MAY 1913

MODERN ELECTRICS

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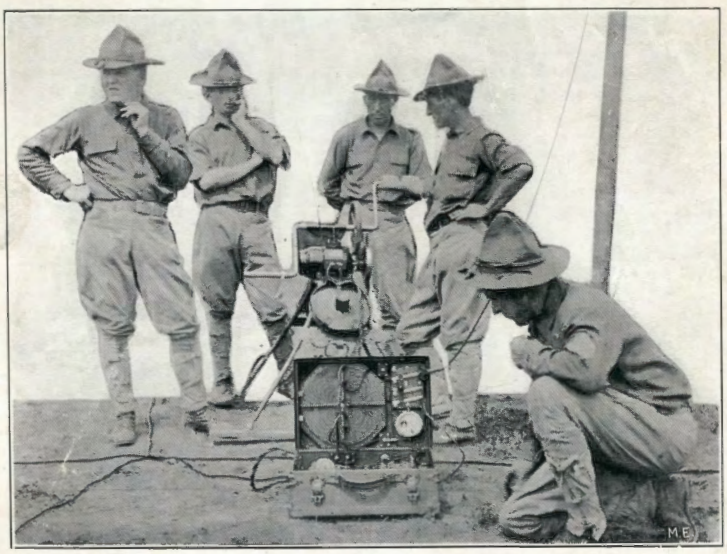

U. S. ARMY FIELD RADIO PACK SET

THE ELECTRICAL MAGAZINE FOR EVERYBODY

When writing, please mention "Modern Electrics."

A Magazine devoted entirely to the Electrical Arts

MODERN ELECTRICS

"The Electrical Magazine for Everybody"

ORLAND J. RIDENOUR, President. CHARLES A. LEQUESNE, JR., Editor.

Volume 6. May, 1913 No. 2

Contents

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Modern Electrics

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Field Radio Sets of the Signal Corps, U. S. Army

By Thos. W. Wylie

FOR radio communication in the field the Signal Corps of the United States Army has adopted a portable 500 cycle, quenched spark set that is transported on three pack mules.

This set consists essentially, of an alternating current generator, hand driven, and permanently mounted on a light tubular steel stand; an operating chest containing all apparatus necessary to trasnmit and receive radio signals, and a jointed mast forty feet high when erected, with antenna and counterpoise.

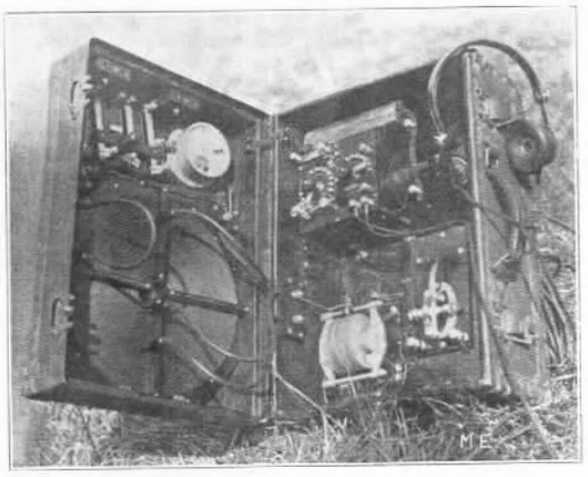
READY TO OPERATE

In packing the set the generator together with the sections of mast are placed on one mule. The operating chest, a canvas bag reinforced with leather containing the antenna and counterpoise, and an accessory kit in which repair tools and spare parts are placed, are carried on a second mule, while on the third animal is packed a light, waterproof, canvas tent which is used as a shelter for the operator and instruments when it is intended to establish a station for any length of time. There are also carried on this last animal many articles that are used when the station is established semi-permanently, such as a picket rope for the animals, folding lanterns for night work, brush cutting knives and hatchets. These articles are contained in a canvas cover conveniently rolled for packing on the mule. The mules when packed are led by mounted men, each animal being led by one man.

One radio pack set is assigned to a section of a Field Company of the Signal Corps, there being two radio sections and four wire line sections to each com-

pany. Each radio section contains 10 men, 3 of whom are radio operators, 4 antenna men who stake out the antenna and then relieve one another in turning the crank handles of the generator, 1 messenger and 2 horse holders.

In maneuvers in the field, or during actual war, a radio section is assigned to duty with a suitable division or command of troops of the line of the army. A suitable command may consist of a cavalry screen, a regiment, or an entire brigade or division of cavalry or infantry. It is the duty of the section to keep abreast of, or in touch with the body of line troops to which attached, and to transmit to and receive from headquarters and other points important dispatches. It frequently happens that a cavalry commander on the march will desire to transmit a message to headquarters without halting his column. When such is the case the radio section leaves the column, and the command "open station" is given by the non commissioned officer in charge. In less than two minutes the mast will be erected, the antenna staked out, the counterpoise stretched on the surface of the ground, two men will be turning the crank handles of the generator, the operator will adjust for maximum radiation, and presently will be in touch with the radio section at headquarters. In five or six minutes the message will have been transmitted and its receipt acknowledged. Then the command "close station" will be given, and in another minute the mast will be lowered, antenna and counterpoise reeled up and placed in the canvas bag, the generator crank handles and gear wheel demounted, operating chest closed and fastened, and the mules repacked. The men then mount their horses and are off at a gallop to catch up with the column. Each man in the section is assigned a definite duty in opening or closing station, and is drilled in the particular thing he is to do until he is letter perfect, hence there is no confusion in any detail of the work.

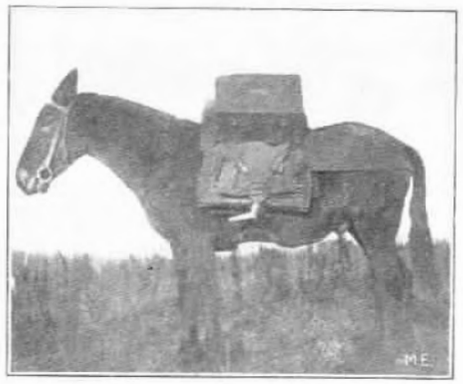


OPERATING CHEST

The generator used is an 18 pole, 500 cycle machine, generating 110 volts at 1.12 amperes, which gives an output of approximately 123 watts. The machine is designed for an armature speed of 3,333 r.p.m. On the main shaft in addition to the alternating current windings, is mounted a direct current armature which generates the exciting current for energizing the field magnets of the alternator. The machine has demountable crank handles and gear wheel which in transport are carried strapped to the tubular stand of the generator. The gearing mechanism is provided with an underspeed and overspeed regulator which prevents the armature shaft from rotating until the crank handles are revolved at such a speed as will give approximately 3,000 r.p.m., and which releases the shaft when the rate of speed exceeds 3,500 r.p.m. The ratio of the gearing is such that at the proper armature speed to give 500 cycles, or 3,333 r.p.m., is obtained when the crank handles are revolved at the rate of 36 r.p.m. Two men are required to turn the crank handles of the generator.

In the operating chest are the transformer, the sending key, condenser, quenched spark gap, oscillation transformer, and hot wire ammeter for indicating the radiation; also the receiving apparatus consisting of an inductively coupled receiving transformer, series and stopping condensers of fixed capacity, rectifying detector, and a high resistance double head telephone receiver.

The transformer is of the open magnetic circuit type, with dry insulation. The secondary is wound in twelve "pies" which are connected in series, the entire winding being tapped at three points and leads connected to outside contacts. The 110 volts in the primary are stepped up to approximately 7,000 volts in the secondary.



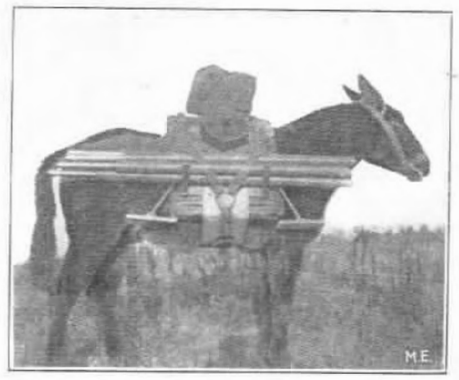
OPERATING CHEST, ANTENNA, COUNTERPOISE, ETC.

A small mica condenser of about 0.006 micro-farad capacity is placed across the circuit between the quenched spark gap and the oscillation transformer.

The quenched spark gap consists of several metal disks, separated by mica washers, the space between disks being made air tight by clamping the whole to the proper tension. Connection is made to one side of the gap through the edge of one of these disks by means of a slotted contact, this contact being placed on the disk which in series with others gives the proper amount of damping in the condenser circuit. In the use of this gap it is found that all of the energy in the closed oscillating circuit is transferred without loss, and in a few oscillations, to the radiating circuit, after which the spark is quenched and the circuit is, in effect, open. When the oscillations in the closed circuit cease, the radiating circuit continues to oscillate in its own period, radiating a wave of its own electrical length without any retransfer of energy to the closed oscillating circuit, which continues open until the resistance of the spark gap again breaks down. The high pitch of the note of this spark makes it exceptionally easy to tune in even when the air is full of waves of identical length, but lower group frequency, and in bad cases of that common foe of all radio telegraphers, static, messages have been copied with ease.

An inductively coupled receiving transformer, perikon rectifying detector, and fixed condensers, are used for the receiving side. The primary of the transformer is wound with 170 turns of No. 22 enameled wire divided into two groups, one of 10 turns, and one of 160 turns. Each turn of the small group is tapped off and the leads conected to 10 switch contacts. At every 10 turns the large group is tapped, there being 16 leads to 16 switch contacts. The switches for each of the two groups are so connected that the contacts on which placed bring in series the turns of the primary to which they correspond. The secondary winding is tapped at four places and leads connected to switch contacts. The relative position of the coils can, of course, be varied by sliding the secondary in and out of the primary.

The mast proper consists of seven light, hollow, wood sections, each 5 feet 8 inches in length, by about 3 inches in diameter, containing in one end a steel tube 2 inches in diameter which projects 1 foot beyond the end of the wood section. In erecting the mast an insulator containing the antenna ends is placed in the hollow space at the top of the first section, which is then raised vertically,

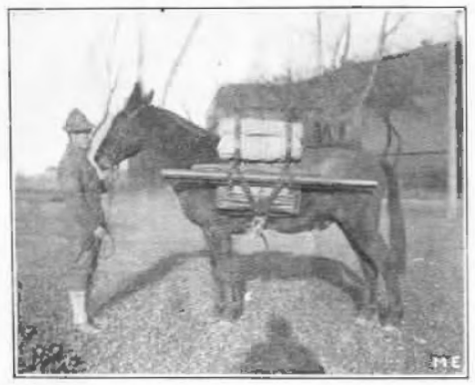


GENERATOR AND SECTIONS OF MAST

while in the space in the other end of that section is inserted the steel tube of the next section, and so on until all of

the sections have been erected. In the lower end of the last section an insulator is permanently placed to insulate the entire mast from the earth. Three extra sections of mast are carried with the set and are used as poles for the shelter tent when required.

The antenna wires, consisting of four leads of stranded wire each 85 feet in length and attached by means of insulators to guy ropes 75 feet in length, are carried out in opposite directions by four men, and when all of the sections of the mast have been erected the ropes are fastened to iron stake pins, in this manner guying the pole. The antenna lead consists of three stranded conductors, the same as used in the antenna wires, braided together and extends from the



SHELTER TENT AND EXTRA SECTIONS OF MAST

top of the pole down nearly to the ground. The lower end is attached, by means of a spring chip, to a short insulated lead which connects to the instruments.

The counterpoise consists of four leads of rubber covered stranded wire 85 feet in length laid on the surface of the ground,—the wires, however, not being in direct contact therewith,—and parallel to the antenna leads.

The antenna and counterpoise leads, and the leads from the generator are connected to the instruments by means of plugs pushed into sockets permanently wired to the set. This feature materially reduces the time necessary to "open" or "close" station.

The normal range of these sets is 20 to 30 miles, but under very favorable conditions this range has been extended to 50 and 60 miles.

WIRELESS EXPERIMENTS FROM A BALLOON

A series of experiments of exceptional interest to the up-to-date wireless man have been carried on recently in Los Angeles, Cal., under the direction of Mr. H. D. Hayes, who is at the head of the Los Angeles Y. M. C. A. Radio School.

Through the courtesy of one of his pupils, Mr. Hayes has had an anchored balloon at his disposal for some weeks, and has utilized this to experiment with radio telegraphy from a balloon.

The balloon was at a height of about five hundred feet in all experiments. The anchoring cable, being connected to the earth, made an excellent ground.

The type of aerial found to give best results was merely one copper wire about one hundred feet long dropped down beneath the balloon, parallel with the ground connection and about three feet away from it.

Several types of receiving apparatus and hook-ups were tried. Surprising distances were covered with all, but best results were obtained with a simple set consisting of loose-coupler, variable condenser, detector and 'phones. Using this outfit, the experimenters copied the steamer "Siberia," equipped with a five kw. set, two hundred and fifty miles west of Honolulu, at nine o'clock in the evening.

