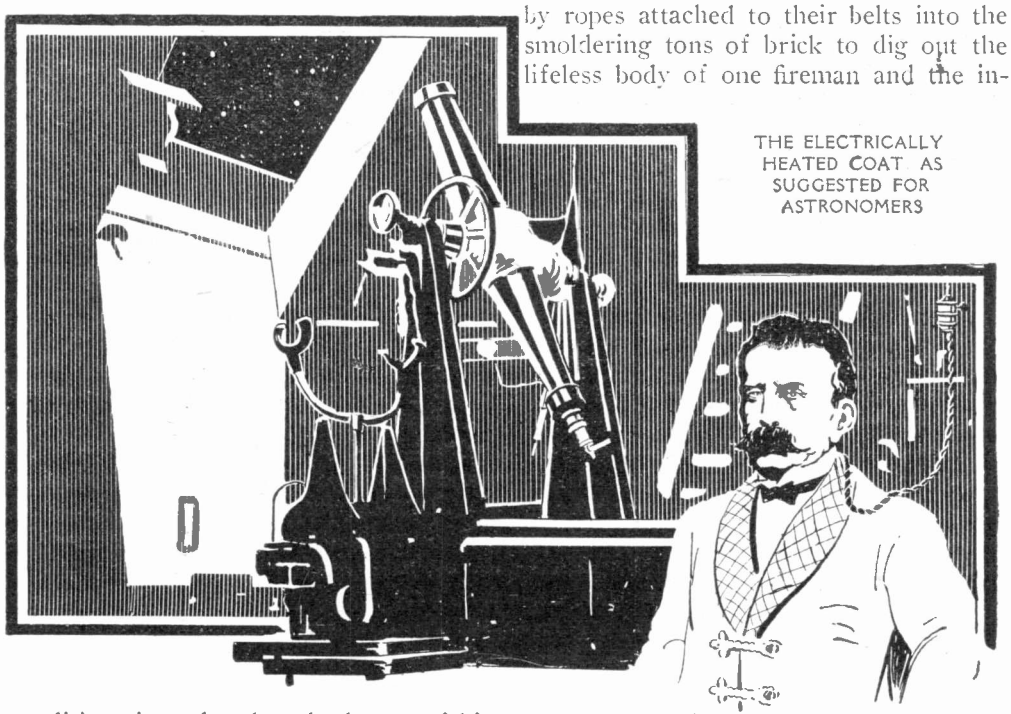
ONE OF THE CURIOUS NARROW GAUGE OR "LIGHT RAILWAY" TRAINS OF NORTHWESTERN IRELAND. THERE IS TALK OF ELECTRIFYING THESE LINES

now be made on the suburban electric lines which radiate in all directions from Dublin.

An influential factor in behalf of the electrical development of Ireland is found in the interest of Marconi, who has his principal wireless station at Clifden in western Ireland, and who, having married an Irish woman, is taking more than a casual interest in the country. Several Americans, including Richard Croker, who has built a mansion some nine miles from Dublin, are also interesting themselves in industrial projects which embrace the development and utilization of electricity.

Heated Coat for Astronomers

The astronomer in his observatory is often obliged to work in low temperature conditions in order that the lenses of his instruments may not cloud up with condensed moisture.



THE ELECTRICALLY HEATED COAT AS SUGGESTED FOR ASTRONOMERS

An electrically heated coat has been suggested for his use. Such a coat to all appearances resembles an ordinary house coat, but is made in the same manner as a heating pad of an electric blanket. A fine wire is woven about between the lining and outside cloth of the coat. This wire is heated by current but there is no possibility of a shock, as the wire is well insulated.

The accompanying illustration shows an astronomer wearing a coat which is connected to the circuit by a flexible cord and plug.

Electrician Heroes

Mr. Chas. Sanges and Mr. Frank Nettles, both electricians of the Mobile Electric Company, Mobile, Ala., displayed rare bravery Thursday, January 9th, in rescuing two firemen who had been buried beneath the débris in a fire which destroyed the Mobile Theater. These men, at the risk of their lives, were lowered by ropes attached to their belts into the smoldering tons of brick to dig out the lifeless body of one fireman and the injured body of the other. The red hot bricks were removed and the two taken out from among the red hot ruins. Although burned and blistered, the linemen went back to their work, after receiving medical attention, and resumed their daily duties just as usual.

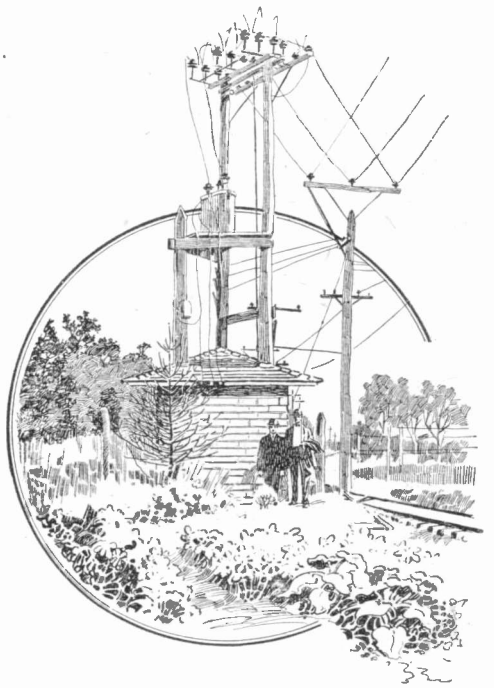
An Ideal Electric Plant on a Farm

Located about two miles outside of Marietta, Ohio, on the banks of the Muskingum river, is what one might consider almost an ideal farm. It is owned by Mr. W. W. Mills, a Marietta banker, who is also vice-president of the Parkersburg, Marietta and Interurban Railroad Company. This company, in addition to operating the railroad between the cities of Parkersburg and Marietta, also supplies light and power in these cities.

The farm consists of about 60 acres of very valuable land, approximately one-half of which is located along the river bank and is of the very richest kind of soil. Mr. Mills decided some time ago to have a modern and up-to-date farm, and selected this locality as being specially suitable. The trolley road runs parallel with the river and directly through the farm, so that it affords excellent transportation facilities to and from Marietta and Parkersburg.

Wishing to avail himself of all modern advantages, Mr. Mills naturally turned to his own company for suggestions as to the possible use of electricity on the farm. On consulting with the general manager of the P. M. & I. Company, it was found that it was possible by use of outdoor type apparatus to secure the electric energy at a very reasonable expense. All that was necessary to do was to tap the 22,000 volt transmission line which runs past his farm, install a transformer and switching apparatus and use the current in various applications on the farm.

The accompanying illustration shows clearly the simplicity of the installation, which consists of a standard Westinghouse outdoor type transformer, giving 110 or 220 volts on the secondary. The small building contains the switchboard, a watthour meter for measuring the energy received and the auto-starter for a ten horsepower motor which is located about 1,200 feet away on the river bank. The motor is used for pumping water into a tank located just back of the house. When desired, it can also be used for irrigating the truck farm, an operation accomplished by means of several valves which can be opened and the water allowed to flow by gravity through some piping which is perforated at intervals, thus spraying the water over the land.



FARM TRANSFORMER STATION

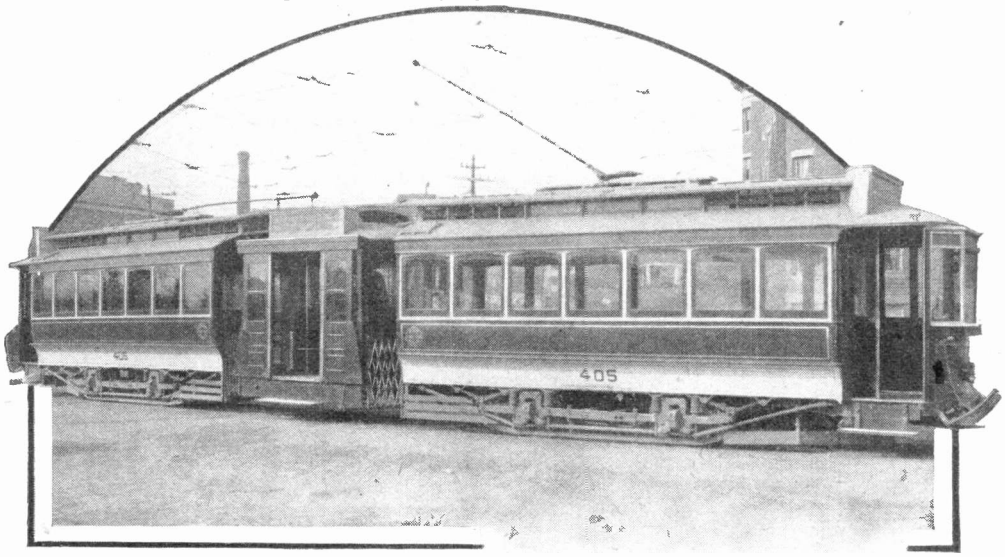
Appreciating the desirable features of electrical devices in the home, advantage was taken of the electrical installation to light the residence and equip it with the many modern electric devices that do so much to make home life easy.

This installation has proved conclusively to the officials of the railroad company that it is entirely feasible to tap, for power and lighting purposes, the transmission line which had heretofore been used only for supplying energy to the railway. By this means, it is possible to supply a number of villages and small towns along the line of railway, and thus derive a very considerable revenue at a small outlay.

Boston's Articulated Trolley Car

The Boston Elevated is making some experiments with an articulated car as a means of solving the problem presented by the many sharp curves on the tracks of the Boston street cars.

Boston, in the 1600's, was but a village nestled on the slopes of Beacon Hill and connected with the village of Roxbury by a narrow neck of land extending across the small bay. This "back" bay was gradually filled in during modern times, but with all the modernizing, the erecting of brick and stone structures, it is a remarkable fact that the same old crooked paths of the original hamlet of Boston were preserved.



ARTICULATED TROLLEY CAR

The new car has been devised by the company itself at its Bartlett Street plant and if the car proves satisfactory, it will then be manufactured outside and put into general use on the Boston trolley system.

The articulated trolley car consists of two of the old style "bobtail" trolleys, hinged onto a small platform car. Thus 150 to 200 persons can be carried at one load and the train is so broken up that a very short curve can be taken.

The World's Greatest Battleship and Her Electrical Equipment

From the crude generator and scant electrical equipment of the old steam frigate *Trenton* to the installation on the modern dreadnaught *New York* runs the history of electrical appliances in the United States Navy. The ill-fated *Trenton*, wrecked in a hurricane at Samoa in 1889, was the first American vessel to be lighted by electricity, the installation being made in 1885 under the supervision of Rear Admiral Royal Bird Bradford, then a lieutenant-commander.

Quite different from that of the ship of the present day was the lighting apparatus of the old wooden ship, for her lights were installed at a time when commercial lighting on land was in its infancy. Current was generated by a bipolar machine and supplied light only. The *New York*, the very latest of Uncle Sam's fighters, will, when she is commissioned next Fall, have electrical machinery for everything except the actual driving of her propellers, current being supplied by four 300 kilowatt generators.

In the first place there will be the ship's lighting, some 2000 sixteen candlepower

incandescent lamps and 42 mercury vapor arcs being required in addition to the sixteen 36 inch searchlights and the lamps on the semaphore arms and of the Ardois system.

From his place on the bridge the navigating officer will control every movement of his ship, for a system of telephones, speaking tubes and bells puts him in instant communication with every part of the vessel from the tops of the fire control masts to the dingiest stoke hole. In addition to this lighting apparatus and signaling equipment there will be electric motors to perform every task on shipboard.

At the turn of a lever on the bridge a great motor of 50 horsepower will swing the rudder to keep the vessel on her course. In battle it will be motors of 50 horsepower that hoist the powder and shells from the magazines to the turrets of the fourteen inch breech loading rifles, another motor of three horsepower will open the breech and one of fifteen will ram the charge home. Others of 25 and fifteen horsepower will swing the turrets to port or starboard and elevate and depress the guns and when all is in readiness an electric spark will explode the powder and hurl the shell on its mission of destruction.

While the five great turrets, each with its pair of fourteen inch guns, will be handled by this elaborate electrical machinery, the 21 five inch guns of the secondary battery will be handled entirely by hand, the members of the gun crews swinging and elevating the rifle by means of wheels, although the ammunition will be brought up from the magazines far below the water line by means of three horsepower electric hoists.

In addition to the motors for the ship's fighting machinery there are the great electric cranes for all the heavy hoisting. They will pick a steam launch and its crew out of the water and deposit it anywhere on deck, a 50 horsepower motor hoisting the load and one of half that power turning the crane from side to side. A 35 horsepower motor will turn the capstan to haul the anchors to the deck and a deck winch of the same power will be provided for hoisting stores out of the hold. Motor driven pumps will keep the ships' fresh water in circulation as well as supply the standpipes from which the ship is washed down with sea water. Forty-four ventilating sets will provide fresh air and 35 horsepower blowers will supply forced draught when necessary.

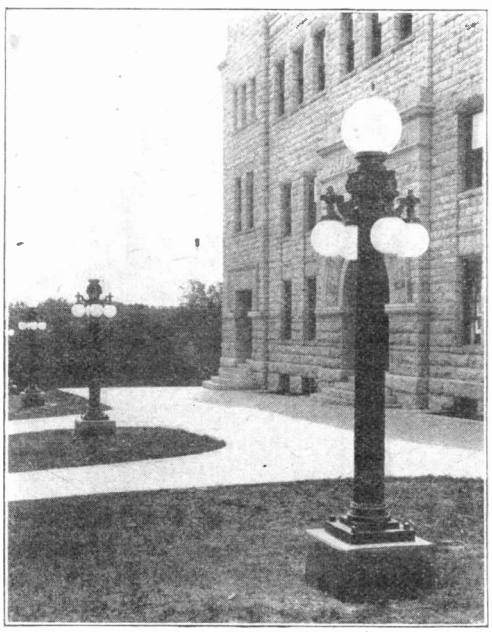
In the ship's galley will be an electrical installation that will be a radical departure from former practices, for the old kitchen range with its dirt and ashes is to be displaced by an electric oven. In this oven all the bread will be baked and a ship crew now requires thousands of loaves a week. There will also be a complement of culinary tools that will do all the tasks that the jackies used to do when they wanted to gain the cook's favor. These appliances will peel potatoes, slice bread, beat eggs, mix dough, grind and slice meat, wash dishes at the rate of 6,000 pieces an hour, freeze ice-cream and operate a refrigerating machine that will not only preserve the food in the store rooms, but will pump brine through a system of pipes encircling the magazines, thus keeping them cool and reducing the danger of combustion to a minimum.

Such in brief is to be the electrical equipment of Uncle Sam's newest fighter, the *New York,* launched at the Brooklyn Navy Yard last October. She will be completed in time to take part in the mobilization of the fleet next fall and will be the largest war vessel in commission. The *New York* will have a speed of 21 knots, a displacement of 27,000 tons, a length of 575 feet and a beam of 95 feet. Her crew will consist of 64 officers and 1,000 men and in the crew will be about 40 expert electricians, men trained in the government electrical school at the Brooklyn Navy Yard and fitted especially for the peculiar requirements of caring for a fighting ship's intricate electrical machinery.

College Class Leaves Memorial

In many universities and colleges the graduating class leaves behind a memorial to perpetuate its memory. This custom prevails at the Kansas State Agricultural College, Manhattan, and the class of 1912 arranged to "so let its light shine" that it will be remembered for all time.

The memorial, costing $600, consists of four bronze finished electroliers set



A USEFUL AND ARTISTIC CLASS MEMORIAL

upon metal posts along the walk fronting the auditorium. Each electrolier is fitted with five globes—one large sixteen inch center globe and four ten inch globes supported on side brackets. A 150 watt Mazda lamp is used in the large globe and 40 watt Mazdas in the small ones.

Each post is set on a square cement base, making the uppermost lamp twelve feet above the walk. The current for lighting is furnished by the college power plant, being 220 volts, direct and is carried to the posts by steel-armored lead-encased cable laid directly in the ground.

The arc lights shown in the picture attached directly to the building and formerly used for lighting have been removed.—V. E. MILLER.

Electric Charge on Rain

In the proceedings of The Royal Irish Academy for Sept., 1912, are described the experiments of Messrs. McClelland and Nolan on the electrical charge on rain. Of the total amount of rain collected 82.6 per cent was found to be positively charged, while, of the total amount of electricity brought down, 76.9 per cent was positive. Tables giving the results of each month show that the charge per cubic centimeter of rain tends to be lower in the winter than in summer.

The rain was separated into three types —fine, large and mixed rain. Large rain is always highly charged, the average charge being one to two electrostatic units per cubic centimeter. The largest charge per cubic centimeter was one of 12.3 electrostatic units on March 5, 1912. Mixed rain is weakly charged. On both of these types positive electricity predominates, but fine rain is always negatively charged .

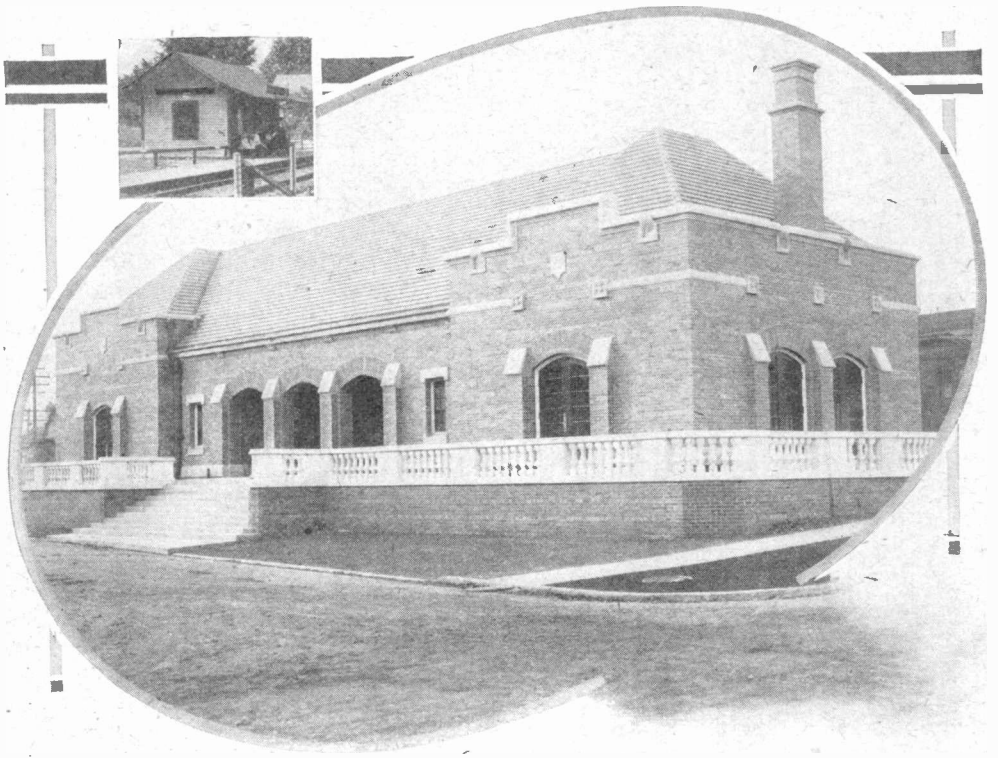
Tables are given showing the current per square centimeter of the earth's surface brought down by the rain. Summing up, the authors say that there is no doubt that a large excess of positive electricity is brought down to the earth's surface by rain. Their experiments show that the rain occurring during normal elecrical conditions is charged, generally speaking, in a similar manner to thunderstorm rain.

Where Carbon Boils

It is held that when an electric arc light hisses, the carbon, melted from one of the rods, is actually boiling in the little crater formed in the end of the rod. The superheated liquid, with blinding flashes of light, moves and jumps about very much as water does on beginning to boil.

Modern Interurban Stations

The small wooden structure is a type of station frequently found along interurban lines serving as a waiting room. Only a few months ago this type of station occupied the spot on the Aurora and Elgin Interurban Railway where is now located the imposing brick structure shown in the large picture. The favor of the public toward the electric railway particularly in winter and the consequent increased patronage due to freedom from smoke, dirt and unreliable service common on steam roads account for the building of substantial accommodations for the public.

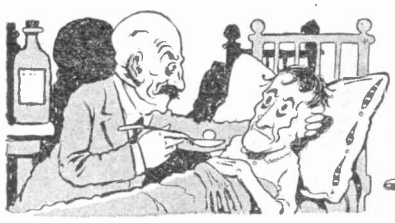


A MODERN INTERURBAN STATION IN CONTRAST TO THE OLD WOODEN STRUCTURE

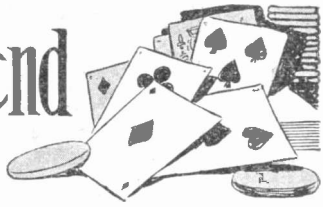
This imposing and modern station is divided into general and separate waiting rooms with conveniences. The large French windows and porches give an air to the station entirely different from that of the stuffy place with which patrons were more or less familiar and can but make for the popularity of electric interurban service.

Electric Bells Rung by the Sun

Professor Köhl, of the Odder Observatory, Denmark, reports that when the huge sunspot of September last was crossing the solar meridian, magnificent auroral lights flashed across the heavens and the electric bells in the great telegraph station at Frederica rang without any visible cause. The telegraphic service in Denmark was disturbed for hours during the auroral display. Professor Köhl thinks that the agency of the sun in producing the phenomena was evident. Similar exhibitions of "wireless telegraphy" between the sun and the earth have been noted in the past, when electric currents at pressures of several hundred volts have been noted in the telegraph lines all over the world.



The Sick Friend Story



By GEORGE F. WORTS

Without going into further personal details let it suffice to say that Mr. Jones typified the average American business man. At 10 a. m. he sat in his office smiling knowingly over the following note from a friend:

"Dear Jones," it ran, "big poker party on at the club to-night—sky the limit as usual. Phone your wife the 'Sick Friend' story and—"

At this juncture Mr. Jones reached for the 'phone to call his wife. He lifted the receiver from its hook on the tapering nickeled pedestal and put it to his ear. At the end of the fourth second, precisely, when "Central," by established precedent, was scheduled to break the monotony with a crisp "Number please!" Mr. Jones commenced to fidget. "Why, what rotten service," he muttered. He clicked the hook up and down with his forefinger impatiently. Nearly a quarter of a minute passed. His face became flushed and his eyes fairly bulged with rage. He rumpled his hair with his disengaged hand, unconsciously augmenting an already superb dramatic effect. By this time he had forgotten entirely the ingenious little tale he had cracked up for his wife.

Meanwhile, confronted by a sudden spurt in the number of calls, due to a grave slump on the stock exchange, "Central," who had been striving valiantly to hold her own against this unexpected burden, picked up a switchboard cord—one of the arteries through which flowed an endless traffic—and answered in its turn the flickering dot of light on her switchboard which indicated Mr. Jones's rising wrath.

"Number please?" she asked sweetly.

"Number!— Number!!" shouted the furious voice of Mr. Jones over the wire. "Why—blankety blank it! I've been waiting here over half an hour—" etc. Figuratively speaking, the wires fairly writhed and sank under the weight and substance of Mr. Jones's words. Central, who, as usual, was a sensitive young girl, was compelled to sit quietly by, mind you, and listen with an ear pink with shame to the unstemmed flow. She beckoned for a supervisor and the supervisor listened, too, for a time, with the color mantling her cheeks, to Mr. Jones's caustic opinion. In despair and disgust she finally switched the connection to a cooler wire—that which led to the manager's office. Mr. Jone's anger, it seems, was a sort of a regenerative affair and did not falter until the brisk voice of the manager interrupted with a "What is the trouble please?"

Mr. Jones gasped in astonishment, but upon gaining the indentity of his auditor—completed the citation of his grievances.

The manager apologized for the poor service, explained the temporary cause and promised that such a lapse would not occur again if he could help it and then, upon inspiration, he suddenly asked:

"Mr. Jones, exactly how do you consider 'Central'—as an integral part of a well oiled machine which, for some unavoidable reason, may 'slip a cog,' as it were,—or is your conception of her a girl at a desk reading a magazine, or embroidering or talking loudly with the other girls in the room and occasionally answering a call when the fancy takes her?"

Mr. Jones was silent for a moment. "To tell the truth," he replied, "I never gave the matter much thought, although I always have had a vague idea—as you suggest—of a girl with a magazine in one hand and not paying particularly strict attention to business."

"That is exactly what everyone imagines who has never been through a modern telephone exchange," replied the manager. "Now, Mr. Jones, I will have a few minutes to spare at four o'clock this afternoon and if you can take the time from your business I would be glad to have you pay us a visit. Can you arrange it?"

HIS EYES FAIRLY BULGED WITH RAGE

Mr. Jones consulted his appointment card, saw that he would be free at the suggested time and acknowledged that he would be delighted to accept the manager's kind invitation. Punctually, at the appointed hour, Mr. Jones's card was presented to the manager. He was received promptly.

"We are always glad to have subscribers drop in and see how we run things," said the manager, shaking his caller's hand warmly. "It usually revises their conception of a telephone office a little." He led the way up a flight of stairs into a large, well ventilated room. Mr. Jones received his first of a succession of surprises.

In the room, facing a long, narrow horseshoe arrangement of desks—the switchboards—were more than 200 girls each intent upon scores—hundreds—myriads of tiny metal lined holes in the mahogany panels rising before them. No word could be heard coming from them individually, yet a low, soft, subdued murmur arose from the throng—so well modulated and controlled that it could scarcely be heard in the hall outside the open door. Little red lights winked continuously from narrow shelves below the panels. "Was this your conception?" asked the manager in a low voice He, too, seemed to be influenced by the tense, subduing effect of the room's very atmosphere. "From here, we can connect you with any place—city, town or out-of-the-way villa within a 2,000 mile circle." Mr. Jones could only shake his head in wonderment.

A trim, business-like young woman passed the manager and nodded smiling. He called to her, "Miss Rourke," he said. "This is Mr. Jones, one of our subscribers who has had a little difficulty with his service lately. Mr. Jones, let me present our assistant chief operator." Mr. Jones bowed.

"I will show you how the calls come in," said Miss Rourke briskly, "if you will step to this nearest board." The two men followed and she continued:

"When one of these tiny lamps lights up on the face of the board, it indicates that someone has the receiver up—is trying to call 'Central.' 'Central' answers the call with one of these sets of cords, of which every position has seventeen. As you see, each pair of cords has two little parallel lamps down on the horizontal shelf, associated with it, and these lamps are arranged so that they light when the talking parties hang up their receivers, so we know when to take down a connection or if a subscriber

"THIS IS THE TIME WHEN THE CLUB MEN ARE USUALLY PLANNING THE SICK FRIEND STORY"

wants to make another call or ask a question.

Those little round holes in the board, known by us as jacks, and which the girls face, are arranged in mathematical order, 20 to a strip and each jack properly numbered so that a girl can at once pick out any number called.

"Do you mean that any girl can call any number without requiring the assistance of any other girl?" Interrupted the surprised voice of Mr. Jones.

"Exactly," she replied. "That is, the young ladies here can reach any number terminating in this office. Calls for numbers into other exchanges about the city have to be connected by special order wires and trunks to the other exchanges and are completed there by operators working under similar conditions to those in the room here."

Mr. Jones looked about him. Of all the 200 girls in the room, none but was busily engaged in deftly manipulating the shining metallic plugs attached to the long flexible cords. "How do they ever keep it up?" he marveled. "No wonder 'Central' on my line took a second or so longer than usual answering this morning. I don't blame her a bit."

"From nine to ten in the morning and from four to five in the afternoon are the busiest hours," the assistant chief operator was saying. "Traffic is lightest from midnight until dawn. Then is the time the club men are usually 'phoning the 'Sick Friend' story to their wives."

Mr. Jones underwent a twinge of conscience and he observed that the manager, too, winced.

"I didn't think there were that many liars in the city," whispered Mr. Jones to the manager. "Perhaps they're not all club men," condoled the manager.

"Some of the girls are so expert that they can tell exactly what number is calling from the flashing of the light on a switchboard at the other end of the room —and they can answer from where they are sitting."

"At which board is number 5500 located?" Mr. Jones queried.

She pointed to one of the girls near by. "She would handle that call."

Could it be possible that this nice looking young woman was the one to whom he had spoken so harshly that morning? He felt suddenly ashamed.

"Her calls come mostly from the business district and often the men are impatient, but she is so sweet she rarely has trouble."

The manager pulled out a small ear receiver and connected it by a plug to the girl's board. "Listen in on that a moment Mr. Jones," he suggested "That may still further alter your conception." Mr. Jones listened. For an interval it was very confusing—a jargon of variegated voices—shrill sopranos, rasping tenors and harsh bases constantly punctuated by the sweetly modulated voice of "Central" with "Number please." "Line busy," "Calling your party" and the many other expressions current in telephone parlance. Always brief, yet invariably polite was her response. As Mr. Jones was about to return the instrument to its owner he heard in answer to the usual "Number please?" a coarse, masculine voice exclaim:

"Hello Honey! How's the little—"

"You have the wrong party," interrupted the little operator firmly. "This is *not* a beehive. Number please?" The amicably inclined gentleman at the other end hesitated and probably blushed—at least Mr. Jones hoped he blushed—and then, in a perfectly subdued voice, gave the number he desired.

Behind the operators' chairs, pacing ceaselessly—vigilantly—back and forth, were the supervisors. Much like caged lionesses, Mr. Jones thought, although they were probably somewhat more gentle. It is their duty to help in rush moments, to instruct beginners and, as the name implies, to supervise—incidentally to settle complaints and maintain order among the operators. They are the sub-bosses. In the center of the room were the "Information" desks. To the rear was the chief operator's office, at the desk in which a decidedly capable appearing young woman sat, glancing over some pay rolls.

"Positions as telephone operators in large exchanges offer good opportunities for girls," remarked Miss Rourke. "The hours are comparatively short; the work, when once learned, is quite easy—merely a matter of second nature—and could almost be done with one's eyes closed; the chances for higher pay and promotion are good; the employment is respectable and honorable and the experience is broadening. All in all it is a good field for an ambitious working girl—much better to my mind than the ordinary business office, not to speak of the factory. However, I think the home and not the office is the place for girls, but that is another story. I? No, I am not a suffragette."

"I am sure," she said in parting, "that you will be inclined to be a little more lenient with the girls if they are a trifle slow in answering your calls—after having visited our exchange. Although," she amended apologetically, "I presume you would never be impatient with them."

"Heavens no, never!" assured Mr. Jones.

An Electric Mail Carrier

An interesting device for the prompt delivery of letters to the tenants of the upper floors in lofty houses is employed in Geneva. On the ground floor is a letter box for each of the floors above. When a letter is dropped into one of the boxes, it makes an electric contact, which not only sets a bell ringing on the floor for which the letter is intended, but also opens the valve of a water tank on that floor, by means of which a cylinder, connected with the letter box by cords and pulleys, is filled with water. When full, the cylinder descends and pulls up the letter box. The latter, on reaching its destination, automatically dumps its contents, while at the same time the cylinder discharges its water. The box now outweighs the cylinder, and accordingly descends, lifting the cylinder.

Ozone in Tunnels of Central London Railway

By FRANK C. PERKINS

For the past decade the Central London Railway has been ventilated on the exhaust system, the method consisting in closing all the doors underground for a certain period after the running of the last train, and drawing air right through the tube from one end to the other by means of a 200 horsepower exhaust fan fixed at Shepherd's Bush. This thorough cleaning out every night was supplemented by a continuous running exhaust fan at the British Museum Station and the natural ventilating action of the running trains. On account of the increasing traffic, directors of the railway decided to install a more positive system of ventilation and the management decided to adopt an elaborate equipment to provide a continual influx of ozonized air during the whole of the day. This new installation of the Ozonair type was installed under the direction of E. P. Grove, Chief Engineer of the Central London Railway.

The Central London Railway runs from Wood Lane on the west side of London to the Bank of England in the center of the city, a distance of nearly seven miles and comprises two separate tunnels, having an aggregate length of about thirteen miles. With the exception of a very short length between the first two stations—Wood Lane and Shepherd's Bush, the railway is entirely underground. The "up" and "down" lines are in practically separate tunnels, each eleven feet eight inches in diameter, pierced in the London clay and formed of segments of cast iron bolted together. These tunnels are interconnected at several points by crossovers.

During heavy traffic there are some 25

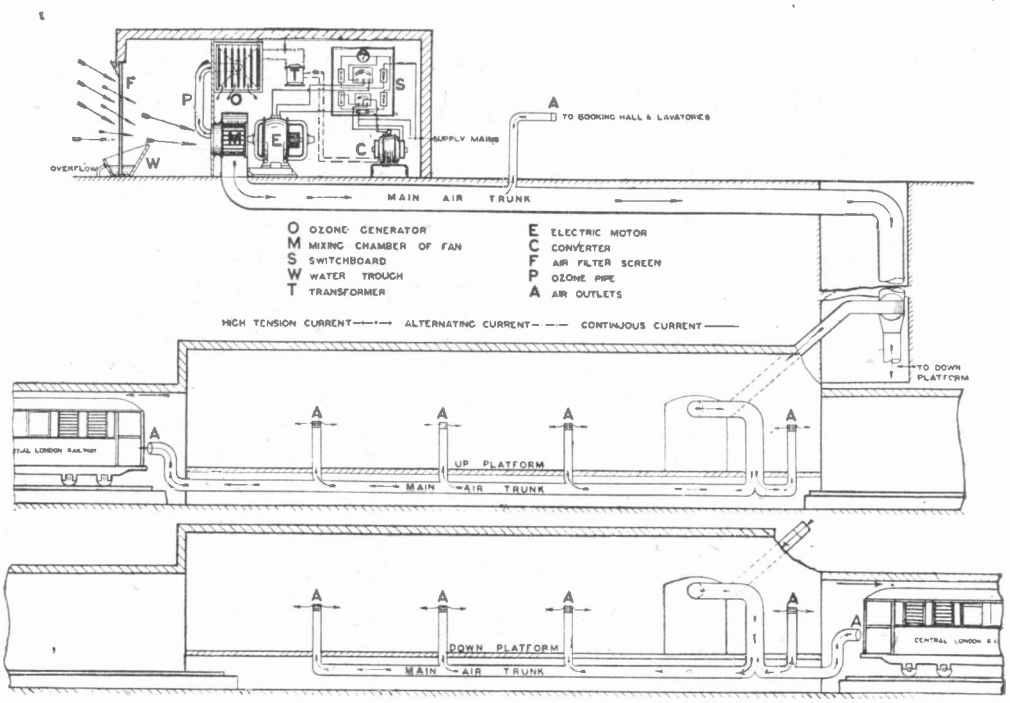
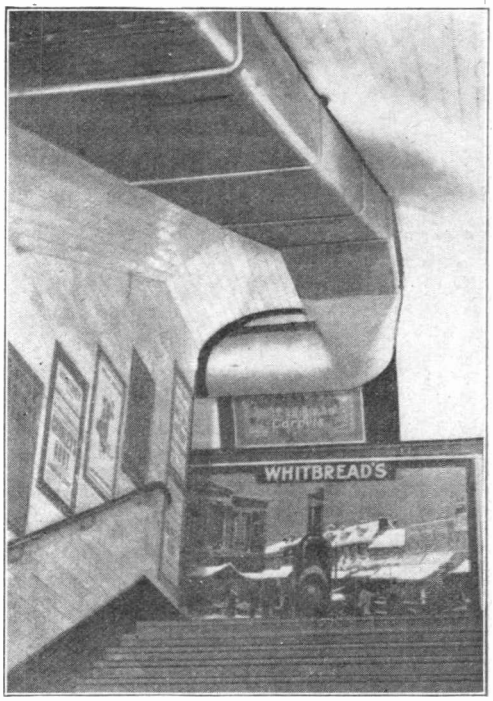


DIAGRAM SHOWING THE "OZONAIR" SYSTEM IN THE TUBES OF THE CENTRAL LONDON RAILWAY

or more trains in the tunnels at the same time, each of which carries 300 people more or less. Assuming that the trains are on an average three-quarters full, it will be seen that there are every day over 6000 people in the trains, or including those on the platforms and lifts there may be as many as 10,000 in the tube continuously for two or three hours, and four or five thousand all day, so that the necessity for thorough ventilation is obvious.

The installation for the ventilation of the railway tubes on the Ozonair system is unique and consists of a separate and independent plant at each station; with the exception of Shepherd's Bush, which is near the open end of the tunnel. The explanatory diagram illustrates graphically the general arrangement of one of these plants, and shows how the air is purified ozonized and introduced into the tunnels. The actual generating plant is shown in the small room on the upper left hand side of the diagram. Commencing on the extreme left is the filter screen (F) which cleans and washes the incoming air from all dirt and smuts, and at the same time absorbs all the deleterious gases, such as ammonia and sulphurous acid, which are always present in the atmosphere of large cities. The air is drawn through the filter screen by aid of a fan (M) which is driven by a powerful electric motor. The screen is kept moistened by means of a continual flow of water from a series of jets at its upper edge. The used water is caught in the water trough (W).

The ozone generator is shown at (O). The pattern supplied to the Central London Railway consists of a series of ten generating units, each comprising a thin mica plate with a sheet of metallic gauze on either side, the set of ten plates being spaced and mounted on insulating supports. The gauze sheets are connected across the secondary of a small transformer delivering alternating current at a pressure of several thousand volts, and an innumerable number of minute discharges occur all over the opposing surfaces of the plates. These discharges convert the oxygen of the air into ozone. In view of the very large volume of air dealt with in the Central London Railway plants, a comparatively strong mixture is produced in the ozone generator and this conveyed by the ozone pipe (P) to the mixing chamber of the main ventilating fan (M), where it is mixed with the main current of air, and thence blown down the main air trunk to the various distributing sheet metal ducts or conduits.



DUCT FOR CARRYING OZONIZED AIR IN THE LONDON "TUBES"

These air outlets are marked (A) on the diagram.

Most of the Central London Railway equipments will pass normally some 360,000 cubic feet of air per hour, and the generator provides an amount of ozone sufficient to preserve the proper proportion. It is stated that the main ducts in the case of the normal equipments are about three square feet in cross section and are all constructed of galvanized mild steel.

It is said those who travel on the Central London Railway fully appreciate the advantages of the purer and fresher air now provided for their comfort, an advantage that more than ever differentiates this railway from others, and thus encourages other people to make an even greater use of it than they have done in the past. Whether it be in the cold, clammy weather of winter, or in the excessive heat of summers height, travellers in the Central London Railway Tube are neither too cold nor too hot, for its temperature is practically uniform all the year around. To this feature is added the freshness and purity of the air of the mountain top.

For Transporting Lamps

We illustrate a new Paris idea in the way of transporting incandescent lamps and it is claimed to be much safer and give less breakage of the glass or filament than usual. It is curious to note that the Ovigarde method was first put in use for handling eggs, and it was such a success that the next step was to apply it in packing lamps. Here it proves better than what was used before for the purpose, such as cotton, corrugated pasteboard or cell-boxes.

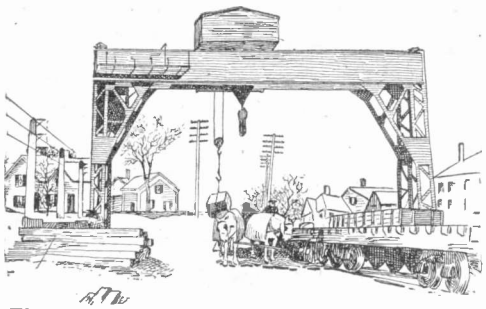
CASE FOR TRANSPORTING LAMPS

The packing shell is of thick corrugated paper, molded by pressure into the right shape and it has the form of the lamp so that it guards the lamp on all sides, as will be noticed. It may be asked how the lamp is put in. This is done by simply opening out the overlapping edges of the slit running down one side, which then spring shut again when the lamp is inside.

At the top is a small expanded end which serves to surround the fragile point of the lamp so as to protect it well. Lamps fitted with this cover can then be packed into any kind of a box just like ordinary pieces, and will stand all kinds of shocks. The new packing is quicker and cheaper to handle, weighs less and takes up less space.

Crane Service at a Way Station

Electricity is being used more and more to facilitate the handling of freight at large railroad terminal stations, but its possibilities in small cities and towns are as yet only slightly realized. A somewhat unusual installation is located at Quincy, Mass., from the point of view of crane capacity at a small way freight depot.



TRANSFERRING FREIGHT AT A WAY STATION

As shown in the accompanying drawing the equipment consists of a 40 ton Shaw crane operated back and forth upon a wide runway inclosing a teaming road and train track facilities, so that the quickest transfers may be made between the trucks and the cars.

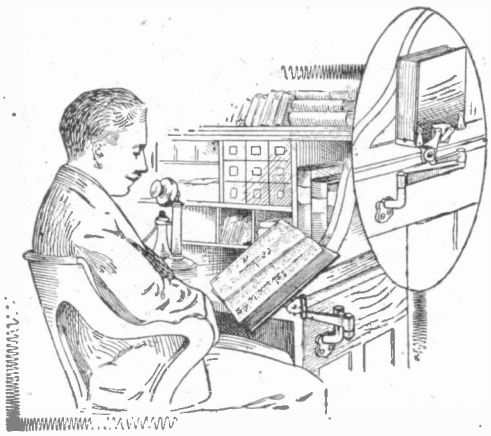
Current is supplied to the crane by contacts running upon three horizontal trolley wires located at the side of the runway, and the service is furnished by the local electric service company. Out of Quincy are shipped yearly many carloads of granite quarried by electric power in the adjacent hills, and since the installation of the crane the promptness of shipments and the cost of handling have clearly shown that the use of motors is by far the best method of taking care of heavy work of this kind.

Experiments with Selenium

The photoelectric properties of selenium are well known. Some experiments have been made in Germany on a crystalline form of the metal obtained by heating it to 217° C. and cooling it rapidly. The results show that the photoelectric sensitiveness of the crystalline selenium increases after the time of preparation, especially if kept in the light; the sensitiveness is increased by positive electrification at low pressures, but reduced by negative electrification in the open air. In the case of noncrystalline selenium, which has a higher sensitiveness than the crystalline variety, the sensitiveness is reduced by light and recovered in the dark. Negative electrification at all pressures diminishes the sensitiveness, while positive electrification increases it.

Telephone Book Holder

The business man has occasion to refer frequently to the telephone directory and will appreciate the convenience of a holder that keeps the book ready at the side

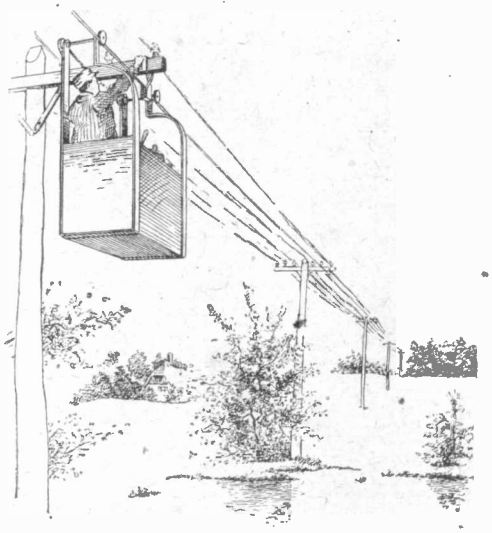


HOLDER FOR TELEPHONE DIRECTORY

of his desk. The Stromberg-Lindh telephone book holder consists of a bracket and two revolvable arms, all of metal, that secure the directory, open or closed as is desired; near at hand and accessible.

Lineman's Aerial Car

The future lineman may possibly travel in an aerial car propelled by a gasoline engine if the invention of Henry M. Preacher, Brunson, South Carolina, is put into operation. Furthermore, the lineman



THE LINEMAN OF THE FUTURE

will not need to climb poles or do any walking but will be carried along near the wires he is caring for.

Depending from the cross arms are brackets carrying a cable. From this by means of grooved wheels a car is suspended, the whole being driven by a sprocket chain connected to the engine in the car.

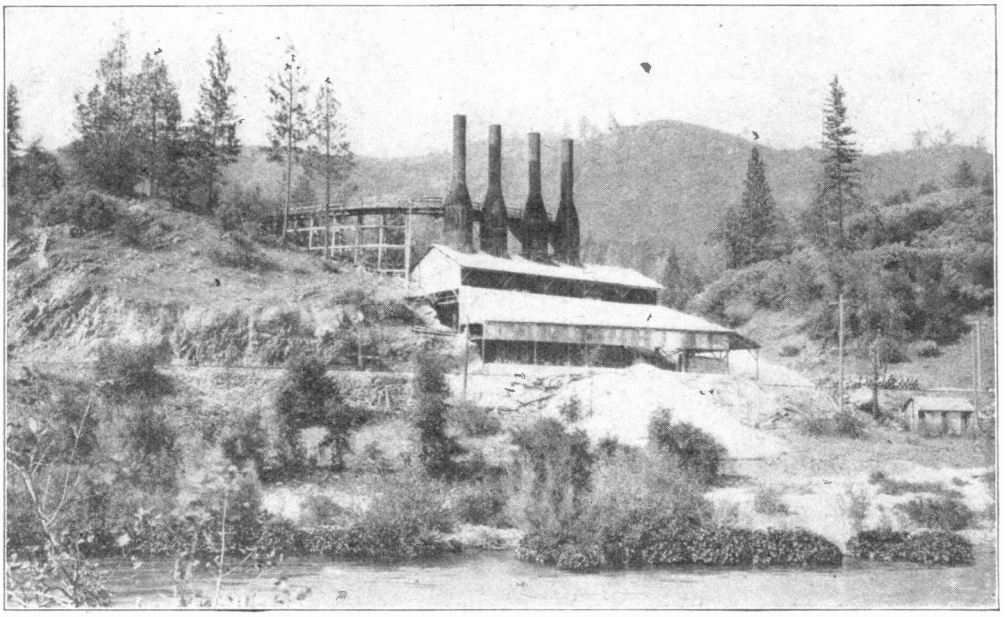
Termites Destroy a Cable

The French authorities have been investigating the matter of the destruction of an electric cable in Tonquin by the attacks of termites. The cable crossed a marshy tract and was enclosed in a tube of lead. The insects bored holes in the tube and completely destroyed the insulation of the cable. It has been proposed to guard the cable against future attacks by enclosing it in an envelope of cotton and jute impregnated with sulphate of copper, which it is believed, would prove a fatal poison to the insects.