No attempt has been made as yet to use a transmitting set, on account of the weight of the necessary coil, storage battery, condenser, etc. However, surprising results would undoubtedly be obtained even with a small coil. It is planned to thoroughly insulate the aerial from the balloon and connect it to a two kilowatt Marconi transmitting set on the ground. Great results are expected from this.

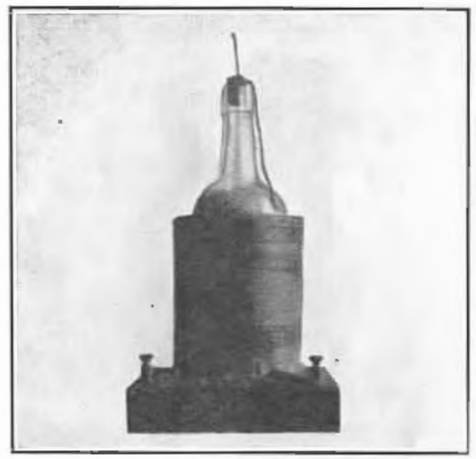
An interesting point to be noted throughout these experiments is one which has been emphasized so many times before in *Modern Electrics*—the simpler the apparatus, within reasonable limits, the better the results obtained.—*G. S. Corpe.*

Construction of a Small Oudin Resonator

By Stanley E. Hyde

THE apparatus about to be described will make a nice addition to a set of high frequency instruments consisting of a step-up transformer, condenser and spark gap. Many interesting experiments can be performed with it.

A resonator of this type is really a sort of auto-transformer in that it raises the voltage very much higher than it was formerly. The completed resonator is shown in the photograph. Secure a two-quart bottle, and, beginning at the bottom, wind one layer of No. 34 D. C. C. copper wire, stopping at the shoulder and bringing this terminal to a brass tip that can be screwed into the cork in the opening at the top. Imbed the winding in an inch of wax. This can be done by making a form from stiff paper that is two inches larger in diameter than the bottle and placing the bottle in the center of this paper tube, which is then filled with wax to a position that just comes a little over the top of the winding. When this has hardened wind on five turns of No. 12 rubber covered wire, preferably stranded, beginning at the bottom as before. Wind these turns close together so that they will be as close to the bottom as possible. Wrap these turns with a layer of tape so as to hold them in place while the whole is embedded in a preparation of wax. Connect up, as shown in Fig. 1. For a maximum spark length with this resonator it will require a ¼ kw. outfit, but it can also be made to give fairly good results when operated by a small spark coil. Mount it on a block of wood, as shown in the cut, bringing out the terminals of the primary to two binding posts, as shown. To operate, the plates in the condenser are varied until the oudin gives a maximum spark or brush discharge. This means that the condenser must be varied until the two are tuned to the same time period or frequency, and when this is obtained the resonator is operating at its highest efficiency.



OUDIN RESONATOR MADE FROM A BOTTLE

This bottle resonator can be made to operate Crooke's and Geisler tubes very beautifully. Stand on an insulating stool and touch the terminal of the resonator with the one hand while holding a tube in the other and the tube will light up. Of course, a metal rod should be held in the hand that takes the current from the tip of the resonator, so that the hand will not be burnt, although if a shock should be experienced it will not harm the operator, except that when it is taken on the hand very much it produces a stinging sensation. Another experiment that is interesting to perform is that of lighting to full incandescence a 110-volt, 16-candle-power lamp through the body.

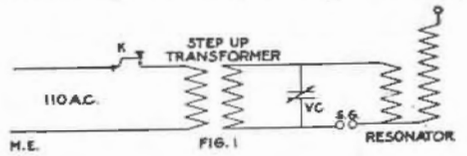


FIG. 1

FIG 2

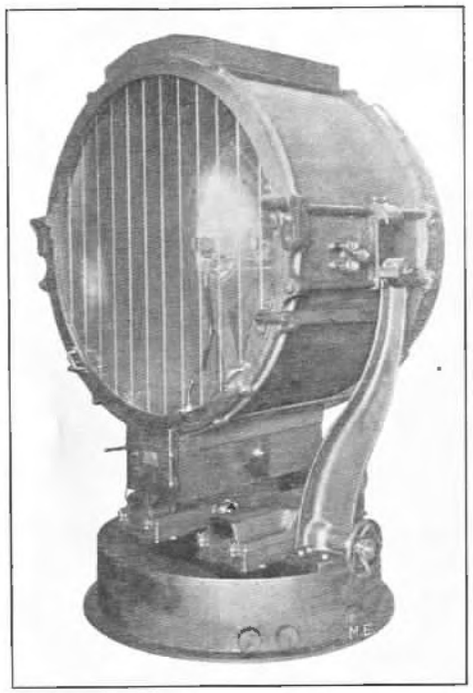
Take an ordinary 16 c.p. lamp and solder two wires to the two terminals respectively, as shown in Fig. 2. Let one person stand on the insulating stool and touch the tip of the resonator with the

(*Continued on page* 116)

The World's Tallest Building

By Bertrand Sherburne

DIMES did it. You never thought, did you, that those little silver pieces which slip away so easily, would make a structure 790 feet high, with 55 stories and 11¼ acres of renting area. But the little despised ten-cent piece made in the five and ten-cent store business did it: that and electricity, for, without this most powerful and flexible force, the great Woolworth building, just completed in New York City, would be as dead and useless as one of the Egyptian catacombs.



60" SEARCHLIGHT FOR TOWER

Without the electric power for the 24 passenger elevators, the business man occupying an office on the fiftieth floor would have a somewhat tiresome climb, on his arrival from the subway in the morning. Or, without this same source of energy to supply the 10,000 25-watt tungsten lamps, which are to furnish artificial light when the daylight from the 3,000 office windows is insufficient, the little stenographers would have a merry time during those frequent periods when the clouds wrap about the tower of the structure so thickly that it is completely hidden from the view of pedestrians on the street. At such times, the great searchlight to be placed on the tower will be powerless, but, on clear nights, its rays will reach out over the waters of the Sound, and the Atlantic, and will serve as a welcoming signal to the homeward-bound passenger aboard the incoming liner.

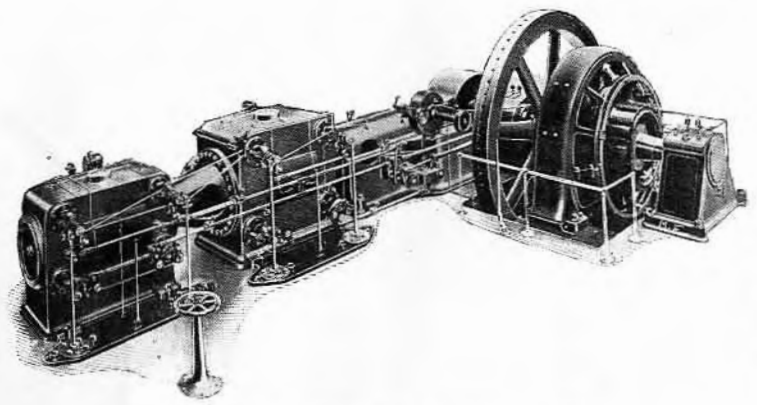
To supply this great lamp with its illuminating power, and to speed the elevators up and down on their lengthy journeys, four electric generators are located in the sub-basement. These are of the General Electric, 250-volt, direct current, multi-polar type, and each is direct connected to a tandem compound Rice & Sargent engine of the Corliss type, manufactured by the Providence Engine Company. Two of these generators will supply 500 kilowatts each; one, 300, and the fourth, 200 kilowatts. All run at the comparatively low speed of 100 revolutions per minute, and all are provided with heavy balance wheels, whose inertia makes the entire mechanism move as smoothly as a seventeen-jeweled watch. These units are, of course, not in simultaneous service, the plan being to keep one of the 500-kilowatt machines running continuously, and to supply the peak loads by impressing one or the other of the smaller generators, as the needs of the service require. All of the units are controlled from a single switchboard, especially designed for this plant. The latter is illuminated from above by hidden lights which shed a soft radiance through ground glass panels in the ceiling.

The lighting is arranged on the 3-wire, 125-250-volt system. There are three balancer sets to care for the sudden fluctuations in the demand for current, which would unbalance the system, causing part of the lights to burn too brightly and the rest to burn dimly. Two of these sets are designed to take care of 300 amperes in the neutral wire. The third will care for 92 amperes in the neutral wire.

THE WOOLWORTH BUILDING, TALLEST BUILDING IN THE WORLD

Broadway, Vesey Street, Park Place, New York City

A two hundred million candle-power searchlight will probably be placed on the tower of the building. Plans for this spectacular illuminating feature are still in the tentative stage, and several schemes have been proposed, but the one which has, so far, met with the most approval is that of a 60-inch reflector, equipped to throw a ray of two hundred million candle-power. This great light will be rotated at definite intervals of time by a clock-work device in the base, which will actuate an electric motor geared to the rotating mechanism. Should this plan be adopted the light will perform a valuable service as a signal for ships at sea, for, on clear nights, its rays will be visable far out on the Atlantic.



ONE OF THE 500-KW. GENERATING UNITS

The elevator starter has risen to the dignity of a train dispatcher in the Woolworth building, for he is the occupant of a dispatching office located between the first and second floors. Instead of parading up and down with a pair of Spanish castanets in his hand, and making anxious passengers wait while he shoos a persistent peddler out of the front door, he will sit in dignified solitude before a signal board, whose changing lights will indicate the exact position of all cars, and his routine train orders are issued by means of a row of push buttons within convenient reach. Should a special order be required, a telephone at his elbow may be instantly connected with the telephone in the distant car. All plant offices of the building will be on this same telephone, so that the manager of the building can sit at his desk and control every operation. All elevators are to be run on regular time, and the regular schedule starting-signal is given by an automatic device.

The elevators are of the Otis traction type. The design of the hoisting mechanism of these cars is a reversion to the principle governing the construction of the early pioneer types of cars, except that the armature of the motor is mounted on the same shaft as the drum over which the cables pass, and the hoisting machines are at the top of the elevator shaft instead of in the basement with the other machinery.

Two of the elevators will run the entire distance from the ground to the fiftieth floor, and this distance is so great that much care was necessary in designing them to prevent elasticity of the steel cables from making the car bounce like a rubber ball, if stopped suddenly. A new signalling device, never before used, will be employed on these two cars, for the night and Sunday service. When the problem of signal-wire cables for these two through-route cars was considered, it was found that the weight and bulk of the necessary cables to carry the current for the ordinary signalling device would make their use impracticable. In addition to the mechanical difficulties was the fact that these cables alone would cost nine hundred dollars. A reflecting periscope was therefore adopted. When a prospective passenger on a floor above presses the signal button, an electric lamp is lighted, the rays from which are reflected downward so as to become visible to the operator of the ascending car.

Fifty-five thousand feet of telephone cable, containing 460 miles of copper wire, enough to reach from New York City to a point 22 miles beyond Buffalo, were required for the building. This house cable weighs about 20,000 pounds, or 10 tons; and the weight of the copper alone is between two and three tons. These wires connect with a distributing frame having a capacity of 4,000 lines. The estimated cost of the telephone cable work was $6,500.

The initial estimates for power and lighting conductors for the General Electric contract alone involved the placing of an order for 271,000 feet of twin conductor, equivalent to over one hundred miles of single conductor; and a rough estimate of the total length of wire and cable required for the entire power and lighting equipment would approximate three hundred miles.

Two hundred arc lights and 2,000 incandescent lamps were used in the course of the construction work on the building, and the work required the use of 1,200 horse-power in electric motors. A force of 6 electricians was kept constantly busy making changes in the wiring, as the work progressed.

More than fifty miles of piping were used in the plumbing installation, and the total cost of the latter exceeded $100,000. Special precautions were necessary to provide for the contraction and expansion of the vertical pipes, and the problem was met by forming a loop in each pipe at every sixth floor.

In place of the usual clumsy method of vacuum cleaning by means of a gasoline engine in the street, and leads of hose to the rooms above, the building will be piped throughout for a plant vacuum system, with convenient outlet boxes in every office. Vacuum will be supplied by motor-driven exhaust fans in the basement, and utilized by portable vacuum cleaning tools which can be carried about the building. The terrors of spring cleaning will therefore never ruffle the tempers of the tenants.

A large swimming pool is located in the basement and a public luncheon club on the 28th floor.

Twenty-one thousand tons of steel were used in the construction of the frame of the building, and 50,000 tons of brick were required to cover it. Five hundred tons of terra cotta formed the partitions and floors. The building is 790 feet from the street to the base of the flagpole. The main structure is 29 stories high, has a frontage of 152 feet on Broadway, and a depth of about 195 feet. The total cost approximates $7,500,000. Excavation was commenced on November 2, 1910. The design is a combination of the French, Italian, and Modern Renaissance schools of architecture. The structure, when seen from a distance, has the stately dignity of a cathedral. The Thompson-Starrett Company was the general contractor; Cass Gilbert was the architect.