Electric Smelter Plant in California

Dr. P. Heroult, the noted French engineer, is the designer of the electric steel furnaces at the plant of the Noble Steel Company, Heroult, Cal., a picture of which is here shown.

In the mountains back of the plant are rich deposits of magnetite iron ore and limestone adjoining each other, the latter being used as a flux for the molten bath in the electric smelters.



HEROULT FURNACES IN A CALIFORNIA SMELTER

In the beginning of Dr. Heroult's experiments five electric furnaces were sent to the junk heap. The sixth was a success and is now in use and others are being built.

The electric smelter building has a heavy steel frame and is covered with galvanized corrugated iron. It is rectangular in shape, 120 feet long and 75 feet wide. Its position is parallel to and adjoining the railroad track. The 24 inch gauge track system runs through the building with the necessary switches, turntables, etc. The furnaces are placed in a line parallel to the length of the building and will number six each with a capacity of eighteen tons per day when the plant is completed. The furnace enclosure is very simple. It is a steel box 27 feet long, thirteen feet wide and twelve feet high. The upper half of the box is rectangular but in the lower half the sides taper toward the center of the foundation. The box is lined with fire-clay on the vertical sides and a hearth of the same material slopes slightly from the sides towards the middle to facilitate the flow of the molten bath when the furnace is tapped.

The roof of the furnaces is arched and is surmounted by five stacks in a row. In the four spaces between the stacks at the center of the dividing arches are inserted the graphite electrodes which are cylindrical, twelve inches in diameter and four feet long. These are fed downward with the aid of jackscrews. Both the electrodes and the arched roof are water cooled, this feature being essential to successful operation.

A charging platform is built near the top of the stacks and carries a track.

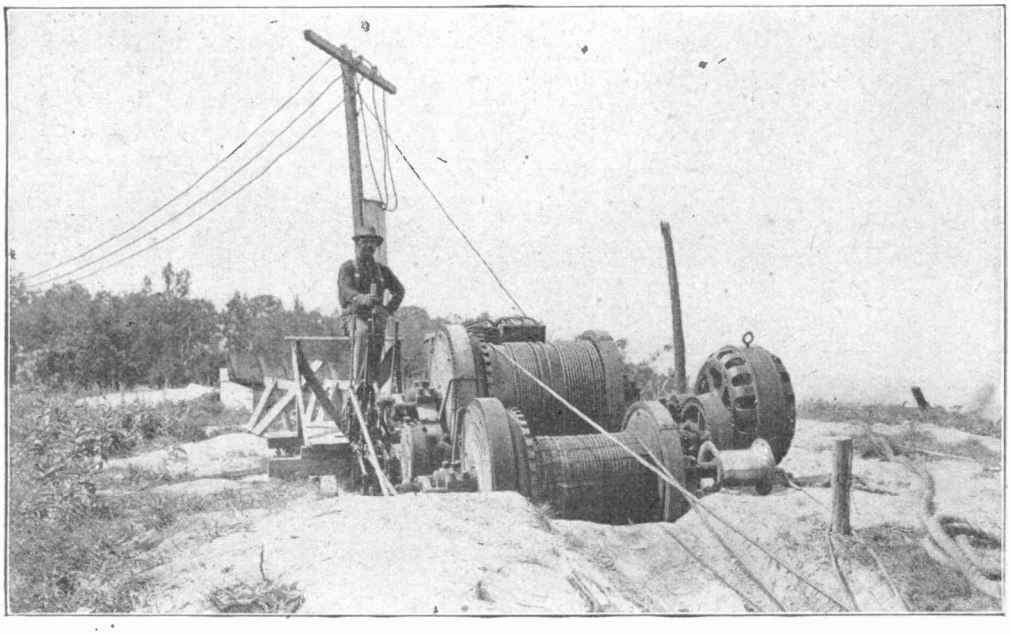
Dump cars with the charge are run along the platform and dump directly into the stacks.

The supply of current is taken from a 60,000 volt line through six 1,500 kilowatt transformers. The temperature within a furnace when in operation is around 4,200°F. but this great expenditure of heat is hardly evident to one standing beside it.

Removing Top Soil by Electric Power

The taking off of from one to six feet of top soil to expose the clay subsoil was a task a Minnesota brick and tile company found very slow and expensive by the use of horse-drawn plows and scrapers. Two teams were kept busy at this kind of work.

An economy investigation resulted in an electrically driven hoist being placed on the top of the hill; the hoist cable was attached to a large specially constructed scraper and as much of the hillside was cleared this way in two weeks as was done in two months by the former method. The illustration shows the hoist and its operator. The motor is a 50 horsepower, alternating current machine; power lines are brought up the hill from transmission lines below.



UTILIZING THE ELECTRIC HOIST TO DRAW A SCRAPER

Rutile

Very few people have ever heard of rutile. This is not strange since there is only one company mining it—The American Rutile Company at Roseland, Va.,—and it is used for unusual purposes, as for making ferrotitanium for use in the manufacture of steel, in electrodes of the "magnetite" arc lamp, in the ceramic trade and in dyeing leather and textiles. Prices range from $30 to $160 a ton according to percentage of titanic oxide and quantity. Pulverized rutile and extra pure grades sell for higher prices.

The production in 1912 was 275 tons of concentrates carrying from 80 to 85 per cent of titanic oxide. The principal impurity is iron oxide carried in an iron-rich mineral which from its black color

is supposed to be ilmenite. The ilmenite is easily separated from the rutile by an electro-magnet and 100 tons of such purified concentrate were produced which carried 94 per cent or more of titanic oxide. The separated material carries from 50 to 60 per cent of titanic oxide and as much as 42.3 per cent of iron oxide. It is especially adapted for making ferotitanium.

A Portable Photo-Telegraph

A French physician, already well known on account of his electrical inventions, Mons. Edouard Belin, has just completed a portable apparatus which makes possible photographic reporting by telephone. This scientist produced his first photo-telegraph in 1907; this, however, was not portable, as is this later one.

This new photo-telegraph, of quite small volume and weight, consists of a complete transmitter which can be connected with a telephone or telegraph line terminating at a distant station, at which are arranged the receiving instruments. The transmission depends upon the properties possessed by bichromatized gelatine. It is known that in what is called the carbon method, invented by Poitevin, photographic proofs are obtained with paper sensitized with bichromatized gelatine, which becomes insoluble when exposed to light. After taking out of the printing frame they are washed in warm water and the gelatine is dissolved more or less according to the degree of opacity of the different parts of the negative. When this is done, the proof presents a surface of depressions and reliefs which corresponds respectively to the whites and blacks of the original negative. The half tints are produced by intermediate heights which are in exact proportion to their intensities.

This proof is then put on the cylinder of the photo-telegraph, which is set in motion by a spring. The screw which winds up the spring, turning as the spring unwinds itself, causes the movement of a point in the instrument, called an "exploring point" because its purpose is to transmit the movement produced by the depressions and reliefs of the picture to the sending instrument. This latter is called a rheomicrophone, and is a box having a bottom of insulating material, and a lid composed of a flexible conducting plate which translates the variations of relief of the image into currents of different intensity on the line. For this purpose there are interposed resistances, suitably calculated, between ten contact points on the insulating plate at the bottom of the box. The current coming from a small battery reaches the first contact point, which is always in contact with the conducting plate, and passes out by the wire attached to the last point. The plate, in consequence of the pressure conveyed to it by the inequalities of the surface of the proof, touches a certain number, varying according to the pressure, of the contact points. In this way are produced successive variations of the intensity of the current sent onto the line.

Let us see now how the photograph reporter proceeds. After having finished up a negative, he takes from it a bichromatized gelatine proof, which before drying he places on the cylinder of the photo-telegraph; then he connects the instrument with a telephone line by means of binding screws. At the other end of the line his correspondent connects the ends of the wires to the receiving station of a large Belin photo-telegraph, on the cylinder of which is the sensitive paper which is to receive the photograph, this paper being protected by a hexagonal photograph frame.

Everything is ready now for the sending of the photograph. The two operators, after having sent the necessary signals, and synchronized the apparatus, begin the transmission. It may be mentioned that the putting of the apparatus on the wire does not interfere with the use of the line for ordinary purposes.

The mechanism of the receiving sta-

tion consists of a Nernst lamp, which is the source of light; it projects its rays upon the sensative surface through a Blondel oscillograph, which is an instrument for recording alternating current wave forms, and for the study of electrical oscillations. It consists of a soft iron wire upon which is a small mirror, pivoted between the poles of an electromagnet and vibrating with a frequency proportional to the intensity of the current received. The pencil of luminous rays from the Nernst lamp is thrown upon this vibrating mirror, from which it is reflected through an aplanatic lens; that is, a lens which brings parallel rays to a focus without spherical or chromatic aberration. Against this lens is applied a scale of tints, or a sheet of glass shaded gradually from left to right, from black to perfect transparency. An electric motor, running at a speed determined by the speed of the transmitting mechanism, and made to correspond with it most accurately by means of a special rheostat and a frequency meter, causes the rotation of the receiving cylinder, whose dimensions are identical with that of the transmitting mechanism, and which is enclosed in a wooden box. This dark chamber is pierced by a circular hole of one third of a millimeter in diameter, through which pass the rays of light from the lens, those irradiations of the pencil of light which would blur the outlines of the photograph being arrested by the walls of the box.

As the reliefs of the image on the transmitting machine convey to the plate of the rheomicrometer a series of displacements varying in amount, the intensity of the current sent varies in proportion to the depressions and reliefs of the original proof. These electrical variations communicate to the mirror of the oscillograph movements proportionally rapid. Consequently the reflected luminous pencil oscillates from right to left, from the center to the edge of the lens; in its movements it encounters the different degrees of transparency of the scale of tints and thus has its intensity modified to a greater or lesser degree. When the pencil falls at the center of the lens it meets the transparent part of the chromatic scale and consequently the light transmitted suffers no weakening, and the effect is the production of a photographic black. On the contrary, if the reflected ray falls on the edge of the lens the complete opacity of the scale extinguishes the ray and the result in the picture is a white. For all the intermediate positions of the reflected ray, the scale of tints determines the amount of the modification, and the result is a photograph identical in tone with the one from which it is produced.—*Translated from Cosmos by J. H. Blakey.*

Incandescent Lamp as a Telephone

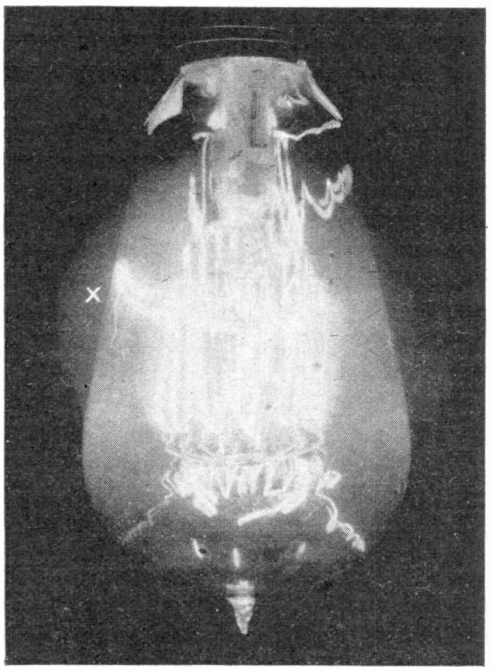
Without going into technical details concerning the connections, it may be stated that a 100 candlepower Osram lamp, burning on a 150 volt circuit, has been shunted into a telephone circuit in such a manner as to reproduce faintly speech which is transmitted to it from a microphone. The effect is attributed to the varying temperature of the filament, which sets the thin glass envelope in vibration. Lamps of 16 and thirty-two candlepower do not respond, as their glass envelopes are too thick.

Fleeing from Electricity

The spread of electric railways and electric light systems is driving magnetic observatories from the neighborhood of large towns and cities. The delicate instruments employed in such observatories lose their usefulness when extensive electric plants are in operation near them. An instance of this occurred not long ago when the magnetic observatory of Vienna was abandoned. The Austrian government felt that steps were necessary to provide a new observatory situated at a distance from the capital.

Tungsten Filmament Plays Trick

From the appearance of the picture, one not familiar with the sight of tungsten electric lamps might conclude that



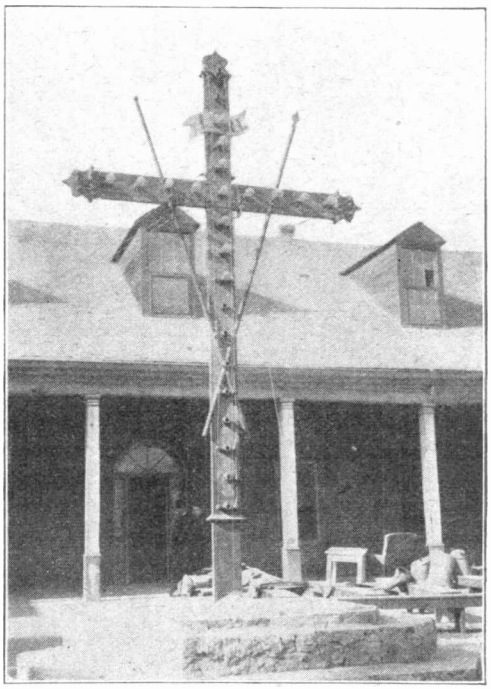
AND YET THE LAMP BURNED

some aspiring rival of the wonderful Edison had been experimenting and placed within the globe a crudely constructed filament of complex design. Not so, however. The two prongs near the bottom, jutting downward to the right and left respectively, are not solid material at all. They are reflections. So is the one near the top on the right and also about half of the mass in the center.

But consider the one on the left near the center. That one is a white hot tungsten filament—part of the long zigzag glower in the center. This 40 watt lamp, while disconnected and hot, was dropped to a table. From there it dropped again to the floor and when reinserted in the socket caused surprise by glowing the same as ever. This alone was a wonderful enough stunt for a tungsten filament, but notice it again. In the hard fall the slender glower broke in two, but in some way the terminals became crossed and the filament was welded together again. Two dead ends through which current did not then have to flow may be seen hanging below the joint, and stranger still, the filament was hanging to the glass wall of the lamp, having become fastened there at the very point of welding, tiny as that was.

Electric Cross for Historic Church

The ancient and the modern are brought into striking contrast by the recent electric illumination of the cross which stands in the court of an old Spanish church in Los Angeles. This is probably the oldest remaining building in that city as it was built in 1812 at the time that Los Angeles was a collection of



ELECTRIC CROSS IN FRONT OF AN ANCIENT MISSION CHURCH

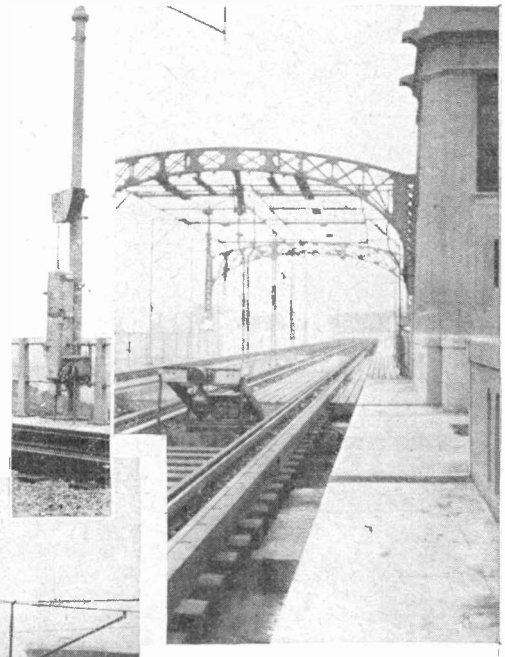
adobe huts straggling about the plaza. The historic edifice is the scene of many fiestas held by the Mexican parishioners, and on these occasions the cross in the churchyard shines forth.

An Elevated Railway for Trolley Cars

One of the latest additions to the rapid transit system of the Boston Elevated Railway Company is a new viaduct extension connecting the North Station with the Lechmere Square district in East Cambridge. The line was opened for travel last summer at a cost of about $3,500,000 and although it is less than a mile in length, it is one of the best equipped electric railway sections in the world. The new route saves about seven minutes on the average for each passenger entering the city of Boston over its rails. The tracks are laid upon a reinforced concrete structure, and are provided with both inside and outside guard rails for the entire distance. The movement of every car is governed by automatic block signals of the shielded lamp type, the signals being operated from a track circuit and by alternating current, so that they are independent of the direct return current used in the car service.

GLIMPSE OF THE VIADUCT EXTENSION OF THE BOSTON ELEVATED RAILWAY

Perhaps the most interesting feature of the new line is a drawbridge located over the Charles River Basin outlet into Boston Harbor. At this point a concrete tower has been erected and switching apparatus provided with signal interlocking safeguarding the approach of cars to the draw. The latter is of the bascule type, built in two sections and it is raised and lowered by a 40 horsepower motor, geared to each leaf, the control being effected by the tower operator.



THE FOLDING BUMPER

In each track and about 50 feet away from the draw opening is located a folding bumper which is raised and lowered by a three horsepower motor controlled by the towerman. The bumper is built with a structural steel frame and provided with a red danger lamp operated by electricity.

Tools Hardened by Electricity

There is a process, of French invention, for hardening steel by means of an electric current traversing the red hot metal. Tools thus hardened are said to have given surprising results. A sharpened table knife cut one-eighth inch iron wire as if it had been a string. Iron bars were easily cut with a circular saw. Drills pierced cast iron plates; and in all cases the tools showed no injury.

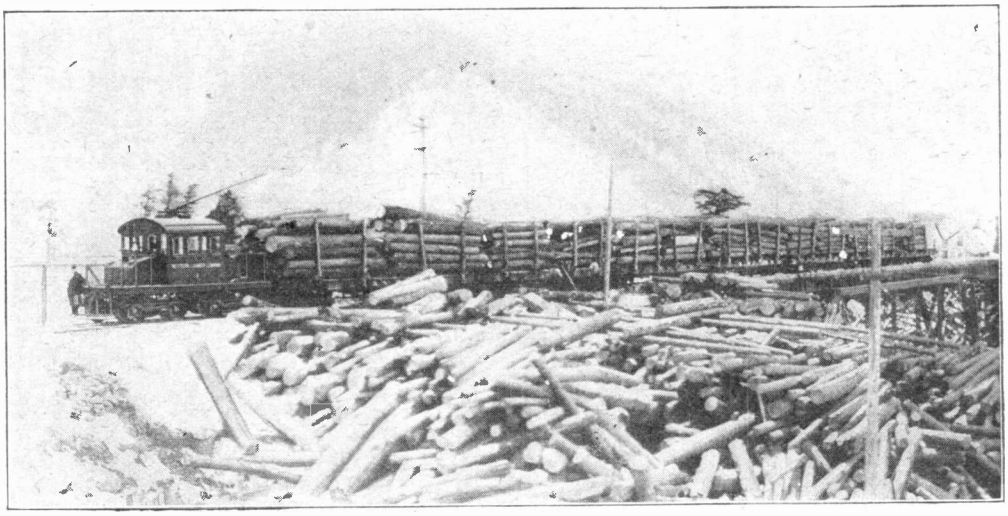
Utilizing the Power of the Columbia

At the present session of the Oregon legislature a bill was passed authorizing a committee of five from the House and Senate to investigate the possibilities of utilizing the power of Celilo Falls on the Columbia river, in accordance with plans prepared and submitted by State Engineer John H. Lewis.

If these falls are harnessed in accordance with the present plans the power generated will be 200,000 horsepower at the season of extreme low water and over 1,000,000 horsepower during a portion of the year. This would place this project among the largest of its kind in the world.

At the present time the money has not been appropriated for the carrying out of the project, as it will first require a thorough investigation and study of the conditions to be met from an engineering standpoint. This preliminary work will cost from $50,000 to $100,000. It is now under way and will no doubt be completed in time to submit the report to the next legislature in order to secure the appropriation necessary to complete the project.

The cost per horsepower per year is estimated at $9.00. It can readily be seen what a project of this magnitude will mean to the cities and manufacturing interests of the Northwest, especially in view of the fact that the project is to be carried out by the state of Oregon or the states of Oregon and Washington combined. This state supervision would insure the lowest possible cost to the power consumer and will no doubt go far toward placing these states in the front rank among manufacturing states of the west.



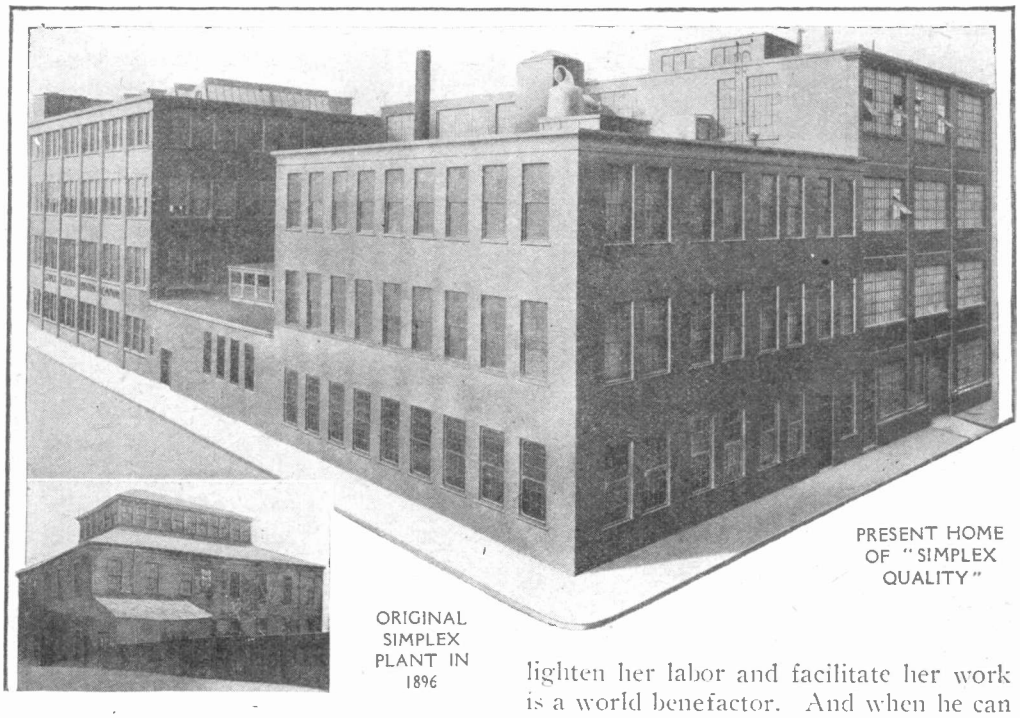
LOGGING BY ELECTRICITY

Progressive lumber concerns in the great Northwest have not been slow to realize the advantages of electricity as a motive power in their logging operations. The one great advantage over steam is the elimination of the fire risk; another is the actual cost of electric current which is lower in the west than in the east because of the development of the many waterfalls.

The illustration shows a train of fir logs being drawn by an electric locomotive to the saw mills some miles distant.

The Simplicity of Quality

By H. Bedford-Jones



PRESENT HOME OF "SIMPLEX QUALITY"

ORIGINAL SIMPLEX PLANT IN 1896

Every woman hates her domestic drudgery. But every woman is proud of her domestic drudgery, whether she does it well or not. She knows right well that nothing exists but for her, that all business is in the end operated for her, that every function of government and labor is exerted for her, the maker of the home. It is the woman who has no home to make who goes into business, but she never belongs there. She only stays there until she can make a home.

Business realizes this fact. Business men know its truth. Little by little the store is openly operated more and more for the maker of the home, less and less for anyone else. Most branches of our modern system of advertising are calculated to appeal to the home-maker. Every man who gives to the maker of the home some thing or things which will help to lighten her labor and facilitate her work is a world benefactor. And when he can combine this gift with the making of money he is a genius.

Such a man is James I. Ayer.

Eighteen years ago Mr. Ayer was a man with an idea. He lived in the Middle West, where ideas are born every year with the corn crop and die as regularly. But James Ayer had more than the mere idea. He had confidence in it, an absolute conviction of its worth to the world, and thorough belief in its worth to him. These things make for success, when combined with business ability.

Ayer had business ability to the nth power, and still has it in the same degree. He knew his business, which was electricity, as far as anyone knew it in those days and a good deal more than most people know it now. He was holding down an executive position, and his idea did not agree with it.

He gave up his position in the west and came east with his idea. He came to Cambridge, Mass., a town about as old as Boston and a whole lot prouder, and settled down to train his infant idea in the way in which it should go. It went.

Ayer got laughed at right and left on account of his idea. His enemies jibed at him and his friends pitied him, but he knew that his idea was right. That they could not see it was nothing against the idea; it was simply out of their range of vision. He had the right end of the glass, and they had a firm grip on the wrong end; the glass spelled business acumen. Today the others are fighting for a peep into Ayer's end.

His idea was that electricity could be used for heating. Others had tried it without success, but what of that? Everything else was in use as fuel, from natural gas to coal, and out in Illinois they burned corncobs and do yet.

"There's one objection to that," said friends and enemies alike. "That is the fact that electricity costs more than any other fuel."

At this James Ayer would look away and smile. The objection seemed perfectly valid. The only trouble was that the other fellows had the wrong end of the glass. It did not show them the water power of the West, and it did not show them straight business. But Ayer foresaw what actually happened; that just as soon as it was possible and to their advantage to do so, the electric companies would cut down the price. It was his job to make it to their advantage.

But to make the average housewife buy a product and keep buying it, that product must have two qualifications which will attract her. It must simplify her work and it must be reliable in the extreme. "Once bitten twice shy" is a favorite maxim of the homemaker and she observes it to the maximum. So James I. Ayer changed his name and began to write it "Simplex." When people asked what it meant, he replied "It means Quality." In order to be real aristocratic, he was soon writing it "Simplex-Quality."

"No, we'll lunch right in here," and Mr. Ayer opened a door from the show room, just off the main offices. There before me was a dining room, with a kitchen next door—both rooms fully as small as those of the average apartment. Yet the dining room accommodated six people and a good deal of tobacco smoke that noon, with ease.

In the kitchen was a cook, just drawing out a pie from an electric oven. Then I knew that I was to have an electrically cooked meal.

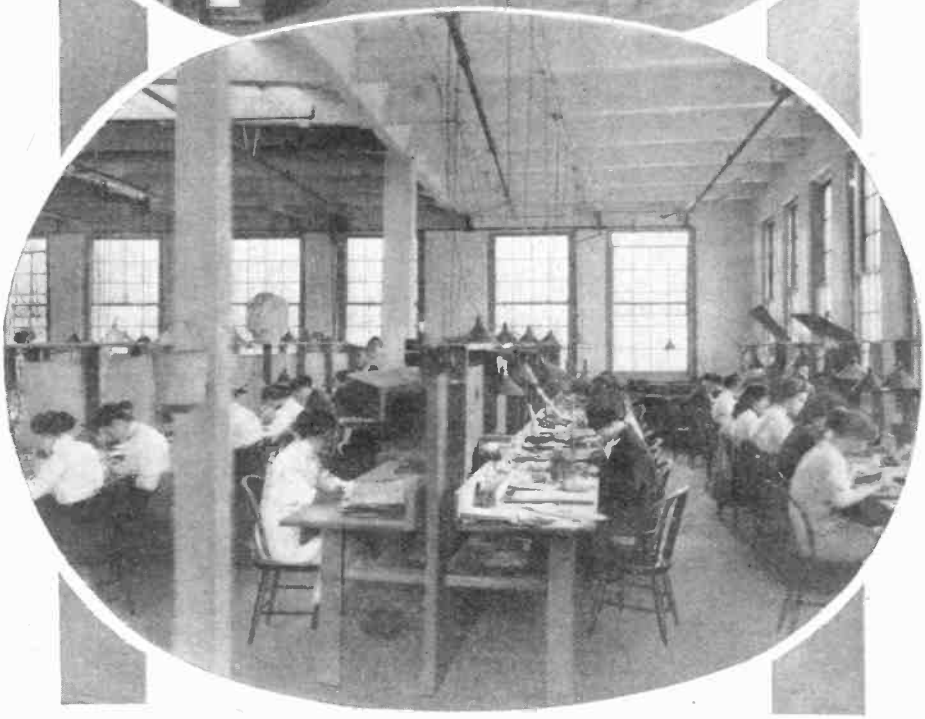
My friend showed me a basin and a nickeled tank above it. Pressing a button, a stream of hot water flowed in, all ready for the grit and grime of the shops.

"A little stunt of my own," he smiled. "Keeps enough water at any temperature desired to wash an office force. Handy, eh?—One ampere!"

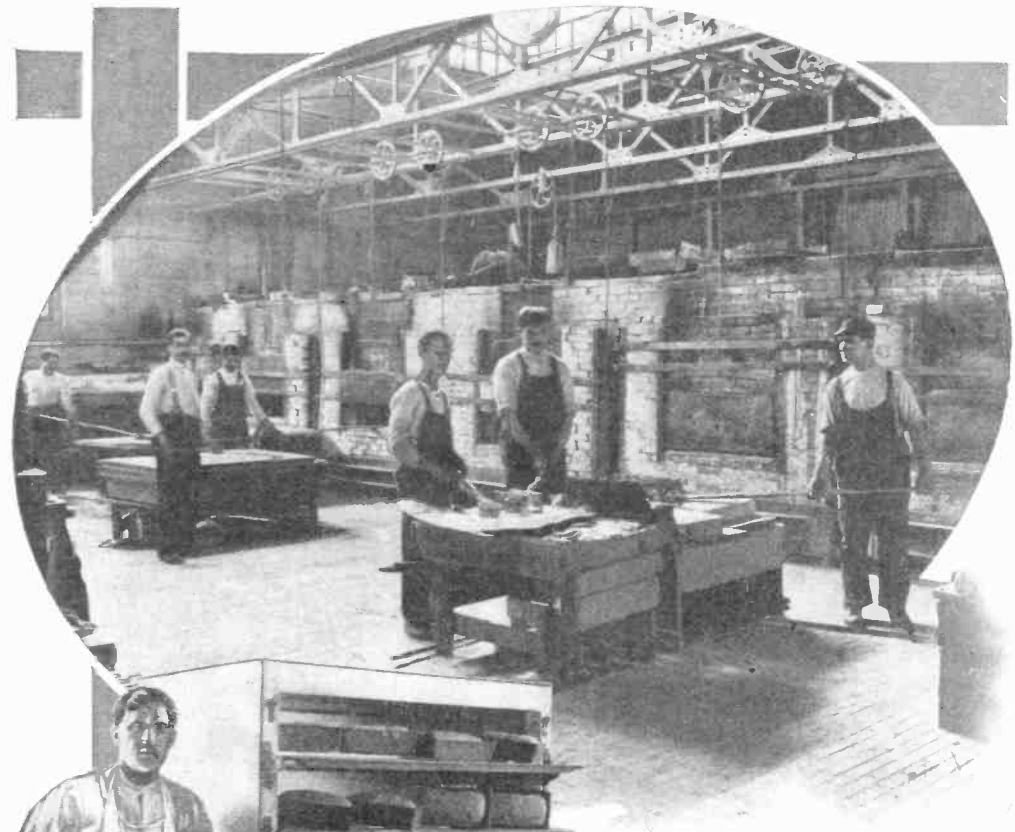
I inspected that luncheon before it was eaten. Later, there wasn't enough left to inspect. Here in the kitchen was an electric range and oven, with other things all around them. The cook was not very busy, either; all she had to do was to turn switches and let the "lightning" do the work.

That luncheon was more like a dinner. A good share of it was made on the table, and we kept the toaster busy turning out evenly browned, flat and crisp toast which was a thrill to consume. A certain Boston restaurant installed a series of these toasters and inside of a month was renowned for its toast products. Folks come there from all over town for toast—when they could have the same thing at home. From roast to coffee, everything was delicate and delicious; nor had the cook expected company. I inquired why the Simplex inventions were not more widely advertised.

"No use," came the smiling reply. "We're advertised by one thing—Quality. Everything that goes out of the shops is an advertisement.



THE UPPER ILLUSTRATION SHOWS ONE OF THE ASSEMBLING ROOMS WHERE THE ELECTRIC COOKING UTENSILS BEGIN TO TAKE DEFINITE FORM. BELOW IS SHOWN THE PROCESS OF WINDING AND FORMING THE HEATING UNITS



THE ENAMELING PROCESS IS HIGHLY INTERESTING

A GIGANTIC BAKE OVEN SUITABLE FOR THE REQUIREMENTS OF A BATTLESHIP

"We are simply following out a basic principle of good business—that quality is essential to continued sales. Right now we're getting ready to occupy the new building, and we can't fill the orders. Of course, we do advertise to a certain extent, but we can't keep up. Want to see how the iron is made?"

The various portions of the iron are first received from the foundry to be cleaned. The foundation of the Simplex goods is the direct contact established between heat producer and heat consumer. In the iron, as in other products, this is effected by enamel.

The face, or base, of the iron is a hollow, boat like cast. In this is poured enamel, six layers to it. Then the iron base goes to the wiring room to be wired —and here steps in Quality.

When received, the wire is examined

under the miscroscope for any defects; it receives, in all, eight such inspections. Then it is crimped into a continuous S shape. It is then inspected for resistance, shaped to the figure of the iron and flattened. When immersed in the enamel, this wire forms a continuous network reaching all over the base of the iron. Larger wire terminals are left out, the rest being overlaid with more enamel.

The enameling process is highly interesting, too. After each of the nine layers is put on it must be dried and baked in the furnaces and then tested. All this work is done by hand; all the work of shaping and immersing the wires is done by hand; and I suggested that machines could do it as well and a good deal more quickly.

"They might," was admitted after some argument. "But on the whole hand work is more satisfactory. Then we know it's right. The whole network of wires must touch at no point or the whole affair is ruined. The enamel might all be put on at once, too, but the quality would be a good deal different."

So here were working crews of girls, women, men and boys, sending wires down the line, each shaping or bending or testing some piece until it was ready for immersion. When the wires were covered the iron, or range plate or heater, as the case might be, was inspected and tested thoroughly for insulation and resistance, and went on to the assembling room. Here the top of the iron was added.

Between the top and bottom pieces of the iron is an air space. This keeps the top of the iron cool, air being a non-conductor of heat. For the same reason, the range heaters, coffee percolaters, toasters and other devices are all equipped with a lock or clamping device, which is most important. Suppose an ordinary cooking utensil were placed upon one of the heating disks of the stove. Had the utensil any bumps or dents in its bottom, as ordinary ones have, a pint of water would take a long time in coming to a boil because of the air interposition. When the flat bottomed vessel is clamped to the disk the water will boil in less than twelve minutes.

The cost of running electric cooking devices for an average family is between four and five dollars a month. This is what James I. Ayer has done for the housewife. He knew well enough that when people began to use electricity for heating, the electric companies would give special heating rates, as they now do in many cases. Out west and in Japan, where water power predominates, the demand for these devices is more than surprising. But the real saving is in the more indirect ways.

"Most people figure on direct savings," declared Mr. Ayer. "I'm just teaching them to figure on indirect saving. Often they teach me, though. For instance, we sold a line of waffle irons to the Harvard Union here. Some time after I discovered by accident that they were making an immense saving on material. It surprised me. I found that they did not have to grease the irons, which saved butter. Then the irons required only 25 per cent of the attention needed by the old ones, which saved labor. By heating the dough on each side at once, and more evenly, much less dough was needed because the waffles came out lighter and better cooked. Then we began figuring on shrinkage in everything.

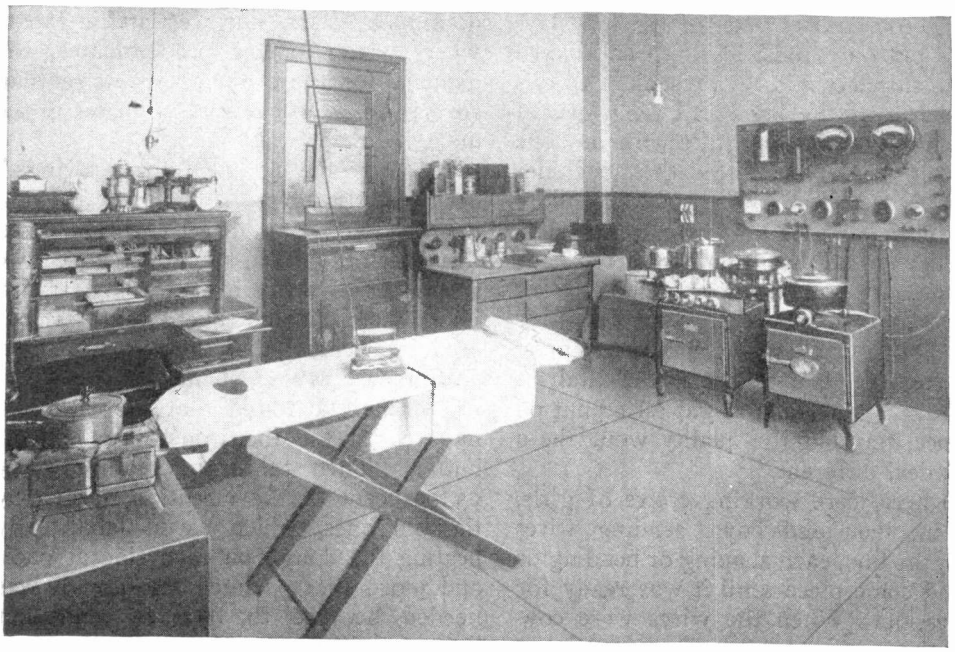
"For example, our bread ovens, which are used in large institutions as well as in private homes, and our regular ovens for general cooking. With gas or other fuel there is a passage of fumes and air through the oven which shrinks meat and other foods in a large percentage. This is eliminated here."

The test of efficiency in the modern housewife; are we master of our own comfort or is it master of us? If the average home-maker could go through the Simplex factory she would not be afraid of this test. Here were immense coil heaters for heating water, together with attachments for ordinary boilers which would maintain an even tempera-

ture. Here in one room I saw the heating pads being stitched and wired—everything arranged for three heats under absolute control.

The factories themselves are indicative of their famous watchword. Here I had come half across the continent to find them, and yet none of the Cambridge folk could tell me their location! Finally I saw them—a group of rough finished concrete buildings four stories high, illustrative of every style of concrete structure from the earliest solid-block wall to the addition under construction, with glass and steel walls. Inside was none of the terrific magnitude of other great electrical centers; each worker was going steadily ahead, not rushing to fill orders but plodding away steadily and surely, working for quality and not for quantity. Here there were no secret processes to avoid, all was honest New England workmanship, simplicity and quality throughout.

What a change from the New England workmanship of a century since—from the wooden nutmeg to the Simplex iron! As you go through these factories and watch the assembly workers putting together electric ovens, coils, stoves, coffee pots, dining room table stoves, curling iron heaters, and numberless other devices, you realize that life is being transmuted for the modern housewife from drudgery to a series of thrills unparalleled. Then there are the radiators and their kindred air heating cousins, made for every purpose and kind of room. A modern housewife can be an artist, no less! Automatic, perhaps, but none the less an artist, for her work will be done artistically. The pad heater, for example, which takes the place of the old hot water bag, is controlled by two thermostats, which automatically prevent the heat becoming too great; the coffee percolator contains an automatic safety device which prevents it "going dry," and makes it foolproof. Only artistic things are foolproof.



KITCHEN IN THE SIMPLEX FACTORY USED PURELY FOR EXPERIMENTAL PURPOSES

A noteworthy thing in these shops is their readiness to turn out work which

is special. In one corner was a gigantic bake oven, a special order for a battleship. Here in another room was a matrix heating table for a large city newspaper office—a device which will greatly facilitate special and "late" editions, since the matrices are thus dried at an extremely rapid rate.

But let it not be supposed that Mr. Ayer confines his activities to the home and the kitchen. Far from it! The factory applications of these heating machines are many, from soldering irons to paraffin kettles, and here they were all in process of manufacture. In one department were copper workers, turning out hand worked copper utensils of singular beauty. In the oven department I saw ovens adapted to various drying uses—lacquer and other things—while the laundry machinery has worked a tremendous saving in laundry equipment and work.

Another point in favor of the large baking oven for hotels and the like, besides the 75 per cent saving in space or floor room and the large saving in labor, is the absolute uniformity of the product and the cleanliness of the cooking. There is no gas vapor or soot to be cleaned out lest the loaves be dirtied, while the aluminum finish on the interior of the ovens remains bright for years. The result is that the products absorb none of the flavors which make an almost imperceptible and yet large difference in the end.

As I was writing this I happened to see a report of a gathering of hotel chefs, in which it was stated authoritatively that the usual allowance for shrinkage in a 40 pound roast was eight pounds. This, of course, in the average old style ovens. With the electric oven this would doubtless be reduced to almost nothing—which fact would annihilate the argument of high cost of power.

And for general purposes of heating, electricity bids fair to be the cheapest fuel. The price of other fuel tends steadily to rise, that of the electric current to lower, as improvements are made in generating and distributing it. In Chicago the rate for electric baking to a bakery with a capacity of 10,000 loaves a day is 1½ cents per kilowatt-hour—about one cent or less for each twelve loaves. In a larger plant, with a 50,000 loaf capacity, the rate would be one cent per kilowatt-hour. Where water power is available, current can be had at still lower rates, and its cost is going down steadily all the time.

And all this is the simplicity of quality—the highest and yet the simplest thing in all our civilization. All this electric heating business is coming into its own before long, when the people of the world shall have wakened to its possibilities. And the wakening is due to my friend, James I. Ayer!

Vaporized Quartz

A beautiful opalescence may sometimes be observed in the glass globes used to diffuse the light of the electric arc, particularly after such globes have been in use for a long time.

Close examination shows that the opalescent effect is due to the presence on the glass of minute spheres of silica which have evidently been formed by volatilization from the glass under the influence of the electric arc. This effect is in accordance with the experiments of French scientists whose electric furnaces have produced some surprising results.

The essential feature of the furnace is an electric arc of great intensity. When rock crystal, broken into fragments, is placed in the furnace it simply melts, like so much ice, and in a few minutes the liquid thus formed begins to boil.

The vapor rising from the liquefied crystal is condensed into a little bluish white cloud, from which tiny spheres of silica, glimmering with opalescent hues, are deposited. These spheres, as already remarked, are similar to those found on arc light globes. The latter, of course, are the product of a very slow and gradual process, while in the electric furnace the volatilization is effected with rapidity.

Harnessing the Nile

The engineers who have been at work on the problem of transmitting electric power from the cataracts of the Nile, continue to picture the results obtainable in glowing colors. One states that the city of Cairo can be lighted cheaper by power generated at the First Cataract, over 400 miles away, than by means of steam engines situated in the city itself. By a system of irrigation, combined with electric power from the cataracts, he avers, the Dongola province, up to the Fourth Cataract, may be made the most fertile country in the world.

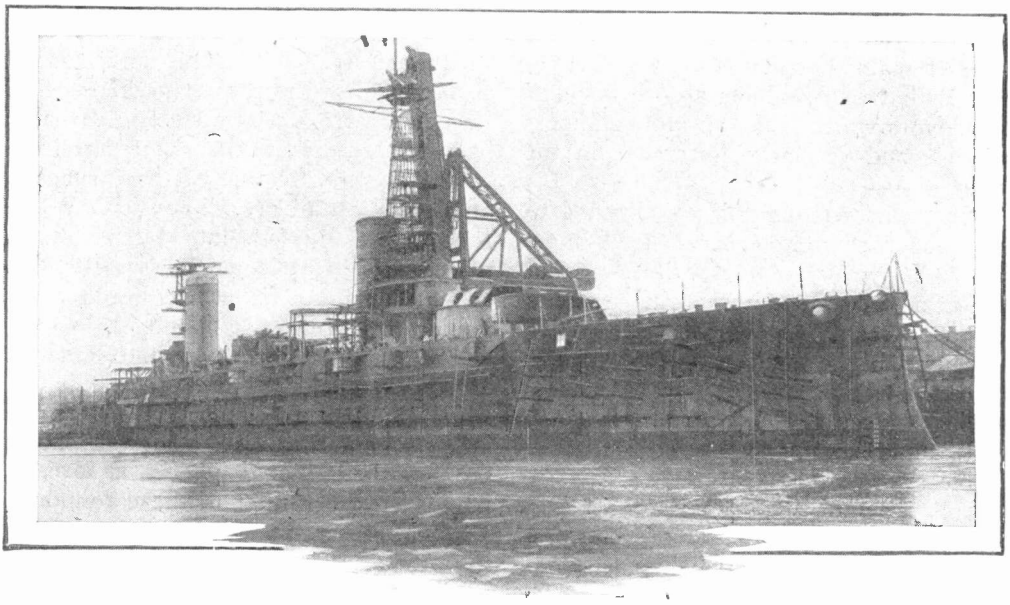
White Lines to Protect Life

Two electric railway companies of a western locality have lately adopted an innovation for the protection of passengers and others, extremely simple and effective. It consists of a white line about six inches wide painted or whitewashed on the ground a distance of about twelve inches from the path followed by the extreme point of any projection on the passing trains or cars. Persons adjacent to the tracks instinctively notice these conspicuous marks and as a result casualties are fewer, particularly at curves where the forward and rear ends swing out over a greater distance than the remaining parts of the cars. It is this last "gymnastic" action on the part of moving cars that has caused many an unexpected "bump."

Giant Electric Crane

The Fore River Shipbuilding Company, at Quincy, Massachusetts, is using in its work of building battleships and other war craft, a giant electric gantry or crane. This crane was originally designed for a maximum capacity of 75 long tons. Finding this to be insufficient for the great weights introduced with the building of turbines, this was increased to 100 tons, which weight it will carry out for a distance of 50 feet from the side of the wharf and 30 tons from there out to the end of the arm, 85 feet from the side of the wharf.

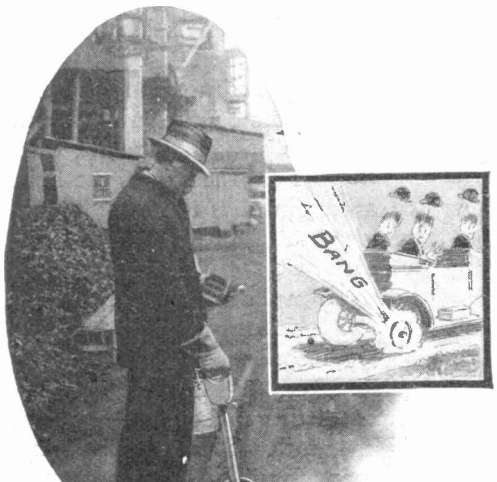
With the arm raised the end towers eight or ten feet above the 225 foot fire control masts of the battleship *Rivadavia,* now being fitted for her trials in March.



ELECTRIC CRANE AT THE FORE RIVER SHIPYARD

Magnet Bill

He does not look like a very important part of a big automobile factory organization, this tall, broad shouldered man who may be seen, rain or shine, summer and winter, walking slowly about the



MAGNET BILL AT WORK

plant of a motor car company, Toledo, Ohio. His eyes are almost constantly cast earthward. And he saves the company thousands of dollars in a year.

"Magnet Bill," as he is called, gets his nickname from the fact that his tools consist solely of one tin bucket of the ten or twelve quart variety and a big steel magnet strapped to the end of a shovel handle. His work is to save automobile tires, those costly rubber overcoats which adorn the wheels of motor cars, by removing from the roadway every nail and bit of iron, brass or steel that might cause a puncture. When it is known that 40,000 cars, which is the output of the factory for 1913, will be run back and forth in reaching places where they are tested and that scores of visitors' cars, office machines and delivery trucks use the roadways daily, the importance of Bill's job is at once apparent.

Safety Switches on Old Seventeen Mile Grade

Along the headwaters of the Potomac River, high up in the Allegheny Mountains, winding and twisting its way tortuously down the steep sides, is one of the steepest and longest railroad grades to be found east of the Rocky Mountains.

Here every year railroad men have been killed and in winter time especially, for every train that descends this grade must have hand brakes set in addition to the air brakes, for once the train gets started air alone will not stop it.

This is the old "seventeen mile grade" of the Baltimore and Ohio Railroad, the bug-ga-boo of all eastern railroad men. It starts at Altamont, Maryland, and drops at the rate of from 73 to 124 feet to the mile till it terminates at Piedmont, West Virginia, seventeen miles below. This grade is on a very important division, too, as it taps the West Virginia coal regions and connects with Chicago via Chicago Junction.

Trains often get beyond the control of the engineman and brakemen and rush down the grade at a terrific speed, wrecking themselves against the first obstacle.

It is for the purpose of catching and safely stopping these trains that electric safety switches have been installed—one five and the other ten miles from the top. Side tracks at each point lead directly from the eastbound main track and run parallel with it for a distance of 4,500 feet, but unlike the other track they rise, starting with a three per cent and gradually they assume a 24 per cent grade, sufficient to stop a train traveling at a speed as great as 120 or 125 miles an hour.

The switch to each side track is connected to an electric release in such a manner that a train going more than fifteen miles an hour will be headed in this track and stopped before it has time to do any damage.

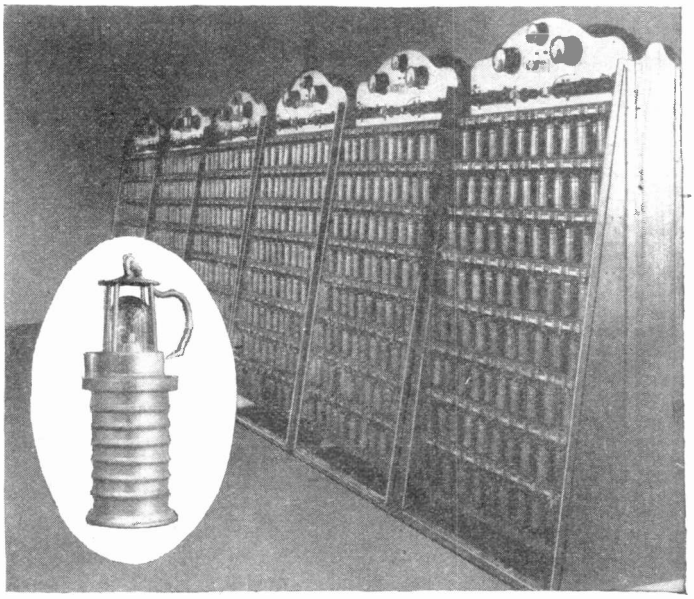
Instructor's Variable Resistance Unit

In teaching students the use of electrical measuring instruments, a resistance that may be varied is very often needed with its ohmic value known to the instructor and unknown to the student.

A handy way of arranging such a device that is capable of being easily and quickly changed is as follows: Use an ordinary plug resistance box with indicated values. Enclose this in a box just large enough to contain it and attach binding posts at a convenient outside point, with wires leading to the binding posts on the resistance box. The resistance should be accessible to the instructor who can change the combination at will by withdrawing certain plugs, unknown to the student. This device will effectually prevent "copying" and is much more accurate than the ordinary calibrated coil.—V. E. MILLER.

German Miners' Electric Lamp

This German prize miners' electric safety lamp will not ignite inflammable gases, a most important requirement. The two volt lamp gives 1½ candlepower and will burn steadily for sixteen hours on the storage battery used. The steady light which the lamp affords protects the miner from nystagmus, an involuntary, rapid twitching of the eyeballs often brought on by the ordinary flickering torch. The light is switched on and off by simply turning the top of the lamp, all other contacts being dispensed with. The large picture shows an equipment for charging 80 of the lamp batteries in a series of racks.



GERMAN MINERS' LAMP AND BATTERY CHARGING RACK

Flickerless Moving Pictures

In looking at a moving picture every one is aware of a perceptible flicker and the most modern machines have never done away with it entirely. The cause of this flicker is in the shutter of the projecting machine. Each individual picture on the long film is brought before the lens of the arc lamp. It is exposed for a fraction of a second, the revolving shutter shuts off the ray of light, another picture is brought forward during the instant of darkness, and the light is turned on again. As these individual exposures occur at the rate of about sixteen per second we see practically a continuous picture on the screen, but just the same there are sixteen periods of darkness in every second which cause the objectionable flicker.

To eliminate this flicker has been the dream of inventors. Theoretically it can never be done, for this is attempting to reproduce a moving train of separate and *slightly different* pictures as a single continuous picture. Practically, however, the result may some time be so nearly attained that the eye cannot perceive the

blending of one picture into another—which is all that is necessary.

The vanoscope is a new moving picture projecting machine, so entirely different in principle from other machines and so promising in the results obtained from the first crude machine built, that it is hoped that with further refinements it will produce a flickerless picture, at least as far as the eye can perceive.

The machine has no shutter—there is no period of darkness. So far it is promising.

The film, the ordinary kind, travels horizontally. The arc lamp lens is above the film and the ray of light is projected down vertically through the film. Below the film is a mirror so set as to project the beam of light out horizontally to the screen.

Imagine, now, a single picture moving through the beam of light. The picture is caught by the mirror and thrown on the screen.

"But," you say, "in that case the image would travel down across the screen as a blur."

True enough, it would, if the mirror remained stationary. But it does not. It rocks. This rocking motion is regulated so accurately that it just corrects for the forward motion of the film and the image of the particular picture we are considering remains stationary for an instant on the screen. If some one were carrying a candle by in front of you and you were attempting, with a mirror, to throw the image of the flame at one point on a large mirror or screen in front of you, you would have to move the mirror in your hand a very little as the candle passed by. In this new projector the principle is the same.

Another question now immediately arises. "This is but a single picture on the film. How about the next one following right behind it? Does the mirror jump back to pick up this new image? In that case there would be the same period of darkness as with a shutter."

The answer is that there is more than one mirror. They are mounted on a revolving shaft—at a slight angle that gives the rocking motion. As one picture passes through the beam of light it is taken up by one of the mirrors and thrown onto the screen. Passing through, it begins to fade but immediately behind it comes the next picture, which is taken up by the following mirror and begins to come on the screen as the preceding one begins to grow dim.

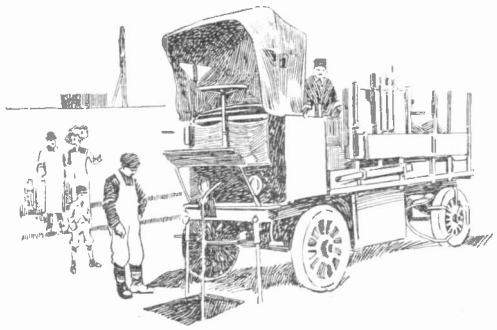
To carry our analogy further, suppose four persons with hand mirrors stand in a circle facing outward. Now suppose a line of several hundred people carrying candles, all held at the same height, to be passing by at uniform speed on one side of the circle. In the background is a large mirror or screen. Now let the circle of mirror holders begin to revolve. The first member of the circle catches the image of the first candle and projects it at one point on the screen just as long as he can by rocking his mirror. But he finally passes out of range. But long before this the second member of the circle has caught the image of the second candle and projected it on top of the first image—and so on around. If the members of the circle could move just fast enough and manipulate their mirrors with mechanical exactness a continuous image of a candle flame could be kept on the screen.

In other words it is a dissolving effect, only this dissolving is done so rapidly—say about eight times per second, that the blending of one picture into another is scarcely perceptible. When the machine is perfected it is expected that the change from one picture to another will be imperceptible to the eye and that the resulting picture will be flickerless.

There are in addition certain other advantages claimed for the new machine. The light when it strikes the film is cold and cannot ignite the film if the latter stops. A saving in electric current is also claimed. The film travels more slowly, giving a more natural speed to moving objects in the picture.

Electric Truck as a Moving Power Plant

Almost every day, industry is discovering new ways to make use of the sustained energy of a storage battery in connection with truck transportation.



TRUCK MOTORS USED IN CABLE PULLING

For example, concerns have converted it into a portable power station which, when not engaged in propelling heavy vehicles, is used as a plant for hoisting, or for cable service work as shown in the illustration.

Telephone Dispatching on the Canadian Pacific

With the exception of a small strip between Winnipeg and Port Arthur, train dispatching by telegraph has been totally abolished on the Canadian Pacific Railway of Canada. This mammoth system that operates 16,000 miles of first class equipment, and incidentally owns 75 steamships and eighteen big hotels, cast aside the last telegraph instrument used for dispatching on its single track lines during the first week of January, 1913, when telephone wires linked up Vancouver and North Bend. Between the Pacific Coast and St. John, New Brunswick, with the one break for 400 miles of double track at Winnipeg, the manipulation of rolling stock is by voice and not by the Morse code.

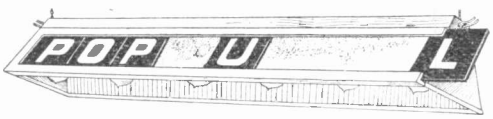
When the first experimental station between Montreal and Farnham, Quebec, a distance of 60 miles, was installed six years ago, a test then made showed that an operator could dispatch 86 trains in eight hours. Messages were sent to three offices and repeated back. That meant that a train was dispatched on an average of every five and a half minutes during the whole of the time. The man in charge of the initial experiment was Mr. J. F. Richardson, now superintendent of C. P. R. telegraphs at Vancouver.

Such work, the railway chiefs claimed, was a physical impossibility for the telegraph or its operator. It meant, too, a great economy over the entire line in the delays obviated. To make the change involved enormous expense, two extra heavy copper wires being required over every inch of the 16,000 miles of trackage. On the section between North Bend and Vancouver copper wire weighing 210 pounds to the mile was strung—quite an unusual specification in telephone work.

The chief reason back of the change from the telegraph dispatch system is that the telephone is vastly less liable to make mistakes, and that one train wreck involves a railway in more expense than would meet the cost of scores of miles of modern telephone construction.

Combined Window Sign and Reflector

A window reflector that serves at the same time as an illuminated sign is here illustrated. The letters, which are held in place by metal strips, can be readily



WINDOW SIGN AND REFLECTOR

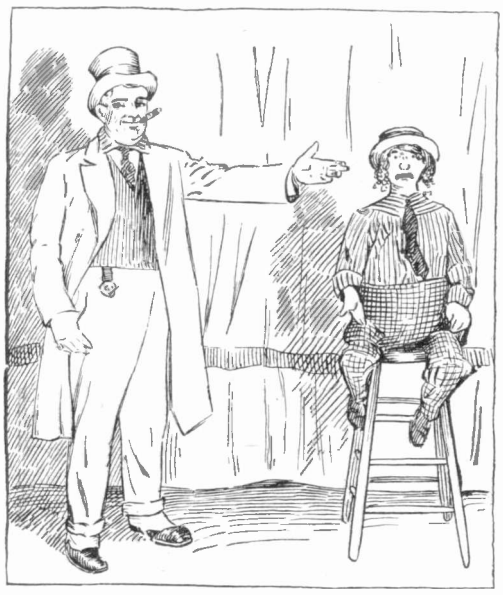
changed about to make the sign call attention to sales, special offers, etc. The sign is made up in sizes to suit any window and is held in place by chain suspensions.

Lightning Discharges from Kites

A number of very violent lightning discharges down the wires with which scientific kites are flown have been recorded. In some cases the flash coming down the wire burned and destroyed several thousand feet of wire. One observer says that a column of fire a foot in diameter seemed to follow the wire. The slight electrical disturbance conducted down Franklin's wet kitestring, was trivial compared to these most dangerous discharges.

Ventriloquism and the Loud Speaking Telephone

At a recent luncheon of the Chicago Electric Club this odd looking figure perched upon the stool demonstrated that



ANYONE WHO CAN OVERCOME STAGE FRIGHT MAY BECOME AN EXPERT VENTRILOQUIST

anyone who can overcome stage fright may become an expert ventriloquist.

Within the dummy was carefully concealed a loud speaking telephone which was connected to a transmitter behind the scenes by wires running down the legs of the stool to the floor.

The dummy, which was introduced by President A. A. Gray as "the mysterious electrified ginkerino," talked, sang, whistled and moved its head, arms and jaws in a manner fitting replies to the interlocutor's questions. The "ginkerino" was made under the direction of Mr. A. S. Hibbard of the American Telegraph and Telephone Company of New York City, and is fondly called by him a "figure of speech."

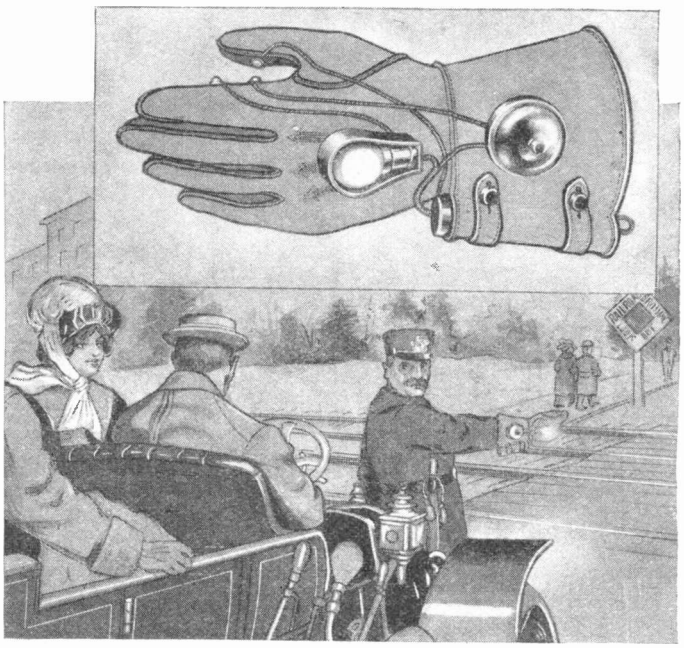
Magnetic Attraction and the Compass

It is curious how the scientific realities of to-day often bring back to one's mind the memory of some half-forgotten fairy tale. We can most of us call to mind the story of the ship which approached too near the enchanted island, with the result that the lodestone rocks drew from the vessel's timbers all the nails and bolts and it became a total wreck.

A terribly real story of a wreck is that of the Danish steamer "Norge," which, some time ago, strayed from its reckoning and struck on the island of Rockall, with a loss of many lives.

A scientist, in discussing this wreck, asked the question, "Can the compasses of modern ships be influenced by magnetic disturbances to such a degree as to imperil navigation?" He assumed that the "Norge" should have been quite 25 miles to the south of Rockall when she struck. He believed that the difference in position must have been due to some deviation of the compass brought about by a local cause, and he cited the depositions made by two captains of other vessels in corroboration of that view. In one case, when in the neighborhood of Rockall, the ship's compasses acquired a hitherto unknown easterly deviation of ten to eleven degrees. In the other case the compass of the ship—also in proximity to Rockall—deviated nine degrees, and while the captain was steering to pass 20 miles north of the island—he found that the actual path covered was 45 miles north of it.

Audible and Visible Signal



The crossing policeman, the chauffeur, and the driver of the horse drawn vehicle—all will find use for the bell and lamp signal patented by Charles A. Schindler, West Hoboken, New Jersey.

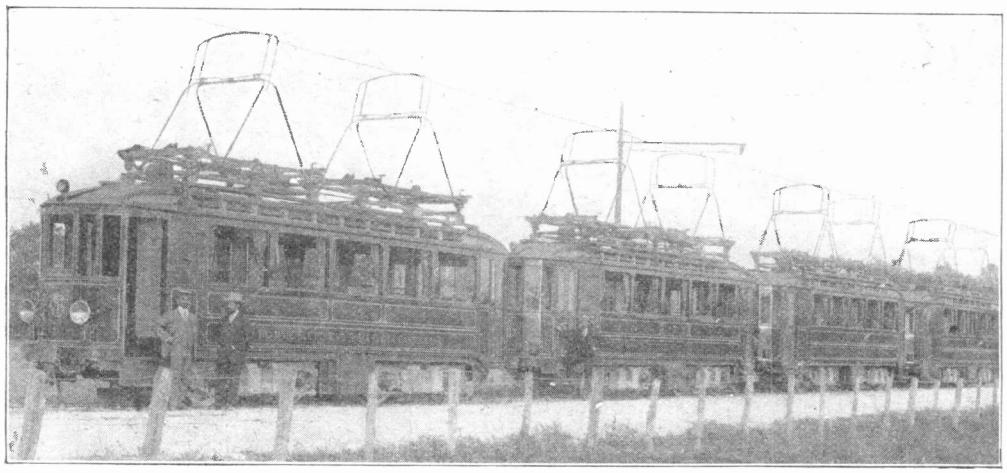
The outfit, consisting of a bell, lamp and battery, is secured to a specially made glove. Up in the first finger of the glove are two contacts and upon the thumb, one. By bringing the thumb contact against either one or the other of the finger contacts either the bell may be rung or the lamp lighted according as an audible or visible signal is desired.

Odd Current Collectors on Italian Cars

To call them cumbersome would be putting it mild, in expressing oneself concerning the current collecting devices on these Italian cars. They are almost as cumbersome as the name of the line on which they operate—the Tramvie Elettrische Roma-Civita-Castellana.

Tension on the Surface of Charged Conductors

If two soap bubbles are blown, one at each end of a glass tube, the smaller one grows smaller at an increasing rate, if both are unelectrified. If now the smaller one is electrified, the effect is reversed,



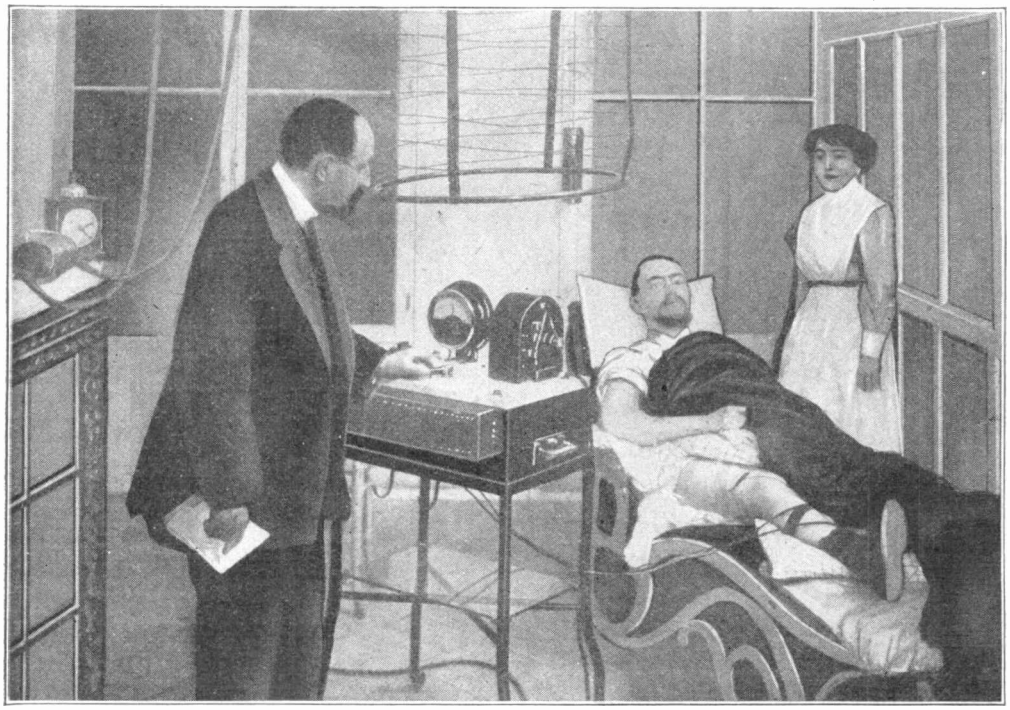
INTERURBAN ELECTRIC CARS IN ITALY

the larger unelectrified bubble becoming smaller. This simple experiment has been quoted by a member of the Cambridge Philosophical Society as proving that the electrification of a conductor results in the creation of a mechanical tension over its surface.

Dr. Bergonie's Apparatus

Much has been written recently of the work of Dr. Bergonie of the Institute of Bordeaux in regard to the results he has obtained with high frequency current. In the March issue of this magazine appeared an interview with the celebrated physician in which he corrects many false notions that have become prevalent concerning his methods and the results obtained, and tells exactly what he has been able to do. In view of all this, it is interesting to see the apparatus itself and the photograph here reproduced is of the Doctor's own equipment as he uses it in Bordeaux, France.

The apparatus consists of a high frequency coil or resonator made in the form of an old fashioned hoop skirt and suspended from the ceiling. The current, brought from an outside feed wire, passes through a suitable transformer. On the table is placed the governing apparatus. A control switch and a dial indicate the intensity of the current, which is easily regulated by the slightest movement of the switch handle. The top of the table is of marble to facilitate insulation. Two wires lead to the patient's body and the circuit for the high frequency current is completed by two contacts strapped to the bare flesh of the leg or such part as it may be specially desired to treat. The current may be regulated to two or three amperes with a difference in potential of several thousand volts but without any uncomfortable sensation; this by the high frequency of the alternations.



DR. BERGONIE OF BORDEAUX EXPERIMENTING WITH HIS HIGH FREQUENCY APPARATUS

Semi-Indirect Units

As a result of the present day tendency in illumination installation design to employ some type of fixture which completely conceals the glaring light source a wide field has been opened for the design of shallow bowls and plaques known as semi-indirect units. Such lighting

SEMI-INDIRECT UNIT

units are so named because the electric bulbs are completely concealed from view and a certain portion of the light is transmitted directly through the translucent glass of which the bowl is made in a very soft, diffused form, while the remainder of the light, owing to the high polish of the interior surface of the bowl, is reflected to the ceiling, which in turn redirects the light, also in a diffused form, down onto the working plane.

These bowls are made in designs characteristic of the art designs of the different historic periods, so as to harmonize with the architecture of the buildings in which they are used. The accompanying illustration shows a Renaissance design semi-indirect unit, 20 inches in diameter, in Lucida glass, which displays the features of art design in the Fifteenth and Sixteenth Centuries and is unique in it's elaborate and intricate character.

The cast iron molds from which these bowls are pressed are engraved by hand and cost hundreds of dollars.

Electricity Used in Dyeing Cloth

Among the tasks now imposed upon that busy servant of man, electricity, is the acting as an assistant in the operation of dyeing. When cloth soaked in aniline sulphate is placed between two metal plates connected with the opposite ends of a dynamo and an electric current is passed through it, the sulphate is converted into aniline black. By altering the strength of the solution and of the current, shades varying from green to pure black can be obtained. In the case of indigo, the cloth is impregnated with a paste of indigo blue and caustic alkali. The electric current converts the insoluble indigo blue, by reduction of oxygen, into indigo white which is soluble and on being exposed to the air becomes oxidized once more and turns blue, thus thoroughly dyeing the cloth with that color.

Street Car Held to be "Vehicle"

In a majority opinion handed down recently the Massachusetts Supreme Court, in the case of J. Sidney Foster against Thomas P. Curtis, held that an electric car is a vehicle in the meaning "of the law of the road" and the driver of an automobile or other vehicle going in the same direction as a car must turn to the left. Chief Justice Rugg and Justices Loring and Hammond dissented, holding that the electric car is not a vehicle.

The Crookedest, Costliest Roulette Wheel

By FRANK PARKER STOCKBRIDGE

This is the true story of the crookedest, costliest roulette wheel in the world, and it was operated by electricity. In fact, it is the story of two of them. One still exists and may be seen by anyone who has the entrée to the beautiful New York mansion of one of America's steel magnates, a mute witness to the fact that the game of roulette may be not only the crookedest game in the world, but that its fraud may be developed to such a degree of refinement that the player could not win a single bet against the dealer's wishes, even though he might play away the combined fortunes of all the millionaires on earth. The other wheel, mate to this one, has been destroyed and I had a hand in its destruction.

One day, in the early autumn of 1907 there came to the city editor of one of the New York dailies the story of a big gambling enterprise that was being conducted in a modest little cottage near Cedarhurst in Nassau County, Long Island. I was called upon to investigate. Going to Mineola, the county seat, I discovered a somewhat singular condition of affairs. Stories were being told of the astonishing sums of money lost by the wealthy residents and that great mystery seemed to be thrown around the details of a raid that had been made upon the little "Inwood Cottage," when a roulette wheel and other gambling devices were seized by the sheriff. All about the courthouse at Mineola men looked strangely wise and said little whenever questioned about the raid. Especially were they close-mouthed concerning the mysterious roulette wheel and what had become of it.

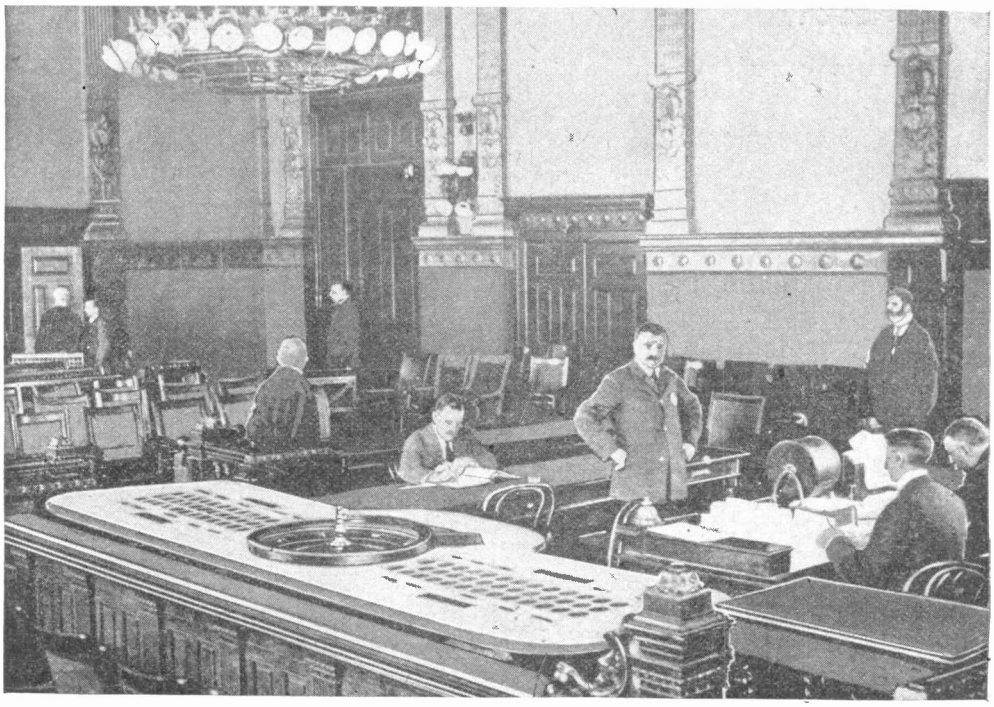
Briefly, the story was that early in the summer a pleasant featured, ministerial man had appeared at Cedarhurst looking for a summer cottage. He was known as Mr. J. Martin. After much investigation, he took the Inwood Cottage, on the ouskirts of the village and shortly after the lights first appeared in the windows of the new neighbor's house there began to float about the neighborhood stories of interesting doings. The neighbors gossiped and watched and finally somebody put pressure on the sheriff and the raid followed. Still there was mystery, for Martin, the proprietor, escaped, and nobody knew what had become of the roulette wheel, about the peculiar actions of which there had been a great deal of talk.

The sheriff, with more or less reluctance, allowed me to go down into the basement of the courthouse and examine several roulette wheels that had been taken in various raids in that country. But the wheels I saw there were ordinary ones and evidently the instrument of crookedness that had been described by some of the men who had paid tribute to its ingenious mechanism, was not among them. From reliable sources that night I obtained a more detailed description of the electric wheel and returned to Mineola with the determinaton to find it.

On my second visit I fell in with a kindly disposed under-sheriff who, quite innocently, as I believe, opened the way for the final discovery. At first he led me down into the basement where I had seen the other wheels.

"Are you sure," I asked him, "that these are all the roulette wheels in the custody of the sheriff?"

"Oh, no," he answered. "There is another one stored in there," and he pointed to a door opening into another part of the courthouse basement. Only a glance at it was required to convince one of its superior order. It was exquisitely fashioned and finished and everything about it showed the superior skill of its builder. A crowbar, chisel,



THE ROULETTE WHEEL USED AS EVIDENCE IN COURT TO SHOW THE PRINCIPLE OF THE DEVICE AND METHOD OF PLAY. THIS ONE DIFFERS FROM THE CROOKED WHEEL IN THAT IT IS A DOUBLE ENDED AFFAIR HAVING TWO TABLES FOR PLAYERS

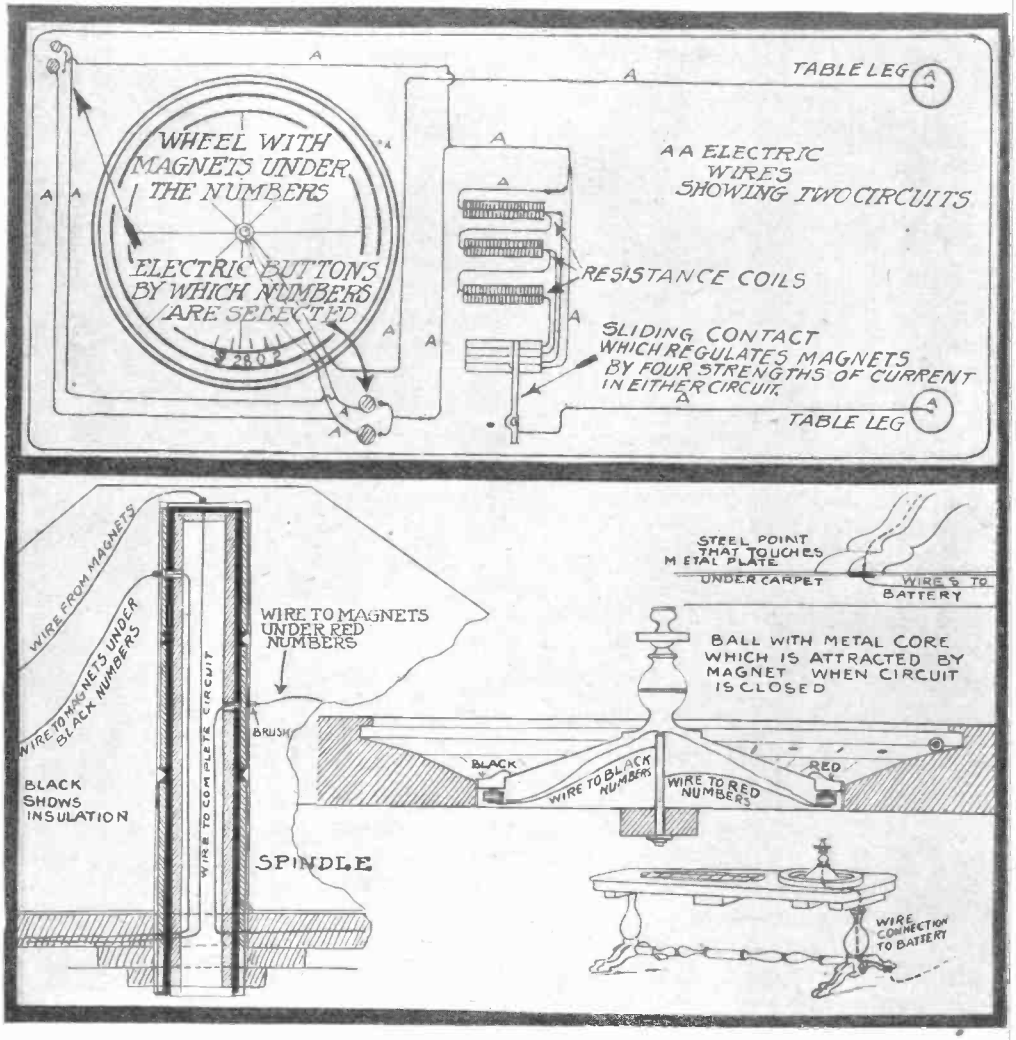
screw driver and other tools were obtained and the work of dissection began.

The cash drawer was the point where our examination began and immediately that was drawn out, the key to the mysterious working of the wheel was disclosed. Projecting from the under side of the table, where they could not be seen when the drawer was closed, were three tiny knobs within easy reach of the dealer's fingers. Steel dowels prevented the drawer from being carelessly removed.

Our next move was to remove the cloth from the top of the table, and there we found, in puttied concealment, resistance coils and switches for controlling the current. Under the cloth and soft blanket were two metal disks. These were set flush with the top of the table and directly in front of the dealer's position. Until one of the knobs under the table was slightly rotated, these disks remained immovable, so that one might pass his hand over them and never discover their presence. The disks were a trifle larger than the chips or counters ordinarily used in gambling and were located at a point on the table where the dealer could place a stack of chips upon them without attracting the slightest attention. The least pressure was sufficient to depress the disks.

We next discovered that each disk operated a switch by which the main circuit that formed the basis of the device was connected. Buried also in the wood top of the table were three German silver resistance coils, so insulated and packed as to indicate that they were intended for use with currents of comparatively high potential, such as that used in incandescent lighting. These coils connected with three copper bars across which traveled a contact point actuated by the second of the three knobs in the drawer.

When contact was made with one of the bars the current traveled through a



LAYOUT AND CONNECTIONS OF THE CROOKED ROULETTE WHEEL

single coil on its way to the magnets, thus reducing its energy appreciably. Contact with another bar sent the current through two of the coils, reducing it still more. The third bar sent the current through all of the coils, while the contact of the same switch with a fourth bar gave the full normal strength of the current. The switch could be placed instantly in any one of the four positions by a single move of the dealer's fingers, making it possible to throw the current into any one of the four sets of magnets, each wound for a different strength of current. Both main circuits were connected with the resistance coils, so that eight different combinations could be made, each affecting a certain group of numbers on the wheel.

In operation, therefore, it would be possible for the dealer to set the magnets for either black or red, high or low, odd or even, making certain that the ball would roll into the desired group. Switches for black, odd and high—29, 31, 33 and 35—eliminated all chance of winning on any other combination outside of that. If the switches were so manip-

ulated as to throw the ball into black, odd and low—11, 13, 15 and 17—all other bets were lost. It was the same with black, even and high—20, 22, 24, 26 and 28.

Even the bolts and screws were made to transmit current, and we found that one screw that held on a cleat under the extreme end of the table was loose and could be slightly rotated. This was near the wheel and in manipulating this screw we discovered that two slight depressions could be felt under the cloth. Ripping off the cloth at this point we found two more disks, smaller than the others and discovered that they also operated the two main circuits. It was readily seen that the purpose of these extra disks was to enable a confederate to stand carelessly at that point and operate the screw in case the dealer chanced to have no chips in front of him to place on the other two disks.

Each leg of the table carried a wire which by means of plates under the carpet was easily connected with the electric lighting current. These wires were not revealed, even when the bolts holding the legs in place were unscrewed, for each nut was a terminal into which one of the four main wires was soldered and the bolt itself made a contact with the wire that projected ever so slightly into the hole in the leg. For carrying the current to the wheel the table circuits ended in three minute pin points, barely projecting through the cloth, where they were covered when the circular frame of the wheel was in place. Plates on the frame completed the contacts, and wires run through the wood to the contact pin, on which the wheel revolved, which was laminated and the sections carefully insulated from each other by mica strips. Connection with the revolving wheel was made by means of tiny copper brushes set up in the cavity into which the pin slips when the wheel is in position. The wheel could be taken off and closely examined without their presence being revealed and any spark such as might come from brush contact was so hidden that its light would never give the device away.

The magnets were concealed inside the wheel itself, with only a thin veneer between them and the rolling ball. The ball, while of ivory, had a soft iron pin through its center, the ends being almost invisible because they coincided with the lathe centers.

The manipulation of the wheel was simple. Roulette is played by spinning the cup like wheel, while the ball is thrown so as to travel around its rim in the opposite direction. The ball drops eventually into one of the numbered pockets of the wheel and that is the winning number. The players place the money or chips representing their bets on the numbered spaces on the table and all bets on the number into which the ball drops win and the others lose.

A winning bet on a single number pays the player 35 for 1; on the line between two numbers, 17 for 1; on a group of three numbers, 11 for 1; on one of the three columns or on the combinations 1 to 12, 13 to 24 or 25 to 36, two for one; on red or black, odd or even, or high or low, one for one. All players except those who have bet on the 0 or the 00 lose when the ball drops into either of those spaces.

By noting the preponderance of bets on the table, the dealer could switch the current on this electric wheel so that the ball would be drawn by magnetic attraction into the section of the wheel containing the numbers on which the smallest amount of money had been staked, and in the course of time the "house" was sure to win everything the players were willing to risk.

Publication of the details of the finding of this remarkable machine occasioned a decided stir among the gambling fraternity on both sides of the Atlantic. It established once and for all that electricity could be so employed as to enable a roulette wheel to win every dollar placed on the table. It also brought to light the fact that these two remarkable wheels—

the one described and its mate in Atlantic City—had robbed their patrons of many hundreds of thousands of dollars. Following the exposure came a series of court proceedings by which effort was made again to gain possession of the device. Although the deputy sheriff with his crowbar and screw driver had mutilated the apparatus in pretty bad shape, what remained of it was still regarded sufficiently valuable to fight over in the courts, but so far as I know it was never restored to its original owners and was finally destroyed by the officials of Nassau County, in accordance with the law.

But some very interesting things did develop in connection with the other wheel in Atlantic City. That is the one that my millionaire friend in New York has among his bric-a-brac, and he paid a high price for it. How much of his great wealth its magnets had attracted from him I do not know, but at the time the disclosures were made at Mineola the proprietors of the Atlantic City wheel held his "I O U" for the little matter of $125,000. It had so happened that one night when he left his check book at home, he had plunged pretty heavily in the hope of beating the wheel, and before he got around to settle the matter the proprietors of the gambling place had fallen out and were having a bitter quarrel which involved the share that each was to have in the millionaire's little account of $125,000. The man who had made the two electric wheels in Minneapolis and brought them East was to have received one third of all the winnings on the Atlantic City wheel, which he still owned. The proprietor of the house refused to make good. The manufacturer of the wheel then went to the millionaire:

"That roulette wheel," he said, "was the crookedest wheel ever made. I made it and I confess it. I will say to you frankly that it was made primarily for the purpose of skinning you out of a reasonable part of your wealth. The wheel is mine, and when the place was opened in Atlantic City I entered into a contract with my partner that I was to have one third of all the money it made. Now he refuses to stand by the contract and I have come to you to warn you not to pay that $125,000 to him."

"Well," replied the millionaire, "I do not intend to pay him or you or anybody else the $125,000, but if you will get that roulette wheel and set it up here in my house I will give you $25,000."

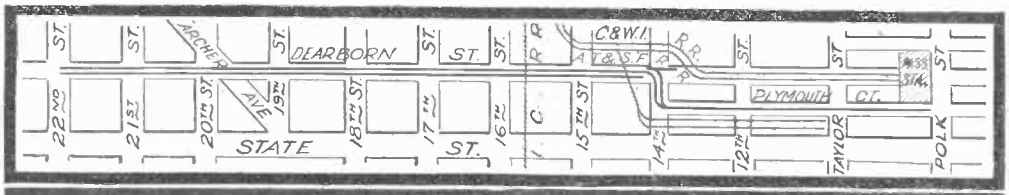
The gambler agreed to the proposition and in a few days the wheel was placed with the rich man's other art treasures and there it is to-day, a thing of beauty, and a great treasure because it is, beyond question, the crookedest roulette wheel in the world.

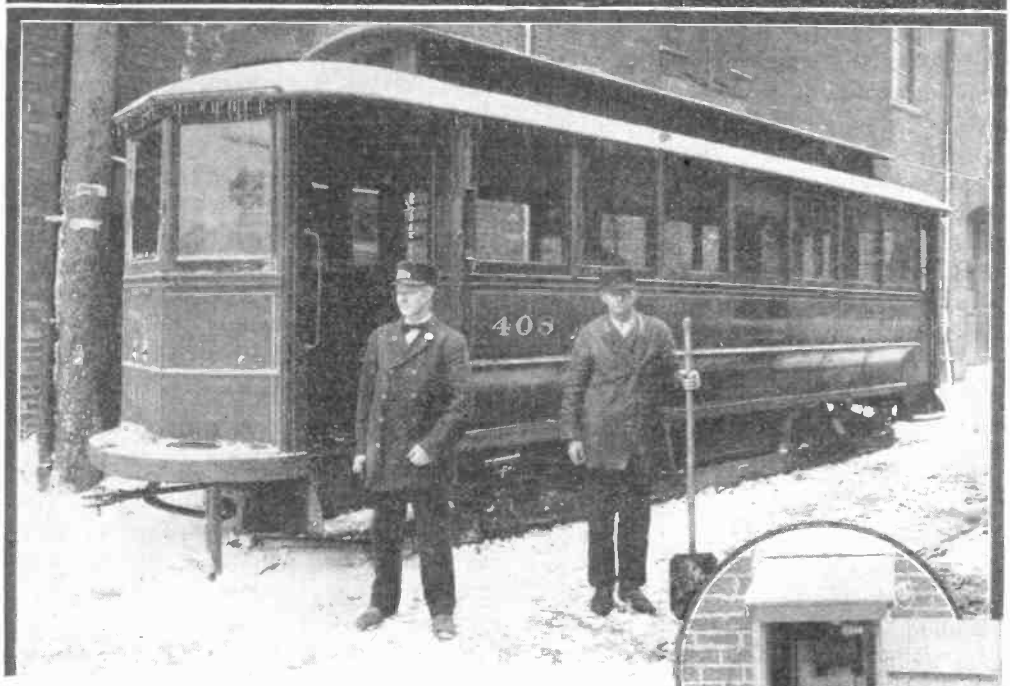
Electric Power Drainage of a Coal Field

One of the great coal fields of England, some 32 square miles in area, has numerous pumps established at as many different points to pump out the water. Now it is proposed to work these pumps by electricity. They will all be so connected that at a single point the necessary switching can be done to throw them all into action at once. There are 50 pumps in all. If the project is successfully carried out it will be one of the most striking applications of electric distribution and control of power yet presented.

Warships Injured by Electricity

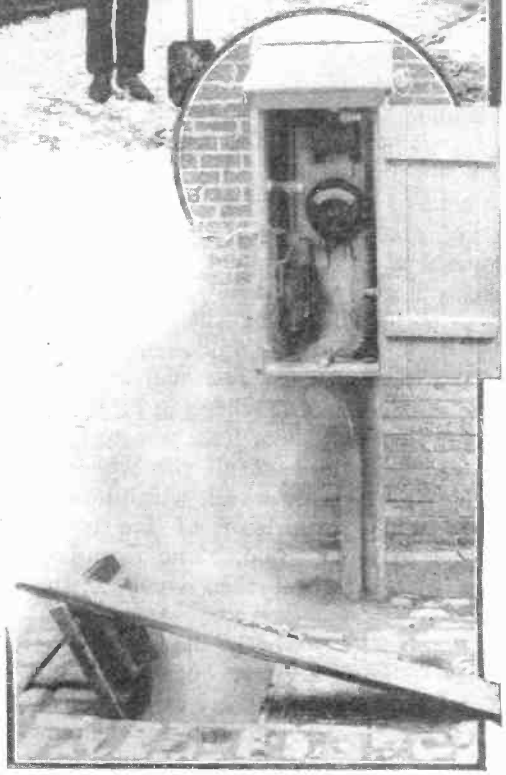
Not long ago an Italian court, after a trial, ordered the removal of some wooden yachts, whose bottoms were sheathed in copper, from the neighborhood of iron warships anchored in the harbor of Leghorn. It was alleged that an electric connection was established through the ships' cables whereby the copper bottomed warships were turned into the poles of a galvanic battery, the result being a rapid corrosion of the iron in contact with the seawater.





CHICAGO'S FREAK CAR LINE

Chicago possesses an oddity in the street car line believed to rival, if not eclipse, anything offered elsewhere in this country. This freak is a full fledged street car line, which in the words of an employe "starts from nowhere and ends nowhere" and takes in an average of five cents a week in fares during the winter and as high as twenty cents a week during the summer. These few precious nickels represent the total return on the cost of operating about one and one-third miles of track, a little more than one-half of which is double track. No trolley pole is visible for the lone car of this railway is operated by a storage battery and the working force consists of a crew of two men—a motorman and a conductor, who by the way are father and son.



THE CAR AND ITS CREW—SHOWING ALSO THE BATTERY CHARGING STATION

The history of the Chicago General Electric Company, as it is called, is shrouded in considerable mystery. Traction experts in the City Hall smile and look wise when it is mentioned—which is on extremely rare occasions. The line had its beginning when a franchise was asked and obtained in 1896 from the Chicago city council. The right of way began at Jackson Boulevard on the north and single tracks were to run south on Plymouth Court and what was then called Custom House Place (now Federal Street). The route was to proceed in a general southerly direction.