HOW THE WOOLWORTH BUILDING BREAKS UP THE SKY LINE

The Practical Electrician

A Popular Course in Electricity on the Construction of Electrical Apparatus and Experiments to be Conducted with them

By PROFESSOR W. WEILER, of the University of Esslingen, (Germany)
Translated for MODERN ELECTRICS

CHAPTER IV

(Continued)

131. Direction of Current and Lines of Force

(1) Rule of Direction. The end of the iron, which is nearest to the observer, is a north pole, if the current (positive) flows counter-clockwise, and a south pole when it flows clockwise. (See Fig. 192.)

(2) Pen Rule. If the pen-holder be the wire and if the current flows in the direction of the ink, then the north pole is at the thumb.

(3) Maxwell's Corkscrew Rule. If the current flows in the direction in which a corkscrew turns, the lines of force flow in the direction in which the corkscrew moves endwise. That is, if the current flows around a core, with a right-hand twist, the north pole of the magnet is at the far end of the core.

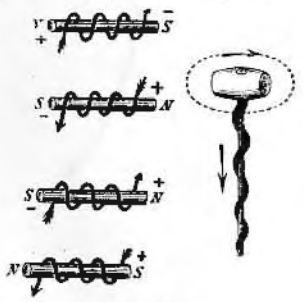


FIG. 192

A closed iron ring, surrounded by a circulating current is poleless; it is an electro magnetically generated toroid. The magnetization reaches a high value with the least magnetic resistance of the material. Such electro-magnets are, therefore, used in determining the magnetic peculiarities of the various sorts of iron.

132. Dimensions for Three Forms of Electro-Magnets

(a) For a ringing apparatus with a bell of 3 inches diameter, a straight leg 2 inches long is placed ¼ inch away from a simply bent round rod about 5/16 inch diameter. If the bell is made 3½ inches in diameter, the round rod is then made ⅜ inch in diameter, and the leg is made 2.5 inches long.

(b) For the magnetizing of steel rods and the production of the usual electro-magnetic results, the following measurements will suffice: diameter of the core, 1 inch; length of the core 4¾ inches; distance between the legs of the core, 3 inches; yoke = 5½ × 1 × 1 inches: copper wire is 0.062 inch in diameter, No. 14 B. & S., and should be double

FIG. 193

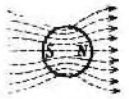


FIG. 194

FIG. 195

cotton covered. The winding should be four layers deep. The cores project about 0.4 inch above the coils. The legs and yoke are composed of annealed wrought iron.

(c) For diamagnetic purposes. Iron core, a ring; diameter of core, 1 inch; outside diameter of ring, 7.5 inches; wire, 0.047 inch thick, No. 17 B. & S., and about 0.9 ohm resistance; winding principally at the ends.

Experiment. A thin piece of bismuth about 0.4 to 0.8 inch long suspended between the poles by a silk thread, is placed equatorial; that is, perpendicular to the lines of force between the pole-extremities by the current from 6 Bunsen Batteries. (See Fig. 193.)

Diamagnetic substances are: Bismuth, antimony, zinc, tin, mercury, lead, copper, etc., hydrogen, and most other

FIG. 196

FIG. 197

FIG. 198

gases, and flames. While the para-magnetic bodies (iron, cobalt, nickel) absorb the lines of force, Fig. 194, their number is diminished diamagnetically, Fig. 195; that is, the paramagnetic bodies are more conductive for magnetic lines than the air—the diamagnetic, less than air.

Experiment. Plücker placed between the pole-extremities of a very strong electro-magnet 0.14 inch apart, a quietly burning tallow candle, making no soot, and held the same between the pole extremities so that the latter were ⅞ of

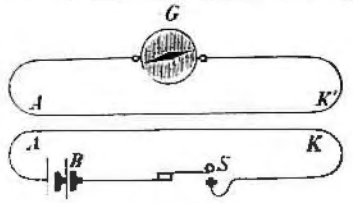


FIG. 199

the original height of the flame above the tip of the wick; Fig. 196 shows the appearance of the flame in this case where the current was on.

As the flame was raised, so that the pole-extremities became ½ their original height above the wick, the flame acquired shape shown in Fig. 197.

Finally, the candle was raised so high that both pole-extremities were just even with the tip of the wick, and the flame cooled, because of the iron poles, did not burn with its full light. When the current was shut off, it not only recovered its former light, but burned more intensely, as it had been forced down and acquired the form shown in Fig. 198.

A very smoky light gives entirely different results.

A soap bubble filled with hydrogen, if brought between the extremities of the poles is burst.

133. Electro-Induction

Experiment. (1) If two conductors, AK and A^1K^1, Fig. 199, be placed parallel to each other, for example, a twin conductor, 30 feet long, as is used in wiring branch circuits for electric light, and to one wire a battery, B, be connected, with a key, S, while to the other a very sensitive galvanometer, a movement of the needle of the galvanometer would then be noticed every time that the key is pressed down. This movement is only transitory, and proves immediately that the current diverting the needle is opposed to the generating (inducing) battery current. If, after the needle has come to rest, the key is opened, the needle is again deflected, but in the opposite direction. The battery current is also called the primary or main current, and the current passing through the other conductor, the secondary, inducing or galvanic induction current or also adjoining current.

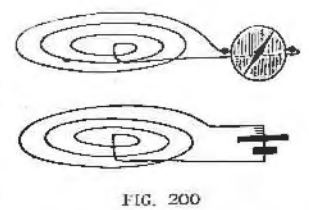


FIG. 200

If the double conductor be pulled into a piece of gas pipe, the induction force is increased considerably, because the number of lines of force are increased in consequence of the great permeability of iron.

(2) Experiment likewise with two flat coils, Fig. 200, one over the other or with copper wire coils, fastened to either wood, glass or slate. The force of the individual turns is added up. This contrivance serves also to demonstrate the induction or influence by means of the discharging spark of frictional electricity.

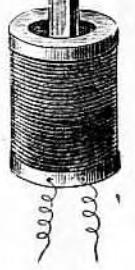


FIG. 201

(b) *Fundamental rule for electro-magnetic or current induction.* With the formation of a current in a conducting circuit, there is induced in every neighboring closed circuit a momentary current; with the decrease another current is induced, but its direction is opposed to that of the first induced current.

(2) *Experiment.* Upon two square boards, whose sides are about 30 inches long, large coils of insulated iron wire, 0.12 inch thick, No. 8, B. & S., are fastened; connect a strong battery and a Morse key to the poles of one and to the poles of the other, a telephone, and then support the boards parallel to each other; the current interruptions generate induction currents in the telephone up to a distance of about 20 feet.

A careful research demonstrated that a distance of 2500 feet can positively be covered in this manner by means of a current of 1 ampere with coils of 9 turns, iron wire 0.165 inch thick, No. 6 B. & S., and with the diameter of the coil 7.15 inches.

(3) Analogy. A vibrating tuning

fork produces a distant, even toned sound through the waves of air; in similar manner do moving magnets and primary currents set up alternating magnetic lines, and these, cutting across a secondary wire, induce currents in the same.

134. Magnetic-Induction

(a) Using about 20 feet of insulated copper wire of 0.0315 to 0.0394 inch diameter, No. 18 or 20 B. & S., and a shell of wood or cardboard, make up a

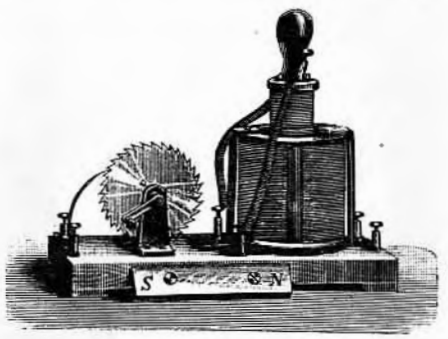


FIG. 202

coil about 4 inches long and having a hole through it about ⅞ inch in diameter, with square or round extremities of wood about 0.4 inch thick (see Fig. 201), connect the ends of the wire to a galvanometer placed at a distance and plunge into the coil a strong permanent magnet of about ⅝ inch diameter and 8 inches long. The needle shows a momentary deflection.

Observe, 1, the deflection of the needle when the magnet was put in the coil to the center, then from the center to the other end; 2, likewise when withdrawing the magnet. Turn the magnet end for end and again notice a and b. Hold the magnet firmly and move the coil, and then again notice the peculiar actions.

The current generated by the movement of a magnet through a conducting coil is called magnetic induction current.

Note:—With this coil and a strong battery, the hard steel rod may be magnetized, if while the current is flowing through the coil, the rod is moved to and fro more or less and the current is cut off while the rod is still in the coil. Instead of moving the steel rod, one can also hold it in the coil and shake it violently by striking it with a mallet.

(b) Wind around a soft iron rod about 6 inches long and 0.4 inch thick a single layer of insulated copper wire, the same size as used on the above coil, and move the electro magnet up and down in the coil as before with the magnet, while the current of a strong battery flows through the winding on the rod; the galvanometer needle will make stronger movements than before because this time the magnet and current induction work together. Observe again the four possible cases. Instead of moving the primary coil, the primary current can be broken up by means of a cog wheel, the positive current is led to the spring bearing against the wheel, then from the wheel itself to one end of the primary coil, then through the coil and from the coil back to the battery. (See Fig. 202.)

(c) Explanation by means of the Lines of Force.

The electro and magneto-induction experiments described above tend to demonstrate a relation between the magnetic and the electric currents. If a coil is in a magnetic field, whether the field be produced by means of a magnet or primary coil, a current will be induced in the coil whenever a change is made in the magnetic field; that is, that the conductor or the magnetic field change their positions.

Let us observe the case with a magnet pole. The ray-like lines of force radiating in all directions in space, as they leave the pole, spread out further from one another, so that if we move a copper ring perpendicular to the axis of the magnet, it will cut through more or less lines of force in proportion to its closeness to the pole; likewise, the strength of the induced current in the ring will vary

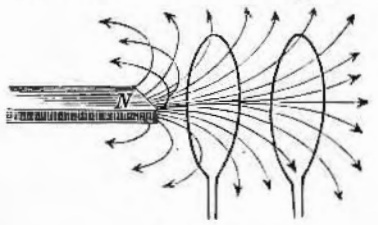


FIG. 203

in proportion to the closeness of the ring to the magnet. (See Fig. 203.)

(d) *Fundamental rule for magneto-induction.*

Whenever a conductor is moved in a magnetic field, there is produced a change in the number of lines of force cut; also there is set up in the conductor

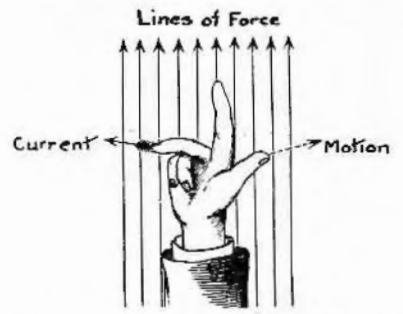
an EMF and its value is dependent upon the number of lines of force cut in a unit of time.

(e) Induction finds application in magneto and dynamo electrical machines and motors, in induction apparatus, in telephones and in transformers.

(f) *Rules for Direction of Current.*

(1) Maxwell's Rule. If in any action in a loop conductor, the number of lines of force are diminished, there will be a clockwise current induced, but if they are increased a counter-clockwise current is induced. It is assumed that the lines of force from north to south pole are flowing toward the observer.

(2) Right Handed Rule. Fig. 204. Hold the right index finger in the direction of the lines of force and the thumb stretched out in the direction of the



movement, the induced current will then flow in the direction of the middle finger.

(3) Conversely hold the right index finger in the direction of the lines of force, the middle finger in the direction of the current, then the thumb at the right of the other two fingers points in the direction of the movement.

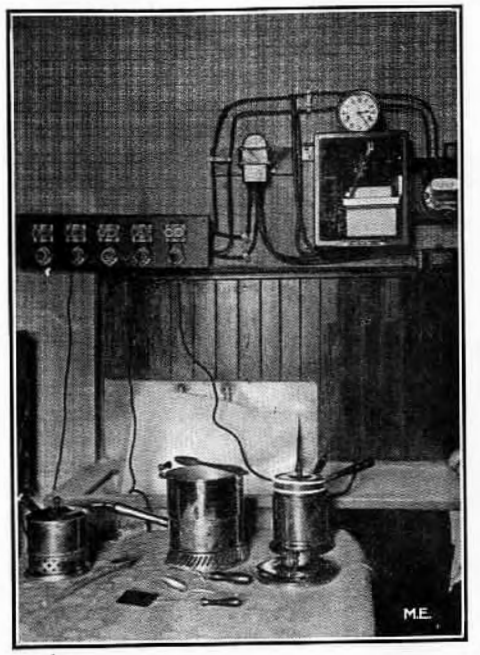
(4) Lenz's Rule. (1836) By means of a movement of a conductor in a magnetic field of force there is always a current induced in such a direction that reacting electro-magnetically upon the field, it tends to oppose the movement.

(g) Rule. The EMF of induction currents increases: (1) With the number of turns of the secondary coil; (2) with the strength of the generating magnet or with the number of turns of the primary coil and the strength of the primary current; (3) with the number of alternations in a unit of time, although with a larger number of alternations, the increase is slower than with a smaller

(*Continued on page* 116)

ALARM CLOCK STARTS BREAKFAST

For cooking breakfast with the least amount of work in the morning, when time is usually so precious, the outfit shown in the illustration probably takes the prize. In this kitchen the food to be cooked is put into the electric cookers the night before; the alarm clock is arranged to close the circuit to each cooker



at whatever time the clock is set for. When that time is reached the current comes on and by the time the family is ready to eat breakfast is all ready to serve.

GRAMERCY WIRELESS CLUB.

At the fifth semi-annual election of the Gramercy Wireless Club the following officers were elected to serve for the ensuing term: President, James Platt; Vice-President, Jas. Quigley; Recording Secretary, Helmuth Hoepfer; Corresponding Secretary, John F. Diehl, 207 East 25th street; Treasurer, John Gebhard.

Our two years of activity have been prosperous and we are hoping for great advancement in the coming year.

The Electric Aerial Line at Kohlererberg, Near Bozen

By Frank C. Perkins

A PORTION of the electrically operated aerial railway up the Kohlererberg, near Bozen, in the Tyrolese Alps, may be seen in the photograph on the opposite page. This installation shows one of the best solutions of the problem of transporting goods and passengers up heavy inclines, such as a mountain side or irregular formation.

The illustration gives a good idea of the tremendous grades which are encountered.

The cars are suspended from cables and are as comfortable as a modern electric car, and travel in a smooth and easy manner.

The Kohlererberg aerial line has a total length of 1,650 metres, or a little over one mile. It is carried by 12 structural steel towers, the highest of which is about 27 metres, or about 90 feet above the ground, and a distance of 430 metres, or about a quarter of a mile, from the lower station. The passenger cars are each capable of holding 15 passengers and the driver, and two cars travel, simultaneously, each way at one time. The speed is 3 metres, nearly 10 feet, per second, and in thirteen minutes a difference of level of 840 metres, a little over half a mile, is traveled.

Each car is pulled by two traction cables, which are operated from a power station placed close to the line. The object of duplicating the cables is to secure safety in case one of the cables should break, and the same means is adopted in connection with the suspension cables.

The cars are supported from a traveling mechanism or trolley carried by eight pulleys, four of which ride on each of the two suspension cables. Each of the steel cables on which these pulleys travel is 44 millimetres, 1¾ inches, in diameter. The cars can swing like a pendulum, but a brake retards any undue oscillation. All fear of derailment due to oscillation sideways is avoided by the fact that the carrying cables themselves swing with the car.

The drive is by electric motors, and in order to secure immunity from breakdown of the transmission system, even if the power plant fails to operate, a storage battery is installed which can furnish sufficient power to operate the line.

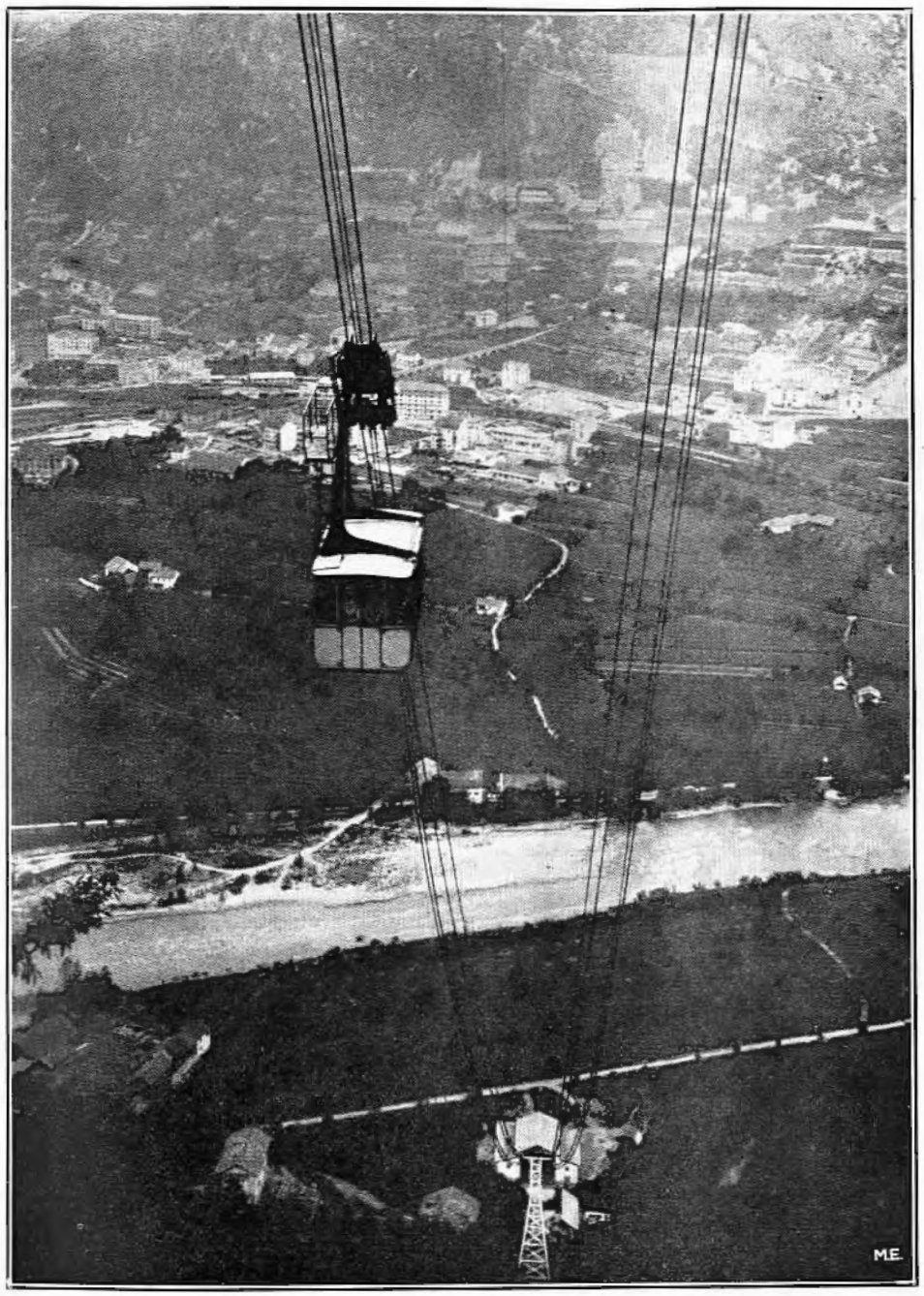
To provide communication, a system of telephones and electric signals is installed, and the driver of a car can communicate with either the upper or lower terminal station from any part of the line.

The cars cannot be started before the necessary signals have been given between the two stations and confirmed, so that there is no danger of mistake. In addition to this, safety is most efficiently studied in connection with every detail of the equipment.

The traveling mechanism of the car contains two braking arrangements which operate automatically if there is an excess of speed. The same device operates if either of the carrying cables breaks or if a break should occur on either one or both of the hauling cables. In addition to their automatic action, the operator can put the brakes into service by hand, the operation being simple and quick; and when this catching device is put into action steel jaws grip the carrying cables at eight different places. The friction is sufficient to hold the car firmly in position even on the steepest incline, and, simultaneously, by the movement of the same mechanism the supply of electricity to the driving motor is stopped and the brake is instantly applied at the hoisting drums.

To provide further security and insure the safety of the passengers in the event of a breakdown, there is a spare car kept at each station in readiness to go to the point where the ordinary car is left suspended, to transfer the passengers and bring them back to the nearest station.

The regular passenger car is also fitted with a special device in the floor by means of which it is possible to lower the passengers to the ground from the



MOUNTAIN CLIMBING WITH THE DANGER AND HARD WORK LEFT OUT

The car which carries fifteen passengers travels up the mountainside on steel cables. Though it looks dangerous it is perfectly safe

car direct. This hoist is fitted with a brake to prevent undue speed of the descent. Should the driving gear of the whole line break down, thus stranding the cars in the middle of the route, an auxiliary winder is available for bringing the cars back to the terminal stations.

It is claimed that this application of electric traction has been so carefully designed in all its details that absolute safety and reliability of service is assured. In this aerial system of transmission a great number of difficulties have been avoided which would otherwise have been encountered in proceeding over such a rough and mountainous section of route, and the service has been most successful since the line was opened.

SMALL OUDIN RESONATOR

(*Continued from page* 105)

metallic rod that he is holding. With his other hand he takes hold of one wire that is soldered to the light while the other person who stands on the floor and is grounded takes the other free wire. The lamp will light up to full incandescence if the apparatus is properly tuned without the persons feeling any shock at all. The reader can invent many interesting experiments that when operated in a darkened room will show many beautiful and weird effects.

The reason that the high frequency currents do not shock the person is that high frequency currents travel on the surfaces of conductors and do not penetrate very far into the wire. It takes 25,000 volts to jump a one-inch gap, so if the operator is taking a four-inch spark he is receiving in his body a pressure of 100,000 volts, although the current may only be 1/000 ampere.

PRACTICAL ELECTRICIAN

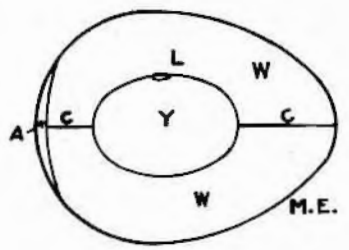
(*Continued from page* 113)

number; (4) with the resistance of the winding of the secondary coil; (5) with the closeness of the primary and secondary coils to each other; (6) with the introduction of a soft iron rod or bundle of iron in the inducing primary coil; (7) the opening current dies out quicker than the closing current, but both currents deliver the same quantity of electricity; (8) the resistance of the primary coil, also that of the source of current; (9) every induction current lasts only a moment; (10) the quantity of electricity set into motion is not dependent upon the duration of the change.

(*To be continued*)

A CORRECTION

I wish to offer a correction. In the February issue of *Modern Electrics,* "Practical Electrician" Department, you published a diagram for an electric incubator. It appears satisfactory from the electrical standpoint,



but from the egg standpoint it would be impractical, since the heat must be applied from above. The reason for this is the construction of the egg. First is the shell, immediately under which is a thin membrane; under this is still another membrane, which separates from the first membrane at the large end of the egg, leaving the air space marked A, in the accompanying sketch. All life starts at the life spot, L, which is always up, and for this reason the heat must be applied from above. The yolk, Y, swings on the cords, C and C, thus allowing the life spot to be up at all times. W is the "white" of the egg.

I learned the above quite recently from Otis Crane, the "Chicken Man" with the Purdue Short Course, which is canvassing my state, giving three-day instruction courses.—*T. Raymond Watts.*

Electricity From Air New Great Discovery

By Dr. Leonard Keene Hirshberg

WORKING quietly in the heart of Baltimore for weeks on an invention which some critics say will revolutionize the method of converting electricity to practical use has been Roy J. Meyers, who like Benjamin Franklin, extracts the electric current from the air.

Mr. Meyers' invention was made last summer while he was confined in the penitentiary at Florence, Arizona. His first finished apparatus was made in Baltimore.

A practical, unlettered electrician, Mr. Meyers, while in Arizona, was arrested on a comparatively minor charge and sent to the penitentiary. There he was placed in charge of the prison electrical plant, and there he says he made his discovery that the current which the civilized world is beginning to use most extensively for light and power could be transformed from the atmosphere without the aid of moving machines or batteries.

Miss Kate Barnard, Commissioner of Charities and Correction, of Oklahoma, hearing of Meyers' invention and of his desire to have it patented, appeared before the Arizona legislature to make an appeal in behalf of the young convict. As a result a special bill was passed which granted Meyers a month's leave of absence on parole. He went unaccompanied to Washington, filed his patent applications and returned to the penitentiary. Since then he has been indefinitely paroled.

He came to Baltimore as the place where he could easily obtain the mechanical parts needed to make a more nearly perfect machine than the crude model he had fashioned in the penitentiary workshop, and is making his headquarters here while working on his invention. With him is W. E. Chenot, who has been his assistant in assembling and testing the machine and who says that he has bought Meyers' patent rights for Germany.

They have proved beyond doubt that the invention is practical and that when finally brought to a state of perfection it will introduce a new epoch in the industrial use of electricity. By Westinghouse meters they tested the strength of the current gathered from the air, and with the use of only two of the four rectifying transformers the voltmeter recorded four and one-half volts, and the ammeter, which had the capacity of recording 75 amperes, was broken by the force of the current.

The machine itself is simple. It is in reality a transformer, which is familiar to anyone knowing anything at all about electricity in its practical uses. On a high tripod, which resembles somewhat the framework of a windmill tower, is the transformer, which Mr. Meyers calls his "absorber." It is made up of an iron core, wrapped with copper wire. The secret of the invention is the manner in which the disks composing this "absorber" are magnetized, and this secret Meyers says he found by accident while at work in prison.