All that was ever built, however, was thirteen blocks of single track on Plymouth Court from Polk Street to Fourteenth Street, where the line swerves west to Dearborn Street. Then there are eight blocks of double track to Twenty-second Street, where it comes to an abrupt end. The tracks were laid in 1898. No attempt ever was made to build farther. No traffic came to the line and no prospect appeared in store for the future.

It was just at the lunch hour that the car was found at the Twenty-second Street end.

"Sure," said the gray-haired conductor, "you'll find us here every day between 12:30 and 1:30. We charge the battery for an hour.

"That steam over there," said he, pointing to a hole in the alley paving from which a heavy iron cover lay back, "comes from a fifteen barrel tank of water that we use as a resistance in charging. It gets pretty well 'het up' in an hour. The charging current comes from that piece of trolley run in here for that purpose.

"Yes, I keep that switchbox locked when we are on the road and this charging cable we hang on that big hook up there on the front platform. Come on in."

In passing, the date on the controller was noted as 1895. It is a five point affair and was made by the Walker Company of Cleveland, Ohio.

"You don't use electric heaters?" was asked.

"No, that stove"—pointing to an old type street car stove perched up seat high on one side of the car—"does pretty well. The company don't have any repairs in stock for it either. They had to send out and buy a new fire pot last fall.

"Some days when it's freezing, stormy weather it takes me and my son here all day to clean the track and make one trip to Polk Street and back. Then's when that rack up there over the stove comes in handy. It's where we dry our mittens. We carry that bunch of shovels and picks ye seen on the rear platform and they all git used.

"It'll be thirteen years next October since I started runnin' this road. In good weather we make four round trips a day. Time to go, Tom. You better stay on, mister, we'll reach Polk Street (twenty-four blocks) in 'bout an hour to-day. The runnin's good."

"Tom," shovel in hand, walked ahead clearing away snow and ice here and there. Freight yards and houses, teams and trucks fill the district traversed by the north end of the line. Pedestrians stopped to gaze at the primitive car. At one point a truck blocked the way.

"We don't have to cuss our heads off like them fellers over on State Street. We wait till the driver is ready to move on."

"You want my fare, don't you?" the lone passenger volunteered as Polk Street was reached.

"Gosh! I nearly forgot it. You see we don't keep our money so handy as the pay-as-you-enter men," the conductor remarked after he had used two minutes in finding change for a dime. "Next summer it'll be different. Our regular customers will be riding again," he added as he rang up the only fare he will probably get for a week.

And day after day this freak battery car runs over the entire length of track to keep alive a franchise of possible future value.

Electrical Men of the Times

VLADIMIR KARAPETOFF

"To your request for an appreciation of Professor Vladimir Karapetoff from the personal viewpoint I respond with pleasure alloyed only by the consciousness of inability to express it adequately within the time and space at my disposal. Our acquaintance dates back less than a decade and his technical achievements are quite beyond my comprehension, but a very brief intercourse sufficed to win for him my confidence as a colleague, my admiration as a musician, my esteem as a man, and my affection as a friend." So writes B. G. Wilder, Emeritus Professor, Cornell University, appointed as an instructor by Andrew D. White on the recommendation of Louis Agassiz and whose association with Professor Karapetoff is more like that of a brother than a personal friend.

He gives us further glimpses of this versatile scholar, musician and electrical engineer.

"Several of Mr. Karapetoff's unusual qualities were displayed in connection with a catastrophe that occurred under

my eyes a few years ago. He had just purchased a grand piano on the installment plan but had not yet added it to his insurance. One Sunday evening he played upon it for us. Monday night his house, opposite our own, took fire and burned so rapidly that once he and his wife had left their rooms to ascertain the source of the smoke, they dared not return. Within an hour the piano was in ashes and with it his music, all his other property and the nearly completed manuscript of an extensive work upon his special branch of science. Next day, calm as ever, he attended his duties; he soon began to rewrite the book and finished it in an astonishingly short time; but never by his words or demeanor would it have been suspected that a calamity had befallen him."

Mr. Karapetoff was born in St. Petersburg, Russia, in 1876. It is quite probable that his wonderful versatility in achievement is inherited, for his father (Nikita) was a mechanical engineer while his mother (Anna) was a student of medicine. His common school education was obtained in Tiflis and Baku, Transcaucasia. In 1897 he graduated from the Imperial Institute of Ways of Communication, St. Petersburg, receiving the degree of civil engineer. It was not until two years later that he directed his attention to electricity by entering an engineering school in Darmstadt, Germany. For four years beginning with 1897 he taught electrical engineering in three different colleges in St. Petersburg and lectured to evening classes of the Imperial Gun Works. In 1904 he was made assistant professor of experimental electrical engineering at Cornell University and is now professor in this department. During that year he married Miss Francis Lulu Gillmor of Pittsburgh, whom he met at a course of lectures where they chanced to occupy adjoining seats.

During the summer Mr. Karapetoff has always at hand some engineering work to accomplish. Reference to these "summer jobs," as he terms them, reads like a description of a trip around the world: In 1893, constructing a railroad in Transcaucasia; 1894, assistant locomotive engineer between St. Petersburg and Moscow; 1894, surveying a railroad to Archangel City; 1895, maintenance of way and repair of buildings for St. Petersburg-Moscow Railway; 1896, with the Trans-Siberian Railroad on Lake Baikal; 1899, making power plant estimates for the Lahmayer Electric Company, Frankfort, Germany; 1900, working on harbor electric crane equipment for the Allgemeine Elektricitäts-Gesellschaft, Germany; 1906, designing electrical machinery for the Allis-Chalmers Company, Cincinnati, Ohio; 1907, special testing engineer, Niagara, Lockport & Ontario Company; 1909, designing electrical machinery for the Westinghouse Electrical & Manufacturing Co., Pittsburgh, Pa.; 1910, designing electrical machinery for the General Electric Company, Schenectady, New York; 1911, with J. G. White & Company, New York City.

Besides his work as an engineer and teacher Mr. Karapetoff has contributed freely to both general and engineering literature. Of the former his "On Life Satisfaction" and "Some Life Ideals" are noteworthy; in the latter field his efforts are too many to attempt to note all, but among them are: "The Magnetic Circuit," "The Electric Circuit," "Engineering Applications of Higher Mathematics," and "Concentric Method of Engineering Education."

He is a member of the American Institute of Electrical Engineers, the Society for the promotion of Engineering Education, the American Association for the Advancement of Science and the Sigma Xi Fraternity.

He believes in simple life, simple pleasures and simple, frank ways of treating people and in not pretending to be what he is not. It is his custom to eat simple food twice a day only, and he does not smoke or use liquor. He even avoids the use of tea and coffee, believing that

the only stimulation which a man needs is that natural enthusiasm which comes from a right concept of life.

People sometimes ask him how he manages to accomplish much within a comparatively short time. The answer is the habit of systematic work acquired in youth; doing things systematically, even in the matters of recreation and pleasure. Not a minute must be lost without either doing some work or enjoying some pleasure, even though it be the pleasure of watching a little bird. At the same time the very word "hurry" is forbidden in Mr. Karapetoff's house. He even found that his mind works most efficiently when occupied by several problems and for years he has carried on the scheme of practicing on a mute piano and at the same time listening to his wife's reading of some book on history or philosophy.

Notwithstanding his distinct and set opinions in matters political, for he is a strong Socialist, he has numerous friends who belong to all branches and shades of political parties. He sincerely enjoys talking with people whose opinions differ from his own because it allows him to correct his own views and to see the reason for their beliefs.

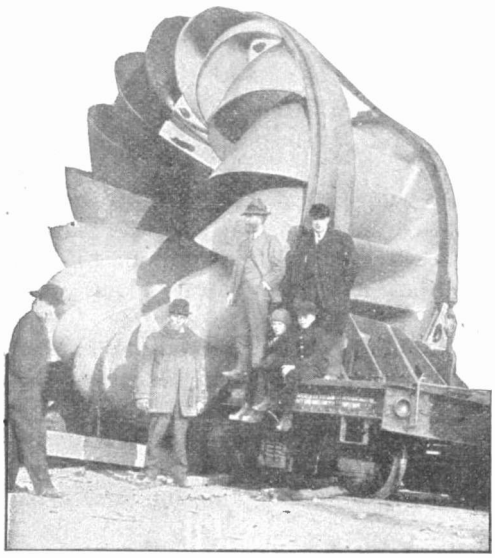
Mr. Karapetoff considers art to be a necessary part of his life, not something detached from his daily activities, but organically incorporated in them. To him art in all its forms is the most forceful expression of goodness and beauty. In his childhood he was made to study the piano and there was some intention of making a professional musician out of him. Notwithstanding his engineering career he has succeeded in keeping up his technique and appears from time to time in public recitals, but never for money.

Telephones Served With Your Meals

Those who are not in the habit of dining in the great metropolitan hotels and cafés may not be aware of the telephone service given to patrons therein. In these places, where service is the watchword, portable telephones are part of the dining room equipment and stationary boxes or receptacles are located at convenient intervals for the reception of the terminals connected to the long cords attached to the portable phone. A word to the waiter and he brings the instrument to your table and makes the connection by inserting the terminals in the nearest plug box with the result that you are in immediate communication with the outside world during the meal.

The Largest Water Turbine

The photograph from which the accompanying illustration was made lay for a few days on the teacher's demonstration table in a high school physics laboratory. Of course it was examined by the students with great curiosity, and the following questions were asked, over and



BUCKET WHEEL OF THE LARGEST WATER TURBINE

over again: "Is that a ditch digger?" "That's a rotary snow plow, isn't it?" "Is that some kind of a pump?" or "Gee! That's some blower fan!" And when it was on its way west from the factory, mounted on its own special car as shown, it is on record that some people in the small towns through which it passed made it out to be a gigantic cream separator, on its way to Elgin! And one woman of imagination is said to have declared that it looked like a great big iron rose! You see when we meet with an unknown object we at once try to classify it by its resemblance to something we do know about.

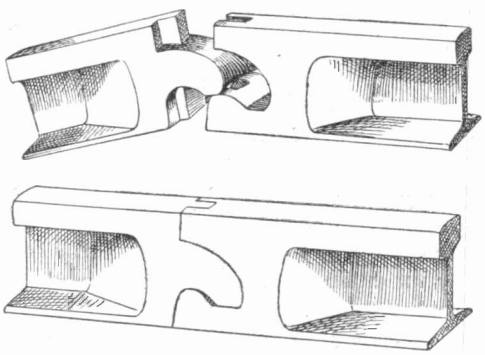
However, those who thought it to be one of the machines mentioned had one right idea, viz., that it was some sort of rotary device. This it shows by its form. It is the "runner" or rotating part of a huge water turbine, and is by this time installed in its casing in the great waterpower plant now being completed at Keokuk, Ia.

The rotor, or "runner" is only one of 30 similar ones, which will ultimately be installed in the great power house. These "runners," the largest of their type ever built, weigh about 130,000 pounds each. When installed, the end with the curved blades goes downward. Through the middle of it runs a steel shaft. This shaft extends upward through the floor of the power house, and attached to its upper end is the rotating magnetic field of a huge alternating current generator.

New Rail Joint

The usual method of fastening rails together at the joint is by means of a flat plate called a "fishplate" secured by bolts and nuts to the rail ends. An improvement and a saving over this construction is shown in the accompanying illustration.

It costs about $742 a mile to put on the fishplates, while the interlocking joint can be used at a cost of $434 per mile—a saving of $308 per mile. The saving may be estimated when it is known that there are 40,000 miles of electric rail-



RAIL JOINT THAT REQUIRES NO FISHPLATE

roads and 275,000 miles of steam roads in the United States and that the average life of a rail is seven years.

Electrical Interests of Women

EDITED BY GRACE T. HADLEY

An April Shower

It was an inoffensive April day. It began with a blue sky, a few fleecy clouds and uncertain sunshine. Little Mrs. Winsome resolved to go to market early that day, so she called up her best friend, Mrs. Minton, and asked if she would like to go also. Mrs. Minton was always ready and soon they were speeding down to the city market.

"I think it is just lovely to get out early these nice Spring mornings," said Mrs. Minton, enthusiastically.

"Yes, indeed," agreed Mrs. Winsome, "and I like to do my own marketing."

"When you have your own car, there is no reason why you shouldn't," commented Mrs. Minton.

"I like to get what I want before it is picked over," observed the practical little housewife.

Soon the two women were elbowing their way through the market, chaffering with the tradespeople and driving close bargains. In the course of an hour or, so they emerged, triumphant and parcel laden. Jerry, the chauffeur, piled the packages into a huge basket in the floor of the car beside himself, and away they went. Chug! Chug! The car came to a sudden stop; out jumped Jerry to make an examination. The women were patient until he announced: "Carbureter troubles and other things; she's missing fire in two cylinders."

"Oh, how provoking!" cried Mrs. Winsome, "when I had so many errands to do this morning and now we shall have to go a-foot."

Jerry ran to a nearby telephone booth to send in a distress call and upon his return Mrs. Winsome announced decisively:

"We will get out, as we don't want to be towed in. You may take the market basket with you. Wait a minute, I'll just take that nice juicy steak along with me."

Jerry deftly extracted the brown paper parcel, and handed it to her; then the two passengers left the car to Jerry's tender mercies. They spent the morning going through different shops and inspecting various bargain counters. Mrs.

SOME OF THE WOMEN WERE ELBOWING THEIR WAY THROUGH THE MARKET, CHAFFERING WITH THE TRADESPEOPLE

Winsome picked up such a nice shirt waist for $2.98 marked down from $3.00. The day before it had been $2.50 marked up from $2.00, but as long as she did not know this she was happy in her bargain. Mrs. Minton picked up some lovely table linen, slightly soiled, but then she knew it would all come out in the wash.

Mrs. Winsome felt that she must make some amends for the way the car had acted, so she invited Mrs. Minton to lunch with her; that is, they went to the club where Mr. Winsome was a member and charged the luncheon to him. Afterwards, Mrs. Minton suggested that they attend a vaudeville performance, so she bought the tickets, while Mrs. Winsome checked the beefsteak and other parcels. During the performance, they were much amused by a clever pantomime comedian who utilized glare effect in reducing visual acuteness. The theater was lighted by the indirect system while he and his paraphernalia were dimly illuminated by diffused light from the auditorium and by a little direct light from a crescent moon suspended against a black background. The hazy stage setting made possible a number of mystifying and spooky tricks.

When Mrs. Winsome and her friend emerged from the theater, they found a nice little April shower in progress, so they rushed up to Mr. Minton's office, whereupon Mrs. Minton said she would remain and go home with Mr. Minton. Mrs. Winsome then decided to go home on a street car, as she had planned to have steak and mushrooms for dinner that evening. It was the cook's half day out and on such occasions Mrs. Winsome always prepared dinner in her electric chafing dish. When she cooked steak and mushrooms, Mr. Winsome thought it a dish fit for the gods and this is the recipe she used:

One medium sized steak, one small can button mushrooms, one tablespoon sherry, one cup water, one teaspoon butter, salt and pepper to taste. Place steak in chafing dish, add water and cook slowly

FOUND A NICE LITTLE APRIL SHOWER IN PROGRESS

for fifteen minutes. Add butter, then mushrooms, sherry and seasoning. When heated through, serve on hot plates immediately.

When Mrs. Winsome boarded the street car she secured a seat next to a window and on account of the recent shower all of the windows were closed. Her arms being quite laden with parcels, in order to rest them, Mrs. Winsome placed her shirtwaist bargain in her lap together with a couple of library books. In getting her handkerchief from her handbag, she quite by accident lifted the lid which protects the opening in which the sash rests when the window is open. Without noticing this, she then placed the beefsteak parcel on the window sill. A sudden stopping of the car sent the parcel sliding down into the narrow crevice.

"Oh," cried little Mrs. Winsome in genuine distress, "there goes my beefsteak! How shall I ever get it out?"

A number of heads turned around and persons in the immediate vicinity craned their necks. A kind old gentleman with a ruddy face and white hair said:

"Let me get it for you, Madam." Mrs. Winsome made room for him and he poked his umbrella into the crevice with the result that the steak became more firmly lodged than before. A dapper young fellow, who was a clerk in a bank, then tried to pry it out with his cane, but the cane suddenly snapped and the steak settled itself more closely than ever in its new resting place. A tired business man forgot he was so tired and pushed his way through the crowd to enlist the services of the conductor. Upon learning what the trouble was, the conductor promptly routed two fat men and one thin lady off the rear seat and extracted a crowbar from the seat beneath. Passengers crowded about Mrs. Winsome offering advice and suggestions.

"Did you lose something valuable, Madam?" enquired one.

"I lost my beefsteak," said Mrs. Winsome, on the verge of tears from nervousness and vexation. "It was very nice and I was planning to have it for dinner."

"Here's the conductor with a crowbar; now he will get it for you sure." The conductor poked, jabbed and dug at the obdurate parcel without visible success.

"What's the matter?" demanded a new passenger, who had just boarded the car and passed unchallenged by the P. A. Y. E. box.

"It's no use, Madam," said the conductor, mopping his brow with a highly colored handkerchief. "I can't budge it. You will have to go on to the car shed and mebbe they can get it for you there," and he signaled the motorman to go ahead.

"This has been a perfect April shower of troubles," cried little Mrs. Winsome to the lady who occupied the seat with her and she rehearsed them all beginning with the total depravity of the motor car in the morning and ending with the unreasonable and unaccountable obstinacy of the beefsteak.

IT HAD GIVEN UP THE BEST OF ITS SUBSTANCE TO THE ELECTRIC STREET CAR

"Car shed!" yelled the conductor, "change here for surburban lines. This car is turning in."

All the passengers hurried out, leaving Mrs. Winsome quite alone. The conductor hopped off and disappeared; presently he returned with a couple of yard men armed with axes, crowbars and tongs. After twenty minutes' hard work on the part of three men, the beefsteak was finally dislodged and slowly came to view, a sorry spectacle! The string was gone, the paper wrapper was in tatters and the steak in shreds. It was no longer the juicy morsel purchased in the early morning. It had given up the best if its substance to the electric street car.

"Well," observed Mrs. Winsome ruefully, as she eyed the remains, "this is the first time I ever knew a beefsteak to develop such strong electrical interests!" Then she boarded another car to return home.

When she let herself in the front door of the house, there was Mr. Winsome just taking off his coat and hat. Placing

a brown paper parcel in her hands, he remarked very pleasantly: "Here is a nice beefsteak I just bought at the market on my way home. I was thinking all day how good steak and mushrooms would taste in that new electric chafing dish and—"

"You darling!" cried little Mrs. Winsome, and then to his utter surprise she fell on his neck and wept a shower of April tears.

Chafing Dish Artists

The chafing dish is not a modern utensil, but the application of the electric current to it is the modern feature. Fannie Merritt Farmer states that bronze chafing dishes of unique designs and careful workmanship have been found among the ruins of Pompeii; that Louis XV often amused himself "by making quintessential stews in silver pans," and that Madame Recamier, the beautiful and intellectual society leader whose salon was always filled with a brilliant circle, entertained by the use of a chafing dish.

An Englishman who writes most entertainingly on the subject of the chafing dish says: "Chafing dish cookery bears the same relation to middle class kitchen cookery that the delightful art of fencing does to that of the broadsword. Both are useful but there is a world of subtle differentiation between the two. The average rough and tumble of the domestic saucepan contrasts to the same degree with the deft manipulation of the battery of tiny pans."

Joseph of Savoy offered this advice out of his great wisdom: "Make the good things as plain as possible. God gave a special flavour to everything. Respect it. Do not destroy it by messing."

Given a modern electric chafing dish, a few select condiments, a fork and spoon, an energetic brain—and the possibilities of the utensil are limitless to the enterprising artist of the home. For instance:

LOBSTER PATTIES

The tail part of two boiled lobsters cut into small pieces and season well with salt and pepper and a little lemon juice, one pint of milk, one tablespoon of flour, one large tablespoonful of butter.

In the chafing dish boil a pint of milk; dissolve the flour in cold milk and add

"ONE'S INDIVIDUALITY SHINES FORTH IN THE CHAFING DISH AND IS REFLECTED IN ONE'S SAUCES"

to the hot milk; when thick, stir in gradually the butter and allow it to become quite thick; stir the lobster into the sauce, and when it becomes hot, serve by filling the previously heated shells with the mixture.

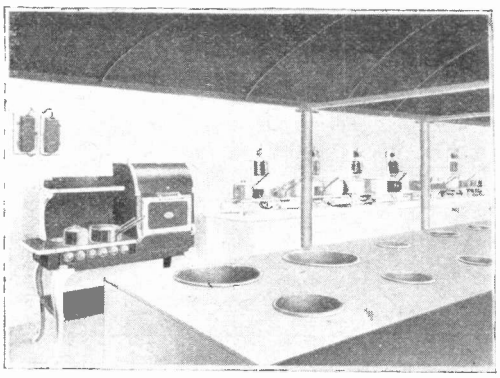
CRABS À LA CRÉOLE

Four soft-shelled crabs, one ounce of butter, one small onion and sweet Spanish pepper (not minced), one-half pint strained tomato pulp, one gill of chicken broth, salt, celery salt.

Put into the chafing dish the butter, onion and Spanish pepper, and cook five minutes, stirring well; add the tomato, chicken broth, crabs (each cut in two), salt and celery salt; stir well; simmer seven minutes.

ELECTRIC COOKING IN A PALACE OF INDIA

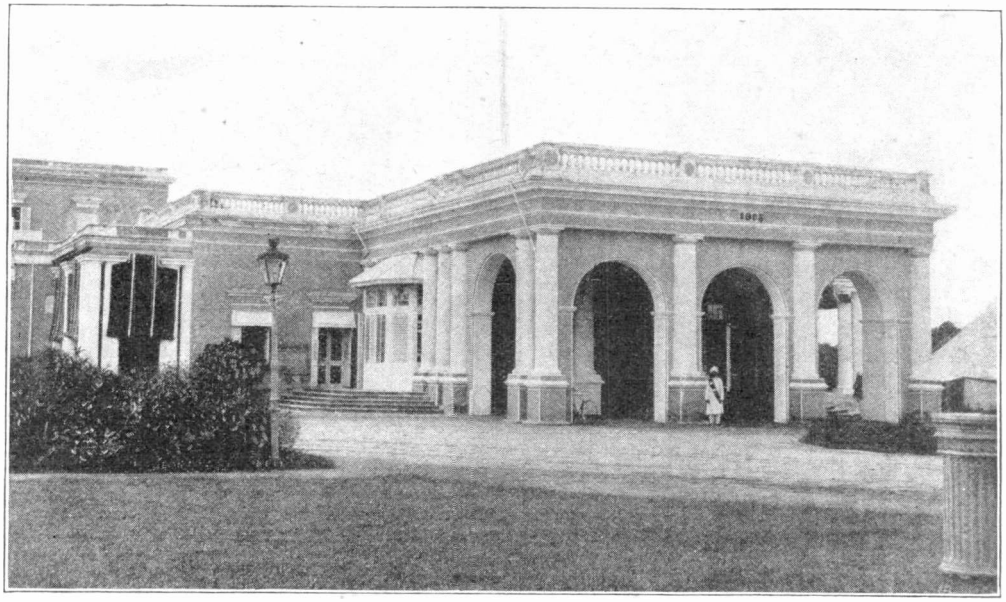
Electric cooking has found its way into the palace of a Maharajah of India. The kitchen has been equipped with an installation of electric stoves and hot plates. The holes in the foreground of the kitchen are the charcoal burners that were used previous to the installation of electric ranges. There are six three-burner hot plates, four two-burner hot plates of another size, one cabinet range, two table stoves, six self contained electric ovens.



THE ELECTRIC KITCHEN IN THE PALACE

His Highness, the Maharajah of Mysore, India, is much pleased with the installation of electric cooking appliances. They were used during the recent birthday festivities for the preparation of food for 130 guests and were found to be very satisfactory in every way.

Some of the good points that electric cooking can claim are these; no heat is wasted going up a flue or passing into the surrounding air; directly the heat is no longer needed the current can be turned off and then be obtained again at a moment's notice.



THE PALACE OF A MAHARAJAH OF INDIA

In warm countries where the climate is often oppressive, these advantages in the realm of the kitchen are most desirable. Lack of variety in the menu cannot be complained of where cooking appliances such as these are installed for all the work involved lies in the preparation of ingredients for cooking. The dusty, dirty work of starting fires is rendered unnecessary, for heat is immediately supplied upon demand and regulated to a nicety.

With electricity no carbon deposit is formed and electric cooking utensils remain clean and bright.

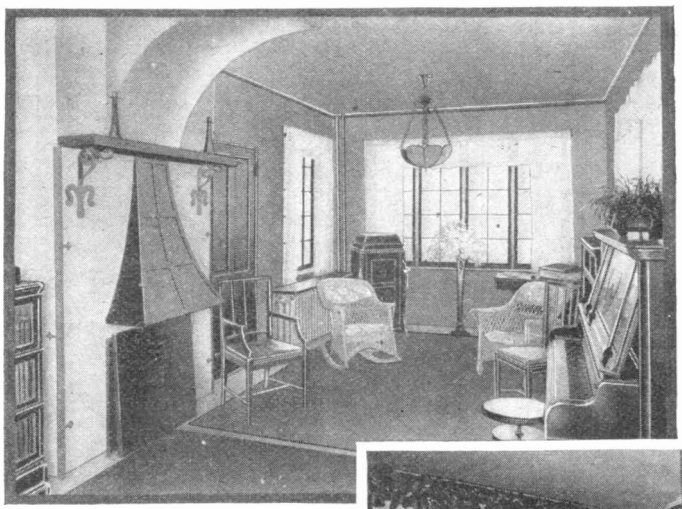
The Modern Concrete Home

Concrete is the hardened, rock like product resulting from a mixture of cement, sand, gravel or broken stone with water. The popular demand for a fireproof home has led to the adoption of cement concrete as a structural material because of its efficiency and adaptability. It is the most versatile material in use, equally suited to a moderate priced bungalow or to a millionaire's mansion.

Interior views of two different poured concrete houses are shown illustrating the fact that such interiors may be as homelike and cheerful as in houses of brick or other material. In the construction of these poured concrete houses, sectional molds are used secured edge to edge to form troughs or molds into which the concrete is poured. Only two tiers of these plates are required in casting a wall, no matter what the height may be, for, as fast as the wall rises, the plates of the two tiers are raised in alternation.

As the pouring proceeds, specially constructed conduits for electric wires are placed in position and wherever there is to be a wall bracket for an electric lamp, a small box-like opening is made, so that the wires may be carried in and out as desired. Thus when the house is finished the conduits are all ready for the electrician.

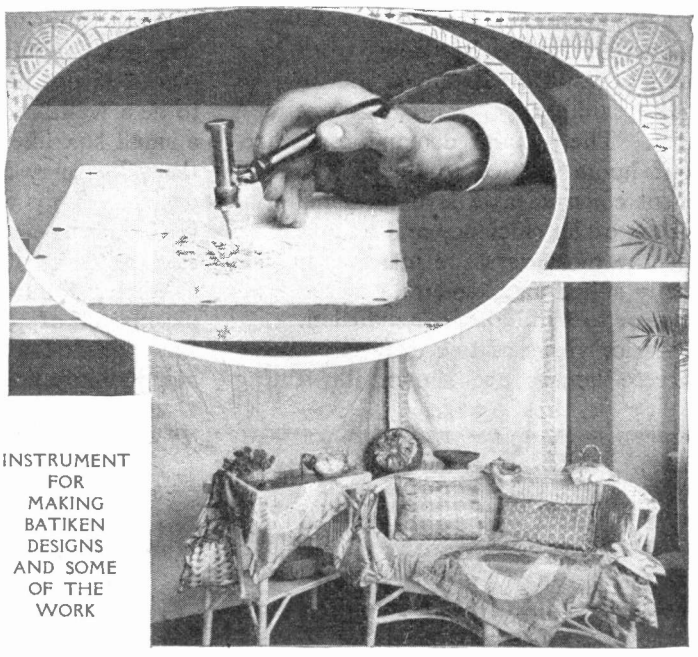
Wiring the house then becomes a simple matter of pulling the wires through the conduits, which are moisture proof, being simply holes in the solid walls.



INTERIOR VIEWS OF A POURED CONCRETE HOUSE

Batiken Color Designs

What is known as the Batiken method for making color designs upon fabrics appears to have been used in Java from time immemorial, and it is now being taken up in Europe. Very rich and brilliant color designs can be prepared in this way and these are far better than any print process on fabrics could give. The method is especially interesting for amateur work, and the designs and colors can be varied in all imaginable ways.



INSTRUMENT FOR MAKING BATIKEN DESIGNS AND SOME OF THE WORK

A white or colored fabric is used to start with, and a first design is put on it with fluid wax which has been heated in a kind of small pouring or tracing vessel. When the design is traced, the fabric is dipped into a bath of dye such as is used for Easter egg colors or the like. None of the places covered by the wax will take the color, but all the rest will be dyed, for instance in red.

After drying the cloth a second part of the design is put on with the fluid wax. This protects the red color and leaves the rest to be dyed in a second bath, of blue for instance, which combining with the red will give a purple. A third design is put on, then dyeing with another color, and so on. Finally, all the wax is washed out with benzine so as to leave the cloth free, and it then appears with brilliant color designs, should the colors be properly selected.

For this work a new electric heater for tracing with fluid wax is made by Frau Lamprecht-Gewecke, of Kaulbachplatz 15. Nürnberg, Germany. It has a small tube vessel in which the electric heater keeps the wax always fluid, so it will run out of a fine opening below. The picture shows the device and some of the work it will do.

The Domestic Revolution

"Woman and Social Progress" is the title of a new book that discusses the biologic, domestic, industrial and social possibilities of American women; it states that under the domestic system of industry, the home was a complete economic unit, producing most of the goods which were required to satisfy the wants of the family. The industrial revolution, by substituting mechanical power and labor saving machinery for the craftsmanship of the domestic system affected the home in several ways.

The present home industries have been bulwarked by a myriad of inventions, such as the stove, kitchen utensils, sweepers, washing machines, heating systems, sewing machines and the like. Cooking,

cleaning and sewing are still, in part, performed in the home, but in every one of these fields, inventions have materially lightened the housewife's labor.

Electric light and electric heat do much to facilitate the work of the modern home but there are many household duties which these cannot lighten and here appears the need of the electric motor. The uses to which an electric motor can be put in the house are numerous, such as the driving of various household labor saving devices and conveniences. The energy consumption is comparatively small, while in addition to the labor saved the convenience is a great item.

Solidarity in the home under the domestic system was produced by common industry and common responsibilities at home. The material means of producing solidarity has left the home,—another means must therefore be substituted. Social ideals, not material things, must become the binding ties of a home in which solidarity will depend on an ethical rather than a material basis. A similarity of ideas, a conscious or unconscious tending of aims in the same direction must take the place of co-operative home industry. For this new kind of home solidarity, four qualities are essential,—sympathy, compatibility, confidence and mutual aid. With these four qualities as a foundation, the home of the future will afford a new basis for solidarity and social growth almost limitless in its possibilities of development.

Cost of Operating Electric Irons

The cost of operating electric irons is less than the cost of coal for the laundry stove when used only to heat irons. It has been estimated that each worker with ordinary sadirons loses one minute out of every ten in trying to keep them at the right temperature for use. Electric irons maintain their proper heat steadily.

Modern Dusting

For removing dust from around buttons in tufted upholstery there is no other method so rapid and thorough. Health and sanitary cleanliness demand that upholstery and bedding should have this kind of treatment at least once a week. There are always places where dust and germs lodge and places which the maid neglects to clean with a duster because of the inconvenience, but with the different tools that are part of the

REMOVING DUST FROM UPHOLSTERY

electric vacuum cleaner, it becomes a simple and easy matter to clean thoroughly over the tops of doors, plate rails and the tops of picture frames.

"I really do not mind doing my own cleaning nowadays," said a young housekeeper, "since I have an electric vacuum cleaner. I go over the house with it and there is no dust stirred up. All dirt and germs are drawn into a bag. I can clean curtains and pictures without removing them and no fabrics are injured. I would not part with my electric vacuum cleaner because it does away with 90 per cent of the dusting in the old way."

Electricity for the Homes of Swiss Villagers

By ROLAND RICHARDSON *

In going about among the small villages of Switzerland, I noticed that the streets and houses were lighted with electricity, even the real old houses with thatched roofs. This fact interested me, so one day I, with a friend, made a trip of investigation out into the country from Neuchâtel to a little village about eight or nine miles away. We went by train part of the distance and walked the rest of the way. When we got there I noticed right away that they had electricity in most of the houses and as I had my kodak along, I took photographs of some of the houses in which electricity was used. Then as I had gotten this

TRANSFORMER HOUSE IN A SWISS VILLAGE

*Roland Richardson is a reader of this magazine, an Ohio boy who is now living in Neuchâtel and going to school. Switzerland being the land of the "White Coal;" that is, cheap water power, he finds applications of electricity on every hand. It is to be hoped that he will write often for the benefit of readers of the Junior Section and tell of his experiences there in the shadow of the Alps.

deep into the matter, I determined to follow it through to the end. So I followed up the biggest bunch of wires until they came to, and ended in a small stone house, about fifteen or 20 feet high and not over ten feet square. As I got nearer, I heard a low, humming sound coming out of the building, and then, after walking around it, I noticed three small wires leading out of it and going away across a field on some poles. That is how I discovered that it was a transformer station. And I learned something at the same time, for I never knew before that transformers hummed.

I didn't like the idea of following up those three small wires, which, so far as I knew were nothing more or less than wires from a high tension transmission line. I could see where they went out and connected up with it, but as I didn't know which way the main line went, or rather it went two ways, I didn't know at which end the power station was located. So I had to go home, not knowing much more than when I left.

Back in Neuchâtel again, I inquired around and at last found out that there was a big "usine," as they call a power station, about ten miles away on another lake called Bienne, which is joined to the lake of Neuchâtel by a canal.

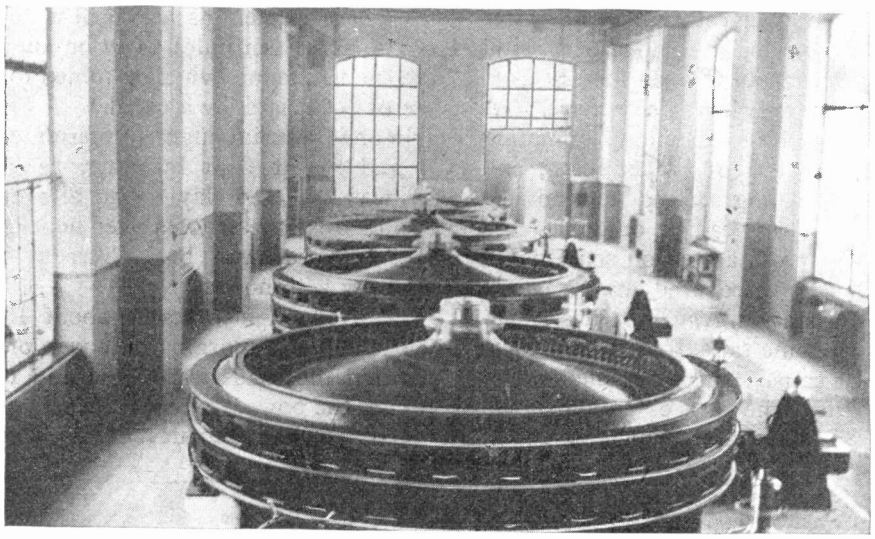
So one Saturday night I determined to go and see it next morning, as Sunday was the only day I had altogether free, because the schools over here don't give us Saturdays, but Thursday and Saturday afternoons.

I started on my bicycle about 10:00 o'clock Sunday morning. It was pretty cold, but the roads were good and I arrived at the power station, which I found named "Hagnek," about half past eleven.

A PICTURESQUE THATCHED COTTAGE IN SWITZERLAND. ELECTRICITY IS USED IN THIS MODEST HOME

But when I got up to the door I found on it "*Entree defendu*," which means nothing more or less than it wasn't for me to see.

Just then the boss came out and I asked him if I couldn't see the inside, but he shook his head and said that before I could go in I must have a "*Carte de permission*," from Bienne, a town near-



DYNAMOS IN A SWISS POWER PLANT, DRIVEN BY WATER TURBINES

by where their headquarters were. Then I asked him if he would tell me what kind of dynamos they had and where they sent the "juice," etc., but he wouldn't even do that, and much less would he let me take a photograph of the outside. So I had to get along home again, very much disappointed but not downed.

Then Christmas vacation came along and I decided to go up to Bienne, which was about three-fourths of an hour away by train, and see about my *"carte de permission."*

After much searching on the "Bahnhofstrasse" or "Rue de la Gare," I located the office, and going up stairs I found myself face to face with a push button. I pushed it and a young lady came to the door and saluted me in German and then in French, for I don't know any German and very little French; but she understood what I wanted. After waiting about fifteen minutes I was led into an office room, where a man questioned me as to my wants, etc., and gave me my *"carte de permission"* right away and also the permission to take photographs. I went back to Neuchâtel very happy.

I decided then and there to go the next morning and try my luck again with the boss who wouldn't tell me anything. This I did, taking my lunch and kodak on my bicycle.

A very nice man met me at the door, and when I asked for the boss he told me that he had gone out for the day. So I showed him my permit and he telephoned to Bienne to see about my taking photographs. When he found that I could he just turned me loose and told me I could go anywhere I wanted to, only to be careful.

I shall never forget the sight of those big dynamos. They were at least thirty-five feet in circumference and four and one-half feet high. They were of the vertical type, five of them; three of them were going and their roaring noise made it difficult to hear the explanations, but I found out all I wanted to know about them. One was 1,500 horsepower and the other four were 1,300 horsepower each. The three that were going were whirling around at 100 revolutions per

minute, generating current at 8,000 volts pressure. The water turbines which drove these dynamos were equally large, only they were below the cement floor and I couldn't see much of them.

The water to run them comes from the River Aar, which runs into the lake at a point further up. They dug a canal about 100 feet wide, straight over from the river to the lake and run the water through the turbines with a fall of about 27 feet.

So here was the place where they make the electricity for most all of the little villages, far and near. Some of them as far away as the real Alps, which are about 50 miles away, and others quite near. Besides all these small villages, they supply the electricity for the whole town of Bienne, with its street cars and all.

So you see how the Swiss look on electricity in their homes. These may be fine city houses or nothing but old houses with thatched roofs, where they keep the cows and horses under the same roof as the family; not as a luxury, but as a necessity.

Aeronautic Advertising

The originator of this new field of advertising is not a New Yorker at all, nor is he an American. His name is Rene Demarest and he is French. This is his plan. He has constructed a number of balloons about 20 feet in diameter and he sells the space on the swelling sides of the gas inflated spheres at a goodly price.

This space is filled with transparent signs advertising everything from chewing gum to vacant buildings and each evening after sunset the balloons are unfettered and allowed to float skyward. Of course they are all captives and when they reach the end of their rope, which is about 500 feet, they bob about in the wind in a most interesting fashion.

But the important part about the balloons is the interior arrangement, which through the ingenious efforts of Mr. Demarest is such that a huge 500 candle-power incandescent lamp can be placed in it.

The balloons are made of translucent silk and through this lighting effect the advertisements, which are also on translucent silk, are made to stand out against the dark night sky in a weird but attractive manner.

It is this interior arrangement, the secret of the inventor, that makes the balloons so valuable for advertising purposes. Even though the bulbs should break or the wires inside of the bag become short-circuited the gas which inflates the balloon can not be ignited, consequently there is no possibility of dangerous accidents of any kind. The current is supplied by a cable running along the rope which holds the balloon a captive.

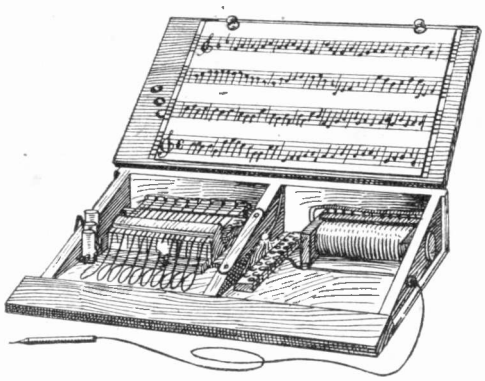
By courtesy New York Edison Company

ADVERTISING BALLOON WITH ITS INTERIOR ELECTRICALLY LIGHTED

Electric Music Teacher

By using the electric music teacher, children will find that it is an attractive task to learn their notes, instead of a dry lesson as heretofore, so that they will begin to take an interest in music at once and not consider it as a drudgery.

M. Pierre Gélis, a Paris inventor, makes the device which we illustrate here. It is based on the principle of using an electric contact plate under the music paper. By pricking each note with a sharp



ELECTRIC MUSIC TEACHER

metal point, we make contact for an electric device carrying a hammer, so that the hammer strikes a string or preferably a metal piece to give out the sound. Thus each note on line or space gives out its corresponding sound, and it is an easy matter to read a simple piece of music in this way.

The device is quite an elaborate one, for it is required to take care of the sharps and flats which figure permanently as the sign of the staff. But this is easily done by using a revolving contact device to shift over the several required notes at the start. To bring back to natural during the piece, we press on a button which restores the note for the moment.

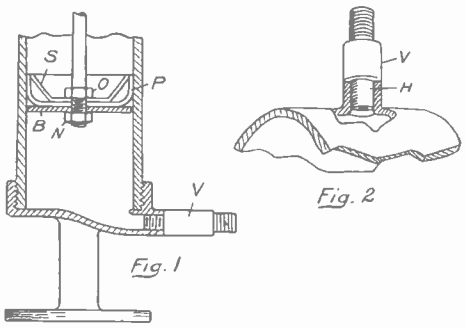
Even professional musicians will find it useful for transposing a piece into another key and this is done by observing the movement of the hammers and also a transposing chart which lies before them.

Laboratory Air Pump from Bicycle Pump

A suction air pump is most serviceable in an electric laboratory for exhausting Geissler tubes, electric eggs and other low vacuum tubes.

A good pump can be made as follows:

Procure a bicycle foot pump and unscrew the upper end from the cylinder. Withdraw the plunger and remove the piston from the plunger rod. Then put



LABORATORY AIR PUMP

the plunger back on the rod in the reverse order, as shown in Fig. 1, where (P) represents the plunger. (B) a metal washer which was previously above (P) and (C) the spider spring which retains the plunger against the wall of the cylinder. (S) and (P) were previously below (B). (O) and (N) are nuts which keep the plunger on the rod.

From an old single tube bicycle tire remove the valve (V), Fig. 2. The rubber is removed from the valve. The small end (H) is threaded. These threads must correspond to those of the air outlet of the pump. If (H) is too large in diameter to screw into the outlet, the latter must be reamed out and tapped. These parts may be threaded by some machinist at a cost of about ten cents. (V), Fig. 1, represents the valve screwed into the air outlet of the pump. Remove the interior of the valve. This may be done with the valve cap, which has a slit cut in it for this purpose. Cut two or three convolutions from the end of the spring with a pair of scissors, before replacing

it. Be sure that the rubber part of it is in a good condition; if it is not, discard it and get a new one, for the value of the pump depends to a large extent upon this.

After replacing the interior of the valve the pump is complete. The rubber tubing leading from the apparatus to be exhausted is slipped over the end of (P).

I have a pump made as above which is not much inferior to the manufactured article.—WM. H. DETTMAN.

New York Horse Car in Snow Storm

(From a Brooklynite's Viewpoint)

In winter the question of the best means of preventing tie-ups or delays to traffic on account of snow storms is a very important one to electric railway

By Courtesy Electric Traction

A NEW YORK HORSE CAR

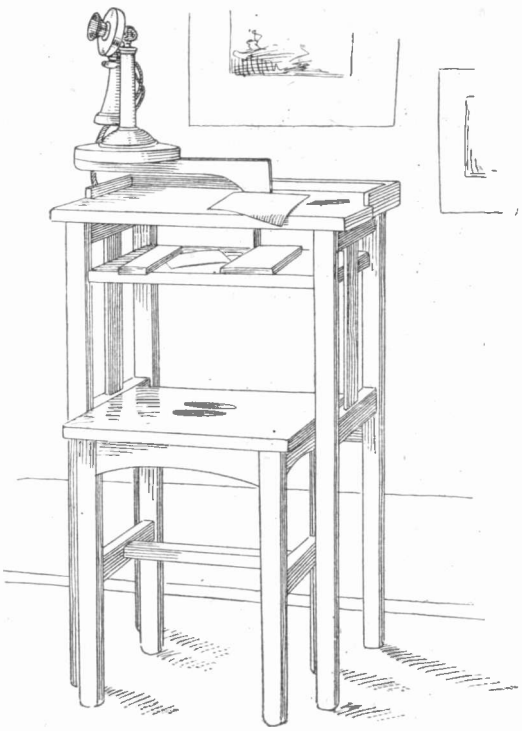
men. This picture showing how the difficulties with snow are overcome in the largest city in the United States may be interesting. While it does not show how the snow is removed from the tracks, it does show "attachments" that are placed on the cars to supply them with increased power.

The "motors" used on these cars are two in number and of only one horsepower each and as more power is needed during and shortly after snow storms the ingenious device shown (two more horses) is made use of, which doubles the power supplied to the car. This attachment can be made and the added power obtained without any increase in the weight of the car. The additional motors can also be attached to or removed from the cars in a few seconds and with only a slight increase in the amount of "control wiring" required.

Owing to the expense of the arrangement it has not found favor in most cities where motors of greater horsepower are normally used. It is only in a progressive city like New York that one can realize that the service rendered by this simple arrangement more than pays for its high first and maintenance costs.

Table for the Residence Telephone

The telephone has become so much an article of the home equipment that furniture manufacturers make specially designed tables for it. These are built to harmonize with the different types of



CONVENIENT TELEPHONE TABLE

furniture. In the illustration the swinging wooden bracket leaves the surface of the table free for writing purposes and also lessens the chance of injury to the telephone by its being accidentally knocked off.

Experimental 200 Meter Wave Sets

By PHILIP E. EDELMAN

PART 2

To operate an experimental set at 200 meters is, after all, not an extreme limitation. According to recent reports, a French wireless position finding project for ships will operate at 150 meters in order to avoid interference with regular wireless communication. This is 50 meters less than the amateur limit with which we are concerned.