What the machine, when finally perfected, will do is yet to be seen. Its inventor claims that it will greatly reduce the cost of making electricity. No batteries of any kind are needed, he says, and not a part of the machine turns upon the other. It is as durable, apparently, as an electric light pole. One of these machines, says Meyers, when perfected may be placed on a vehicle and transform enough electricity to give motive power, be that vehicle a locomotive or an automobile. He declared it can be placed on a building to furnish electric lights or power, and that the only wear will be upon the machinery which its current runs.

Meyers is thirty-four years old and he gained his knowledge of electricity by working in shops along the Pacific Coast. The depths of the mysteries of electricity he has not explored, but he is certain that he has found the means of absorbing it from the air and of converting it to the use of mankind.

Derivation of the Electromagnetic Wave Formula

By L. R. Jewett

MANY wireless enthusiasts often use the well-known formulae for computing various wave-length values, but never know their theory or derivation.

An elementary and simple explanation will be given to show how the formula for the calculation of the length of an electromagnetic wave is worked out. When a formula is worked out it is generally done by substituting certain known values in an algebraic equation.

Take the well-known formula (Ohm's Law) for direct current:

$$I = \frac{E}{R} \qquad (1)$$

Where I = current in amperes.
E = pressure in volts.
R = resistance in ohms.

This formula can only be used for alternating current when neither inductance nor capacity are present in the circuit, such as measuring the current through incandescent lamps.

Now, if an alternating circuit contains both inductance and capacity, we must change the formula accordingly. The following formula, which has been compiled by actual work, is the statement of Ohm's law in such a circuit.

$$I = \frac{E}{\sqrt{R^2 + (2\pi n L - \frac{1}{2\pi n C})^2}} \qquad (2)$$

Where:
I = Current in amperes.
E = Pressure in volts.
R = Resistance in ohms.
L = Inductance in henries.
C = Capacity in farads.
n = Frequency or cycles per second.
π = 3.14159.

In the above equation, we may either increase the numerator or decrease the denominator. We have made E as large as possible and we now make $2\pi n L$ equal to $\frac{1}{2\pi n C}$, causing them to cancel out. Then $I = \frac{E}{R}$ and I is a maximum. This condition is known as resonance. Thus, this is true when neither inductance nor capacity are in the circuit or a condition of resonance is present.

In the transmitting circuit of our wireless telegraph, we wish to radiate the maximum amount of current from the aerial. When this is true, we have resonance, and the closed and open oscillating circuits are in that condition. Then, in equation (2), this would be true when

$$2\pi n L = \frac{1}{2\pi n C} \qquad (3)$$

and equation (2) would reduce to equation (1).

Now since $2\pi n L = \frac{1}{2\pi n C}$,

$4\pi^2 n^2 L C = 1$, or $n^2 = \frac{1}{4\pi^2 L C}$ and taking the square root

$$n = \frac{1}{2\pi\sqrt{LC}}. \qquad (4)$$

The velocity of any wave equals the product of its wave-length and its frequency, thus

$$v = n w \qquad (5)$$

Where v = velocity of the wave.
n = frequency of the wave.
w = wavelength of the wave.

Then, substituting the value of the frequency, n, in equation (4) for the value of, n, in equation (5) we have

$$v = \frac{w}{2\pi\sqrt{LC}}, \text{ or}$$

$$w = 2\pi v \sqrt{LC}$$

Where w = wavelength in metres
π = 3.14159
v = velocity of electromagnetic waves or 300,000,000 meters per sec.
L = inductance in henries.
C = capacity in farads.

In 1909 the telegraph and telephone companies, together with similar concerns that use electric wires in this country, expended over $7,000,000 in the purchase of poles.

LARGEST CLOCK RUN BY ELECTRICITY IS LOCATED IN BOSTON

The clock, said to be the largest in the world, is part of an electric sign in Boston, Mass.

The outside diameter of this clock is 34 feet, the height of the numerals on the face is 5 feet, the length of the minute and the hour hands are 18 feet and 14 feet, respectively, and the decorative and lighting effects are obtained by 6,500 incandescent lamps of many colors. The electric fountains on each side of the clock contain 1,480 lamps.

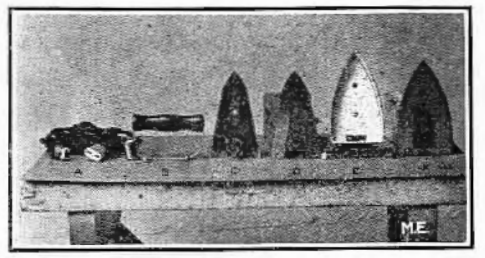
The operating mechanism of this clock is controlled by a master clock, which automatically closes an electric circuit once ever minute, thus operating a 1-20 horsepower motor, which in turn moves the minute hand of the secondary clock throughout a space on its dial equal to one minute and then the motor is automatically cut out again. The operating mechanism is arranged so that when the master clock requires setting, through a synchronizer, the secondary clock is caused to indicate the same time as the master clock. This feature, as well as a self-winding attachment for the master clock, are features which have been perfected especially for clock signs of this character.

RATIFICATION OF WIRELESS-TELEGRAPH TREATY

Ratifications of the wireless telegraph treaty signed at London, July 5, 1912, probably will be exchanged at the British capital within a few weeks by the thirty-one signatory powers. The Senate ratification of the treaty a few days ago paved the way for this formality, as practically all the other governments are understood to have approved the treaty, which will become effective July 1, 1913. By this convention the important maritime nations of the world have linked themselves together to attain the widest range of international usefulness of the wireless telegraph without restriction as to its further development. A full transcript of the London convention and the final protocol, together with an abstract of the regulations, was printed in our December, 1912, issue.

THE "INSIDES" OF AN ELECTRIC IRON

Among the many thousands of users of electric flat irons, many have doubtless wondered just how an electric iron is made up. The same general principles apply to all makes, and the construction, contrary to what might be expected, is very simple. All contain a resistance for converting current into heat; this resistance is surrounded by the iron proper, which applies the heat. The different parts of an iron in general use are shown in the illustration. A, at the extreme left



of the picture, is the conductor cord for connecting the iron to a lamp socket; all household irons can be used with either direct or alternating current. B is the handle. C is the heating element, the "heart" of the iron; it consists of resistance ribbon usually of a metal something like german silver in appearance, but a poor conductor, and so the necessary heat is generated. The heating element, which is encased in mica, is clamped between the steel plates, D and F, which take up the heat and apply it. The ironing surface is on the other side of the plate, F. E shows the inside of the nickeled case for the iron; this case, as is shown, is lined with asbestos, which prevents the heat from radiating outward or upward, and thus the heat is confined very effectively to the ironing surface. At the same time, it serves to keep the heat from the person using the iron. In this iron only four screws are used; two to clamp the parts together and two for attaching the handle.

Electric smelting and refining processes are said to produce steel that is denser and more homogenous than open-hearth steel of the same general composition.

TRAIN OPERATED BY STORAGE BATTERY

There sped noislessly out of the Grand Central Terminal a recent morning a railroad car propelled by electricity supplied from a set of the new high-power Edison storage batteries. It quickly attained a speed of thirty miles an hour. At Highbridge the speed was increased to forty miles and at that rate the car clipped quietly up the Hudson, over the mountains and into Boston, 310 miles away.

It was both the longest and fastest run ever made by a storage-battery car. There was not a hitch from beginning to end, scarcely a sound, and never a speck of soot or cinder. The run was made in less time than local trains of the New York Central require for the trip, but in somewhat slower time than the expresses.

Five years ago R. H. Beach left the General Electric Company and went to Edison's laboratories to build for Mr. Edison a car to which storage batteries might be successfully attached. For four years he experimented, constructing cars and then smashing them, spending in all about $150,000 at the task. Last year a car similar to the one which ran to Boston recently was completed and pronounced suitable.

In general appearance it does not look unlike a subway car, but it is much lighter. For endurance the inventor has disregarded the old principle in car construction which counts weight the chief factor in stability and has depended almost entirely on flexibility.

The essential difference in the car, however, is that the wheels are free on the axles and rotate separately, the motor being attached to each wheel by a chain. This device makes it possible to propel the car with one-half the energy that would otherwise be required.

It is estimated by Mr. Beach that the battery car can be operated at a cost of 16 cents a car mile, while a standard steam train car is operated at an average cost of $1 a mile. The battery car can be stopped and started at an inappreciable cost, while the same operation with a steam train is estimated to cost $5. The new car, batteries and all, is sold for $18,000. It has a seating capacity of sixty persons and will run 120 miles with one charge. An hour is required for recharging.

The car is designed principally for short runs where frequent stops are necessary and for use on branch lines, called "suckers" in railroad vernacular, where there is not enough travel to make the operation of steam passenger trains a paying business.—*Dr. L. K. Hirshberg.*

OUT OF THE DEEP

BN sat at his tuner one cold winter eve,
The receivers clasped tight to his ear.
'Twas an SOS from the SNA,
He received by the Ether so clear.

He called DR with a vigor and vim,
But no answer could he get,
For NF was asleep on an old jar rack,
And he may be asleep there yet.

So he called CX till his aerial glowed,
From his 15 K.W. of power,
But, alas, 'twas too late, 'tis sad to relate,
The boob had been gone for an hour.

So Buffalo he called, they answered OK,
He told them a boat was in trouble,
To them they must hurry and quickly give aid,
Or the boat would go like a bubble.

They answered, "Too bad, but we can't give aid,
There's not even a tug boat here."
He must give them assistance as quick as he could,
This course seemed to him to be clear.

He ran 'cross the snow to Lake Erie, you see,
And at Cleveland he ended his run,
He swam out to them with a load of buckshot,
And tied to his neck was a gun.

He yelled to the people, "Hands up, if you please."
And as the boat started to sink,
He commanded the people with, "Do as I say,
If you wish to be saved from the drink.

"Drop your money and valuables into a bag,
And throw them over to me."
And 'til Buffalo sent out assistance to them,
He held the whole boat up, you see.

—*Worth Chatfield.*

ARLINGTON "WIRELESS" RECEIVED 2400 MILES AWAY IN DAYLIGHT

The United States scout vessel *Salem*, which has been cruising in the North Atlantic Ocean testing the transmitting range of the new government wireless-telegraph station at Arlington, near Washington, has reached Gibraltar. Despite the difficult sending conditions usually imposed by full daylight, the *Salem* was able to receive complete messages from the Arlington station when at a distance of 2,400 miles. Night transmission distances were considerably greater. The station at Arlington is rated at 100-kw, but it is reported unofficially that not more than 70-kw was used. With its own 10-kw set the cruiser returned messages to Arlington at 1,300 miles. Both the Arlington and the *Salem* equipments are of the Fessenden type. The *Salem* reports an extremely rough eastward crossing. It has started on its homeward trip, during which the wireless experiments will be continued.

NECESSITY IS NOT ALWAYS THE MOTHER OF INVENTION

There is in London a man who surely must combine the two characteristics of laziness and invention to a remarkable degree. It is his custom to have his breakfast in bed, and, burdened with the trouble of getting out of bed for the purpose of unlocking his bedroom door, he has invented a door which opens to his whistle.

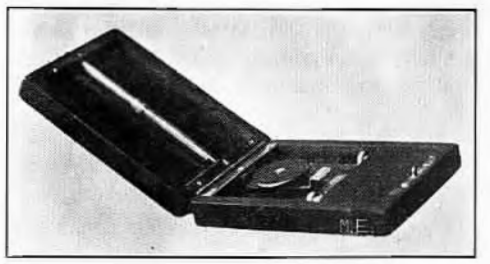
He has accomplished this somewhat remarkable feat by means of a simple electromagnet which draws the bolt when a current passes through it, a platinum point, and a piano wire attuned to a certain note. When this note is sounded the wire vibrates in response, and this vibration brings it in contact with the platinum point. The circuit is thus completed and a sensitive relay is brought into operation and magnetized, thus drawing the bolt.—*Electroforce.*

A NOVEL POCKET WIRELESS

The name "pocket wireless" is generally applied to any set which can be handily carried about. Here is a receiving outfit, however, which can actually be slipped into the vest pocket. It comprises the three most necessary instruments, tuner, detector and fixed condenser.

The case is an ordinary mahogany watch-box, such as may be obtained at any jeweler's. In making the tuner (seen in cover) a quantity of No. 30 enameled wire was wound about a piece of cigar-box wood, just large enough to fit the case. The slider is of the ordinary type, though somewhat smaller.

Some trouble was experienced in



planning a detector which would fit so small a space. The result, however, may be clearly seen in the illustration. The thumb screw was taken from an ordinary telegraph key.

A condenser of the usual tinfoil and paper variety is contained in the box at the extreme right of the case. The leads are brought out through two battery binding posts.