In considering the condenser of primary circuit, Fig 4, the discussion will be limited to a spark system and more particularly to one in which a transformer is employed for the charging of the condenser. The quenched spark or arc systems, while particularly suited to a low wave length, because of their higher efficiency, will not be considered at this time because they require a different design for the parts, which would lead to confusion in this discussion.

The primary or condenser circuit operated at 200 meters must have dimensions such that the product of the capacity and inductance is limited to the value of .011257, when the capacity and inductance are expressed in units of microfarads and microhenrys respectively. This value is found by evaluating a wave length formula as has been explained in a previous article (November, 1912). Any dimensions for the capacity and inductance which will give this product are theoretically satisfactory, but if either factor is made too small the other will be too large, or vice versa. Too large a capacity in the condenser, for instance, means that inductance must be cut down to such a small value that good coupling between the condenser and antenna circuits is impossible. Too much capacity, then, may mean that not even a complete turn of a helix can be used in the primary circuit and this item alone will lower the efficiency of the set considerably. If, on the other hand, the condenser is made smaller in order to allow sufficient inductance, another limit is soon reached. Unless the power is reduced to correspond to the size of the condenser, or either the frequency or voltage used to charge the condenser is correspondingly increased, the set will not operate efficiently. If the limit is exceeded the set cannot be operated at all.

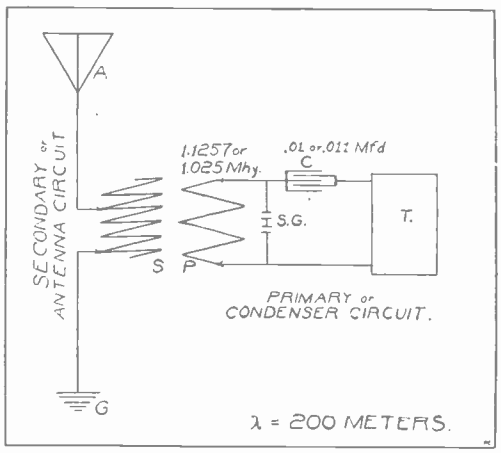


FIG. 4. A—AERIAL; G—GROUND; L—INDUCTANCE WITH PRIMARY P AND SECONDARY S; SG—SPARK GAP; C—CAPACITY; T—TRANSFORMER

It is well known that a smaller capacity may be used when either the frequency or the charging voltage is increased, and this fact may be utilized to keep the dimensions of the condenser circuit within the limit without reducing the power used. The average experimenter cannot obtain the necessary high frequency and must rely upon a high charging voltage if he wishes to use the maximum power at 200 meters. The condenser to be used, then, must be small enough to allow the use of sufficient inductance in the circuit and at the same time be large enough properly to charge and discharge when operated at the given power, frequency and voltage. The frequency being fixed, and with the condenser circuit limited to a fixed value, it is obvious that the voltage must be increased when the power is increased.

CONDENSER CIRCUIT FOR TRANSFORMER

For example, when a power of ¼ kilowatt is used with a condenser of .01 microfarad. the charging voltage should be 7,000 volts. If the voltage is decreased to 6.800, the condenser should be increased to .011 microfarad, or if the voltage is increased the capacity should be decreased. By examining the fixed value for the condenser circuit it will be noted that either .01 or .011 microfarad is a convenient and desirable capacity for the condenser because sufficient inductance to obtain good coupling between the antenna and condenser circuits may then be used. It is obvious that the condenser can be made still smaller to allow a larger margin for the inductance, but that the voltage must then be increased. There are limitations, however, to the point to which the secondary voltage of a given transformer may be increased. The current decreases as the voltage increases with a given power, and too, better insulation is needed throughout. There is more loss in the condenser and the leakage reduces the efficiency as the limit is approached. While the charging voltage may conveniently be increased as the power is increased, the voltage for a ¼ kilowatt transformer should then be below 7,500 for other considerations. A condenser of substantially .01 microfarad charged at substantially 7,000 volts, then, is a suitable arrangement for the 200 meter circuit of ¼ kilowatt capacity. When it is remembered that the total value of the condenser circuit must not exceed .011257 microfarad it becomes plain that a capacity of .01 microfarad allows 1.1257 microhenrys for the total inductance in the circuit.

In order to avoid an increase above .01 or .011 microfarad in the condenser when the power is increased from ¼ to ½ kilowatt, the voltage must be increased from 6,800-7,000 to 9,400-10,000. This means a departure from former practice, as the amperage instead of the voltage has generally been increased with the power. This means further, that a large part of the old transformers having a power of ½ kilowatt and over are not suitable for a 200 meter circuit. In the same manner, when the power is increased from ½ to one kilowatt (maximum power allowed) the voltage should be increased from 9,400-10,000 to 13,000-14,500. It is understood that when these pairs of numbers are given, the lower value corresponds to the use of .011 microfarad, while the higher value (as 14,500 for one kilowatt) corresponds to the use of .01 microfarad. Figure 4 shows the relations of the circuits and the values for the capacity and inductance when a transformer is used. These values (.01-1.1257 or .011-1.025), are, as has been explained, best adapted for all transformers from ¼ to one kilowatt. Indeed, manufacturers of wireless apparatus have in some cases already altered their designs to conform substantially with this limit. There is but little difference between the two, and .01 microfarad is perhaps best adapted as standard. The Clapp-Eastham Co. now supply ¼, ½, and one kilowatt transformers with charging voltages of 6,800

9,400 and 13,000 respectively, to operate a condenser of .011 microfarad. It seems likely that substantially the foregoing values will be adopted and used as long as the present law and regulations remain in force.

CONDENSER CIRCUIT FOR SPARK COILS

In this article the purpose is to consider only such sets as are commonly used. It is for this reason that transformers smaller than ¼ kilowatt and other odd sizes have not been specially considered. The common sizes of spark coils, however, are mentioned because of their general use by the average experimenter. With spark coils, the capacity may be taken as .002 microfarad for every one-half inch of spark length. With this value fixed the following values are found for the condenser circuit by evaluating the relation $L \times C = .011257$.

Spark length in inches.	Condenser capacity in microfarads	Inductance in microhenrys.
½	.002	5.63
1	.004	2.808
1½	.006	1.875
2	.008	1.407

THE CONDENSER

A condenser unit with a capacity of substantially .01 microfarad may be made from ordinary 1/16 inch window glass or old photographic plates 8 by 10 inches, Fig. 5. If photographic plates are used, the emulsion should be removed. The glass should be thoroughly clean and dry before it is used. The tin foil for the coatings should be No. 35 gauge if possible and should be made smooth by means of a photographer's roller. Cut the foil to 6 by 8 inches with a three inch lug, as shown at (A). A less desirable method is to cut the lugs separately, but four inches long, after which they are attached to the coating so that they overlap one inch.

In building the condenser, lay a sheet of glass on a flat table; then place a sheet of foil with its lug on top of it so that the foil lies flat and is evenly spaced from the edges of the plate. Now lay a second glass plate on top of this and place a second sheet of foil on it, spaced as before, but arranged so that its lug comes at the opposite side of the same edge of the plate (B). Proceed as before, placing alternate sheets of glass and foil until 20 sheets of the 6 by 8 inch foil have been assembled with nineteen plates

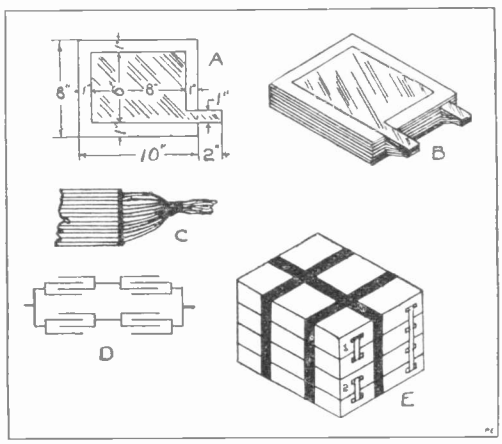


FIG. 5. A—DIMENSIONS OF FOIL AND GLASS PLATE; B—ASSEMBLED PARTS; C—DETAIL OF LUG; D—SERIES-PARALLEL CONNECTIONS; E—FOUR UNITS IN SERIES-PARALLEL

of glass between them. An extra plate should then be used to cover the top sheet of foil. The unit can now be bound together by rubber tape or string. The two respective sets of lugs should be separately clamped between a piece of brass or copper sheet or else soldered to a lead made up of a large number of twisted wires (C). This lead should be at least 3/16 inch in diameter or else equivalent to a copper strip ½ by 1/16 inch. The unit should be carefully constructed and each sheet of glass should be uniformly 1/16 inch thick. For ¼ kilowatt only one unit will be needed, and it can be mounted in a suitable box or jar. The container can then be filled with transformer oil, linseed oil, or vaseline. The condenser should be mounted so that it does not rattle in the container. For ½ to one kilowatt, four units are used, each with the dimensions just given. These are connected in series-parallel as shown in the diagram at (D) and also at (E). This arrangement does not in-

crease the capacity and the combined capacity of all four units connected in this way is the same as that of one single unit. The advantage of this arrangement is that the puncture strength of the four units in series parallel is twice that of a single unit. This arrangement is necessary because of the higher voltages used with ½ and one kilowatt. The four units should be separately assembled and then bound together as shown at (E). All the lugs should be at one end and should be connected with short thick conductors as shown. It is well to solder the joints. Connections are made at (1) and (2) and this end should be up if the condenser is mounted in a box.

By the addition of one more plates to the unit, its capacity will be increased to a trifle less than .011 microfarad. It is understood that any change in the dimensions affecting the area or thickness will alter the capacity. It is important to have good connections and large conductors for the leads.

To construct the capacities for spark coils, use the same dimensions, making each unit with three plates of glass between four of foil. Each unit thus made will have a capacity of substantially .002 microfarad. A desired capacity can then be made up in steps of .002 microfarad (corresponding to steps of ½ inch in spark length) by connecting the units in parallel.

(To be continued)

Wireless Outfit as Moving Picture Attraction

One motion picture manager has put wireless telegraphy to use as a moving picture advertising medium. He had a wireless amateur having a one kilowatt transformer display his apparatus in front of the picture parlor. A small antenna was suspended in the lobby with wires leading from it to both the sending and receiving apparatus. The sending apparatus was mounted on top of the ticket booth, and the receiving apparatus on a table beside the booth.

On the night of the great "wireless show" the amateur operator took a seat at the table, with the receiving headgear on, and operated a telegraph key, which controlled the noisy spark.

The crowd passing by on either side the street was attracted by the noise of the flamy, crashing spark. The spark was mounted in a very conspicuous place on top of the ticket booth, in full view of all, and could be clearly seen from the opposite side of the street.

A sign just above the operator's head, "Wireless Telegraph Station," readily explained the meaning of all the noise, and wireless, being a public curiosity,

CROWDS WILL BE ATTRACTED BY THE CRASHING SPARK

naturally attracted the attention of all who passed by.

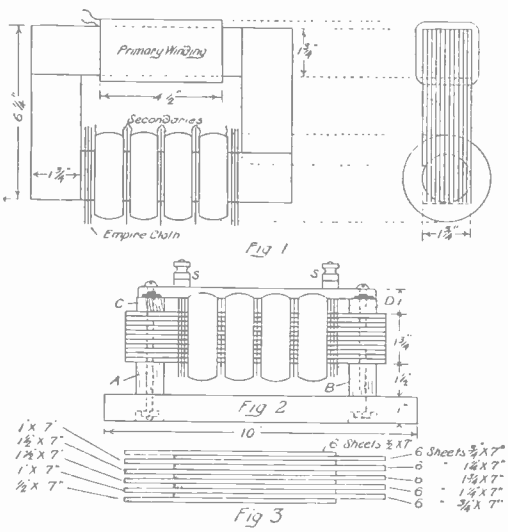
The people would devote a little time to the apparatus, and then the attractive posters of a sinking ship sending the "S. O. S." call, or the like, would have their eyes. And finally many were investing a nickel to see the show.

A New Detector

A Berlin wireless telegraph company has patented a new detector which is formed by the contact of a crystal of molybdenum and of a conducting powder (pulverized silver). The mineral electrode forms the bottom of a closed and insulated box upon which is spread the powder in an even layer; an electrode of large surface is immersed in the powder and connected with the exterior circuit.

Two Hundred Watt Closed Core Transformer

The transformer which is described below is for use on 110 volt, 60 cycle alternating current circuits and may be used without any extra reactance. The secondary potential is in the neighborhood of 5,500 volts and the spark will jump a gap of about ⅜ inch. If the gap be started at ⅜ inch the spark can be drawn



DETAILS OF CLOSED CORE TRANSFORMER

out to 1½ inches and is extremely hot. With a condenser of six metallic plates, 9 by 9 inches, separated by glass 1/16 inch thick, a crashing spark for wireless use is obtained.

The core is composed of laminations of stovepipe iron. The core upon which the primary coil is wound is composed of pieces of the sheet iron 1¾ by 7 inches, sufficient pieces laid upon each other till there is a stack 1¾ inches high. The end pieces for the core are 4½ by 1¾ inches and two stacks of the above size and 1¾ inches high are required. The secondary sections contain a hole two inches in diameter and the leg upon which they are placed has to be 1¾ inches in diameter and seven inches long. In order to make the core round by using the flat pieces of sheet iron it is required to cut the sheets as follows: Six pieces 7 by 1¾ inch; twelve pieces 7 by 1½ inch; twelve pieces 7 by 1¼ inch; twelve pieces 7 by 1 inch; twelve pieces 7 by ¾ inch; twelve pieces 7 by ½ inch.

These are assembled as shown in Fig. 3. In building up the two legs of the core upon which the windings are placed, the sheets should be dipped in shellac varnish before assembling. Every six sheets of iron should be alternated as shown in Fig 3. The core for the primary is of course square and seven inches long. By alternating every six sheets the end pieces of the core can be wedged in more easily.

The legs of the core should be given a layer of friction tape. Two layers of empire cloth should be placed on the primary core and 240 turns of No. 16 double cotton covered wire wound on and leads about six inches taken out for connections. A layer of tape will hold the coil firmly in place.

The secondary is composed of four Dawson-Winger Company's units, 1⅛ inches thick, size hole in the center two inches and wound with No. 34 wire. The core is wound with about five layers of empire cloth and the sections slipped on over this, and a sheet of empire cloth placed between each unit and two or three sheets at the ends to insulate the secondary from the end pieces of the core. The end pieces of the core are then wedged in their proper slots as shown in Fig. 1. The electrical part is almost complete now and all that is required is the joining of the wires in the secondary. These ought to be soldered together with the aid of some non-corrosive flux and solder.

Fig. 2 is self explanatory to show how the transformer is mounted. The base, preferably oak, is 8 by 10 by 1 inch. On this base the pieces (A) and (B), Fig. 2, are mounted. These pieces are 7½ by 1½ by 1 inch. The pieces (C) and (D), Fig. 2, clamp the core down to the pieces (A) and (B) by means of the bolts, as

per diagram. (C) and (D) are 7½ by ½ by 1 inch.

The piece (E) is screwed on to the clamp pieces (C) and (D) and the secondary and primary binding posts are connected. (E) is of oak 8¼ by 3½ by ½ inch. After completion give the transformer a coat of good stain and varnish.—ALEX POLSON.

Judgment for the Marconi Company

On the 24th of December last, in Paris, judgment was rendered in a suit brought by the Marconi Company against La Société Français Radio-Électrique, La Compagnie Générale Radiotélégraphique and the Société des Transports Maritime, for infringement of patent. Edouard Seligmann, who represented the Marconi company, is the same lawyer who won the claims of the Wright brothers in the French courts some years ago. The judgment affirms the validity of the Marconi patents, forbids the defending companies to continue their infringements, orders the confiscation and destruction in all places of their appliances and condemns them to pay damages to be fixed by the state. It orders, besides, the insertion of the condemnation in the French and foreign journals. The Marconi company's rights have already been established by the English, German and American courts.

Canadian Boats Compelled to Carry Wireless

The Canadian government has undertaken to compel all vessels carrying over 50 passengers and plying between ports 200 miles apart to install wireless equipment with a skilled operator. The Minister of Marine, Hon. J. D. Hazen, is inclined to bring excursion vessels on much shorter runs under the terms of the act, but will first summon the interested parties to a "round table" conference. The act is so framed that entry to Canadian ports will be denied vessels refusing to comply, and a system of fines is also available.

New York Clubs Form Relay

The Amateur Wireless Association of Schenectady, N. Y., the Chester Hill Wireless Club of Mt. Vernon, N. Y., the Frontier Wireless Club of Buffalo, N. Y. and the Rockland County Radio-Wireless Association of Nyack, N. Y., have united in an effort to establish a relay between Buffalo and New York. Amateurs in New York state who have either sending or receiving stations are invited to send name and address, call letter and power to John F. Diehl, Secretary of the Gramercy Wireless Club, 207 E. 25th Street, New York.

WIRELESS CLUB DIRECTORY

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

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

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

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

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

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

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

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

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

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

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

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

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

Cardinal Wireless Club.—Miss A. Peterson, South Division High School, Milwaukee, Wis., Secretary.

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

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

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

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

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

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

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

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

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

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

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

Geneva Wireless Club.—Henry B. Graves, Jr., 418 Castle St., Geneva, N. Y., Secretary.

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

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

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

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

Greenfield Wireless Association.—Stanley B. Wolfe, 4125 Haldare St., Pittsburg, Pa., Corresponding Secretary.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

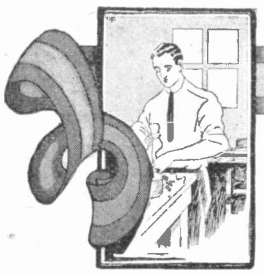
Wireless Association of Savannah.—L. H. Cole, Cor. Liberty and Price Sts., Savannah, Ga., Secretary.

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

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

Y. M. C. A. Wireless Club of Williamsport, Pa.—Lester Lighton, 211 W. 4th St., Williamsport, Pa., Secretary.

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



For Practical Electrical Workers

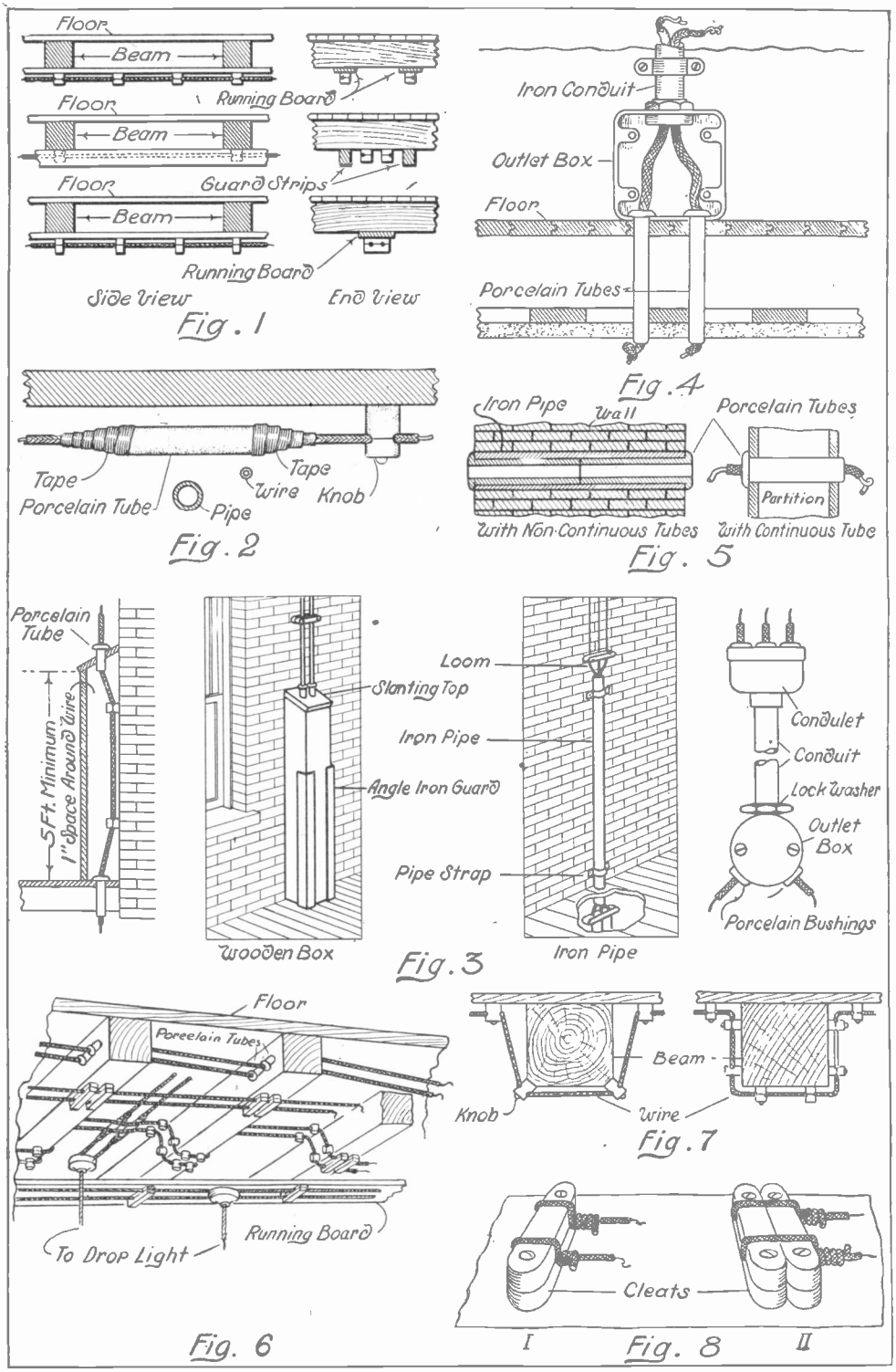
Knob and Tube and Cleat Wiring

By H. B. HARTMAN

Knob and tube and cleat wiring are inexpensive and safe when properly installed. These systems find wide application in factories and mills and in places where appearance is of little consequence. They are also used for running feeders in tunnels and in specially built feeder shafts in fireproof buildings. The wires may be single braid, rubber covered, or provided with a slow burning weatherproof insulation. The exceptions to the use of slow burning wire are in cellars, under roofs and in other places exposed to moisture. Wires must be supported at least every 4½ feet except in mill buildings, where a support on each beam may be approved for wires larger than No. 8 if they are separated at least six inches. Wires must in dry places be separated ½ inch from the surface wired over, and spaced 2½ inches apart for voltages below 300. Above 300 volts and up to 550 volts wires must be separated from the surface wired over by at least one inch and must be spaced four inches apart. In wet places wires must be separated from the surface wired over by at least one inch for voltage below 300.

Wires must be protected on side walls from mechanical injury and when crossing floor timbers in cellars or in rooms where they might be disturbed, Fig. 1, wires must be attached by their insulating supports to the underside of a wooden strip or "running-board" not less than ½ inch thick and three inches wide. Instead of running-boards, guard strips on each side of and close to the wires may be substituted. The strips should be at least ⅞ inch thick and should be as high as the insulators. Wires should also be protected by porcelain tubes when passing over pipes, wires, or any other conducting material, Fig. 2.

Suitable protection on side walls should extend not less than five feet from the floor, Fig. 3. This may consist of substantial boxing, providing an air space of at least one inch around the conductors and closed with a sloping top (the wires passing through porcelain bushed holes), or of approved wrought iron conduit or commercial wrought iron pipe. When common pipe is used the insulation of each wire must be reinforced by approved flexible tubing extending from the insulator next below the pipe to the one next above it. Where single braid, rubber insulated wire is used in conduit, the tubing protection must be provided. Where double braid insulated wire is used in conduit, the flexible tubing can be omitted but each end of the pipe must be provided with an approved outlet box. The two or more wires of a circuit, each with its approved flexible tubing, if carrying alternating current, *must*, or if carrying direct current may be placed within the same pipe. In damp places the wooden boxing may be preferable because of the precautions which would be necessary to secure proper insulation if pipe were used. With this exception, how-


Floor
Beam
Floor
Beam
Floor
Beam
Running Board
Guard Strips
Running Board
Side View
End View
Fig. 1
Iron Conduit
Outlet Box
Floor
Porcelain Tubes
Fig. 4
Tape
Porcelain Tube
Pipe
Tape
Wire
Knob
Fig. 2
Iron Pipe
Wall
Porcelain Tubes
Partition
With Non-Continuous Tubes
With Continuous Tube
Fig. 5
Porcelain Tube
5 Ft. Minimum
1" Space Around Wire
Wooden Box
Loom
Slanting Top
Iron Pipe
Angle Iron Guard
Pipe Strap
Iron Pipe
Fig. 3
Conduulet
Conduit
Lock Washer
Outlet Box
Porcelain Bushings
Floor
Porcelain Tubes
To Drop Light
Running Board
Fig. 6
Beam
Knob
Wire
Fig. 7
Cleats
I
II
Fig. 8

ever, iron pipe is considered preferable to wooden boxing and its use is strongly urged. It is especially suitable for the protection of wires near belts, pulleys, etc. Fig. 4 shows an outlet arrangement with a square conduit outlet box at the floor.

Where conductors pass through floors, walls or partitions they must always be protected. Open work wires can be protected with porcelain tubes, Fig. 5. The tube or bushing must be long enough to bush the entire length of the hole in one continuous piece, or else the hole must first be bushed by a continuous waterproof tube. This tube may be a conductor, such as an iron pipe, but in that case an insulating bushing must be pushed into each end of it, extending far enough to keep the wire absolutely out of contact with the pipe.

Methods of carrying exposed wiring around and through beams are illustrated in Fig. 6 which shows knob and tube and cleat arrangements. In Fig. 7 are shown, further, two different ways of getting around beams and timbers.

The method of dead ending on a cleat at the end of a run is illustrated in Fig. 8, (I). After the wire is passed through the groove the free end is given several short turns around the line. Where a long run is dead ended it is often advisable to so fasten two sets of cleats that one bears against the other so that both will assume the strain as shown in Fig. 8, (II).

Rosettes for open surface wiring are used to connect the drop cords for the incandescent lamps to the branch circuit wires. A rosette with protected (concealed) contact lugs, is preferable to one with exposed lugs. Fig. 9 shows one type.

Switches can be supported in exposed surface wiring as shown in Fig. 10. Small porcelain knobs may be used to support the switch, Fig. 10, (I), which permits the conductors to be brought through the back of the switch without touching the supporting surface. The switch can be mounted on a commercial porcelain switch block, Fig. 10, (II). Sub-bases of non-combustible insulating material which will separate the wires at least ½ inch from the surface wired over must

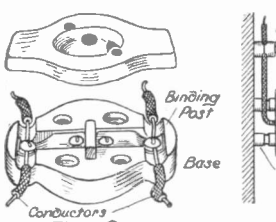


Fig. 9

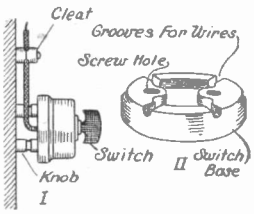


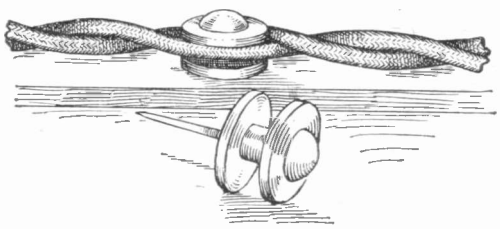
Fig. 10

be placed under all snap switches in this class of work.

Different approved methods of exposed surface wiring as arranged in a building of mill construction, are illustrated in Fig. 6. Which method should be used in any particular case is a matter that is largely determined by the size of wire involved and other local conditions.

Insulating Nail

In hunting trouble on bell or similar circuits it is frequently found that the cause is a "short" under one of the staples or other holding devices, generally due to driving the staple in too far.

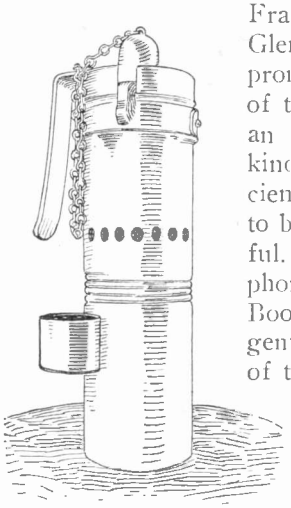


INSULATING NAIL

This trouble may be eliminated by using the Eureka insulated nail, the collar of which, as shown, prevents any undue pressure upon the insulation of the wire and further provides additional insulation between the wires and the metal of the nail.

New Torch for Linemen

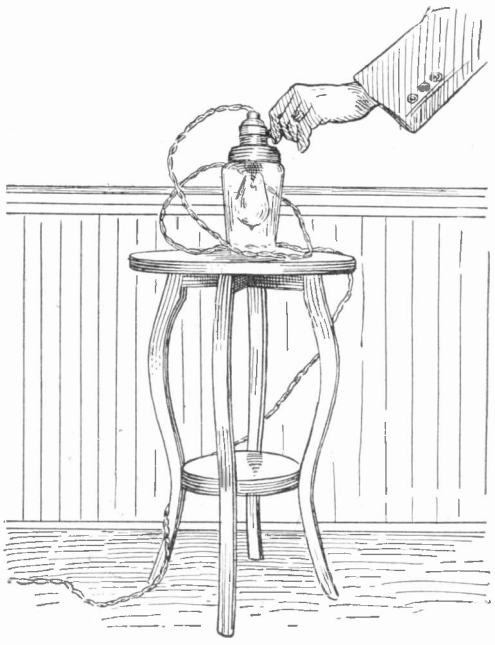
Although simple in construction the wire-joint soldering torch invented by Frank D. Booth of Glendale, Calif., promises, on account of the great need of an article of this kind and the efficiency of this lamp, to be highly successful. Being a telephone lineman, Mr. Booth saw the urgent need of a lamp of this kind and he, after a year of work, invented this one. The torch is cylindrical in form and is about ten inches tall. It is two inches in diameter, weighs about a pound and burns either alcohol or oil. It is carried by means of a hook on the upper side of the lamp, the hook slipping easily over the lineman's belt. It takes but a moment to unhook the lamp, place it in position on the wire and light it. It has been demonstrated that the hardest wind will not extinguish the flame. The lack of weight is one of the torch's principal features. It is a time saver and economizer in fuel.



LINEMAN'S TORCH

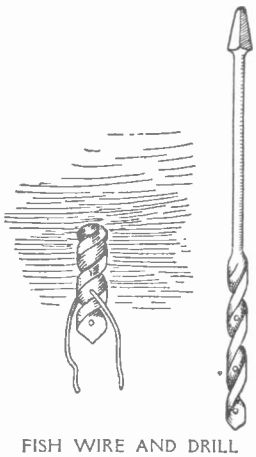
Bed Warmer

As most people are aware, it is dangerous to use an incandescent lamp as a bed warmer owing to the fact that a considerable amount of heat is given off by a comparatively small body—the lamp. This heat is confined and not allowed to radiate because the bedclothes pack tightly around the lamp. More than once fires have been started from this cause. But I have found that no harm is done if the lamp is enclosed in a fruit jar as shown in the sketch. I solder an ordinary lamp socket into the metal top of the jar and a two to four candle-power lamp will give sufficient heat. The size of the jar prevents packing of the covers too closely around the lamp and permits radiation of the heat fast enough to keep the temperature down to a safe point.—Wilbur R. Simpson.



LAMP IN A GLASS JAR AS A BED WARMER

Combined Fish Wire and Drill

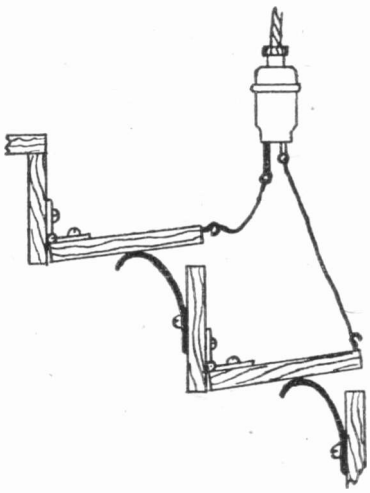


FISH WIRE AND DRILL

Much time is frequently lost on wiring jobs in fishing wires. This may be avoided to some extent by the use of the drill shown. In using it, drill the hole, slip the end of the wire through the fish hole at the point of the bit, pull out the bit and the wire is drawn through the partition with it.

Steps Turn off Cellar Light

The accompanying drawing shows a way to prevent the waste of current by leaving the basement light burning. Two steps near top of the stairs are hinged at the backs and capable of moving up and down about one inch at the outer edge. Hung above them near the side wall is a pull chain socket switch which is connected to control the basement light.



STAIR STEP SWITCH

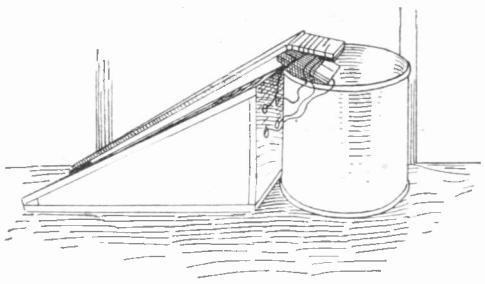
Two eyes are screwed into the outer corners of hinged steps and connected by stout strings to the two "pulls" of the switch. Then on going down stairs the upper hinged step is first pressed down but does not operate the switch as it is already in "off" position. On stepping on the lower hinged step, however, the "on" position of switch is pulled out, thus turning on the light. On coming up the operation is reversed.

While the drawing shows two adjoining steps hinged there should be one solid one between, otherwise at the instant of stepping from one to the other the weight will be partly on both, thus breaking the strings or straining the pull switch.

Two small spring strips serve to lift the weight of the steps after the operator's weight is removed. Two pieces of an old clock main spring will do for this.—JAMES P. LEWIS.

Electrical Rat Trap

The latest of the many forms of rat traps to have been devised is one constructed by Millis Knickerbocker of New Lenox, Ill. A wooden box with an incline cover is placed beside a deep tin can with perpendicular sides. At the end of the cover is a hinged platform held in place over the can by springs. This platform is connected by a copper wire with one side of the primary circuit of an induction coil, and two dry batteries are located inside the box. A small hook to which bait is fastened is attached in front of the platform. The only way in which the rat can get to the attractive morsel is by way of running up the incline cover and onto the platform, which is immediately pressed downward by the weight of the rodent's body. The downward move of the platform to the shelf under it, to which the other side of the primary circuit is attached, causes the primary circuit connection to



RAT TRAP

be closed. The electrical current which is suddenly developed by the secondary winding is then sent into a pair of copper wire windings on the platform. This gives the rat a severe shock and hurls it into the tin can, from which no rat can escape. The platform springs back into place just as soon as the rat leaves it.

Elementary Electricity for Practical Workers

By W. T. RYAN

This important series of articles, after a brief historical introduction and statement of elementary laws and principles, will be devoted to industrial uses of electricity and extend to such subjects as calculation of wiring, discussion of circuits, handling of dynamos, motors, storage batteries, arc lamps, wireless apparatus, etc. The author, who is Assistant Professor of Electrical Engineering, of the College of Engineering, University of Minnesota, will handle this subject in a manner to be of the most benefit to the practical electrical worker. In fact, it will be a "Plain English" series with mathematics, where used, of the very simplest kind.—Editorial Note.

Chapter I — Historical Sketch

Since it is a matter of experience that nothing will fix a fundamental principle better than *rediscovering* it in its own environment, and since every engineer should know something about the history and romance of his profession, the writer proposes to take up at the outset, very briefly, the history of the development of electrical engineering. Most of the fundamental magnetic and electrical principles were discovered quite by accident, by men who were groping about in the dark for an invisible something just as many men are doing to-day.

A study of the history of electrical engineering shows that it may be divided roughly into three periods: (1) The period of mystery, from the beginning up to 1600; (2) The period of scientific investigation and preparation, from 1600 until about 1873; (3) The commercial epoch from 1873 to the present time.

Period of Mystery—B. C. to 1600

This period has been so named by Professor Norris of Cornell University because of the attitude of the people toward the few known phenomena at this time.

The Chinese are said to have made use of the permanent magnet as a compass several thousand years B. C., and the Greeks are supposed to have used the loadstone at the siege of Troy about 1000 B. C. The first authentic knowledge we have, however, of the use of the compass is by Dutch mariners about 1100 A. D. In 1576 the "dip" of the compass needle was discovered by a compass maker who found it necessary to weight down the south seeking pole.

Knowledge of static electricity dates back before the Christian era. Early Greek and Latin writers described the property which amber possesses, when rubbed, of attracting and repelling light bodies. The word "electricity," invented by Gilbert, is derived from the Greek word meaning amber.

The only practical use made of either electricity or magnetism up to the end of this period was the mariners' compass. The relation of electricity and magnetism was not even suspected.

Period of Scientific Investigation and Preparation—1600-1873

In 1600 Dr. William Gilbert, advisory physician to Queen Elizabeth, published his chief work, "de Magnete," containing the results of his laborious and expensive research. He collected and absorbed the knowledge of his time, corrected and verified numerous hypotheses, disproved a number of fallacies and put the study of electricity and magnetism on a sound scientific basis.

An epoch was made in the science of electrical engineering by Stephen Gray who rediscovered that certain bodies had the power of conducting electricity and that others had not. He divided materials into the two great classes—conductors and non-conductors.

The Leyden jar was invented by a monk named Kleist in 1745. It was called a Leyden jar because of the fact that it was invented and tried in Leyden.

In 1752 Benjamin Franklin demonstrated that lightning and electricity are one and the same thing by means of his famous kite experiment.

In 1767 in a paper read, probably at Paris, Sulzer added in a footnote the following remarkable passage:

"If two pieces of metal, the one of lead and the other of silver, be joined together in such a way that their respective edges may form but one plane, and if they be thus placed on the tongue, a taste will be perceived quite similar to that of vitriol of iron; nevertheless, if either of these pieces of metal be separately applied no vestige of such a taste is left. It is not probable that by the junction of these two metals any solution of either occurs, or that the dissolved particles insinuate themselves into the tongue. It must, therefore, be concluded that the junction of these two metals causes in one or the other, or in both, a vibration of their particles, and that this vibration necessarily affects the nerves of the tongue and produces the taste mentioned."

It was probably between 1760 and 1790 that Dr. Luigi Galvani first made the discoveries which have made him celebrated. He was struck by the muscular contraction of the frog when its bare muscles were touched by two metals in contact at the ends away from the frog. He tried to account for his observations by assuming that the nerves of the animal body formed a kind of Leyden jar, which was discharged by the metals whenever they were brought in contact.

Professor Alessandro Volta at first agreed with Galvani, but his own experiments soon led him to change his opinion. Volta explained the action of the frog as due to the metals in contact with the frog's muscles generating electricity whenever their outer ends were brought in contact.

Sir Humphry Davy of England in 1802 with the aid of a large number of voltaic cells heated a platinum wire to a white heat and produced an arc between carbon points. The invention of the electric light indicated very forcibly the practical possibilities of the then rapidly developing science. In 1807 Davy also produced chemical decomposition by means of electric currents.

In 1820 Professor Hans Christian Oersted of Copenhagen accidentally discovered that a magnetic needle or compass could be deflected by a galvanic (or voltaic) current of electricity, the compass needle tending to place itself at right angles to the conductor in a definite direction. The experiment illustrates the electro-magnetic effect between a current and a magnet and was the first proof that electricity and magnetism are related to each other.

Note at this point that experimenters had currents of electricity at their disposal in 1800. Therefore it was 20 years before some one accidentally brought a compass near a wire carrying current and noted the effect on the compass

One week after Professor Oersted's discovery, André Marie Ampère of Lyons, France, discovered that two parallel conductors carrying a current mutually attract or repel one another, attracting when the currents are in the same direction and repelling when in the opposite direction.

In the same year both Davy and Dominique-François Arago of Paris discovered that magnetism could be produced in iron and steel by electric currents.

In 1825 Arago performed his well known experiment in which a metal disk was revolved before a magnet. He found that the magnet tended to follow the disk.

In 1826 the law of the electric circuit was discovered by Dr. Ohm by noting that the effect of the current from a battery varied as the resistance of the circuit, and also that when the same resistance was used that the effect varied as

the number of cells in series; that is, with the voltage.

Michael Faraday of London (a green boy who was picked up by Davy and who was later hindered considerably in his work because of the jealousy of Davy's wife) became very much interested in what was going on in Davy's laboratory and in 1831, after five years spent in experiments to prove it, announced his discovery of the electro-magnetic induction of currents. His first experiments related to the production of currents in a coil by means of currents stopped or started in a neighboring coil; hence the prototype of the modern transformer. His next step was to rotate coils of wire in strong magnetic fields, thus producing the prototype of the modern dynamo.

In 1833 Faraday discovered and stated the laws of electrolysis.

In 1834 Gauss and Humboldt organized the German Magnetic Union and began observations for the purpose of investigating the course of terrestial magnetism and its changes. It may be of interest at this point to note that now some people believe that the earth is an electro-magnet instead of a magnet, and that our terrestial magnetism is caused by currents of electricity flowing around the earth from east to west, the cause of these currents being the sun.

In 1836 Daniell invented the two fluid primary cells which bear his name.

In about 1837 Professor S. F. B. Morse of Massachusetts introduced the telegraph, in which the attraction of an armature produced dots and dashes on a moving slip of paper.

In 1830 Maritz Herrman Jacobi constructed an electric motor which he used to propel a small boat on the river Neva. The source of power was primary batteries.

In 1845 Wheatstone and Cooke patented the use of electro-magnets instead of permanent magnets for dynamo electric machines.

In 1845 Faraday found that a polarized ray of light is affected by a magnet, thus establishing experimentally the electro-magnetic character of light, and as he expressed it, that magnetic force and light have relation to each other.

In 1848 Jacob Brett suggested the principle of the self exciting dynamo.

In 1851 Faraday discussed and defined lines of magnetic force; also expressed the opinion that the term "line of force" should be used to express not only the direction of the magnetic force, but also the quantity (which it now does).

In 1856 C. W. Siemens patented the famous shuttle wound armature invented by Werner Siemens.

The modern storage battery dates back to 1860 when Gaston Planté produced spongy lead and lead oxide sheets by the action of currents. The positive plates in many of the storage batteries now made are of the Planté type.

In 1866 and 1867 the first self exciting machines were built by Siemens and Wheatstone. Siemens built a series machine and Wheatstone a shunt generator.

In 1870 Gramme produced a dynamo with a smooth core ring armature entirely and uniformly covered with wire connected to a commutator having a large number of commutator bars. This was a fairly good direct current machine.

COMMERCIAL EPOCH

About this time capitalists began to see the possibilities of the commercial applications of electricity and the science began developing so rapidly that it is almost impossible to follow it. Just a very brief synopsis of the important discoveries and inventions since 1873 will however be given.

The principle of transmitting power from one dynamo to another used as a motor was exhibited at the Vienna Exposition by Fontaine and Brequet in 1873. This exhibit marked the beginning of the commercial use of electricity.

In 1873 Wilde devised a practical type of separately excited alternating current dynamo.

In 1873 Professor Henry Rowland discovered the law of the magnetic circuit and made some discoveries regarding permeability.

In 1876 Professor Alexander Graham Bell invented the telephone. His crude form of telephone contained the fundamental principles of the present receiver. He exhibited it at the Centennial Exposition.

In 1878 Charles F. Brush introduced his open coil constant current dynamo for use on series arc lamp systems.

In 1879 Thomas A. Edison placed the incandescent lamp on a commercial basis, having produced a durable carbon filament operating in a vacuum.

In 1880 Thompson and Houston introduced their arc lighting dynamo.

Stephen D. Field and Thomas A. Edison constructed an electric locomotive and exhibited it in 1883. About this time Frank J. Sprague, then a midshipman in the United States navy, became very much interested in electric railway work. He is one of the most prominent of the pioneers in the movement.

In 1880 Nikola Tesla patented the induction motor. The patents were acquired by the Westinghouse company. Alternating current distribution at 2,000 volts came into use about this time.

In 1890 a transmission plant was installed at Telluride, Colorado, employing Westinghouse single phase alternators of 100 horsepower, the largest then made. The potential was 3,000 volts.

In 1895 X-rays or Roentgen rays were discovered, also many electro-chemical discoveries; also the beginning of extensive hydro-electric developments utilizing high tension, polyphase alternating current for transmission.

In 1900 a 25,000 volt, three phase transmission line was run from Apple River, Wisconsin, to St. Paul, Minnesota. Part of the line was of paper and rubber insulated cable, under ground.

In 1901 the Cooper-Hewitt mercury vapor lamp and the alternating current rectifier were brought out.

In 1902 the first wireless message was sent across the ocean.

In 1903 the Nernst lamp appeared. (Also marks the advent of Wright Brothers' flying machine.)

In 1904 the International Electrical Congress was held at St. Louis. In 1905, the tantalum and other high efficiency lamps were introduced. In 1906, the New York Central direct current electric locomotives were put into regular service. In 1907, tungsten incandescent lamps were in general use; also New York, New Haven and Hartford alternating current single phase locomotives were placed in service. Flaming and magnetite arc lamps were produced. In 1908, the Great Northern three phase electric locomotives were placed in service in the Cascade tunnel. In 1909, wireless telephony became successful for some distance. In 1910, the Pennsylvania direct current locomotives with side rods and with the motors mounted on a deck were used. In 1911, wire type tungsten and incandescent lamps, giving 20 candlepower for 25 watts were produced, creating a new era in the electric lighting industry.

In 1912, at least ten 110,000 volt transmission lines were in successful operation, and both the Westinghouse company and the General Electric company announced their successful construction of 60 cycle, 500,000 volt transformers. One of the above companies is building a 1,000,000 volt transformer. The Allis-Chalmers Company, of Milwaukee, Wisconsin, is building transformers for the Nevada-California Power Company's 150,000 volt transmission line. The transformers are rated at 87,000 volts and three of them are to be connected in star to give a line pressure of 150,000 volts.