An ordinary umbrella serves very well as an aerial, while the ground may be taken on any convenient hydrant. A loop aerial ten or twelve feet long works exceptionally well, and in this case, no ground is needed.—*Charles L. Hedwell.*

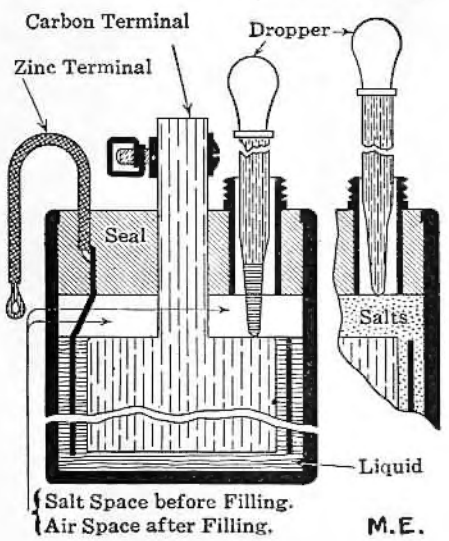
QUITE SHOCKING

The storm caused giant trees to yield;
The quarries, e'en, were rocked;
The lightning flashed, and in the field
All of the grain was shocked.
This verse you see in print to-day,
Electrical and light,
Because 'twas written in a way
That made its meter right.

—*Howard C. Kegley.*

SEALED PRIMARY BATTERY

The Burn-Boston Battery & Manufacturing Company, Boston, Mass., has recently brought out a form of dry cell known to the trade as the "Noloss" battery. The general design resembles that of the company's standard carbon, zinc and sal-ammoniac cell. It is waterproof and moisture-proof and is built in two sizes having capacities of 30 amp.-hr. and 50 amp.-hr. The manufacturer contends that this cell will last from five to seven times as long as ordinary dry cells at a little more than double the first cost of the latter, and that this proportion is increased in case the dry cells depreciate while standing. This cell is recommended by the maker for service where batteries alone are depended upon for ignition, without storage cells or a magneto, on two-cylinder and four-cylinder automobile engines,



with ordinary vibrating coils. On motor boats it is usual to ignite one-cylinder 2-cycle and two-cylinder 4-cycle engines for one season without attention, when used for pleasure purposes, on six cells of this type under fairly dry conditions. The battery is designed with a zinc connection composed of a flexible wire permanently soldered under the sealed top, and the carbon terminal is provided with a lock-nut washer. As shown in the accompanying cross-section, the cell is compact and can be easily filled by a medicine dropper.

This type is also specially designed for use in connection with bells, telephones, electric clocks, automobile tail and side lights, railway signaling, electric gas lighting, medical coils, miniature motors, fire-alarm systems and similar electrically operated appliances.

WIRELESS TRAIN DISPATCHING ON THE LACKAWANNA R. R

The Lackawanna Railroad is equipping its stations at Scranton, Pa., and Binghamton, N. Y., with wireless-telegraph transmitting apparatus capable of sending messages 65 miles. The trains which pass these points will be fitted with receiving devices so that orders, messages, etc., can be transmitted directly to the train crews while running at full speed. Besides the regular work of train dispatching it is also planned to use the "wireless" to deliver messages to passengers, transmit news, etc. Mr. L. B. Foley is superintendent of telegraph for the Lackawanna. If this initial installation proves satisfactory, wireless apparatus will be installed throughout the system. — *Electrical World.*

An Electric Nightmare

I had a dream the other night,
When all was dark and still;
I thought I was in a 'lectric car,
A speedin' down a hill.

A 'lectric warmer at my feet,
O'er my head a 'lectric fan;
The speedometer run so fast,
I couldn't see the hand.

I thought my time had surely come,
I saw a bright light ahead;
It seemed to me I'd reached the moon.
'Twas a 'lectric light instead.

Just then I heard sweet music,
Borne faintly to my ear;
I woke and 'twas the 'lectric 'larm
A ringin' loud and clear.

—*A. L. Stafford.*

Knowledge About Thunder Storms

By Dr. Leonard Keene Hirshberg

For the oldest inhabitant, it hardly seems that nearly two hundred years have rolled through corridors of time, since Benjamin Franklin brought proof that the lightning of a thunder storm, is actually electricity. But even Franklin and all of the scientific observers since then—until recently—were unable to explain the mystery of its origin. Briefly the electricity or lightning that accompanies a thunder storm remained one of nature's secrets until Dr. G. C. Simpson, of Simta, India, performed his series of brilliant experiments. Dr. Simpson by the use of an automatic rain gauge, measured the amount, the rate, and the time of the rainfall, and simultaneously there was recorded at two minute periods, the discharge of lightning from the thunder clouds.

The severe storms of India, called monsoons prevail in the spring and summer, so he was able to obtain measurements of several thousand two-minute discharges of his electrometer.

Much to the surprise of many scientists, Dr. Simpson discovered that the lightning sent us, at times, negative electricity. But there was over three times as much positive electricity sent earthward, as there was the negative kind. Furthermore, the period during which positive electricity accompanied the falling rain, was two and a half times longer than the period during which the negatively charged rain was precipitated.

Mr. W. J. Humphreys in his "Physics of the Atmosphere" calls attention to these and other facts. He says that negative electric currents occur in thunderstorms less frequently than positive currents, and the greater the current density the greater the preponderance of the positive currents. Dr. Simpson of course brought out these facts and others in his experiments. The charge carried by the rain is generally less than six units for each fifteen drops of rain or water. There are, however, at times larger charges.

When rain fell at a slow rate, the electric charge increased as the rain decreased and decreased in amount as the rain increased. When a long wet spell occurred, that is when the rainfall lasted sometime, the lightning was more often negative than positive. But there was no constancy in this, for the reverse was also found to be true.

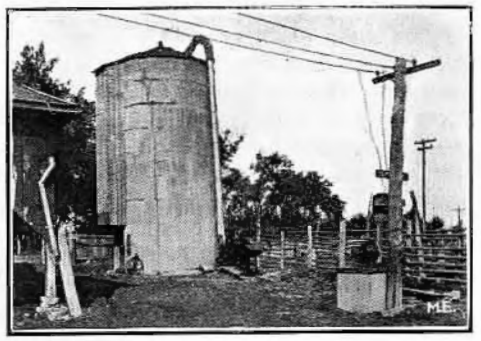
Not only did Dr. Simpson make these careful observations upon thunderstorms in nature, but duplicated natural conditions in his laboratory and there also devised numerous brilliant experiments to confirm his discoveries. He even produced miniature thunderstorms artificially; he produced blizzards, hailstorms, disintegrated drops of water by the air pump, and found in every case that both positive and negative electricity was made, but that three times as much negative as positive electricity resulted.

A vigorous uprush of air is always associated with thunderstorms. If this uprush of air is as much as ten yards or more per second then, says Dr. Humphreys, no water will drop; hence no rain falls. That is to say no rain drops fall nearly as rapidly as this and therefore the uprushing air prevents rain. The drops that try to fall are torn to smithereens and the ensuing spray is carried upward as it evaporates.

Thus you may see how the powerful uprushing air-currents inside the thick, darkening clouds, break up and give positive electricity to the big rain drops. These big drops sooner or later reach a point where the upwhirling air is no longer rapid enough to keep them from falling. Then the rain descends and the drops are charged with positive electricity. Thus the bulk of descending rain and lightning is positively charged electricity. So also is the greater part of the storm. The outlying edges of the shower as well as the smaller drops are usually charged with negative electricity.

MOTOR CUTS ENSILAGE AND BLOWS IT INTO SILO

A progressive Ohio farmer uses a motor for running a fodder cutter and also to run a blower that forces the fodder into the silo. The cutter and blower are placed beside the silo and belted to the motor, near by. As the fodder is cut, it is forced by the blower up into the silo through a sheet metal pipe. This arrangement does the work in much less time and with less work than is required by the usual method of carrying it up



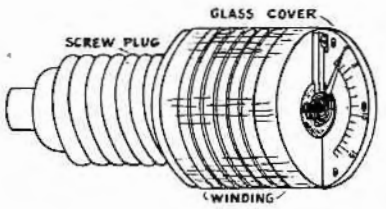
a ladder one armful at a time, or by other methods. The three-horsepower motor, which weighs only 100 pounds, is easily moved, and is also used for other duties on the farm, such as running a corn sheller, a root cutter, a churn, etc. Power is taken from transmission lines and connection boxes are located near the silo, in the barn, and in the churn room.

COMPULSORY WIRELESS IN NEW ZEALAND

The Union Steamship Company has been informed by the Minister for Marine that there will shortly be put into operation in New Zealand regulations making it compulsory for passenger ships to carry wireless apparatus. The minister suggests that it might be advisable for the company to have wireless installed on the *Wahine*, the new steamer which is coming out for the Wellington-Lyttleton ferry service, before she leaves home. The *Maori* will also have to be equipped with a wireless installation.

PLUG AMMETERS AND VOLTMETERS

The accompanying illustration shows a type of ammeter (or voltmeter) specially designed to enable current or voltage measurements without the necessity of breaking existing connections in any



wiring installation or making special temporary connections thereto.

The instruments are arranged for attachment to either Siemens' cartridge fuse fittings or Edison type fuse boxes, and are suitable for direct current or alternating current circuits. Any desired range up to 40 amperes in ammeters or 250 volts in voltmeters can be supplied, and the accuracy of the instruments is amply sufficient for all practical purposes.

The makers of these handy instruments are Messrs. Gans and Goldschmidt, of Berlin, who also place on the market a somewhat similar ammeter mounted with lamp holders and flexible leads to enable the rapid determination of the current consumption of various glow lamps.—*Electricity.*

ARGENTINE "WIRELESS" SIGNALS REPORTED AT NEWPORT

Operators at the naval wireless telegraph station at Newport, R. I., on March 4 reported catching messages which, it is supposed, were being exchanged between two stations in the Argentine Republic, 7,000 to 8,000 miles distant. If these signals were correctly identified, this may be the greatest transmission distance yet reached with "wireless."—*Electrical World.*

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

Using a Wavemeter

By P. Mertz

Part I—In Connection With The Transmitting Set.

IT is surprising how few amateurs can intelligently use a wavemeter with their sets to some advantage, or even appreciate results obtained with it. Moreover, owing to the new wireless law, they should be able to know how to find out if they are sending out a pure, undamped wave, and the amateur who can present curves showing a single, high-peaked wave, will stand a far better chance of getting a license and being heard than the one who knows little or nothing about it. This article will take up the method of using the wavemeter described by the writer in the last issue of this magazine. The directions can be applied to most other styles of wavemeters as well.

The most well-known use of the wavemeters is in getting resonance between the primary and secondary circuits of the transmitting set; in other words, to find out at what adjustments (practically always of inductance) the wavelengths of both are equal.

For this purpose a sheet of cross-section paper, such as is shown in Fig.

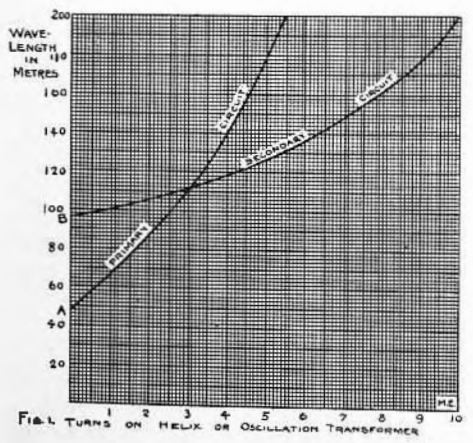


FIG. 1

1, must be had, and along the last horizontal line numbers are put corresponding to the turns on the helix or oscillation transformer. In this instance it is assumed that the total number of turns is ten. Along the extreme left vertical line numbers are placed corresponding to wavelengths from 0 to 200 meters. The transmitting set is then connected together, as shown in Fig. 2, with one

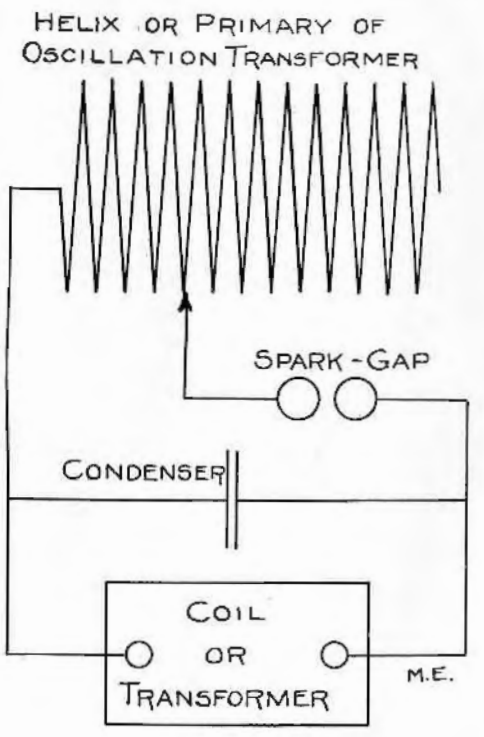


FIG. 2

turn of the helix or primary of the oscillation transformer included. The wavemeter is now adjusted for low wavelengths, the detector brought to a sensitive condition, and the potentiometer shunt around the phones disconnected. It is brought to some convenient place in the vicinity of the helix or oscillation transformer (not too near the spark coil), and the slider adjusted until the sound is loudest in the phones. It may be that the slider can be moved over four or five turns without much perceptible change in the sound; in this

case the turn midway between these is taken as a basis for working. Then the wavelength corresponding to this adjustment is read off on the scale; let us assume it was 67 metres. Then on the cross-section paper, at the intersection of the vertical line corresponding to one