The Usherless Theater

By THERON P. FOOTE

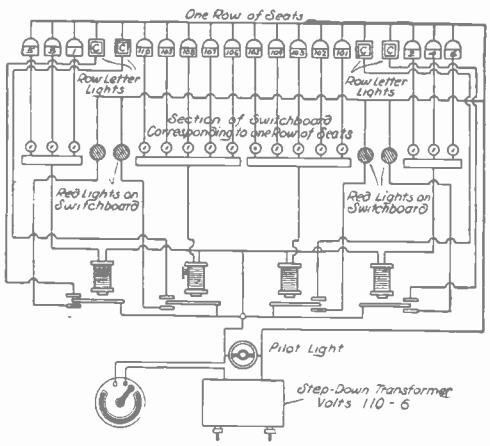
Ushering is an expense every theater manager would like to avoid. But it has always been assumed, and perhaps rightly, that the theater patron is not competent to find his own seat even when the section, row and seat numbers are plainly written on the cardboard stub which is torn from his ticket and handed to him as he enters the door. Indeed, scarcely anyone is prepared to take the initiative in this matter and we all invariably wait until the usher has shown us clear to the right row, and then, even, if he fails to turn down the seat itself we are more or less "up in the air" and are apt to ask several excited questions before we finally are placed.

All this is largely a matter of education. We have been taught by the theaters that in this one place, at least, we are not capable of looking for ourselves, and we have grown to believe it.

But now that there are automatic photographing machines, automatic restaurants, automatic telephones and automatic this, that and the other, perhaps people have arrived at a state which would permit them to take readily to an automatic, or rather an usherless, seating arrangement in a theater and one is here presented which would work if patrons would become familiar with it and "keep their heads." A wiring system for this purpose, although a considerable expense when the theater is built, would, by saving usher service, be able to pay for itself.

Cables of wires are laid from each row of seats on the main floor and balconies back to a booth under the vestibule. Directly over this booth in the main vestibule is a switchboard laid flat in the form of a table, the sides being all boarded in to enclose switches and wires running to the booth below.

To illustrate the operation of the equipment suppose a party of three to enter. The ticket taker at the door calls out as he tears off the seat stubs, "Right aisle—parquet—C 101-2 and 3." The man at the switchboard, which is near the ticket taker, presses buttons corresponding to the seats called for. The persons pass down the right aisle until they reach a row of seats at the end of which is a small illuminated box having glass faces on which is the letter "C." If this row-letter-box is on the right of the aisle they give attention to



ELECTRICAL CONNECTIONS FOR ONE ROW OF SEATS

the right hand row of seats. If the left hand row-letter-box is illuminated they seek seats in the row at the left of the aisle. Passing along the row they come to seats on the backs of which small lamps are burning. Upon sitting down these lamps go out as does also the row-letter-box lamp. The man at the switchboard has nothing to do with turning out the lamps—this is done by the turning down of the seats—he merely turns on the lights for each seat called. In large theaters when the rush is on two men might preside at the switchboard or even three and still there would be a saving of a dozen or fifteen ushers.

Seats can be provided such that electrical connections can be made at a bolt from each of the two legs under the floor. The embedded lamp on the back of the seat is wired in series with the seat switch so that the lamp burns when the seat is up and the operator at the switchboard has turned the proper switch but goes out when the seat is down.

Referring to the diagram, the light circuit enters the underground booth and passes through a step-down transformer. One side of the low voltage line connects in common one side of every seat in the house. The other low voltage wire is common to one side of every magnet in the controlling apparatus of the row-letter-box lights. From the remaining side of each seat a wire is run to the switch on the switchboard corresponding to the seat number.

Suppose there are sixteen seats in the first row; three on the left of the left aisle, three on the right of the right aisle and ten between the two aisles. Four row-letter-boxes will be needed, two in each aisle. Divide the switches corresponding to the ten seats which are between the two aisles into two sets, five in each set, and place a common contact or busbar under each set thus making four busbars needed for each row. Each busbar is connected with a magnet in the booth below. The armatures under the magnets control the row-letter-box lights. From the top contact of the armature under the magnet which is connected from the busbar corresponding with the three seats on the left of the left aisle runs a wire connecting the remaining side of the row-letter-box light on the left of the left aisle. When a switch, corresponding to a seat on the left of the left aisle in the first row is pressed current passes from one side of the transformer through the seat switch (if the seat is up) and lamp on the back of the seat, back through the switch which was pressed on the switchboard through the busbar and through the magnet which controls the row-letter-box on the left of the left aisle back to the transformer.

The current passing through the magnet draws the armature to the top contact and current then passes from one side of the transformer through the armature and top contact to the light in the row-letter-box and then back to the transformer.

As soon as the seat is pushed down the first circuit is broken, putting out the light on the back of the seat and cutting off current entering the magnet, which drops its armature and breaks the row-letter-box light.

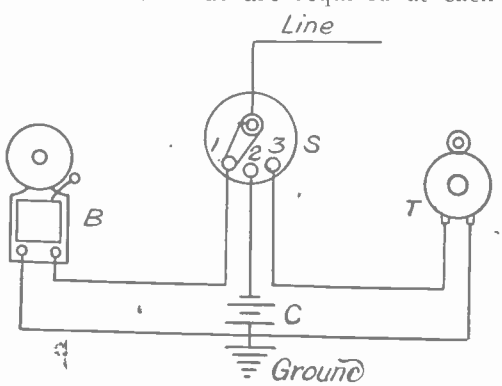
Should more than one seat switch be pushed down, all seats corresponding to switches must be down to cut out the circuit from the magnet which releases the light in the row-letter-box.

On the main switchboard miniature lights, preferably red, may be embedded, occupying the positions of the row-letter-boxes. One side of these lights may connect to the transformer and with the lower contact of the armature which works from the magnet in control of the corresponding row-letter-box light. Then on the switchboard, all red lights being on, when a switch button is pushed the light on the back of the seat corresponding to the button goes on, the light in the row-letter-box situated nearest the seat goes on and the red light on the switchboard goes out. As soon as the seat is pushed down, the seat light goes out, the row-letter-box light goes out and the red light corresponding to the row-letter-box goes on.

Simple Telephone System

The following is a description of a simple and cheap telephone system, which will operate successfully up to a distance of one mile. Its use will be convenient between house and garage, house and shop or for similar short distances.

In the diagram, (S) represents a three point wooden base switch, (B) a door bell, (T) a pocket telephone receiver, and (C) one or two cells of battery. The diagram represents a complete set of instruments such as are required at each



CONNECTIONS FOR SIMPLE TELEPHONE SYSTEM

station. The system requires but a single line wire, the gas or water pipe being used as the ground return.

The normal position for the switch is on point (1). To call up, move switch to point (2), letting it stay there a short time. Then move it to point (3), and take up the telephone receiver. While the switch is on point (2) the bell of the party called is ringing. To answer, the party called moves his switch to point (3) thus completing the talking circuit. When through talking both switches must be returned to point (1). The telephone receiver is used both to talk into and for listening. This may readily be accomplished by placing it in front of the mouth to talk, and moving it to the ear to hear the reply.

This system may be extended to three or more stations by using a definite number of rings for the call of each station. The number of cells of battery required depends upon the length of the line. Two cells will generally be sufficient. The total cost of apparatus for one station, without the battery is about one dollar.—J. W. BACON.

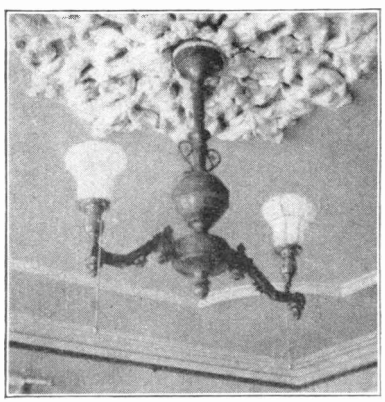
Converting Gas Fixtures to Electric

Some time ago the gas works in this village went out of business and the users of gas permanently abandoned the use of the system and adopted electricity for lighting purposes.

As a wiring contractor, I have very often talked with customers who said, "Why can't I use my old gas chandeliers?" They argued that their gas fixtures were in perfectly good condition and thought they could be used just as well for electricity as for gas.

As a consequence, I have sometimes wired these gas fixtures and the result has always been satisfactory.

The accompanying illustration shows one I fixed recently and a glance is convincing of the practicability of it. I drilled holes in the pipe for the entrance and outlet of the wires; added an in-



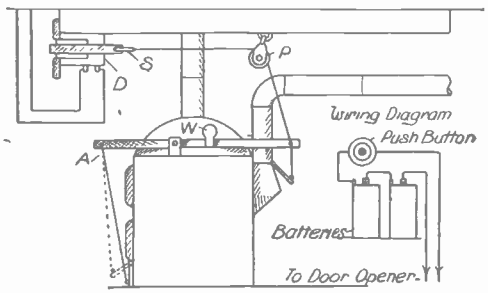
GAS FIXTURE CONVERTED TO ELECTRIC

sulating joint; put one-eighth inch sockets on the same nipples the gas burners were on; pushed in the fixture wires; connected them precisely as if it were an electric fixture direct from the shop; assembled, and the thing was done, ready to pass inspection.—M. S. LOKE.

Control for Steam Heating System

In houses heated by individual steam heaters the temperature of the buildings is quite low about six or seven o'clock in the morning of a winter's day, and some little time must elapse after the drafts are turned on before the pipes and radiators become filled with steam.

Persons of an electrical or mechanical turn of mind need have no more discomfort on this account. The arrangement shown in the drawing will turn on the drafts and insure a warm house when the occupant is ready to get out of bed.



CONTROL ARRANGEMENT FOR HEATING SYSTEM

The device consists of an electric door opener (D), such as is used in apartment buildings for opening the main entrance door. This is secured to a beam or to the cellar ceiling near the heater. A strip of heavy metal (S) is bent in the form of a hook and this engages the movable member of the door opener. A length of picture wire is fastened to the end of the hook and passes over a pulley (P), connecting to the arm (A), which controls the movements of the drafts.

At night the hook (S) is drawn over and engages the door opener, thereby lifting the back draft and closing the one in front of the heater.

When the alarm clock rings in the morning it is merely necessary to press a button located near the bed, after turning off the alarm clock, and the door opener releases the hook, which in turn operates the drafts which are moved by the weight of the ball (W). The door opener should be released about 45 minutes before rising time.

The wiring diagram shows the method of connection, two or three dry cells being used to actuate the door opener.

This arrangement can be applied to any type of heater. The writer has had it in use for some time with considerable satisfaction.—A. B. COLE.

The Tree System

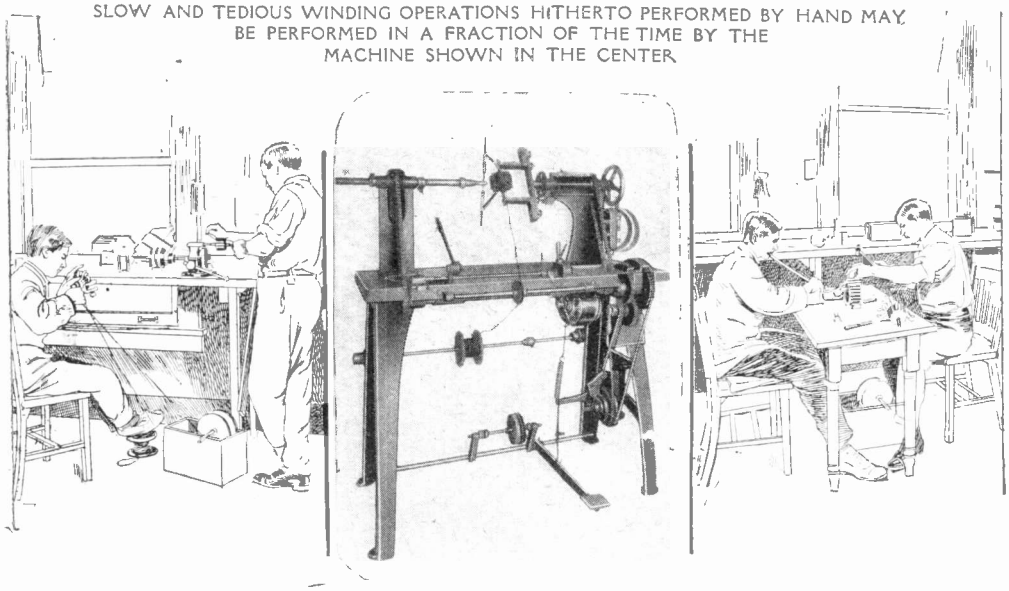
In the early days of electric lighting, the "tree" system was the common method upon which electric wiring and distribution were carried out. In the tree system, branch circuits are tapped from the trunk mains, and small branches are tapped from the main branches, hence the name "tree" system.

Nowadays, a branch is known technically as that portion of the circuit where the section of the conductor is reduced. Hence, if a conductor is reduced in a straight run, the reduced portion is a branch, just as much as if it had been tapped or branched off the trunk main. A tapping, however, is not technically a branch if the size of conductor is the same as that from which it is tapped; the reason for this distinction being that, according to modern wiring rules, every "branch" must be protected by a fuse. The "tree" system is still used for the distributing networks of public supply systems, also for collieries, exhibitions, and scattered installations of a like character, but is practically obsolete for interior wiring. The objections to the system are: That the pressure on the lamps is not uniform; that, with a varying number of lamps in circuit, the pressure cannot be maintained even approximately constant at the lamp terminals; that a fault on the system is difficult to localize, and that a short circuit on a branch may cause a main fuse to blow."—FRANK BROADBENT.

Coil Winder

In shops where coils are wound for armatures, fields, heating elements and the like, the work must be done by hand.—a slow process—or else special machines must be constructed to fit each particular class of work. An almost human machine that will wind wires on almost any electrical device manufactured, as represented by the International winder, will immediately interest any one having this class of work to do. There is all the difference in the world between

SLOW AND TEDIOUS WINDING OPERATIONS HITHERTO PERFORMED BY HAND MAY BE PERFORMED IN A FRACTION OF THE TIME BY THE MACHINE SHOWN IN THE CENTER



winding a drum armature and a ring armature. Yet so flexible is the machine that in a few moments it may be adjusted to do either. In addition it winds solenoid coils, transformer fields and induction coils; even more, it embodies an adjustable coil form, a very simple device which, attached to the winder, actually forms up the coils, after they are wound, to any desired shape.

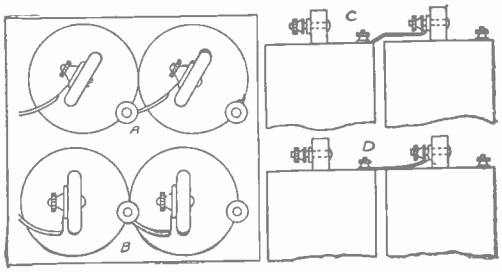
The work when done is neater and more accurate than hand work and in many cases it can be accomplished in one-tenth the time. A small motor of one-eighth horsepower suffices to operate the machine.

Boxing and Connecting Dry Cells

It is sometimes desired to place dry cells in a battery box and in many instances when this is done the cells are not properly arranged and are also crowded too tightly against one another, says *Telephony*.

In the diagram (A) shows the right and (B) the wrong way of placing cells when connecting them in series in the box. As placed in (B), the binding post on the zinc of one cell comes in contact with the neighboring cell. If through jarring or jostling the paper jacket of the latter cell is worn through at the point of contact, this cell will be subjected to a dead short circuit and ruined. Short circuits are much less likely to occur if the cells are placed with the positive and negative terminals out of line as in (A).

Insulated connectors or wires should always be used for connecting cells to form a battery. (D) illustrates a condition which often exists when bare wires are used for this purpose. Initially, as shown in (C), the connecting wire is carefully raised above the zinc can. However, through accident the wire may



CONVENIENT DRY CELL BOX

be depressed until it touches the rim of the zinc, in which case the cell indicated is short circuited.

Motor and Brake Attachment for Sewing Machines

The following is a description of an electric motor and brake attachment for an ordinary sewing machine. The accompanying drawings show the details and general arrangement of this attachment.

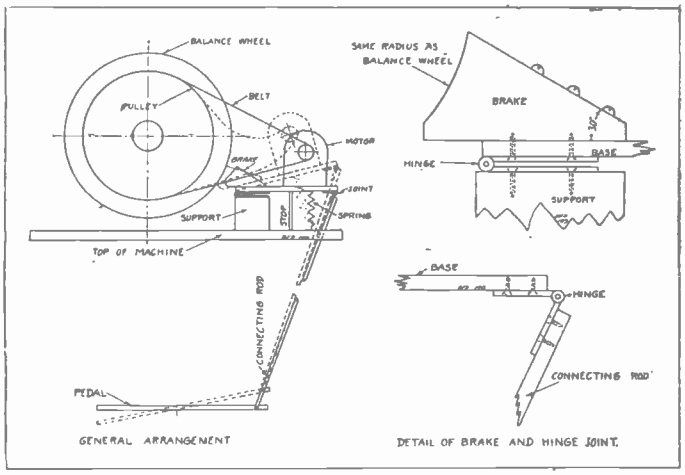
The machine can be brought to an instant stop by simply pressing on the foot pedals, which loosens the belt and applies the brake simultaneously.

In the drawing showing the general arrangement, the small motor base is fastened to the wooden support with a strong, wide, brass, spring hinge. A stop is placed so as to prevent the base from falling too low. The brake is screwed to the base and placed so as to clear the balance wheel by ¼ inch. Screw down the motor and place the belt in position.

The old connecting rod is replaced by a longer one which fastens to the motor base with a small hinge. See details. The tension hinge may be used if no large spring hinge takes the place of a plain strap hinge.

Pressure on the foot pedal is transmitted by the connecting rod to the motor base, which raises the motor base and throws the motor forward, thus loosening the belt and applying the brake. The motor can then run free or be shut off with a switch that is placed in a convenient place.

In the general arrangement the full lines show the running position and the dotted lines show the position when the pedal is pressed.



SEWING MACHINE MOTOR AND BRAKE

Colored Lacquer for Lamp Globes

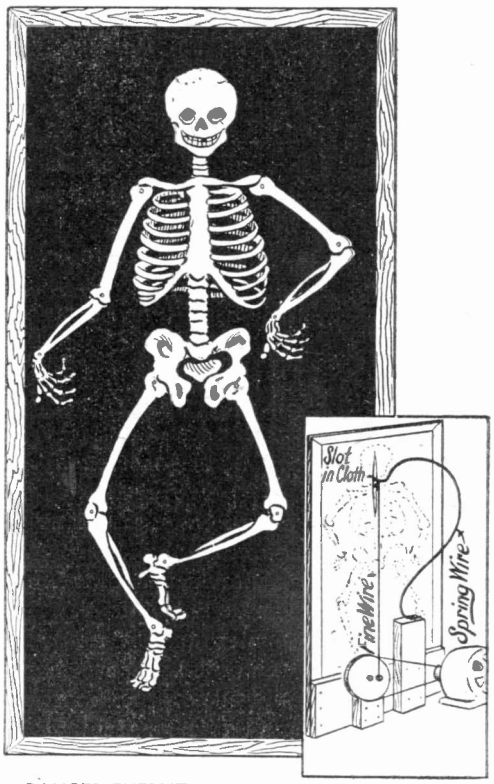
One of the great difficulties that has been experienced with lamp lacquer in the past has been due to the checking and cracking resulting from the expansion and contraction of the glass. A new lamp lacquer which has the same coefficient of expansion as the bulb itself, thus eliminating this very disagreeable trouble, has been put upon the market under the name—Mazda Weatherproof Lamp Lacquer. Another special feature of this product is the fact that the colors positively will not fade.

The cost of applying this coloring to the lamp is reasonable and the color effects that can be secured are excellent. It is furnished in six standard colors; amber, canary, red, blue, green and

white. These colors are remarkably brilliant and any number of tones may be procured by blending the different standard colors.

The Mysterious Skeleton

A mysterious skeleton that dances everything from the "Highland Fling"



DANCES EVERYTHING FROM THE HIGHLAND FLING TO THE GRIZZLY BEAR

to the "Grizzly Bear" was the unique and clever attraction which drew much attention to a store window in a Pacific Coast city.

A large frame was covered with black cloth and against this was hung a skeleton made of cardboard, fastened together with wire at all the joints. Behind the frame was the mechanism which caused the skeleton to dance so gleefully.

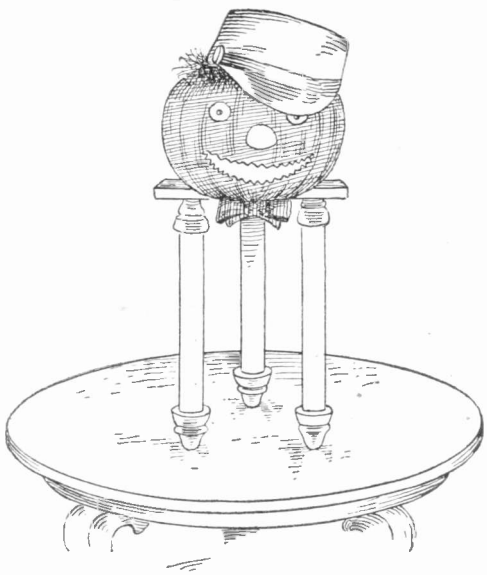
The skeleton was hung on a long spring wire which protruded through a slot in the black cloth just behind the head. This slot was not visible from the front. From the top of the spring wire was run a small wire to a wooden wheel below, which was about eight inches in diameter. The wheel was turned with a belt by a small motor. The smaller picture shows the construction from the rear.—H. O. BUNNELL.

The Talking Pumpkin

The illustration shows a figure which attracted considerable attention at a recent electrical exhibition. It consisted of a life-size imitation jack-o'-lantern mounted on three large glass pillars cemented at either end to brown porcelain high tension insulators.

At specified times during the day the pumpkin would break the silence and answer questions and crack jokes with the mystified spectators who invariably gathered around his enclosure.

The secret of the device lay in an especially designed dictaphone placed inside the hollow head and connected to a distant operator by concealed wires. Fine, tightly drawn conductors passed in vertical lines through tiny holes in the insulators and pillars and concealed grooves in the table legs to the floor below.



THE TALKING PUMPKIN

Electrical Securities

By "CONTANGO"

The Balance Sheet and What It Means — Assets

In studying any corporation security the balance sheet is the first exhibit to which attention should be given. Briefly, the balance sheet is a statement which shows the financial condition of a given company at a given date, usually the last day of the particular company's fiscal year. It is a showing of assets and liabilities—in other words a statement of what the company owns and what it owes.

Broadly speaking there are three kinds of assets and three kinds of liabilities, usually described as follows: capital assets, current or quick assets and deferred assets; capital liabilities, current liabilities and deferred liabilities.

CAPITAL ASSETS

Capital assets, or, to give them another name which explains itself, "fixed" assets, consist of the things which go to make up the physical property necessary to the everyday running of the business and other things acquired for purposes of more or less permanent investment.

Property Account.—Under this head come naturally the company's plants and equipment or machinery, its real estate, buildings and the like. Usually these items and the amount they represent are set down in the balance sheet without further explanation. In such cases the amounts may be presumed to represent the actual cost of the properties. If, however, the item reads "Value of" real estate, plants, etc., the basis of the valuation should be ascertained as well as the experience and general character of the appraisers responsible for the value placed on the property.

Intangible Assets.—In the accounts of industrial companies, usually under the caption "Capital Assets," is frequently found a sum represented by good will, patents, trade marks, etc.

This may or may not represent fictitious value, for in trade a thing is of value when it commands a price. The fact must not be lost sight of, however, that many substantial going concerns do place a value on good will, etc., and capitalize it. But the investor in such cases should take carefully into consideration the personnel of the management and the soundness of the organization in all particulars.

Some of the well established companies do not attempt to figure in such things as among their assets. For example a great electrical manufacturing company of this country and England, with all its vast business good will and undoubtedly valuable patents, etc., sets their value at just one dollar. For the reason that such assets are spoken of as intangible, it therefore goes without saying that a company whose intangible assets form the larger part of its total assets is not put together as it should be. Other assets more or less intangible, and which should be inquired into carefully to determine their real value, are sometimes shown as organization expense, charter, leases, licenses, contracts and the like.

On the other hand under the head of "Capital Assets" there would legitimately come any securities represented by stocks and bonds in other corporations.

If a company has large security holdings outside its own as compared with its other assets, the character of such holdings should be looked into and their yield as to dividends and interest in relation to the price paid for them when purchased. It has happened that the failure of such companies has in the past proved the undoing of the big concerns holding their securities. Default of interest or failure to pay dividends on securities owned by

one corporation as investments in another is a serious matter. It does not, however, concern so much the electrical system of financing, as in the main this is a matter of holding, and therefore guaranteeing, companies directly responsible for subsidiary companies.

QUICK ASSETS

These include bills receivable and accounts receivable, cash on hand and in bank and any property such as stocks of merchandise which might be turned into cash at short notice, always excepting permanent assets forming part of the "Capital Assets." As a general proposition public utility companies do a cash business, so there is not much to be written off or placed on the liability side of the balance sheet under the definition of "bad debts." But in considering these quick assets such items as advances to subsidiary companies must not be considered, for they may or may not be paid promptly.

Materials and supplies might be considered under this head and usually are, but it would be well to ascertain how they have been rated, whether at the current market value, if that is less than what they cost, or at cost if the cost was less than the market value at the time of issuing the balance sheet. Moreover, if the material is of a speculative character so far as price is concerned, as for example copper, low quotations should be considered when determining their value.

No stocks or bonds may be considered in quick assets except those purchased temporarily for the purpose of using idle funds, but even should the amount warrant their being classed as permanent investments then the same principle as to valuation applies as to materials and supplies—their worth must be considered in the light of market quotations, and if, since the time they were purchased, there has been an advance in price, then wide allowance must be made for a decline. This is merely conservative financing.

DEFERRED ASSETS

This term is used to express an asset which is neither quick nor capital. It is usually meant to apply to advances made to subsidiary companies and other outlays of money of a like character, such as money put out in construction or advanced for taxes, etc. The value depends on the purpose, and, in the case of money spent on subsidiary companies, the strength or lack of strength of these subsidiary companies. But without looking upon this as a separate line of investigation it may be suggested that "Deferred Assets" must be considered to represent a very certain actual value to be considered assets at all. Interest charges for subsidiary companies before they have been properly developed sometimes come under this head.

Treasury stock or bonds can never really be considered as quick assets. By this term is meant amounts of stocks or bonds authorized but never sold, or which may have been purchased by the company itself and made a part of its sinking fund. The change in price whether up or down certainly prevents their being placed in the category of "Quick Assets." This will give a fairly comprehensive idea as to what may be considered a corporation's assets, taking them by and large, as the saying is. In a subsequent issue it will be the purpose to throw an equal amount of light, and more if possible, on "Liabilities" in all their aspects. After that the source of a company's revenue or income, that is, its earning power, will be dealt with and considered in detail from the investor's standpoint.

(To be continued.)

List of Selected Bonds showing Income Yield

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

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

BONDS TO YIELD FROM 4.70% TO 6.00%

New York & Westchester Lighting Co. General 4% bonds. Mature 2004.	Yield about 4.70
Scranton Electric Co. First and refunding 5% bonds. Mature 1913-37.	Yield about 4.78
Watertown (N. Y.) Light & Power Co. First 50-year gold 5% bonds. Mature 1959.	Yield about 5.00
Western United Gas & Electric Co. First and refunding 5% bonds. Mature 1915-50.	Yield about 5.00
Binghamton Light, Heat & Power Co. First 5% bonds. Mature 1942.	Yield about 5.00
Port Huron Light & Power Co. First 5% bonds. Mature 1911-21.	Yield about 5.00
Rockland Light & Power Co. First 5% bonds. Mature 1938.	Yield about 5.03
Central Main Power Co. First 5% bonds. Mature 1939.	Yield about 5.07
Claremont Power Co. First 5% bonds. Mature 1937.	Yield about 5.10
Kankakee Gas & Electric Co. First and refunding 5% bonds. Mature 1930.	Yield about 5.10
Chattanooga Ry. & Light Co. First and refunding 5% bonds. Mature 1956.	Yield about 5.22
Illinois Northern Utilities Co. First and refunding 5% bonds. Mature 1957.	Yield about 5.30
Indiana Railways & Light Co. First and refunding 5% bonds. Mature 1943.	Yield about 5.40
Jackson Light & Traction Co. First 5% bonds. Mature 1922.	Yield about 5.55
Brandon Gas & Power Co. First 6% bonds. Mature 1929.	Yield about 5.70
Central States Electric Corp. 5% notes. Mature 1922.	Yield about 5.75
Parsons (Kansas) Water Supply & Power Co. First 6% bonds. Mature 1922.	Yield about 6.00
Carolina Power & Light Co., Raleigh, N. C. First gold 5% bonds. Mature 1938. ($500.)	Yield about 5.60
Central States Electric Corporation, Cleveland, O. 5% secured gold notes. Mature 1922. ($500.)	Yield about 5.75
Consumers Power Co. of Minnesota, Chicago, Ill. First mortgage 5% gold bonds. Mature 1929. ($500.)	Yield about 5.75
Pacific Gas & Electric Company, San Francisco, Cal. General and refunding 5% bonds. Mature 1942. ($1,000.)	Yield about 5.50
Pacific Gas & Electric Co., Phoenix, Ariz. Sinking fund gold 6% bonds. Mature 1931. ($1,000.)	Yield about 5.80
Tri-City Ry. & Lt. Co., Davenport, Ia. First refunding 5% gold bonds. Mature 1930. ($1,000.)	Yield about 5.62
United Light & Railways Co., Chicago, Ill. First and refunding gold 5% bonds. Mature 1932. ($1,000.)	Yield about 5.60
Western United Gas & Elec. Co. First and refunding 5% bonds. Mature 1950.	Yield about 5.00
Searsport (Me.) Water Co. First 5% bonds. Mature 1927.	Yield about 5.00

working is signaled by bells and lamps, so that the proper point can be inspected. It is said that the well known electrical firm of Walder Bros. & Thomson are to take up the method on a large scale. —*l'Electricien, Paris.*

Bell System Proof Against Fire-damp.—A somewhat novel telephone method is being used on the Continent for mines where fire-damp occurs, and the object is to avoid all sparks that would be likely to explode the gas. Before this there were used telephones and bells mounted in tight boxes for keeping out the gas, but it appears that the gas still leaks in quite frequently so that some better method is to be looked for. As an explosion of the mine gas might lead to a very serious trouble, the matter is one which is worthy of the attention of inventors. M. C. Feder claims to have solved the problem by the use of an electric bell which works on alternating current, so that the magnet and clapper will vibrate without needing any break of the current, and no spark can occur in this way. At the other end of the line is mounted a magneto of novel design and in it the permanent magnets rotate and the armature with its coils is fixed. The wires come directly off the armature so that there is no slide contact and therefore no spark, and the usual commutator is suppressed. As to the telephone transmitter itself, it is found that the microphone does not produce dangerous sparks.—*Genie Civil, Paris.*

Huge African Power Project Near Completion—In the South African region there is being erected a large hydraulic plant by the Victoria Falls and Transvaal Power Company. It is located on the Vaal River at Vereenigung and will distribute current to quite a distance. The power house will have four large turbine and alternator groups of 15,000 to 25,000 horsepower size. This electric station lies some 35 miles south of the Rand, and the site was chosen on account of the hydraulic power which the river affords here, and besides there can be had a good supply of coal as an accessory to the water power. A long power line will bring the current up to the Rand. The wires for the 80,000 volt line are hung by suspension insulators from lofty steel towers using a very long span of 480 feet on the average. At present the work upon the line is well advanced and it will be completed before long. The line comes into the Robinson Central Deep transformer station, and here has been set up a new 80,000 volt transformer, so that the voltage is lowered and the current will be distributed from this point to the districts where it is needed.—*North African Journal.*

Gasoline-Electric Motor Cars.—The new Tilling-Stevens gasoline-electric motor bus is meeting with considerable success in London and other cities of England. While working on the usual lines of this system, that is, using the gasoline motor of the automobile to drive a small dynamo so as to give current for motors on the car wheels, there are a number of improvements which account for the good working of the new bus. Since it was first introduced some four years ago, the method proved excellent for heavy duty such as is required of the passenger bus in large cities. In London there are 200 busses of the kind in use or in construction, and no doubt this number will be increased as time goes on. In other parts of England a number of companies are adopting it for running motor bus lines in connection with the tramways. Quite lately there has been designed a 40 horsepower motor bus which will come into good use in mounting heavy grades in the hilly districts, and already a number of busses of this kind are being supplied for use in the city of Liverpool. These new cars weigh only 350 pounds more than the standard 30 horsepower bus which is now used in the London service. —*Engineering, London.*

New Galvanizing Process.—Iron objects are protected from rusting by galvanizing in an electric bath or by dipping in melted zinc so as to give a thin coat of zinc, by the well known process, but the zinc does not always adhere to the iron so that the layer peels off in spots and leaves the iron so that it will rust in the air. The new German process brought out by Engineer Lohmann is said to avoid this drawback, and the zinc penetrates into the pores of the iron so that it holds on fast. After cleaning the iron in an acid bath to brighten it, he dips it in a mercury salt so as to decompose the solution and give a deposit of metallic mercury on the iron. In fact it is a familiar experiment to give a bright coating of mercury upon a copper coin or other metal piece by dipping or rubbing with mercury salt solution, and the same method is used here. Thus the mercury enters the pores of the iron and gives a deep amalgam. He then puts the piece in an electric bath of zinc solution at a high heat and leaves it for three minutes. The zinc drives out the mercury and takes its place in the pores of the metal, thus adhering very tightly to the iron, and the microscope shows in fact that the zinc penetrates well below the surface. Such a layer is not likely to come off, and the iron is well protected from the weather.—*Zeitschr. für Schwachstr.*

Moving Picture Machine for the Home.—Several of the Paris firms are occupied with designing a moving picture machine of very simple and practical kind for the use of amateurs, especially with the idea of having them used in homes as an attractive and also an instructive amusement. The use of the metallic filament lamp now affords a strong light which will throw a picture on a good-sized screen, so that this does away with the arc light, which is harder to manage. In this way, added to the design of a machine at low cost so as to bring it within reach of amateurs, the new machines are likely to be a success. An ingenious idea is now applied by the Pathé company in this connection. The current for the lamp is given by the machine itself, using a small dynamo which the operator works by the crank at the same time as the rest of the mechanism, and this makes the whole apparatus self contained and will be very useful in cases where the house is not wired up. A brilliant light is given by raising the voltage on the lamp much above the standard, and while this burns it out in time, the lamp lasts at least for eight or ten hours, and is cheaply replaced. Safety is increased by the use of non-combustible celluloid films.—*Genie Civil, Paris.*

NEW BOOKS

PRACTICAL MATHEMATICS. By Claude I. Palmer. New York: McGraw-Hill Company. 1912. 176 pages with 31 illustrations. Price, Part III, 75 cents.

This book is the third of a series mentioned in the February issue, page 1125, and considers the subject of algebra and its applications.

OPERA STORIES. Boston: Henry L. Mason. 1911. 92 pages with 20 illustrations. Price, 50 cents.

Now that the talking motion pictures have arrived and will be placed before the public in a short time by two great booking companies, giving complete operas, there is increased need of such a book as this, which embodies short, concise stories of the great operas. The stories (divided into acts) tell of 132 operas and are embellished with fine portraits of the leading singers.

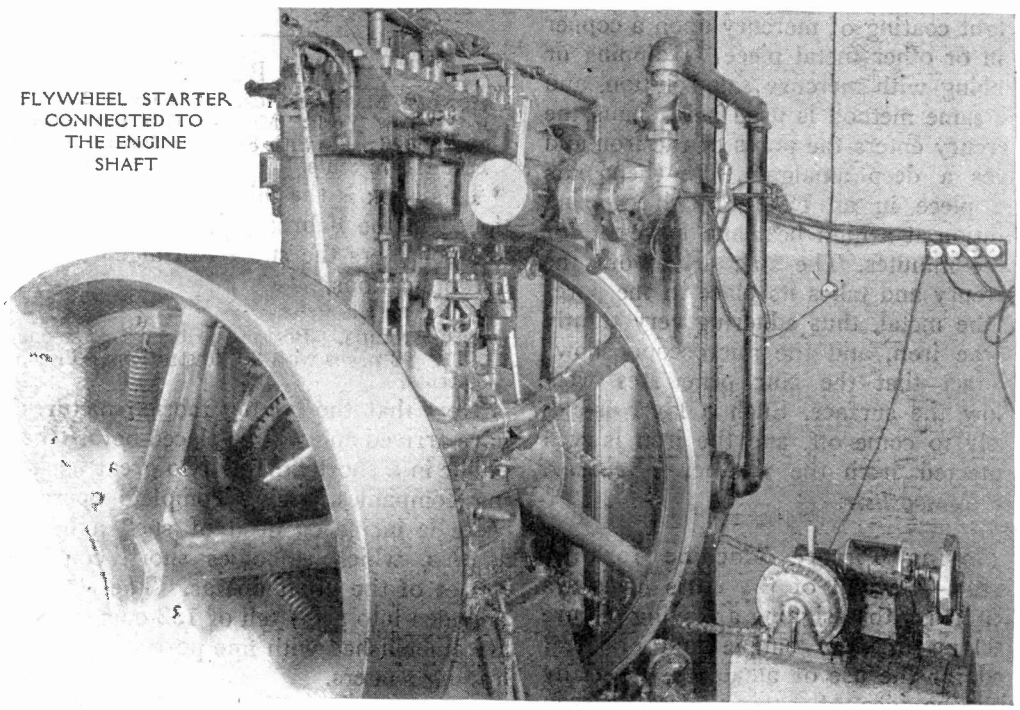
WIRELESS TELEGRAPHY SIMPLY EXPLAINED. By H. T. Davidge. New York: Spon and Chamberlain. 1912. 87 pages with 26 illustrations. Price, 25 cents.

A book in which wireless telegraphy is as simply explained as the number of pages and the technical nature of the subject will permit. A good book for the beginner or reader who wishes to obtain a general knowledge of the subject.

Flywheel Motor Starter

The starting of a gas engine, as everyone knows, requires the expenditure of a certain amount of mechanical energy; this for the reason that the combustible, together with the requisite amount of air, must be drawn into the cylinders and then compressed by the backward stroke of the piston before the charge can be exploded and start the engine to running of itself. This operation is most familiar in the laborious cranking of an automobile engine. In stationary engines, too large to crank by hand, the work is often done by a separate compressed air equipment, which is expensive and, if it fails to accomplish its purpose, puts it up to the engineer to try to start the engine by wrestling with the spokes of the flywheel, and taking a chance of being dashed through a cement floor or out through the roof, as the case may be.

Not long ago, an inventor, facing this problem in his own engine room, designed and patented the flywheel motor starter shown attached to the engine in the picture herewith.

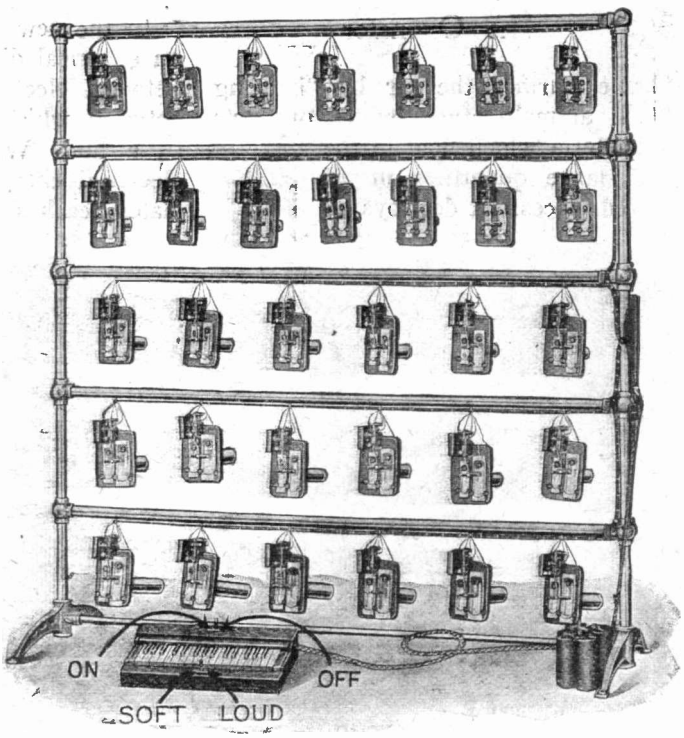


FLYWHEEL STARTER CONNECTED TO THE ENGINE SHAFT

It is a well known fact that a flywheel stores up a great amount of mechanical energy if it is made to revolve rapidly enough. This principle is applied in the starter. A small electric motor operated by a storage battery is designed so as to attain a speed of 8,000 revolu-

tions a minute inside of ten seconds. To the shaft of this motor is fastened a flywheel eight inches in diameter, and weighing eight pounds. When this tremendous speed is attained, even this small wheel possesses a great amount of energy. When the lever of the clutch is thrown over, this stored up energy is applied through a worm gear and the sprocket wheel and chain, to the shaft of the gas engine, and easily throws the engine over. In case the explosion should not occur properly at the first compression, there is sufficient energy in the little starter to keep the engine turning until the explosion does come, as the flywheel on the starter will store up enough energy for this purpose between compression points. When the engine is running, the lever of the clutch is thrown back and the starter disconnected.

The starter is also built to apply to automobile engines. In this case it is run from a storage battery on the car, this battery also serving for ignition and lighting purposes. Here the motor, of 1-3 horspower, is wound to attain a speed of 17,000 revolutions a minute without the five pound flywheel. With the latter connected it is 13,000 revolutions. This is said to be one of the speediest motors ever constructed for low voltage work. It may also be added that the energy stored up in this little five pound flywheel is equivalent to sixteen horse power for one second—enough, not only to start the engine, but even to start the car itself if the clutch were thrown in.



THE OCTOPHONE—A NEW CREATION IN ELECTRICAL MUSICAL INSTRUMENTS

The Octophone

One of the newest creations in the way of electrical musical instruments is the Octophone, operated from a keyboard. Each unit is self contained and consists of special alloy bars mounted upon a frame with resonators operated by electro-magnets which are controlled from the keyboard. The simple wiring is the same as in any ordinary annunciator or doorbell, the circuit being opened and closed by the pressure of the keys.

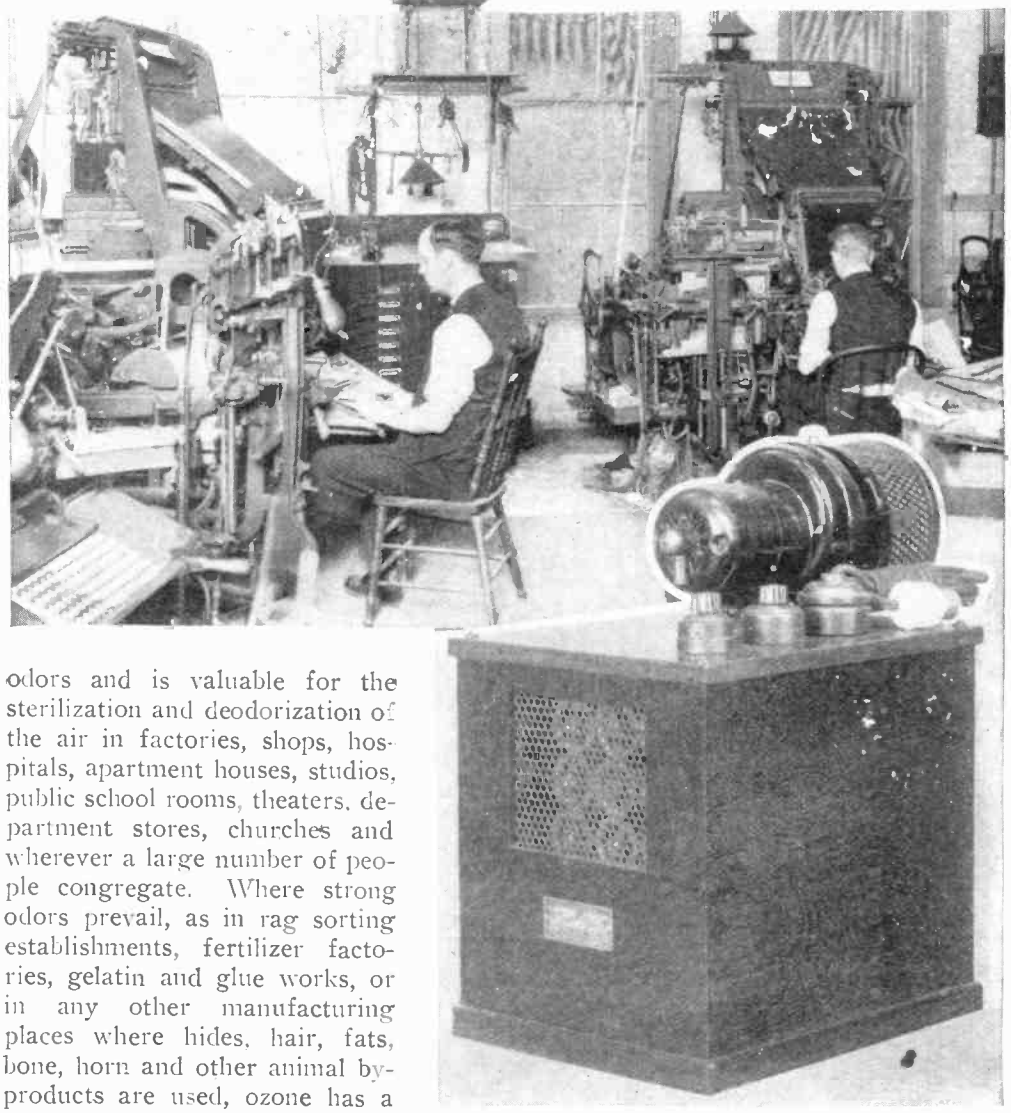
The Octophone is made in several styles, suitable for a theater or for automobiles, in which latter case the trunk containing the instrument can be attached to a running board and no amount of jarring will throw it out of order.

One of the advantages of electricity which seems to have been overlooked is that you can't commit suicide by inhaling it.

The Ozonator

Ozone purifies the air by "burning up" all animal refuse, waste products and bacteria which float in the air in large quantities in all crowded places. It destroys all odors and is valuable for the sterilization and deodorization of the air in factories, shops, hospitals, apartment houses, studios, public school rooms, theaters, department stores, churches and wherever a large number of people congregate. Where strong odors prevail, as in rag sorting establishments, fertilizer factories, gelatin and glue works, or in any other manufacturing places where hides, hair, fats, bone, horn and other animal by-products are used, ozone has a recognized commercial value. For many years the fumes arising from burning gas and molten type metal imperiled the lives of linotype operators. The application of ozone oxidizes and breaks down these poisonous gases.

In the new Ozonator, as is is called, an electrical discharge is caused to pass between electrified cylindrical surfaces between which air is drawn by means of a fan. When the intensity of the electrical charge on the surface of the plates reaches a certain value the electricity will discharge into the air in tiny streams and the energy thus imparted changes the oxygen of the air into another form known as ozone.



POISONOUS FUMES FROM BURNING GAS AND MOLTEN TYPE METAL ARE RENDERED INNOCUOUS BY OZONE

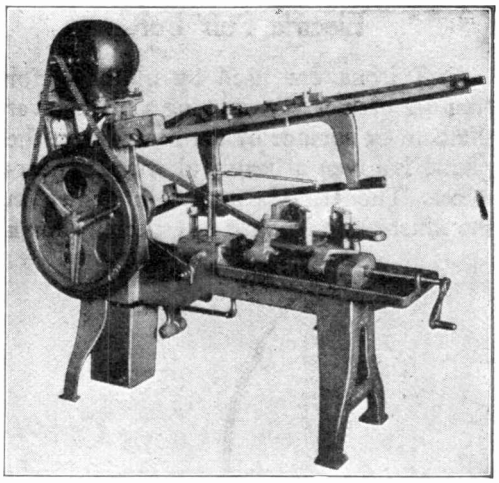
Each Ozonator embodies a step-up transformer which raises the supply voltage, sufficiently to bring about the discharge. The transformer is located in the base of the device and above it is the ozonizer proper, which consists of a bank of ozone generating units, each unit consisting of a cylindrical glass tube outside of which is a metallic coating. Inside of the glass tube is a metal electrode. This electrode is built up of shallow, perforated metal cups, mounted on a spindle, a small air gap existing between the cups and the bore of the tube. One high voltage lead from the transformer is connected to the outer coating of the glass tube and the other to the inner electrodes.

The charge of the outer coating of the glass is induced on the inside of the tubes and a violet electrical discharge takes place between the inside of the tubes and the inner electrodes. This discharge across the small air changes some of the oxygen of the air into ozone. The capacity of these machines can be readily increased by adding to the number of tubes.

The scientists tell us that ozone is a colorless gas with the odor of chlorine when present in small quantities and smelling of phosphorus in strong concentrations. It is one of the modifications of oxygen, with a chemical formula of O_3, formed by the absorption of energy, and in the presence of oxidizable organic substances it readily decomposes into oxygen while the third atom forms a more stable compound with the substance attacked.

Motor Driven Hack Saw

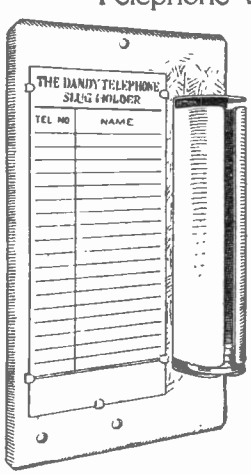
A motor driven hack saw is one of the latest additions to the machinery used in the metal industry. The Kwik-kut saw, contrary to the usual practice of having a fixed stroke of six inches, is arranged so that the length of the stroke is automatically regulated by the size of the stock held in the vise, this regulation



HACK SAW

providing for the use of as much of the blade as possible at each stroke. The saw is also lifted on the return (non-cutting) stroke, a saving of wear upon the blades. The machine stops automatically when the cut is finished. To avoid burning the blade, a pump, tank, pipes and catch basin are provided which keep the work lubricated. The motor which operates the saw rests on a special bracket and is connected to the machine by silent chain drive. A variation of from 50 to 100 strokes per minute is obtainable.

Telephone Slug Holder

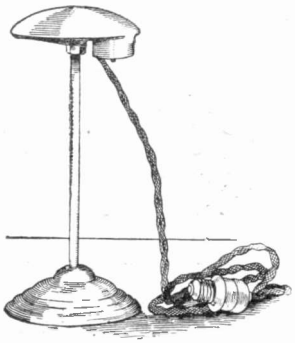


TELEPHONE SLUG HOLDER

The Dandy telephone slug holder adds to its convenience by being fitted with clips which hold in place the names and telephone numbers of persons frequently called. The holder is finished with a coat of black enamel and is provided with screw holes for fastening.

Electric Puff Iron

Puff irons are used by milliners for treating plumes. By drawing a plume over the convex surface of the heated iron the plume is given a beautiful wavy appearance. The electric puff iron shown in the illustration was made especially for a



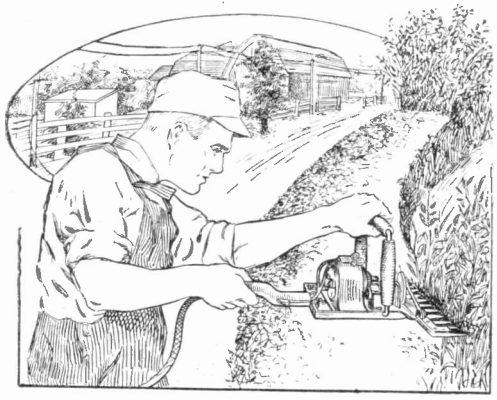
PUFF IRON

large millinery concern and is much superior to other forms; the heat is always uniform and the risk of burning the delicate plumes is reduced to a minimum.

The iron operates on current taken from any electric light socket.

Power Driven Hedge Trimmer

A power driven hedge trimmer is not as yet an article of universal need in this country but as hedges are rapidly supplanting the more familiar garden fence, it will become so as time goes on. A patent on such a machine was recently granted to E. I. Bullock of Ridley Park, Penn. In operation it resembles the familiar barbers' clipper, the power being supplied by the motor mounted as shown, current for it being obtained by connection to the house supply circuits through a long extension wire.



HEDGE TRIMMER

The Respirone

The nose and its connecting passages may be compared to a many storied apartment house with its connecting walls and rooms. These walls, covered

USING THE RESPIRONE

with a delicate and sensitive mucous membrane readily become infected with various germs, or irritated and inflamed by foreign particles. Certain medicines or disinfectants are beneficial in such cases, but difficulty arises in getting the medicines to the seat of the trouble.

Manifestly the medicines can be most easily and effectively applied in volatilized form and the electric Respirone is the most modern instrument for this purpose.

The essential feature of the instrument is the receptacle or reservoir. This receptacle contains what is known as the volatilizing pad in which is contained a small rheostat or resistance. When the medicine is placed in the receptacle it is continually fed to the volatilizing pad and the heat generated by the current passing through the rheostat raises it to its volatilizing point and it becomes converted into a dense gaseous vapor. By an ingenious arrangement of valves and couplings the receptacle is connected to the face mask which fits snugly over the mouth and nose and when the patient inhales, all the air that is taken into the respiratory organs passes through the receptacle and becomes mixed with the volatilized medicine, so that the medicine is bound to reach any part that the breath will reach. It would be impossible to prevent it from doing so.

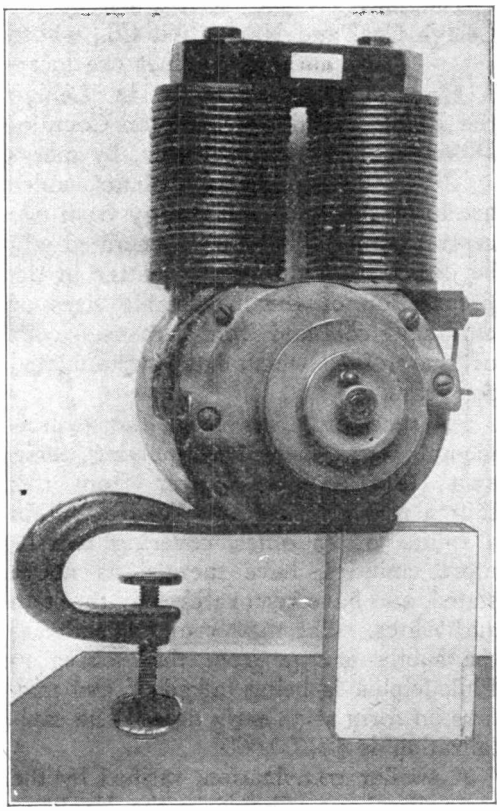
In this manner, without altering their efficiency in any way, these medicines are changed from a liquid to a gaseous form and are inhaled.

Early Electric Motors

Recently an advertisement was published offering to buy one of the original C. & C. electric motors and more than a dozen answers were received, most of which state that the machines are still in good working order. This is remarkable because these motors were designed and built in 1886, more than a quarter of a century ago, by C. G. Curtis, F. B. Crocker and S. S. Wheeler. See U. S. patents.

These are undoubtedly the first electric motors to be manufactured in quantities and not constructed individually. Up to that time the efficiency of small machines had been very low, but these motors were so well designed and built that they actually had efficiencies more than five times greater than the cotemporaneous types of similar size.

The armatures were wound by machinery and flat wire was used to save space. The connections of the armatures to the commutator were provided for by the winding machine which automatically made projecting turns of wire at the right points. The armature, commutator and brushes were enclosed by the end plates which carried the bearings. In fact, these very early machines were



ONE OF THE FIRST COMMERCIAL MOTORS

essentially the same in this respect as the present enclosed types of electric motors which were brought out more than ten years later.

It is particularly interesting to note that in 1886, when these motors were brought out, there were so few electrical supply circuits available that a special primary battery was devised to be sold with each motor as a source of current, otherwise their use would have been very restricted.

On Polyphase Subjects

A Move in the Right Direction

The initiative has been made by the Lehigh Coal and Navigation Co., whose anthracite mines are located principally in Lehigh and Northampton Counties in Pennsylvania, by merging 38 power plants, which are to be supplied with energy from one central point. The power generated will be direct from the refuse matter in the preparation of the marketable sizes of anthracite coal and from immense stocks of this refuse which have accumulated for years.

So successful has been the experimental tests made in supplying their own collieries with power from this source that the outlying districts within a radius of 75 miles, covering two or more counties, have merged as above stated, and have been ratified by the state authorities. The matter of transmitting the subtle energy from this source to Philadelphia is being talked of and may take on form at an early date. The capitalization is $3,700,000.

A similar combination, ratified by the state, has been effected in the Hazleton and Shenandoah districts, which includes both electric and gas plants.

So far as the utilization of this waste refuse, commonly known as culm, is concerned, the general consensus of opinion is that this is a move in the proper direction. It has been suggested further to consume not only the carbon in these immense culm banks, but to transform all fuel that comes from the mine's mouth (except that which is necessary for direct heating) into electrical energy and transport it by wire to the markets, thus eliminating expensive freight charges.

Rural School Pupils

Pupils that attend the rural public schools do not have as good a chance to see and hear of the practical applications of science as do the town and city boys and girls. A man teacher of a rural school who understands boys realized that his pupils, especially the boys, needed something to interest them more than their lessons.

One day he brought to the school a box of electrical articles consisting of "Fun with Electricity," belt, battery magnets, compass, etc. He promised the pupils if they would have their lessons prepared and were good that every day he would show them some experiments.

The result was wonderful. The smoldering spark in the breast of most of the boys was kindled into a flame for they now had their greatest desire fulfilled. They were going to be electricians or electrical engineers.

Electricity and Growing Plants

In a bulletin of the Belgian Electrical Society some details are given of the effects of electricity on growing plants. The author states that the powerful illumination from naked arc lamps is especially injurious, but if the ultraviolet rays are eliminated the effect of the electric illumination is to increase the formation of chlorophyl and the assimilation of growing material by the plant. Recent tests show the following increased production of crops under electric light, in addition to the normal solar illumination: Strawberries, 35 per cent; potatoes, 50 per cent; beets, 35 per cent, together with increased sugar content; cereals, 20 to 40 per cent.

When one has the telephone receiver down, if Central turns on the ringing juice a smart shock may be received. Two-year-old "Billie" Harvey was not aware of this painful possibility, although she had been in the habit of going to the desk phone and holding extended conversations with real or imaginary people. One day she rushed from the room, wild-eyed and screaming at the top of her voice—"Mamma! Mamma! Central bite me!"

* * *

"I see you are carrying home a new kind of breakfast food," remarked the first commuter.

"Yes," said the second commuter, "I was missing too many trains. The old brand required three seconds to prepare. You can fix up this new kind in a second and a half."

* * *

One enterprising concern displayed in great illuminated letters, "Open All Night." Next to it is a restaurant bearing with equal prominence the legend:

"We Never Close."

Third in order is a Chinese laundry, in a little, tumbledown hovel, and upon the front of this building is the sign, in scrawling letters:

"Me Wakee, too."

* * *

As the Sunday school teacher entered her class room, she saw leaving in great haste a little girl and her smaller brother.

"Why, Mary, you aren't going away?" she exclaimed in surprise.

"Pleathe, Mith Anne, we've got to go," was the distressed reply. "Jimmy'th thwallowed hith collection."

* * *

A doctor was attending a dangerous case where a Scotch butler was engaged. On calling in the forenoon he said to Donald: "I hope your master's temperature is much lower to-day than it was last night."

"I'm no sae very sure aboot that," replied the butler, "for he dee'd this morning."

* * *

"My papa's just been called by the Lord to a new church," said the little girl.

"Ith he goin' to go?" lisped the other little girl.

"We don't know yet," said the little girl. "The Lord didn't mention the salary."

"Whatsoever a man soweth, that shall he reap." Johnny repeated it after his father several times and seemed to have mastered the correct wording.

As they drew near the Sunday school the father gave Johnny his last rehearsal. "Now, son," he said, "let's have the Golden Text once more."

This is what he got:

"Whatsoever a man sews always rips."

* * *

In Kansas liquor can only be sold as a medicine. As a New York visitor was buying a toothbrush in a Kansas drug store a cowboy entered with a four-gallon demijohn. He plumped this down on the counter, the druggist looked at him inquiringly, and he said:

" Fill her up, Jim. Baby's took bad. "

* * *

Sea Captain — "Waiter, what do you call this?"

Waiter — "Bouillon, sir."

Sea Captain — "Well, well, I must have sailed on bouillon all my life and did not know it."

* * *

He engaged a German cook not long ago. His wife liked the appearance of the applicant.

"I'd like to have you come," said the lady of the house, "but perhaps you won't want to live with us. We are vegetarians and never have any meat in the house. Would you be satisfied with a vegetable diet?"

The fraulein scratched her head.

"Vell," she said dubiously, "iss beer a wegetable?"

* * *

Aspiring to be an author and to write a real book, a young man approached a literary friend for advice and pointers on the subject. Among other things the friend told him to be sure and make the very first sentence strong—with originality to grip the attention of the reader and get him interested at the very start. The young man went back and labored and burned the midnight oil until finally the book was completed and set in type. Then he sent a proof to his friend and the friend read the opening sentence. What he saw was this:

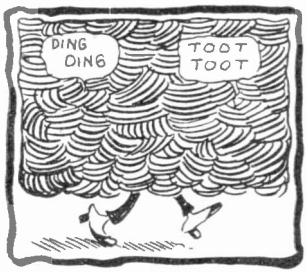
"Oh hell! exclaimed the duchess, who up to this point had taken no part in the conversation."

ONCE UPON A TIME THERE WAS A POET WHOM IT WAS NOT INTIRELY IMPOSSIBLE TO PERSUADE TO TAKE MONEY FOR HIS WORK

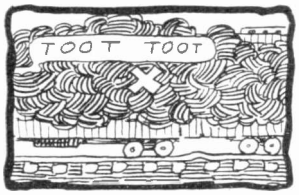
AN EDITOR WROTE HIM —"I HAVE AN IDEA FOR A POEM - COME AND SEE ME ABOUT IT"—

SO, THE EDITOR'S SANCTUM BEING IN ANOTHER CITY, THE POET DRESSED UP & BEAT IT DOWN TO THE DEPOT—

THIS SHOWS THE POET WADING THROUGH THE SMOKE THAT FILLED THE TRAIN SHED—

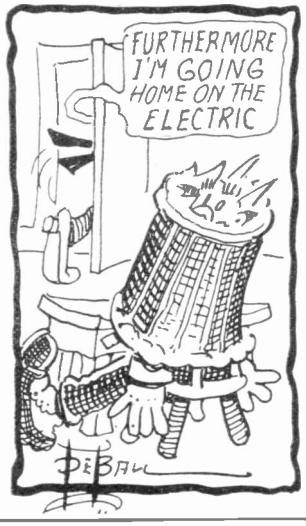


VIEW OF THE TRAIN PASSING THROUGH THE MOUNTAINS OF MAYWOOD ILL. X MARKS THE SPOT WHERE THE POET HAS HIS HEAD OUT OF THE CAR WINDOW LETTING IT LOOK AT THE BEAUTIFUL SCENERY—

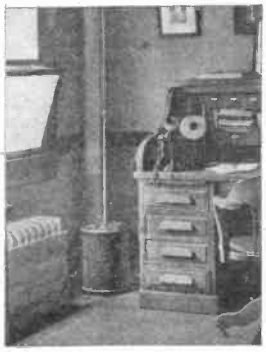


WHILE HE HAD HIS HEAD OUT THE WINDOW THE POET GOT A CINDER IN HIS EYE & ANOTHER LARGER CINDER IN HIS OTHER EYE

THE POET AT THE SANCTUM - SEE THE SOOT ON HIS FACE - NOTE THE MANIACAL GLARE OF THOSE CINDER LADEN ORBS - THE EDITOR IS SAYING - "I WANT A POEM ON - 'BEAUTIFUL NATURE, VIEWED FROM A CAR WINDOW' - DO YOU FEEL ANY INSPIRATION?"



In the Home



In the Office

Ozone Made at Home

Westinghouse Electric Portable Ozonizer

THE pure air of the mountain top, sea shore, or that you breathe right after a thunder-storm can now be had every day in the year.

The Westinghouse Portable Ozonizer produces it from the air in your room by the simple turning of a switch.

For one cent the Ozonizer produces enough ozone to purify the air in any ordinary bedroom continuously for ten hours.

Medical authorities find ozone an aid in the treatment of bronchitis, hay fever, chronic middle ear deafness, asthma and other like diseases.

Send for booklet descriptive of this wonderful electrical device and the many uses of ozone.

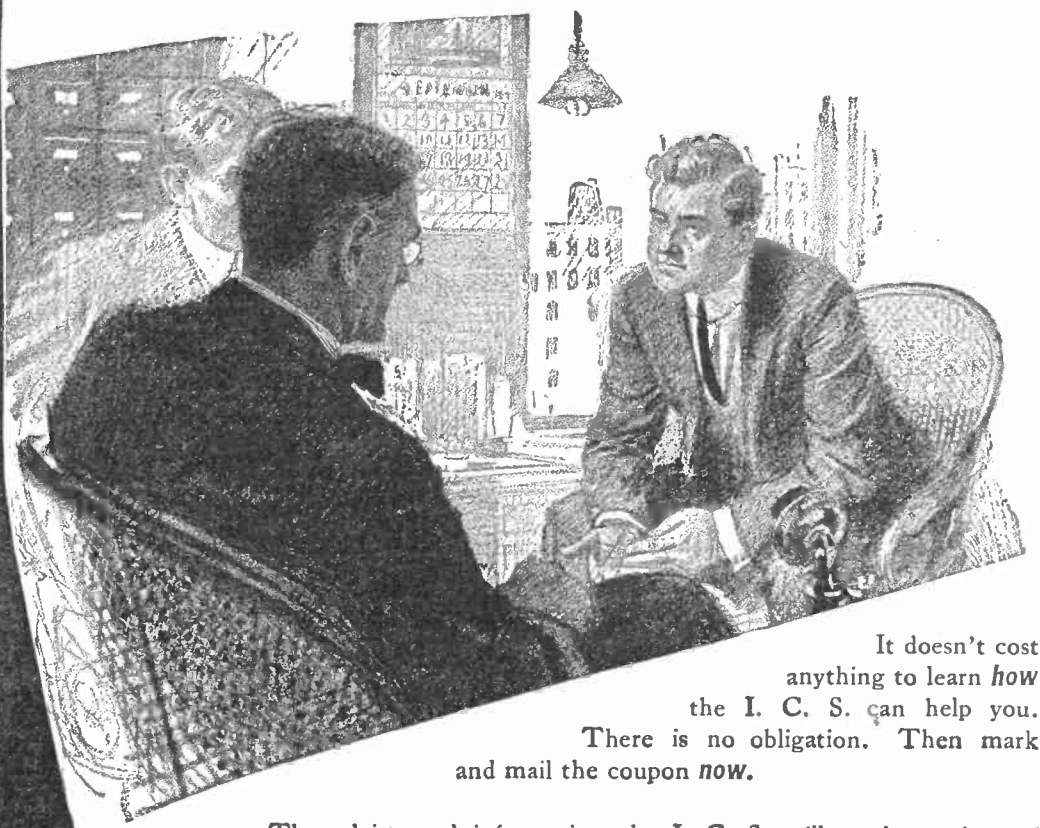
Westinghouse Electric & Mfg. Co.

Dept. OP., East Pittsburgh, Pa.

Are You A Live Wire

In every establishment there are a few men in the "thick" of things, who do the planning. In the ***thin*** of things and trailing off into nowhere are the many who fill the ordinary jobs and who cut but very little figure in the place. ***You*** are in either the ***thick*** or ***thin*** of things. If in the thin, ***switch***—you ***CAN.***

Mark and mail the attached coupon and learn how the International Correspondence Schools can help you become an expert in your ***chosen occupation.*** Doesn't matter who or what you are, where you live, what you earn, or what little schooling you have had, the I. C. S. ***can*** help you.



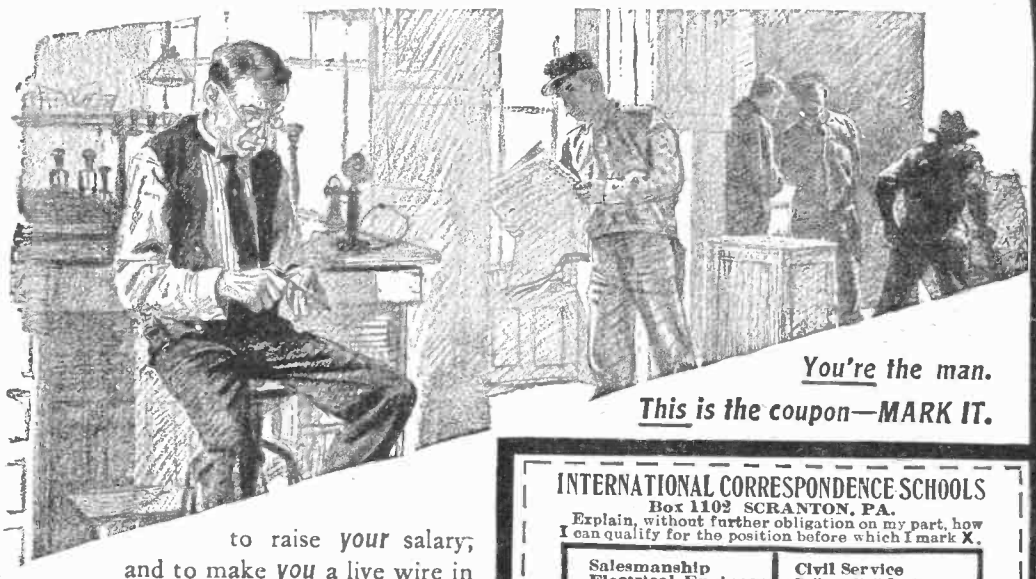
It doesn't cost anything to learn ***how*** the I. C. S. can help you. There is no obligation. Then mark and mail the coupon ***now.***

The advice and information the I. C. S. will send you free, if you will but mark the coupon, will really open your eyes to far greater success than you ever can achieve without the efficiency the I. C. S. can impart to you ***in your spare time.*** It will surprise you to learn how easy the

in the Business?

I. C. S. can make the way for you, how the I. C. S. arranges terms to suit you, how the I. C. S. is ready night and day—whenever *you're* ready, how thousands of other ambitious men owe their *success in life* to I. C. S. encouragement and help.

Every month there are *voluntarily* reported by I. C. S. students over four hundred salaries raised. This only *begins* to indicate how the I. C. S. can help *you.* Twenty-one years' of raising salaries the world over proves the ability of the I. C. S.



You're the man.

This is the coupon—MARK IT.

to raise *your* salary, and to make *you* a live wire in the business. In other words, the I. C. S. gives you more than mere instruction: it gives you real *help* and *advice,* based on the actual experience gained in helping thousands of other poorly-paid but ambitious men win success. Are you willing to be shown? Then *prove* it by marking and mailing the coupon today. From the moment of marking the coupon you will begin to move from the *thin* to the *thick* of things.

Mark and mail the coupon *NOW.*

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 1102 SCRANTON, PA.

Explain, without further obligation on my part, how I can qualify for the position before which I mark X.

Salesmanship	Civil Service
Electrical Engineer	Railway Mail Clerk
Elec. Lighting Supt.	Bookkeeping
Electric Car Running	Stenography & Typewriting
Electric Wireman	Window Trimming
Telephone Expert	Show Card Writing
Architect	Lettering & Sign Painting
Building Contractor	Advertising
Architectural Draftsman	Commercial Illustrating
Structural Engineer	Industrial Designing
Concrete Construction	Commercial Law
Mechan. Engineer	Automobile Running
Mechanical Draftsman	Teacher
Refrigeration Engineer	English Branches
Civil Engineer	Good English for Every One
Surveyor	Agriculture
Mine Superintendent	Poultry Farming
Metal Mining	Plumbing & Steam Fitting
Locomotive Fireman & Eng.	Sheet Metal Worker
Stationary Engineer	Navigation / Spanish
Textile Manufacturing	Languages / French
Gas Engines	Chemist / German

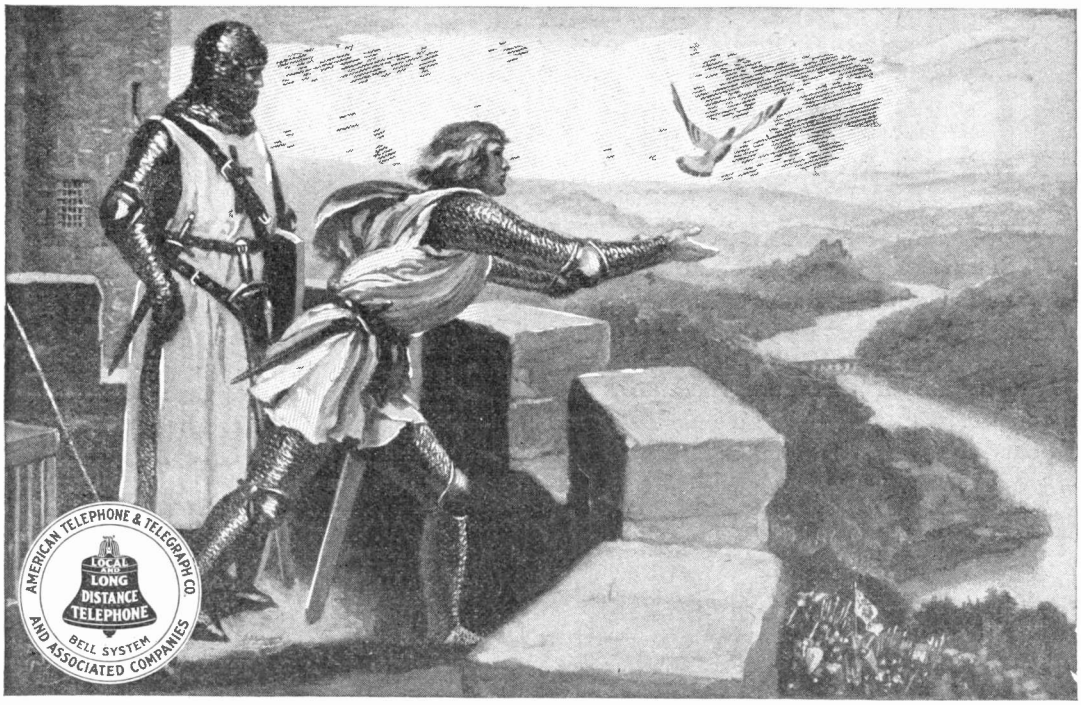
Name _____

Present Occupation _____

Street and No. _____

City _____ State _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



The Winged Message

Noah's messenger was a dove. In Solomon's time, pigeons were trained to carry messages. Brutus used them at the siege of Modena. They served the Turks in their fights against the Crusaders. In mediæval wars they were more useful than ever before.

France had a carrier-pigeon mail service, with messages reduced by photography and read through a microscope.

Even today carrier pigeons are utilized as news-bearers in isolated parts of Europe.

In America, the land of the telephone, the carrier pigeon is bred only for racing. The winged word has taken the place of the winged messenger.

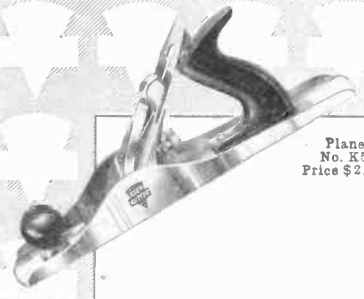
Pigeons may fly more than a mile a minute, but the telephone is as quick as speech itself.

The dove is the emblem of peace. The telephone is the instrument of peace. The telephone lines of the Bell System unite a hundred million people in one national family.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

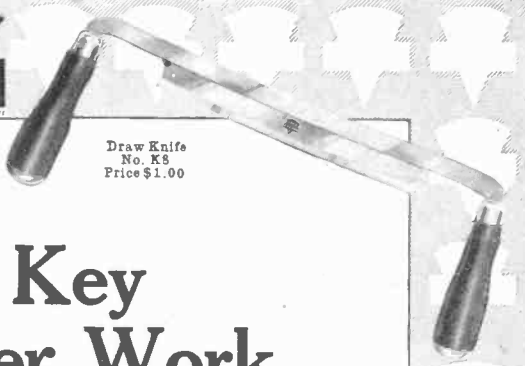
One Policy *One System* *Universal Service*

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



E. C. SIMMONS KEEN KUTTER CUTLERY TOOLS

Plane
No. K5
Price $2.25



Draw Knife
No. K8
Price $1.00

The Key To Clever Work

Plumb Level
No KK30
Price $1.50

Get pleasure and satisfaction from your work—no matter how small the job—by using good tools. They save time and insure perfect results. There is no economy using ordinary tools.

Realize what Keen Kutter tools mean to every man who uses them. They are sturdily built of the finest steel and guaranteed faultless. They last a lifetime under most exacting service.

Hatchet
No. KO2
Price $1.00

KEEN KUTTER
Quality Tools

have the scientific "hang" and "balance." They do not tire the worker.

Keen Kutter tools always hold their edges. They are tested to the limit and must be absolutely as represented or the dealer is authorized to return your money or give you a new tool. This broad guarantee covers *every* tool that carries the Keen Kutter trade mark, famous for over 45 years.

"The Recollection of Quality Remains Long After the Price is Forgotten."

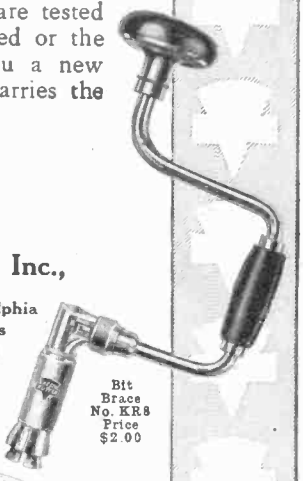
Trade Mark Registered. —E. C. SIMMONS.

If not at your dealer's, write us.

SIMMONS HARDWARE CO., Inc.,

St. Louis, New York, Philadelphia
Toledo, Minneapolis
Sioux City, Wichita.

Hand Saw No. K88, 26—26 in. Price $2.00



Bit Brace
No. KR8
Price $2.00

Pliers
No. K958
Price $1.75

CLASSIFIED ADVERTISEMENTS

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 May issue close April 1st.

AERONAUTICS

MAKE AN AEROPLANE OUT OF YOUR bicycle for $6.00. Drawings 30c. Thomas Hofmeister, Overlea, Md.

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.

AGENTS WANTED

$1 SILK TIES, THREE FOR $1, POSTPAID. Unique Novelty Co., Manufacturers, Independence, Iowa.

400% PROFIT. SELLING OUR HIGH grade work. Samples free. Gordon Co., Northwestern Bldg., Chicago.

AGENTS:—SELL $1000 ACCIDENT POLICIES, yearly dues $1.00. Your commission 60c. S. Rolfe, 923 N. Alder, Philadelphia, Pa.

PERFECTION POCKET ADDING MAchine—Lightning seller; agents wanted. Cincinnati Specialty Co., Dept. E, Cincinnati, Ohio.

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

AGENTS WANTED TO SELL ARTICLE which can be used in every home and schoolhouse. Non-Draft Ventilator Co., Frankfort, Ind.

MAKE AND SELL YOUR OWN GOODS. Formulas by Expert Chemists. We obtain your Government Serial Number. Catalogue for stamp. E. MYSTIC COMPANY, Washington, D. C.

DON'T ACCEPT AN AGENCY UNTIL YOU get our particulars. Beautiful samples 10c. Write at once to Imperial Art Company, Pomona, California.

WONDERFUL INVENTION JUST OUT, makes what was drudgery, "just fun." Sells for $3.00. Agent pockets half. Big demand. Illustrated circular. Tarbox Coy, Haverhill, Mass.

AGENTS—PORTRAITS 35c, FRAMES 15c, Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., Dept. 8404, 1027 W. Adams St., Chicago.

AGENTS WANTED.

WE HAVE THE GOODS WHOLESALE. Write us. Western Puzzle Works, St. Paul, Minn.

AGENTS WANTED FOR ORIENTAL novelties, never before seen in America. Quick sellers. Repeaters. Immense profits. Joseph Kanematz, Box 529, Portland, Oregon.

AGENTS SELL PALS CHANGEABLE SCARF Pin; make $30 weekly, send stamp for FREE sample Pals Manufacturing Company, 25 East 14th Street, N. Y. City.

GREAT NOVELTIES, LITHOGRAPHED pillow tops 25 cents, cowboy fobs fifteen cents, hat bands seven cents, agents supplies that will bring you money. Rose, 631 Hanover, Baltimore, Md.

AGENTS WANTED TO SELL SALES BOOKS on good commissions in every city in the country. Write for samples and commissions. Chicago Sales Book Company, 158 N. Desplaines St., Chicago, Ill.

AGENTS — THREE NEW FAST-SELLING specialties, first time advertised. Get in quick and skim the cream. Write for particulars. Dickinson Specialty Co., 202-9th St., Milwaukee, Wis.

AGENTS — BIG PROFITS SELLING OUR up-to-date line of household specialties; full particulars, catalogue and samples free. Charles H. Emrich, Box 77, Orwigsburg, Pa.

COMPANION TO THE FOUNTAIN PEN. Agents wanted. Something new. Good proposition. Sample 15 cents. Notae Sales Company, Winter Hill, Mass.

BOKARA DIAMONDS — AGENTS, EVERYone, to wear and sell our famous Bokara diamonds. Write for sample offer and catalogue free. Northwestern Jewelry Co., 1123 Wilson Ave., Chicago.

"I'LL TAKE A BOX." AGENTS, SELL A staple necessity and hear this every few minutes. Big money. Particulars free. Write a postal now, and mail to C. S. Mason, Desk A, Westboro, Mass.

GREAT NEW AGENTS' ARTICLE! "FAMily knife and fork cleaner" made of cork, felt and steel. Sells like wildfire. Dozen postpaid 75c. Sample 10c. Bauer, 135 East 34th St., New York.

ALL ILLS QUICKLY RELIEVED OR CURED through our vibrating regulator. No medicine. Lasts lifetime. $3.00 delivered. Return if dissatisfied. Agents. Supply every home. A. Sasse Company, Pueblo, Colorado.

SIGN AGENTS, PAINTERS 500% PROFIT with our splendid line guaranteed non-tarnishable gold sign letters, trade emblems, make-up-yourself aluminum door-plates. Catalogue, samples, free. Eastern Specialty Co., Dept. 3, 63 Barclay St., N. Y.

GENERAL AGENTS — CAPABLE OF CALLing on the big trade themselves and handling canvassers for the house to house and office to office business, to sell the newest electric specialty on the market; sold everywhere there is electricity in the home, office, factory, store, hotel, liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; shows how to use one light instead of two and get the same results; sells for $2.50, $3.50, $5.00 and saves the purchaser an investment of $25.00. Write for particulars. THE HANDY LIGHT CO., 254 Handy Light Block, Cincinnati, Ohio.

AGENTS WANTED

SEE DISPLAY AD, PAGE 57. DOUD LIGHTing Co., Chicago.

SEE WHAT I SAY UNDER "TYPEwriters." ATCHISON.

BURGLAR PROOF DOOR FASTENER — attached instantly to any door without tools. Cannot be picked. Sample and particulars 25c silver. Burglar Proof Lock Company, 435 River St., Dayton, Ohio.

AGENTS AND SALESMEN WILL SECURE FREE, complete information of numerous money-making selling propositions and newest specialties in hands of responsible concerns by addressing DISTRIBUTOR, R. 15, 26 Cedar St., N. Y.

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.

MANUFACTURER OF GUARANTEED hosiery with linen heels and toes wants agent in every town and city. Re-orders insure permanent, increasing income. Exclusive territory. Credit. Parker Mills, 707 Chestnut St., Philadelphia, Pa.

AGENTS — OUR "HOME LAUNDRY TRIO" are winners. Greatest time and labor savers. Money Makers. Write for attractive proposition— To-day. Leibman, Lefferts Ave., Richmond Hill, N. Y.

AGENTS — MEN AND WOMEN; HOUSEhold necessity, every economical family needs one. Large profits. Stamp brings full particulars. Raymond Company, Box 17, Station H. G., New York.

AGENTS WANTED QUICK. CLEAN LEgitimate money-making proposition. No space for explanations. Write for full particulars and exclusive territory. Krueger Mfg. Co., Dept. 8A, 167 W. Washington, Chicago.

AGENTS. NEW INVENTION SURPRISE to all. A copper magnetic household necessity needed in every home. Big profits. Quick seller. Sample by mail 10 cents. William Lorenz, 1638 So. Broadway, Denver, Colo.

AGENTS—GET PARTICULARS OF ONE OF the best paying propositions ever put on the market. Something no one else sells. Make $4,000 yearly. Send postal to-day for particulars. E. M. FELTMAN, Sales Mngr., 6169 Sycamore St., Cincinnati, O.

WANTED—AMBITIOUS, HUSTLING, TOWN OR COUNTRY MAN in each locality who desires to get ahead and earn more. Part or whole time. Fine chance — Experience not needed. Write quick for Cash-Bonus offer. Box 7E-292, Covington, Ky.

AGENTS — OUR NIGHT WATCH BURGLAR alarm. Explodes a blank cartridge if window or door is tampered with; never fail; big seller. Sample 35 cents. Wedge Mfg. Company, H. Binghamton, N. Y.

WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stained glass. Easily applied and beautifies the home. Something new for agents. Two sheets of this glass paper sent as a sample with catalogue in colors and complete instructions on receipt of 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

AGENTS WANTED

$2.50 PER DAY PAID ONE MAN OR WOMAN in each town to distribute free circulars and take orders for concentrated flavoring in tubes. Permanent position. J. S. Ziegler Co., 445-B, Dearborn St., Chicago.

BE INDEPENDENT! START A MAIL ORder business in your own home. We tell you how, and furnish everything needed wholesale. An honorable and profitable business for man or woman. Particulars free. Many make $3000 a year. Murphy Mfg. Co., South Norwalk, Conn.

WINDOW LETTER AGENTS. INCREASE your profits. Sell Attracto ready-made Gold and Silver letters — the kind with class to them. 21 styles, easily applied. Sample and catalogue FREE. Attracto Sign Co., 2649 N. Clark St., 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.

SAMPLE FREE — BOYERS' AUTOMATIC Re-Finisher for Furniture, Store, Bank and Office Fixtures — Finest thing in the World. One application lasts a year. Applied with cheese cloth. Boyer Chemical Laboratory Co., State and Michigan Sts., Chicago.

AGENTS — TO SELL THE NEWEST ELECtric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for $3.50 and saves the purchaser an investment of $25. Write for particulars. THE HANDY LIGHT CO., 26 Handy Light Block, Cincinnati, Ohio.

500 PER CENT PROFIT—YOUR OPPORtunity. Act how. Buyers everywhere for our U. S. Fire Extinguisher. Low Cost; fast seller; sure profits; exclusive territory. District managers wanted. United Mfg. Co., 1135 Jefferson, Toledo, O.

AGENTS — $200 MONTHLY DISTRIBUTing Newell's needle cases. Sell 115 needles in book for 10c and make 200% profit. Approval Plan envelopes make talking unnecessary. Crew Managers write. Send 10c for sample book and particulars. Newell Company, 509 N. Grand, St. Louis, Mo.

BE AN IND-ELECTRIC REPRESENTATIVE. You can make anywhere from $50 to $150 a week selling the *Ind-Electric Health & Beauty Battery* — one of the most remarkable inventions of the decade — a device for which there is a market in every home in America. Our representatives are making this much right now — a few making *more*. You can do the same if you are the right man or the right woman. No special experience necessary. We coach you — tell you of the methods others have used to succeed. With perseverance and enthusiasm you may do as well as our "top-notchers" who are making dandy incomes. We give exclusive territory and let you organize your own sub-agents. Territory being closed rapidly. Write at once to the Ind-Electric Mfg. Co., Desk 18, 432 Peoples Gas Building, Chicago. Capitalization $100,000.

AGENTS WANTED

AGENTS — SAVE TIME AND MONEY. Have your name in our syndicate magazine directory. Big mail for you and the best offers from Dealers and Manufacturers. Special service. Three issues 25c. Results guaranteed. Copy of our magazine 10c. The "LEVER" MAIL TRADER, 449M, Elizabeth, N. J.

WE NEED MORE AGENTS TO SELL THIS wonderful invention, sells at sight for $3.00; costs $1.50. John Peters, without experience, sold twelve in five hours. So can you. You absolutely can't lose. Money refunded on samples without question. Write for free particulars. Spogland Sales Co., 1065 So. Emerson, Denver, Colo.

AUTOMOBILES

FOUR CYLINDER FORD AUTOMOBILE $150. W. Robb, Canal Dover, Ohio.

JUST OUT. GREATEST AUTOMOBILE book, covers every phase of automobile practice. Up-to-date. Circular free. Scientific Book Shop, Syracuse, N. Y.

CHAUFFEURS. SEND FOR FREE SAMPLE copy AMERICAN CHAUFFEUR. Contains valuable information about engines, ignition, carburetion, manifolds, motor balance, cooling and lighting systems, etc. All news of motor world. Every amateur or professional chauffeur should read it. Write now. The American Chauffeur Publ. Co., 252 Butler Bldg., Cincinnati, O.

AUTOMOBILE BARGAINS. LOWEST prices and largest list in the world. All guaranteed, shipped freight prepaid; get my prices before purchasing. Runabouts, Oldsmobile, Reo, Cadillac, $50; Fords, Buicks, $150; Touring cars, Cadillac $90; Reo $150; Buick $175; Winton $275; Pope Toledo $300; Ford $300; Maxwell $275; I have all makes on hand. I desire agents to sell my cars; write for Special Agents' proposition at once. P. E. King, 217 West 125th St., New York City.

AUTO ACCESSORIES

ELECTRIC LIGHT FOR MOTORCYCLES. Storage Battery, built right, $5.00. American Battery Co., 1121 Fulton St., Chicago.

AUTOISTS, NO MORE DEAD ENGINES, OR walks back to town. New discovery. Instructions, 25c. Thomas Mfg. Co., Star Theatre Bldg., Des Moines, Iowa.

CHARGE THE BATTERY YOURSELF. "American" rectifiers—all sizes. Storage batteries—all sizes. American Battery Company, 1123 Fulton St., Chicago.

GUARANTEED 5,000 MILES WITHOUT puncture. If your tires are old, don't throw them away, or you'll throw away $50 to $200. With Durable Treads we give you a written guarantee for 5,000 miles without puncture. This is binding whether your tires are new or old-tread-worn, rim-cut or rut-worn. Durable Treads cost only half as much as tires. Write for booklet and special discount at once to Colorado Tire & Leather Co., 1234 Majestic Bldg., Chicago, Ill., 528 N. W. 34th St., New York City. 435-N Golden Gate Ave. San Francisco, Cal. 1348-N Acoua St., Denver, Colo.

TIRES—ALL MAKES, ALL GUARANTEED. 28x2½ $4.50; 30x3 $6; 30x3½ $13. Write for our complete list of tires and tubes before purchasing. We ship C. O. D. Guarantee Tire Company, Dept. E, 213-219 West 125th St., N. Y. City.

BOOKS AND PERIODICALS

CLASSY BOOKS — STAMP BRINGS CATALogue. Paul Duff, 2713 N. Mozart St., Chicago.

NEW 32 PAGE BOOK FOR GENTLEMEN, send 12c. Curtis Co., E5, Englewood, Chicago.

THREE LITTLE BOOKS FOR LADIES, postpaid, in plain cover, for 25c. (Tell what you want to know.) O. K. Pub. Co., Decatur, Ill.

10,000 FORMULAS, NEW BOOK, 800 PAGES, $3.00. Circular free. P. E. Newnham, Waukegan Ill.

"RHYMES OF DAVID." RACY, RARE, true to nature. One dollar. Fetter Book Co., Robinson, Md.

"TELEPHONE TROUBLES AND HOW TO Find them," 15th edition (56 pages), 25c. Hyde Pub. Co., 183 5th St., Milwaukee, Wis.

WONDERFUL BOOK ON HYPNOTISM, personal magnetism, magnetic healing and occult science sent free to anyone. Send your address today. M. D. Betts, Sta. 129, Jackson, Mich.

ELECTRICAL, MECHANICAL AND practical handbooks, 500 titles. Best prices. Send for circulars. Proctor Book Co., 559B, W. Lake St., Chicago, Ill.

SECOND-HAND BOOKS, HALF-PRICES ON every subject. New 25 per cent discount. Books bought. Catalogue 544 post free. Foyle, 121 Charing Cross Rd., London, England.

IDEAL MARRIAGE: A FASCINATING little book on the sex question. Tells facts everyone should know. Price 25 cents. M. E. Davish, 2481C, 18th St., N-W., Washington, D. C.