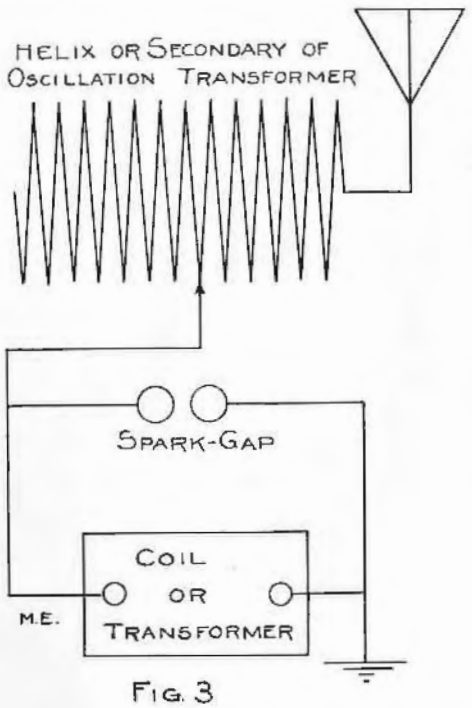


FIG. 3

turn, and the horizontal line corresponding to 67 metres wavelength, a dot is marked. The number of turns on the helix is then changed to two, the wavelength found, and a dot marked at the right place on the cross-section paper. This is continued until the wavelength comes up to 200 metres. Then a smooth curve, A, is drawn through the dots on the cross-section paper and labeled *Primary Circuit.*

The connections of the transmitting set are then changed to those shown in Fig. 3 (if any series condenser or loading coil is usually employed it should be connected just as it is when actually sending) and another curve, B, Fig. 1, plotted in the same way as before and labelled *Secondary Circuit.*

The use of these curves must now be explained. Supposing it is desired to tune the transmitting set to a wavelength of 175 metres. All that is necessary to do is to consult the sheet of cross-section paper and follow the horizontal line corresponding to 175 metres. The points at which the helix clips must be placed can then be easily found. If, when transmitting, it is found that it is interfering with some more important message, the set can be quickly tuned to some other wavelength by referring to the curves.

If a hot-wire ammeter can be had, it should be connected in the aerial lead and the transmitting set adjusted to different wavelengths. It is most probable that a certain wavelength will be found where the hot-wire ammeter will indicate more than at any other. This should be adopted as the standard wavelength of the station, as the set is then giving forth its maximum efficiency.

Another use of the wavemeter is to determine the *resonance curve* of the set, from which many other things may be found.

To plot it another piece of cross-section paper should be obtained as in Fig. 4. The central vertical line should be marked at its lower end with the standard wavelength of the station. The other vertical lines on both sides should be marked with wavelengths from a minimum of not less than 0.9 of the standard to a maximum of not more

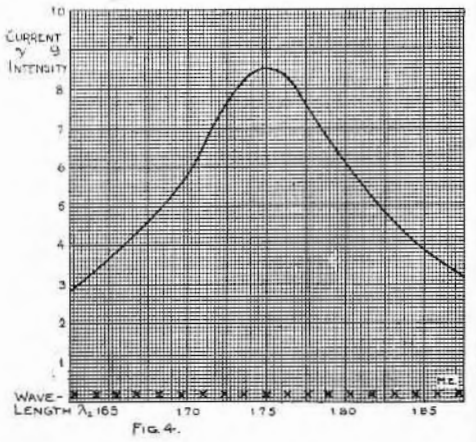
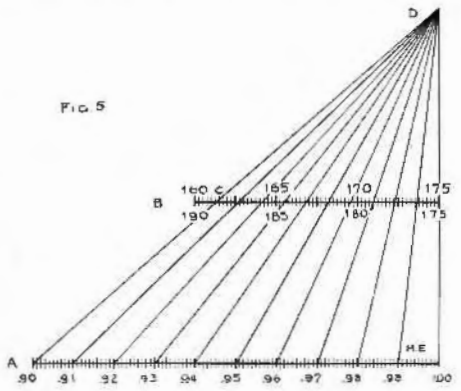


FIG. 4.

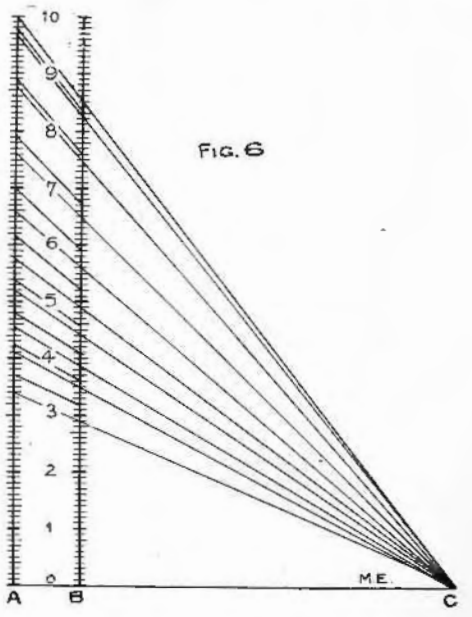
than 1.1 of it. For example, suppose the standard wavelength of the set is 175 metres, then the central vertical line would be marked as shown in the illustration. The other wavelengths would also be marked as indicated. Along the vertical line at the extreme left, numbers are put corresponding to those on the potentiometer scale of the

wavemeter. The latter is then prepared the same as for determining the former curves, except that the potentiometer is left connected and the slider brought to the extreme left. The sending set should be connected up exactly as when actually transmitting, and the slider of the wavemeter (which latter has been switched on to low wavelengths) adjusted until the sound is loudest in the phones. When this point is found the potentiometer slider is pushed to the right until any further movement will entirely stop the sound heard in the receivers. The reading of the pointer is then noted; let us suppose in this case it is 8.5. Then on the cross-section paper, at the intersec-



tion of the vertical line marked 175 metres (the wavelength indicated by the wavemeter slider) and the horizontal line marked 8.5 (the current intensity at the above wavelength) a dot is made. The wavemeter slider is then adjusted to, say, 173 metres and the potentiometer slider (after having been pushed to the extreme left) is brought back until the sound is just audible in the receivers. A dot is then marked at the proper place on the cross-section paper. This process is continued, gradually diminishing the wavelength until the end of the cross-section paper is reached. The wavemeter slider is then adjusted to wavelengths above 175, which (readings on the potentiometer slider being taken and marked on the cross-section paper) are increased until the right-hand end of the cross-section paper is reached. These points are then joined together by a smooth curve, as shown in Fig. 4.

The general characteristics of this curve will usually be found to be about the same as those shown in the illustration. Sometimes, if the wavemeter slider is gradually moved (the potentiometer slider being disconnected) to lower and lower, or higher and higher wavelengths, a point will be found where the sound in the receivers will become greatly strengthened. This indicates a second hump in the resonance curve, and the intensity of the sound should be measured by the potentiometer if possible. This last hump should not be of a greater height than 0.1 the height of the principal one, according to the wireless law. In this case it should therefore not be above an intensity of 0.85. The potentiometer would, of course, not be sensitive enough to measure this, so that the best way is to judge by the sound, the potentiometer being disconnected. If it is not much louder than when at its lowest (adjusted to a wavelength somewhere between the two humps, not outside of either) it can be safely judged that the wave emitted lies within the conditions of the law. Of course, if it can be measured by the potentiometer (i. e., can be heard when the potentiometer is in circuit), or is otherwise judged to be violating the law,



steps should at once be taken to remedy it.

Having plotted the resonance curve of the wave emitted it is now quite easy to determine the logarithmic decrement.

This cannot be a very accurate determination (unless the decrement of the wavemeter is found out, as will be explained later), but it is exact enough for most

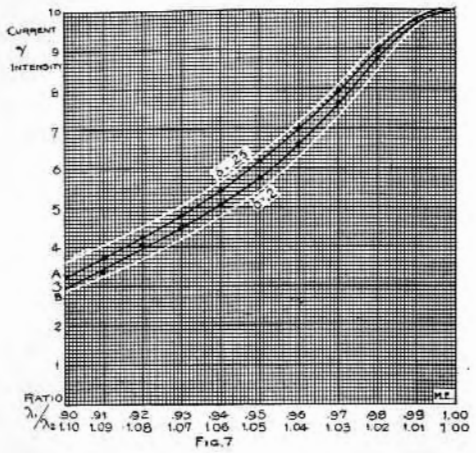


Fig. 7

things the experimenter will have to do with it.

The method to be described for determining the decrement is quite original. It consists in reducing the resonance curve to a standard maximum and wavelength variation and comparing the resulting curve with those shown in Fig. 8. This method will be found much better than to determine the decrement by laborious calculations from complicated formulas, which few amateurs understand, anyway.

A simple method of reducing the wavelength variation of the resonance curve to the same quantity as that shown in Fig. 8 is illustrated in Fig. 5. Two straight lines, A and B, are drawn parallel to each other and decimal scales laid off on each. On the smaller wavelengths corresponding to those on the resonance curve, Fig. 4, are laid off to the left of the 175 metre (wavelength at resonance) instead of to both right and left of this mark shown in Fig. 4. On A, numbers corresponding to those shown in Fig. 8 are marked (in Fig. 8 the ratio λ^1/λ^2 means the wavelength at resonance divided by the wavelength on the resonance curve). The point, C, on line, B, is found by the formula

$$C = \lambda^1 \pm \frac{\lambda^1}{10}$$

or, in the case of the particular resonance curve shown in Fig. 4;

$$C = 175 \pm \frac{175}{10} = 192.5, \text{ or } 157.5.$$

It will be found that these two values for C always represent the same point on line, B. Then a line is drawn through points, A and C. Another line is drawn through the opposite extremities of A and B, and will intersect the first line at point, D. Lines are now drawn from every tenth graduation on A to D. The places where these lines intersect B should be noted and marked by means of crosses on the lower part of the resonance curve, as shown in Fig. 4.

The intensity of the current (γ) corresponding to these values of wavelength are to be noticed. They are then laid off on one of two parallel lines graduated with a decimal scale, as shown in Fig. 6. It will be noticed that the points on one side of the scale do not correspond with those on the other; in other words, the curve is not quite symmetrical. Why this is so will be explained later. The maximum point (i. e., the one corresponding to the highest

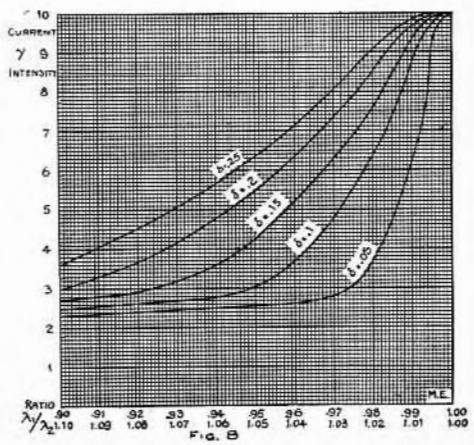


Fig. 8

value of (γ) on line, B, is then joined to the corresponding extremity on line, A, by a straight line, which is prolonged until it meets another line at point, C. This last is a projection of the straight line joining the zero points of lines, A and B. Then the several points just laid off on B are connected with C by straight lines, which are extended till they meet A. In the illustration, for the sake of clearness, in the case of some lines only the part lying between A and

B is drawn. These lines are those corresponding to the right half of the resonance curve.

A piece of cross-section paper like that shown in Figs. 7 and 8 is now to be obtained. The heavy vertical lines are numbered at their lower extremities as illustrated in Figs. 7 and 8. A mark is then made at the intersection of the extreme right-hand vertical line and the horizontal line numbered 10. (The horizontal lines should also be numbered as in Figs. 7 and 8.) Then another mark

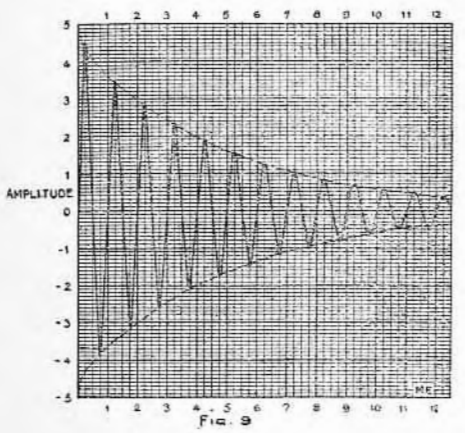


Fig. 9

is made on the next heavy vertical line (.99—1.01), where it intersects the vertical line 8. (The value of γ shown in Fig. 6 on A by the second complete diagonal line from the top.) The value of γ shown by the corresponding partially drawn line in Fig. 6 is also laid off in Fig. 7, on the same vertical line. The same is done for all the heavy vertical lines in Fig. 7. These points are then joined by two smooth curves; one, A, connecting the points denoted in Fig. 6 by the completely drawn diagonal lines; the other, B, connecting the points denoted in Fig. 6 by the partially drawn diagonal lines. Now, one or two curves from Fig. 8 are directly transferred to Fig. 7, as shown by the white lines in the latter. The logarithmic decrement can then be approximately determined by comparing the dark curves with the light ones in Fig. 7. It will be seen that the average decrement of the two curves is about 0.23. This, it may be remarked, is the sum of the decrements of the wave emitted *plus* that of the wavemeter. Saying the latter is about 0.05 (roughly speaking only), it leaves a net decrement of about 0.17, which is then just about within the law. For accurate results the actual decrement of the wavemeter can be found when the latter is calibrated with a standard wavemeter (the procedure is about the same as above described for a transmitting set; it will not be given here in detail as the owner of the standard wavemeter will in almost every case be able to do it for himself).