A GRAND LITTLE BOOK. "HOW TO Pronounce 10,000 Difficult Words." An authoritative handbook of words in common use, by F. M. Payne, 123 pages bound in Russia with index. Price 50 cents postpaid. Ritchie Pub. Co., 11th Floor, 541 Federal St., Chicago.

"THE GUARDIANS OF THE COLUMBIA" by John H. Williams, just published. Describes some of the grandest scenery on the Pacific Coast. With maps and 210 illustrations (eight in colors). Book 7 x 10½ inches. Cloth binding $1.66 postpaid. Descriptive folder for 2c stamp. N. B. Pearson, 340 East 45th Street South, Portland, Ore.

ELECTRICITY. JUST WHAT YOU HAVE been looking for. Our Modern Blue Print Chart Method of Electrical Wiring Diagrams. Thoroughly explained so that you can easily understand them. All kinds of Bell Wiring, Annunciators, Telephones, House Wiring, Conduit, Theatre, Isolated Plants, Dynamos, Transformers, Arc Lights, Special Treatise on Motor Wiring. Write now for information. ELECTRICAL WIRING DIAGRAM CO., Box B 173, Altoona, Pa.

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FREE! 75c CERTIFICATE. WM. COX, Waterloo, Iowa.

MAIL ORDER BUSINESS. I START YOU free. E. Newnham, Waukegan, Ill.

BIG MONEY MAILING CIRCULARS FOR others. Send 25c for complete instructions and circulars. Alkan Co., 823 Market St., Oakland, Calif.

BUSINESS OPPORTUNITIES

PARCEL POST SPECIALS, MUSIC, NOVELties, etc. Bargain list free. O. Fink, Pottstown, Pa.

YOUR 25 WORD ADVERTISEMENT IN 125 reliable magazines, $1.00. Globe Exchange, 433 Lexington, New Haven, Conn.

START EARNING $20.00 WEEKLY UPward, mail order business. I co-operate with you. Free plan. Wm. Benke, Dept. 101, Bucyrus, Ohio.

ALARM REFRIGERATOR DRIP-PAN, A new home convenience for $1.50. Agents com. 50%. Address Clarence D. Skinner, Topeka, Kansas.

BIG MAIL!— RECEIVE SAMPLES, CIRCUlars, propositions, Send 20c (coins) for publishing name in Directory. Directory, 1305 Ashmun St., Burlington, Iowa.

$1.00 A WEEK WILL START YOU IN A BIG money-making mail order business with the best line—in spare time. Particulars Free. Nadico Co., 1671 Belmont Ave., Chicago.

ADVERTISERS! MAIL DEALERS. OUR Advertisers' Guide gives rates, circulation of 2,000 Different Publications. Includes 30 Mail Order Plans. Sent complete 10c. Dearborn Advertising Agency, 527 Franklin Bldg., Chicago.

IF YOU WANT TO KEEP POSTED IN THE Mail Order Business, you should have our magazine each month and see how the other fellow is doing it. 10c per copy. Three months' 25c. The "LEVER" MAIL TRADER, 449M, Elizabeth, N. J.

WE HELP YOU RAISE CAPITAL AT ONCE to start you in retail, manufacturing, patent, real estate, mail order or any legitimate business by means of "Our Practical Method." Particulars free. The Business Aid Co., K 508, Detroit, Mich.

HOME MANUFACTURING — PLEASANT and profitable business quickly established during spare time. Product international necessity. Write for sample and particulars. Delzell Mfg. Company, Desk B, 448 South Mathews, Los Angeles, Calif.

MAKE MORE MONEY. BE A VENTRILOquist. Devote your spare time to giving entertainments. Anyone can learn by my method. Complete course about 2,500 words twelve lessons $2.00. Skeels "The Magician," Box P. 445, Storm Lake, Iowa.

SOMETHING NEW — USEFUL FOUR-INone patented article for women. Sells quickly; big profits; high class imprint circulars furnished; single orders filled direct to customers. Sou. Distributing Co., Sales Mgrs., Sta. B-2. Memphis, Tenn.

FREE! CATALOGUE, BEAUTIFUL ART castings, in concrete, plaster, artificial marble, papier maché, composition, marble dust, interior, exterior decorations, garden furniture, statuary, etc. Describing instructions of their manufacture, including making flexible moulds, renovating frame buildings with artificial stone, modeling, coloring, gold leaf gilding-burnishing, paper selecting-hanging. Big profits. Low expense. Little labor. Mahler, 117 Russell St., Brooklyn, New York.

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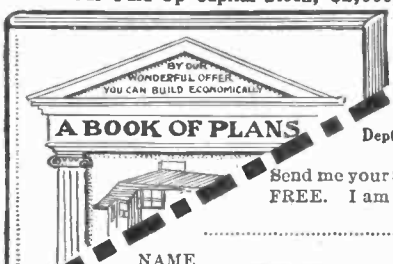

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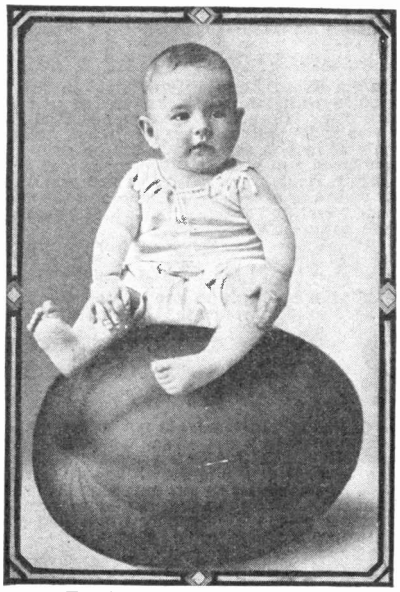
Reaping Rewards from Resolutions

By FRANKLIN O. KING

Do You Remember That Old Story about Robert Bruce and the Spider? Robert was Hiding in a Cave. His Enemies Had Him "In the Hole," Temporarily, So to Speak, As It Were. While Reflecting on the *Rocky Road* to *Royalty*, Robert, the Bruce, Espied a Spider Spinning His Web Over the Entrance to the Cavern. Nine Times Did the Spider Swing Across the Opening in a Vain Attempt to Effect a Landing, but the Tenth Time he Touched the Home Plate, and Robert, admiring the Persistence of the Insect, Cried Out Loud—"Bravo," Two or Three Times, One Right After the Other. Shortly After That Bruce Got Busy and Captured a Kingdom.

All of This Preamble is Intended to Point a Moral, which is—"If At First You Don't Succeed, Slap on More Steam, and Sand the Track." In This Connection I want to Inquire about Your New Year's Resolutions, and to Ask If You Have Kept the Faith, and If Not—Why Not? *I Believe the Pathway to Prosperity is Paved with Good Resolutions. Therefore, let Us Resolve, and Keep Resolving until Victory is Perched on our Banners.* Remember, You Have Fought Many a Victorious Waterloo that the World Knows Nothing About. The Man who Gets Up every Time He Falls Down Will Some Day Cease to be a "Fall Guy." *Good Resolutions Will be Rewarded with Rich Realizations*, and It Shall Follow as the Night the Day.



Two Texas Gulf Coast Products

How Much Better Off are You than Last Year, or the Year Before That? Perhaps Your Wages are a Little Higher, but Have not Your Expenses More than Kept Pace with That Increase? Aren't You Paying a Little More for Your Clothes and Your Meals, and don't You Smoke More Expensive Cigars and more of Them than Formerly? If it isn't Cigars, It may be Something Else—Some More Expensive Habit.

A Man Begins To Go Down Hill at Forty, and the time may come when a Younger Man—perhaps a *Cheaper Man*—will fill your job. The Man Who-Looks-Ahead will prepare himself for that time by getting a Home. My advice to You, therefore, is to Get a Home while you are able to do so—and Begin Now. I would further advise you to Get a Home in the Gulf Coast Country of Texas.

Since Investigating Conditions in the Rain Belt of Gulf Coast Texas, I have no Fear of Old Age or Poverty, because I know I can Take up a Few Acres down there and be *Absolutely Independent*. I am Firmly Convinced that with *Average Intelligence* and *Average Industry*, any Man who is now Working His Head off in the North to make a Bare Living, where they Snatch One Crop between Snowstorms and Blizzards, can soon Lay Up a Nice Bank Account in the **Winter Garden of America.** Come to the *Land of Least Resistance*, where You can Grow Three Big Money-Making Crops a Year on the Same Soil and Without a Dollar's Worth of Expense for Irrigation or Fertilization.

I believe you could save Twenty-Five Cents a Day if You Tried. I know you would Try if you Realized that our Growers of Figs, Strawberries and Early Vegetables clear a net profit of $300 to $500 an Acre. Men have Realized more than $1,000 an acre growing Oranges in our Country. Remember that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring, when they command Top Prices.

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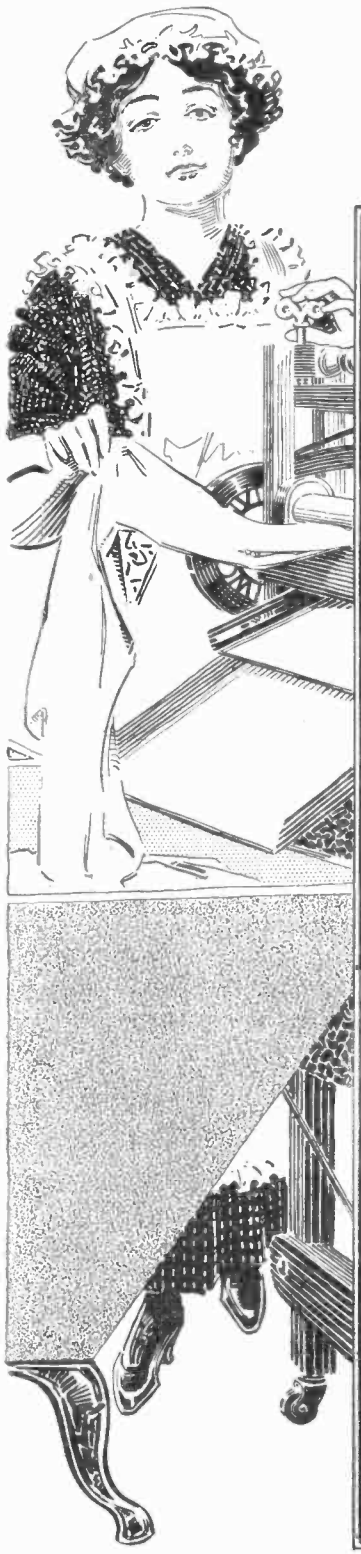

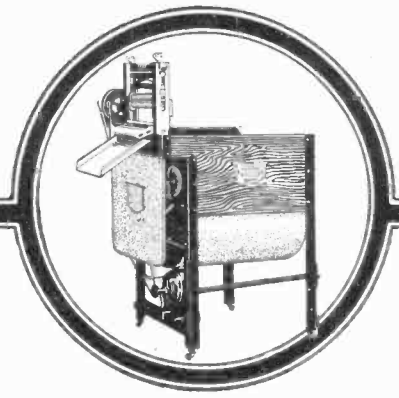

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AGENTS

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Price to net better than 5%

*6% CUMULATIVE PREFERRED STOCK.
Tax exempt in Illinois. Earnings largely in excess of dividend requirements. Interest payable quarterly.
Price to net nearly 6%
* Listed on Chicago Stock Exchange.

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Due April 1st, 1957. Interest payable April 1st and October 1st.
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Tax exempt in Illinois. Dividends payable quarterly.
Price to net nearly 6½%

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Price to net better than 5½%

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Earnings nearly three times dividend requirements. Dividends payable quarterly.
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7% CUMULATIVE PREFERRED STOCK.
Earnings more than double dividend requirements. Dividends payable quarterly.
Price 100 and accrued dividends, with a bonus of 25% Common Stock Voting Trust Certificates.

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Carries a bonus of 25% of common stock. Dividends payable quarterly. Price to net better than 6¼%.

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These gems are chemical white sapphires—**LOOK** like **Diamonds.** Stand acid and fire diamond tests. So hard they easily scratch a file and **will cut glass.** Brilliancy guaranteed 25 years. All mounted in 14k **solid gold diamond mountings.** Will send you any style ring, pin or stud for examination—all charges prepaid—**no money in advance.** Write today for free illustrated booklet, special prices and ring measure.

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Guaranteed Non-Magnetic

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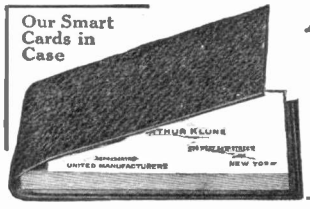

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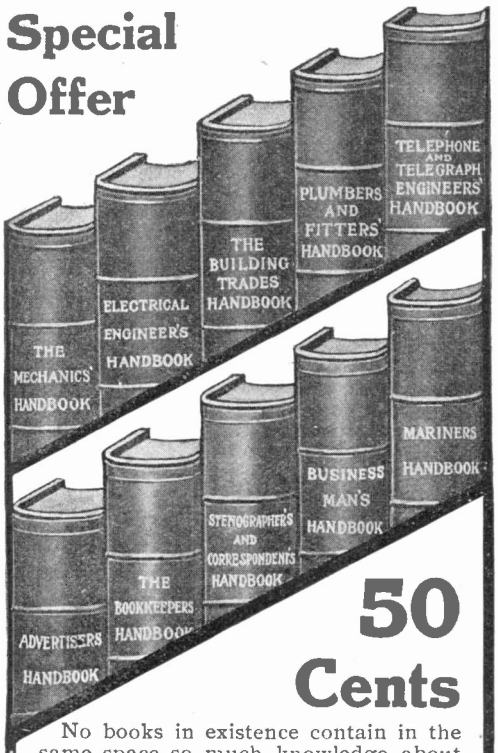

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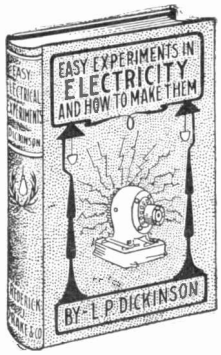

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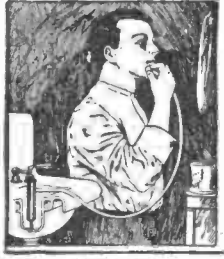

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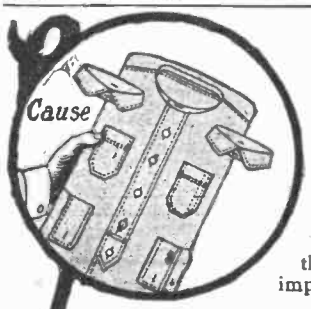

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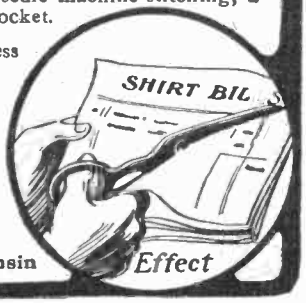

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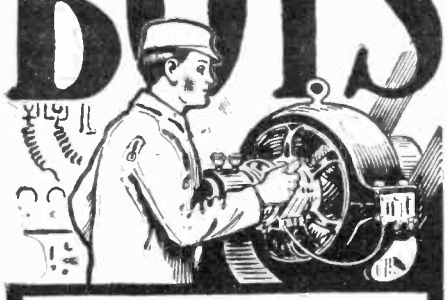

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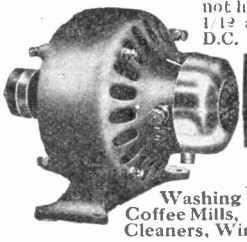

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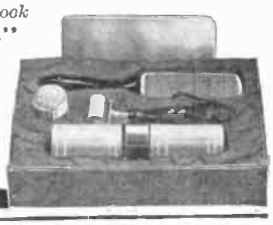
Desk M, 432 Peoples Gas Bldg.
CHICAGO, ILL.

Agents make $50.00 to $100.00 a week selling the Ind-Electric. Write for territory.



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Use Dr. Page's remarkable Snore-Mute and you can't snore. You won't humiliate yourself. You won't annoy others. Simplest device ever perfected on scientific principles. Stop snoring and restore normal breathing while sleeping. Light as a feather, small, simple and antiseptic. Get one and stop snoring. Worn with comfort and pleasure. Carry it in your card case when traveling or visiting.

BOOKLET SENT FREE

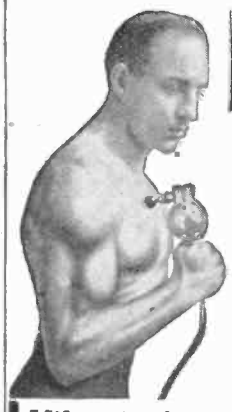
Don't embarrass yourself and annoy others any longer. Get a Snore-Mute and sleep without snoring. Send only 25c today and get your Snore-Mute. Your money back if you are not delighted. Booklet sent free. Send for free booklet anyway. Send today.

DR. C. S. PAGE CO., Dept. 5457, Ironwood, Mich.

"HUMAN INTEREST STUFF"

Big guns out on the coast are trained on a distant target at night by a searchlight; someone sent us a photograph and short description and we bought it at once. Near Los Angeles there is an old, old tree, a government land mark, and a new trolley line was made to take a curve to get around it—we bought another photograph and a couple of hundred words readily. Someone conceived the idea of treating chickens with high frequency current to make them grow faster, and when photographs and description were sent us we were only too glad to accept them. These are examples of what is known in journalism as "human interest stuff." We want more and more of it for the magazine. We want every subscriber to be a human interest scout. Good rates are paid for acceptable material—which must be hinged in some way on electricity. Send for our little pamphlet "What to Write and How to Write It."

POPULAR ELECTRICITY MAGAZINE
54 W. LAKE ST., CHICAGO, ILL.
Editorial Department



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Power from within! Strength that is ***more*** than mere muscular strength—the strength of perfect health, abundant nerve force—now within your own reach through ***Vibration!*** Nine people out of every ten are only ***half alive!*** Are you? Listen—

All the Exhilarating Joys of Life-Strength-Youth

may be returned to you through ***Vibration. For Vibration is Life itself.*** It will chase away the years like magic. Every nerve, every fibre in your whole body will fairly tingle with the force of your own ***awakened power!*** Stagnation simply cannot exist. You are made over new from head to foot. ***All the keen relish, the pleasures of youth,*** fairly throb within you. Your blood is sent humming along through every vein, artery and tiny capillary. All the poisonous matters in your system are ***washed away.*** Every organ is put in ***perfect working order.*** Your self-confidence—***your self-respect*** are increased a hundred fold. Yes, Vibration will do all this, and more, ***much more.*** And it is within your reach. You can enjoy its wonder-working powers right at home, right in the privacy of your own room. You can give yourself the same identical treatments which you would receive in the offices of the world's most famous specialists—all without extra charge.

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Is the result of years of work and experiment. It is absolutely perfect. If you have your house wired for electricity, you can connect it up as easily as an electric lamp; if not, it will run perfectly on its own batteries.

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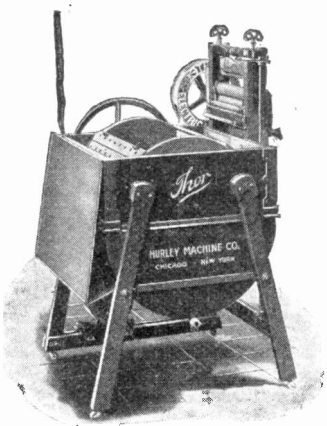

THOR ELECTRIC
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Wash Day Becomes Easy Day

WHEN YOU PUT A

Thor Electric Laundry Machine

In Your Home, and for Only $1.50 a Week, —$6.50 a Month—You Can Soon Own One

Eliminates the drudgery and back-breaking labor, washes the heaviest blankets or daintiest laces spotlessly clean, without injury, and without any hand rubbing. Does the entire week's washing and wringing for the average family in 90 minutes at a cost of 3c. for electricity.

Our dealer in your city will deliver a machine to you, or we will ship to you direct for a

15 Days' Free Trial

We make electric washing machines from $30.00 up. Write for our Catalogue F today.

HURLEY MACHINE COMPANY

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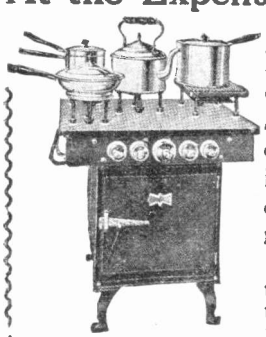
Why Be Old Fashioned At the Expense of Comfort?



The kitchen or laundry properly equipped with *Simplex Electric* cooking and heating appliances is as comfortable as any room in the house.

The dining room with the Simplex electric toaster, chafing dish, percolator, table range, etc., becomes the most delightful place in the world.

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Thousands are sold from coast to coast by good dealers and electric light stations.

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SIMPLEX SERVICE QUALITY

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in your home will demonstrate to your satisfaction how necessary the

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is for economical management.

It saves your strength, **health, beauty,** time and money. It irons five times as **fast, better** and makes it **easier.** Servants are better contented, more efficient. Heats by gas or electricity. Operates by hand or small motor at small expense. It really costs nothing because it saves its cost every six months. Write for booklet and "Ironing Hints." Both free.

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THE CADILLAC ELECTRIC VACUUM CLEANER

Possesses everything that is essential to make it the best Vacuum Cleaner on the market. Light, weighs only 8 lbs. Made entirely of aluminum. Strongest suction, easiest running. Equipped with General Electric Co. motor. *FULLY GUARANTEED.*

OVER 35,000 CADILLACS IN DAILY USE

$30.00 COMPLETE WITH HARDWOOD FLOOR TOOL

Has brush in the nozzle to pick up lint, threads and hair, has rollers allowing it to run easy over the carpets and rugs. Your home is not complete unless you have a CADILLAC ELECTRIC VACUUM CLEANER. Saves babies' and mothers' health.

CLEMENTS MFG. CO.
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$30.00 with floor tool, **$38.00** complete with 9 foot of covered hose and 6 TOOLS for cleaning everything in the home. F. O. B. Chicago. If there is no dealer in your city write to us direct for catalog.

Also manufacturers of Cadillac Hand Power Vacuum Sweepers

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Anyone can attach it to machine. Simple and durable. $14.00 alternating or direct.

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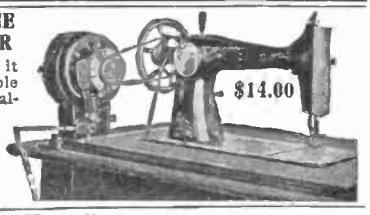

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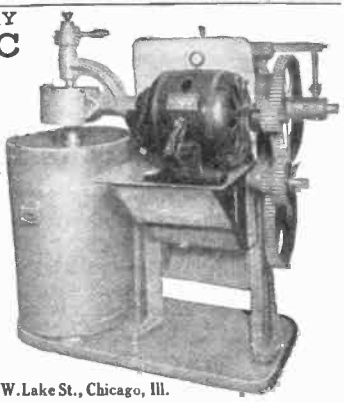
ELECTRIC ICE CREAM FREEZER

Our power freezer is an ice-cream factory complete in itself; having the crusher, freezer tub and motor all mounted on one base plate that occupies but a small amount of floor space. Nothing but the very best of material and workmanship enter into these machines, and are built unusually substantial; for this reason we guarantee that they will give satisfaction. Made in 4, 6, 8, 20 and 40 quart sizes and are equipped with alternating current, variable speed motors. Write today for circular.



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Isn't There Something You'd Like to Know About Lighting Fixtures?

Our "Service Department" is maintained especially for dealers and consumers who have a lighting problem to solve.

Whether you are interested in buying lighting fixtures for a new home, or installing one or two new patterns in place of some old style, inefficient design, this department will be glad to help you—and all their services are free.

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is a 16-page booklet that tells what the lighting requirements of a modern home are, and how to select fixtures designed to give harmony of decoration and healthful illumination.

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It will be sent you by the next mail.

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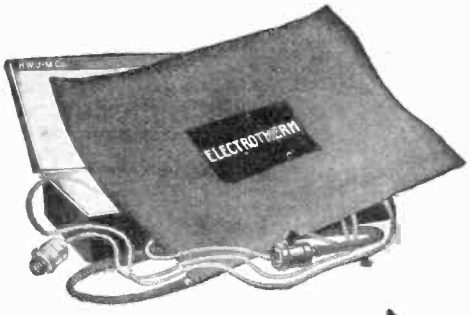
J-M Electrotherm

Takes the Place of the Hot Water Bottle



It consists of a thin, light and flexible sheet or pad containing wires insulated and protected with Asbestos. When attached to an ordinary incandescent lamp socket, it offers sufficient resistance to the current to produce a constant and uniform degree of heat. It is provided with a regulating switch by means of which three different temperatures can be obtained.

Made for any voltage from 7 to 125 volts and can be used with either direct or alternating current. Indispensable in treating such diseases as pneumonia, neuralgia, bronchial affections, rheumatism, etc. Made regularly in blankets, collars, caps, chest and back pads, mats for operating table, sweating jackets, etc.

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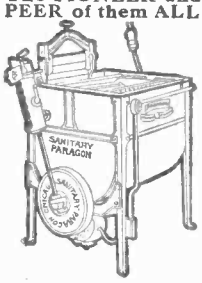
The PIONEER and PEER of them ALL



NO WOOD SANITARY METAL ONLY

Why Pay Exorbitant Prices

for complicated, insanitary wooden washing machines, if you can buy a practical and everlasting All-Metal

Sanitary Paragon Power Washer

for operation by electric or gas motor

AT A TREMENDOUS SAVING IN PRICE

PRICES range from $23.75 to $150.00. Three sizes.

OVER 100,000 PARAGONS USED IN THE U. S.,

the most convincing *proof* of *unequalled superiority*. *Before* wasting your money in buying inferior makes send for our interesting catalog No. 2 and further details of the *most liberal proposition* ever made by any manufacturer. *Established 1902.*

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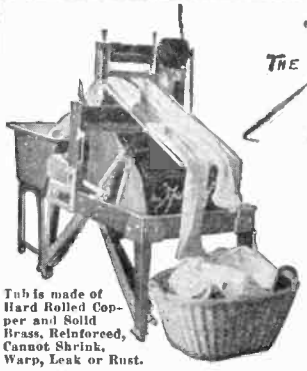

Tub is made of Hard Rolled Copper and Solid Brass, Reinforced, Cannot Shrink, Warp, Leak or Rust.

THE Judd Won't Wear Out the Clothes

The Reason Why ?

It's Perfectly Smooth Inside

Blankets and finest fabrics are all the same to THE JUDD, for the water is forced through the clothes a hundred times per minute. Ten or fifteen minutes will thoroughly cleanse a tub full.

Two hours to do a family washing! The electricity from any light socket will do the work at a cost of about four cents.

The special motor operates the reversible wringer and washer at the same time.

Let us show you how THE JUDD works.

Descriptive literature for the asking.

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2c a Week Pays Wash Bill!

Write for FREE Book

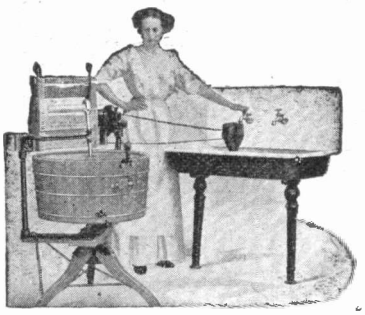
Electricity or Water-Power Does the Work

Just a "Twist of the Wrist" Starts or Stops the Machine!

The 1900 Motor Washers are now at work in thousands of homes. They are doing the work formerly done by women, at a cost of 2c a week for power! Saving thousands upon thousands of dollars in wash bills. Saving worlds of wash-day troubles. Leaving the women free to do other work while the machines are doing the washing.

The 1900 Motor Washer

1900 Water Motor Washer Can be connected with any water tap instantly



Washes a Tubful in Six Minutes!

Handles Heavy Blankets or Dainty Laces

The outfit consists of the famous 1900 Washer with either Electric Motor or Water Motor. You turn on the power as easily as you turn on the light, and back and forth goes the tub, washing the clothes for dear life. Then, turn a lever, and the washer does the wringing. All so simple and easy that it is mere child's play.

Doing the wringling with 1900 Electric Motor Washer

A Self-Working Wringer Sent With Every Washer!

The motor runs Washer and Wringer. We guarantee the perfect working of both. No extra charge for Wringer, which is one of the finest made. Write for FREE BOOK and 30 Days' FREE TRIAL OFFER! Don't doubt! Don't say it can't be done. The free book proves that it can. But we do not ask you to take our word for it. We offer to send a 1900 MOTOR WASHER on absolute Free Trial for an entire month to any responsible person. Not a cent of security—nor a promise to buy. Just your word that you will give it a test. We even agree to pay the freight, and will take it back if it fails to do all we claim for it. A postal card with your name and address sent to us today will bring you the book free by return mail. All correspondence should be addressed to

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YOUR HEALTH
YOUR GOOD LOOKS
YOUR TIME
YOUR CLOTHES
YOUR MONEY

All Metal Springless Tub

DON'T grow prematurely old and haggard over a back-breaking washboard and a side-ache producing wringer, when there is a better and far cheaper way to wash your clothes

DOMESTIC ELECTRIC WASHER and WRINGER

5 cents worth of electricity and 2 hours time will wash your clothes clean—make them look better and wear longer.

Enclosed Working Parts Easily Cleaned

15 Days' Free Trial in Your Own Laundry. Send for Catalogue and Easy Payment Plan.

DOMESTIC EQUIPMENT CO.
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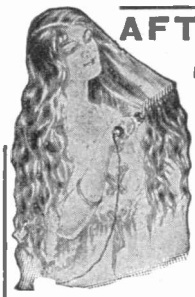
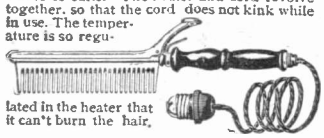


AFTER A SHAMPOO

Dry the Hair Quickly with a

PELOUZE ELECTRIC COMB AND CURLING IRON

Acts as a tonic for the hair and scalp—makes the hair luxuriant—saves time and labor—works perfectly. To use Curling Iron—simply remove the comb—makes beautiful lasting waves or curls. The heater and cord revolve together, so that the cord does not kink while in use. The temperature is so regulated in the heater that it can't burn the hair.

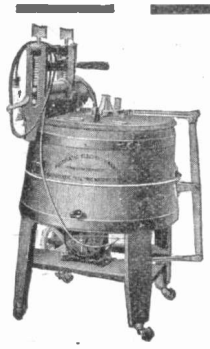


No.	THREE STYLES	Price
542	Electric Comb complete	$8.75
532	Electric Curling Iron only,	3.50
552	Curling Iron and Comb complete . . .	4.50

If your dealer hasn't it we prepay expressage on receipt of price.

PELOUZE MFG. CO.
232-242 E. Ohio St., CHICAGO

THE AUTOMATIC ELECTRIC WASHER



Is represented to be a very high class machine. We claim that it does the work just a little more satisfactorily than any other electric washer; that it is better made than any other electric washer; that more attention is paid to all details and conveniences; that it is a better looking, better selling and better operating machine than any other electric washer; that the control is simpler and more absolute and the results more satisfactory. We make these and stronger representations in our printed matter. And we further say to you that if you will order the AUTOMATIC ELECTRIC WASHER, and upon its arrival examine it thoroughly and test it exhaustively, and find that it is not even better than we have represented it to be, then you are at liberty to return it at our expense. *Do you realize that this is a business proposition?*

Ask for Bulletin 88.

Automatic Electric Washer Co.
Newton, Iowa

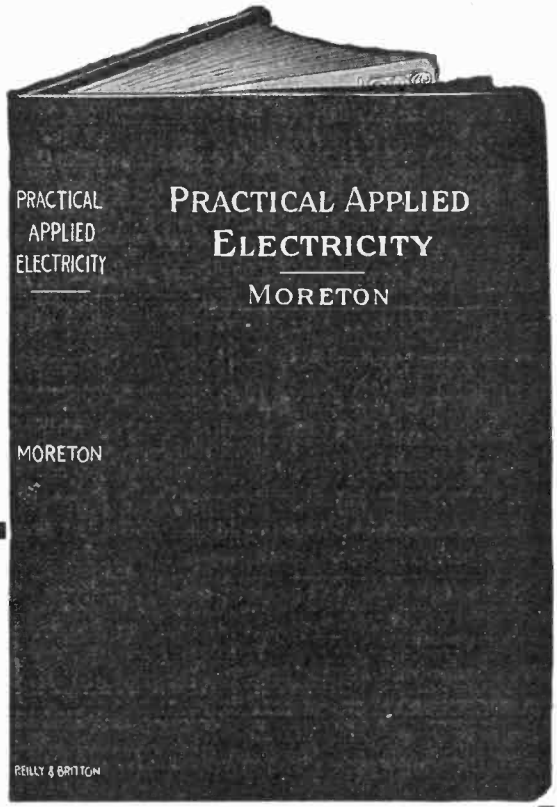
AutoMatic Washer MADE IN NEWTON, IA

A Complete Course in Applied Electricity

Practical Applied Electricity

By DAVID PENN MORETON, B. S. E. E.

Covering every line of electrical work as taught in the Armour Institute of Technology, an institution of world wide fame.



Practical Applied Electricity is the outgrowth of actual work combined with classroom experience. The author is Associate Professor of Electrical Engineering at the Armour Institute of Technology. Most of the students taking the electrical course attend the evening classes, being employed at electrical work through the day. The problems which confront these students are embodied in this book—one reason for its being so practical and up-to-date. To illustrate this valuable information, careful detailed drawings have been made under the personal supervision of the author. In plain words, this book contains the experience of a large number of ambitious electrical workers, gathered together by a recognized authority on the subject.

CONTENTS:

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

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

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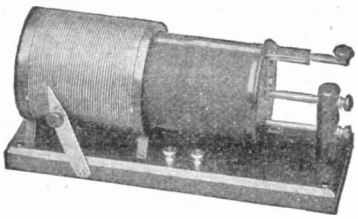

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A Sharp Wave

such as that which must be radiated under the provisions of the wireless law may be efficiently tuned only by circuits containing an efficient tuning device. The receiving transformer illustrated here is the best working instrument ever offered at such a low price. It will perform every required tuning operation with efficiency equal to any instrument on the market at double the cost.

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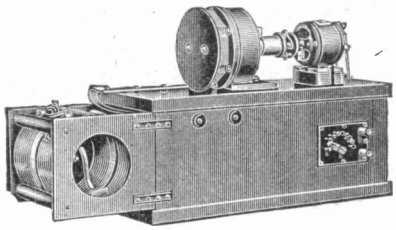

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Has twice the efficiency of standard spark sets, and complies in all respects to the new Federal Radio Regulation Act.

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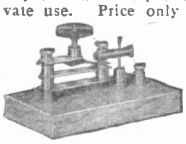

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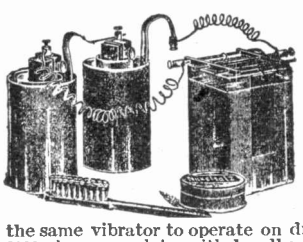

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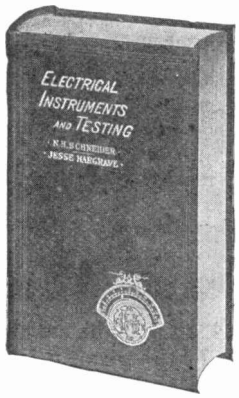

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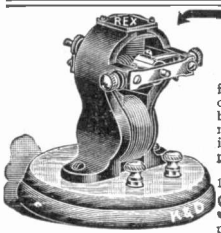

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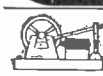

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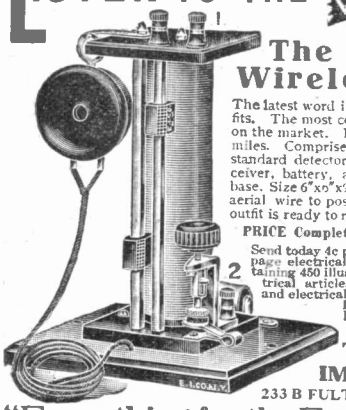

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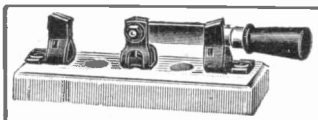

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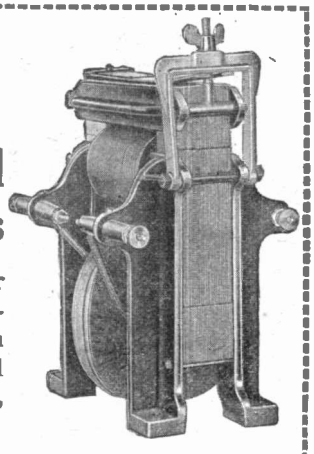

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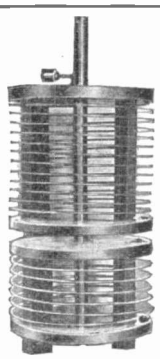

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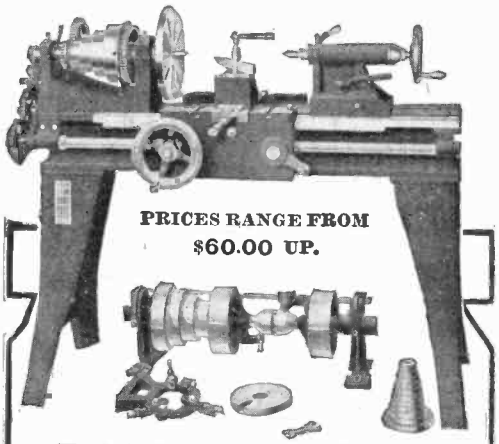

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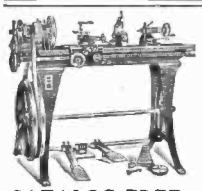

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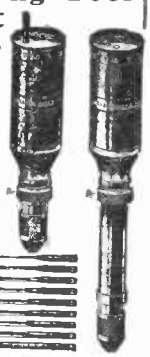

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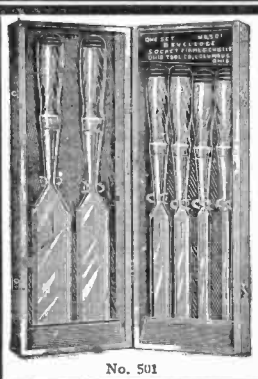

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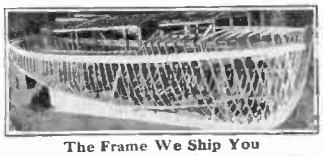

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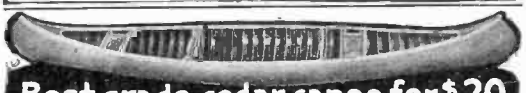

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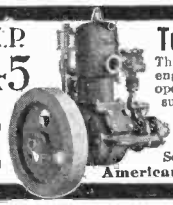

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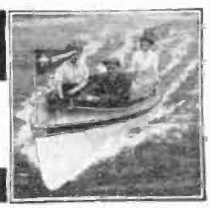

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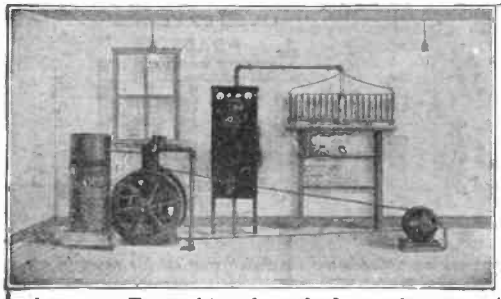

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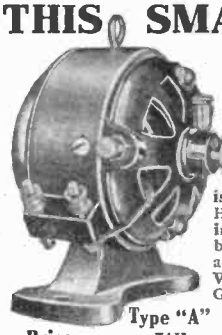

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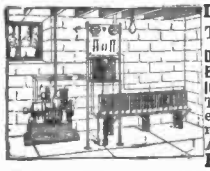

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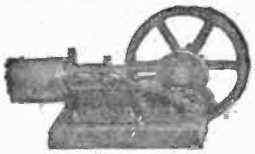

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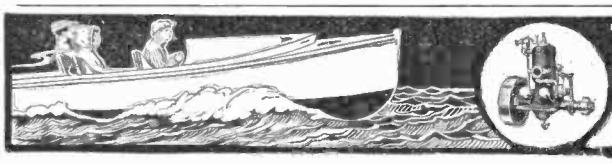

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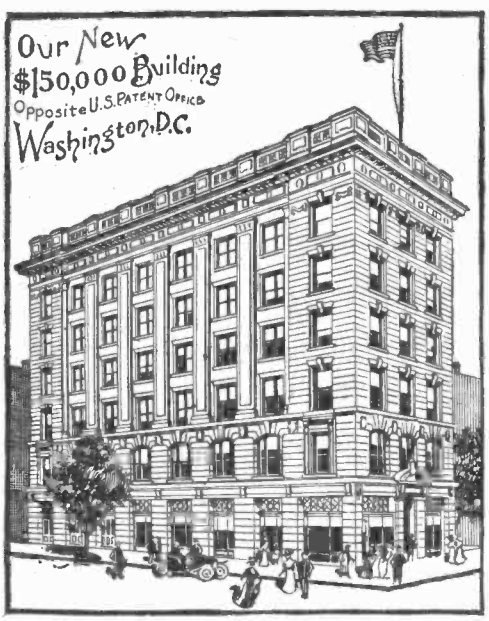

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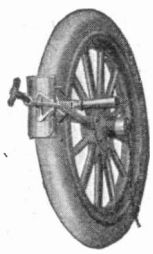

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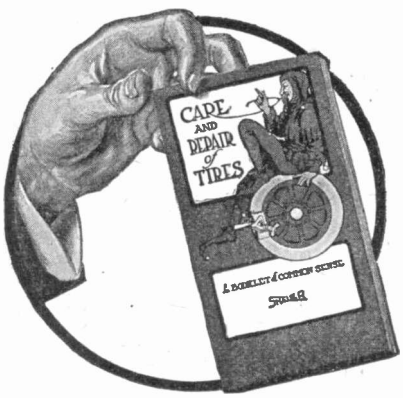

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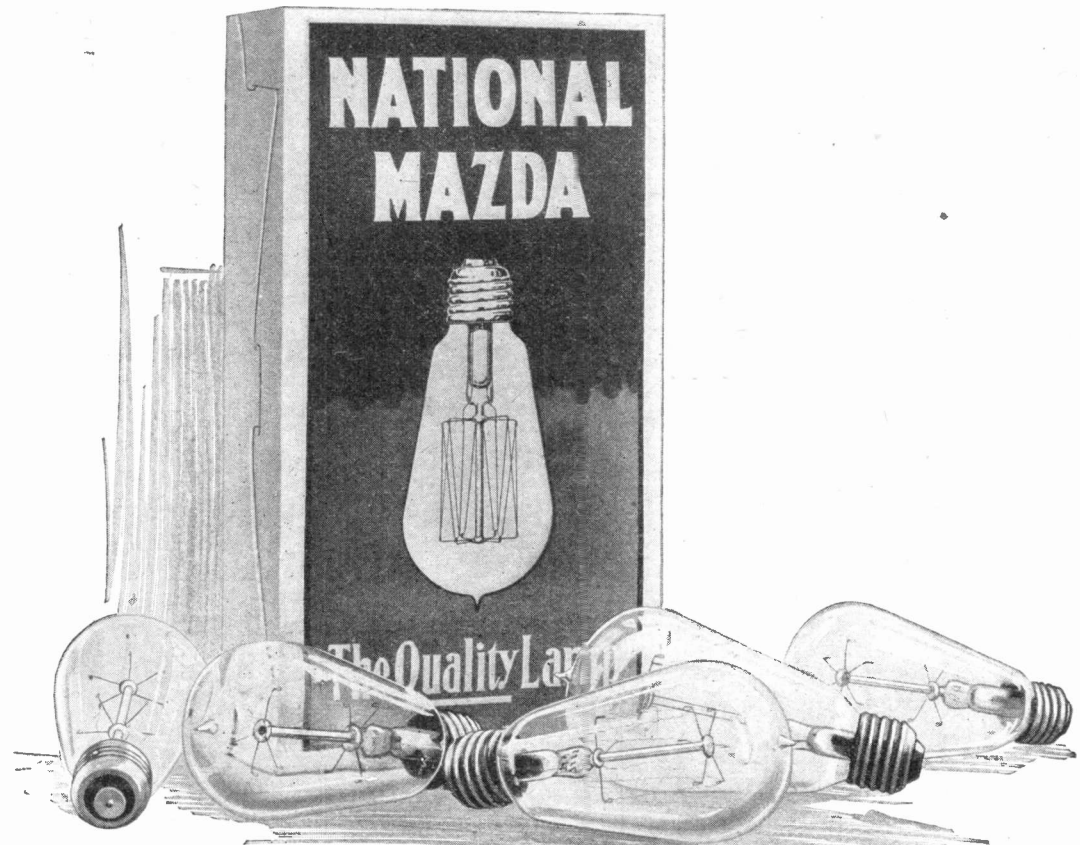

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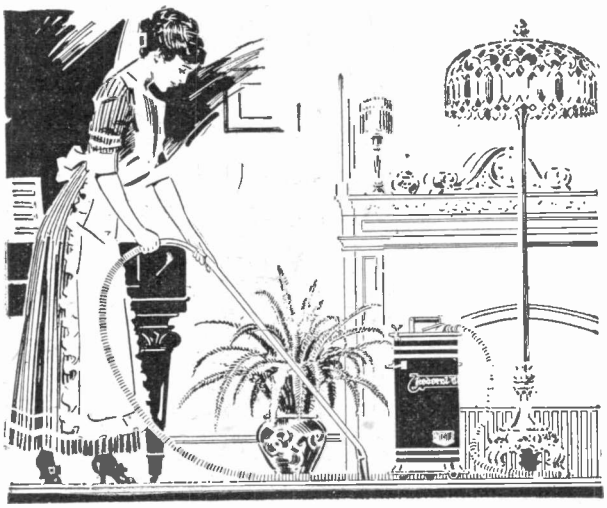

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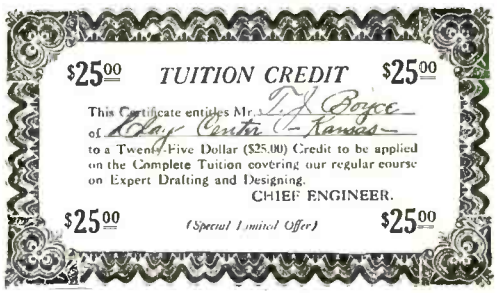

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