Now it will be easily seen why the resonance curve is not symmetrical. For as the wavelength of the wavemeter is increased the resistance of the inductance coil also increases. This in turn increases the damping. For this reason, if every accurate determinations of logarithmic decrement are desired, the damping of the wavemeter must be determined for a number of wavelengths within its range. These values of decrement are marked down on the third row of figures on the scale of the wavemeter.* If the latter were of the type consisting of a variable condenser and a fixed inductance, the resonance curve would be symmetrical, and there would be only one value of damping for the wavemeter.

Now that the damping of the transmitting set is known, it is not a hard matter to determine a curve representing the actual oscillation in the aerial. A piece of profile paper similar to Fig. 9 should be procured, and the horizontal and vertical lines numbered as shown. Then the appropriate curve in Fig. 10 is laid off symmetrically on both sides of the zero

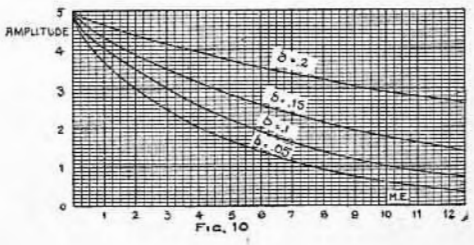


Fig. 10

line. The plotting, from this of the oscillation curve need not be explained. It will be noticed that in Fig. 10 the curves extend only as far as 12.5 cycles. If a long piece of profile paper can be had, and it is desired to plot the whole curve,

*See p. 36, April issue.

the latter may be found by the following formula:

$$a = \frac{5}{\text{antilog } (2 \times \delta \times t \times 0.4343)}$$

where

a = amplitude
δ = logarithmic decrement
t = number of cycles.

It may be explained to those not familiar with mathematics that "antilog," in the above formula, means the number of which the value within the parentheses is the logarithm. In other words, the number within the parentheses is the logarithm of the denominator of the fraction.

It might be interesting to find out how much time it takes to go through, say ten, of the oscillations. Basing our computations upon the formula $\lambda = 300{,}000{,}000/n$, we get the formula:

$$T = \frac{\lambda \times t}{300{,}000{,}000}$$

where

T = the time taken for t cycles (in seconds).
λ = wavelength in metres.
t = number of cycles.

Substituting the values in case of Fig. 9, we get

$$T = \frac{175 \times 10}{300{,}000{,}000} = 0.00000383 \text{ seconds.}$$

This means that the first ten complete oscillations in Fig. 9 occur in 0.00000383 seconds. This gives an idea of how rapid the oscillation of the current in the aerial really is.

Based upon the experiments described in this article, a great many others can be performed, such as the relations between damping and coupling, damping and a change of capacity in the transmitting circuit, etc., so that the wavemeter will become a profitable source of enjoyment and instruction. In part II of this article, the uses of a wavemeter in connection with the receiving set will be taken up.

(To be continued)

NOTICE TO N. Y. AMATEURS

The Metropolitan Wireless Association has been formed for the special purpose of assisting and benefiting wireless amateurs in Greater New York and surrounding territory. New members are desired at once; there are no dues nor fees of any kind.

The real benefits of this club are as follows: Some of our members are expert electricians, and others are wireless experts; these will assist all other members in constructing and maintaining good stations, with no charge for service. Instruction and assistance will be given to those trying to pass the government's examination. A permanent club-room is under way, with a very complete wireless telegraph and telephone station—open to all members day and evenings. The maintenance of a reference library of books and magazines. Illustrated lectures and demonstrations.

If you have a station, or want to build one, join this club. But you must live within 20 miles of Columbus Circle, New York.

Officers: H. Spencer Lewis, president; Wm. E. Meyers, secretary, 181 West 63d Street, New York.

Our own wireless message blanks furnished to all members.

ELECTRO AND MECHANICAL ASSOCIATION OF COLUMBUS, OHIO.

This club was recently organized and the following officers elected: Howard Meyer, president; Robert Poole, vice-president; Stephen Davis, treasurer; Fred Dennis, chairman; Lawrence Luckhaupt, operator; Chester Otto, librarian; John Dobby, secretary, 512 West State Street, Columbus, Ohio.

LEXINGTON ELECTRICAL AND WIRELESS CLUB

Recently the "Lexington Wireless Club" joined forces with the "Red Triangle Electrical Club," both of Brooklyn, N. Y., under the name of "Lexington Electrical and Wireless Club."

The new secretary and treasurer is John H. Schlichting, 517 Throop avenue, and the operators are Paul Hoernal and Frank Wilson.

This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST INVARIABLY BE ON A SEPARATE SHEET NOT IN THE TEXT. The description must be as short as possible. Good sketches are not required, as our art department will work out rough sketches submitted by contributors. IT IS THEREFORE NOT NECESSARY FOR CONTRIBUTORS TO SPEND MUCH TIME IN SKETCHING VARIOUS IDEAS. When sending contributions enclose return postage if manuscript is to be returned if not used. ALL CONTRIBUTIONS APPEARING IN THIS DEPARTMENT ARE PAID FOR ON PUBLICATION.

FIRST PRIZE TWO DOLLARS

QUENCHED GAP FOR SMALL SPARK COIL

Many experimenters are anxious to have some form of a quenched spark gap for small coils; but lack the necessary data for construction of same.

I have made one which I will describe.

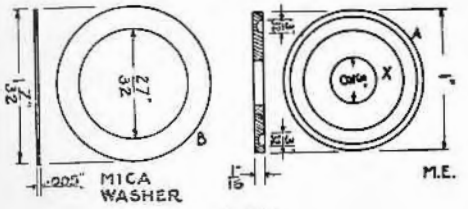


FIG. 1

It has given entire satisfaction, having worked ten miles on a three-quarter inch coil under trying conditions.

The electrodes are made of one inch brass washers, 1/16" thick having a 3/8" hole, Fig. 1-A. It is necessary to select washers having true surfaces, otherwise the spark will not be uniform. Cut a groove 3/32" wide and more than half deep leaving a rim on the outer edge about 1/32" to rest on the mica separators, then remove all burrs due to cutting. The cutting is best done on a lathe, though they may be etched out by nitric acid. The washers should be first dipped in melted paraffine and when cold the wax may be scraped off where the groove is to be.

The separators are made of mica. They were cut from sheet mica about 0.005" thick, with a pair of dividers having sharp needle like points. First inscribe the inside measurement, going over the inscription several times, until the mica is cut through, then cut the outside measured in the same manner. Care should be taken in this operation, as too much pressure will chip off pieces of mica around the edges and that will weaken the insulation of the separators.

The frame, Fig. 2, is constructed of two pieces of brass, D and E, measuring 1¾" x 3/16" x ⅝", and a piece of hard rubber, C, ⅝" square by 1¼" long. F is made of a circular piece of brass, 9, 1" x 1/16", with one side perfectly true. On the other side, in the center, a battery nut, L, is soldered, into which a screw is fastened. This acts as the

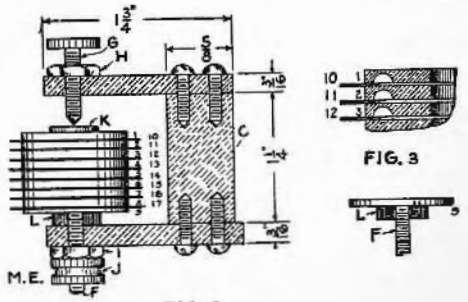


FIG. 2

FIG. 3

lower support of the gap. 9 has no groove in it, as electrode, 8, has the necessary groove.

The frame is assembled, with excep-

tion of E, Fig. 2, and fastened in a vise. F is now inserted and fastened with nut I. Next put one separator, 17, on the surface of 9, then lay electrode, 8, on it so that the groove faces down which will be the case with all electrodes, then separator, 16, and so on. Be sure that they are all laid accurately. Fig. 3 shows partly the method of assembling—1, 2, 3, etc., are electrodes, 10, 11, 12, etc., are the separators. The separators should cover half the groove in each of the electrodes.

K is a circular piece of brass 1/16" by about ½", large enough to cover the hole in electrode, 1, so that screw G, may be used in clamping and adjusting the gap. H is a lock nut.

E is now put in place and G screwed down until the gap is clamped. The gap is now ready for use.

The spark occurs on the inner surfaces of all the electrodes, Fig. 1, and generally covers the whole surface of X if the instrument is constructed with a little patience. Adjustment can be made by screw, G, to a certain extent. However, if no spark occurs, cut out one of the gaps. The testing of the gap should be done in a dark room where the spark can be seen through the thickness of the mica separators.

This gap works to perfection with small coils having high speed interrupters. It cannot be recommended for coils over 1" spark, as the dimensions would have to be altered.

Be careful in assembling that the separators don't get into the sparking surface as this will short circuit the gap.

Contributed by

Ernest Hubner.

SECOND PRIZE ONE DOLLAR A THREE FOOT TESLA TRANSFORMER

A Tesle transformer to be operated on either a ¾ or a 1 kw. transformer, and which, when properly operated, will give a good 36-inch spark, can be made as follows:

First obtain a cardboard or wood tube 38 inches long and 12 inches in diameter. Give this about eight coats of orange shellac. Allow this to dry and then subject it to a heat of approximately 150 degrees Fahrenheit in an oven, so that no trouble will be experienced in the future from shrinkage. After giving it two more coats of shellac, allow it to stand for about an hour. Then wind on this cylinder one layer of No. 30 D.C.C. wire. Space turns apart about the thickness of a No. 26 wire. Care must be taken to see that turns do not overlap each other, which would cause a short circuit between turns. Apply

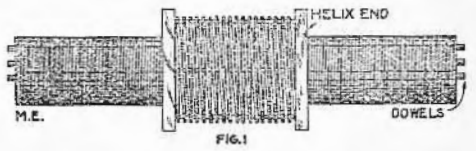


FIG.1

one more coat of shellac to tube and set aside to dry.

Next construct a helix frame 12 inches long and 20 inches in diameter. Around this wind 10 turns of No. 0 aluminum or copper wire. Cut round holes in both ends large enough to allow completed secondary to be inserted and securely fastened. The coil, up to this point, is shown in Fig. 1.

The next step is to connect ten short pieces of No. 10 rubber-covered wire to each of the ten turns on the primary. A cabinet should then be constructed out of oak or any other suitable hard wood. The outside dimensions should be 40 by 20 by 28 inches. This should be made watertight by melting hard tar into joints on the inside of box.

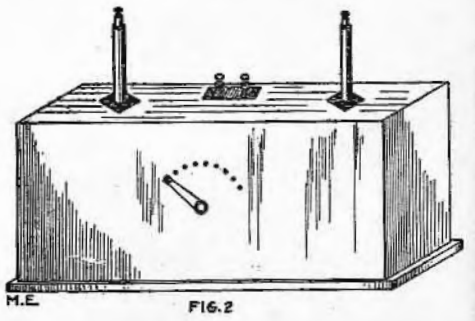


FIG.2

On top of cabinet should be screwed three pieces of polished hard rubber, one piece 6 by 2 by ⅜ inches and the other two should be 3 by 3 by ¾ inches. These pieces should be mounted in a relative position, shown in Fig. 2.

Two hard rubber tubes 8 inches long should be placed on top of square pieces of hard rubber. Brass rods should then

be attached to large binding posts and inserted through tubes and fastened by bolts on the bottom. Mount a large ten point switch on side of box, as shown in diagram, and to the points connect the taps from the primary in their relative order. On rectangular piece of hard rubber affix two large binding posts about 4 inches apart. Permanently attach the secondary to the primary and place in cabinet fastening ends of secondary to ends of box by six wooden dowels. Connect switch arm to one binding post on the side of top and connect the first point of switch with the other one. Lead secondary wires up through tubes to their respective binding posts. Fill the cabinet to within ½ inch of the top with the best transformer, or linseed oil and then seal on top with about 36 round head nickel

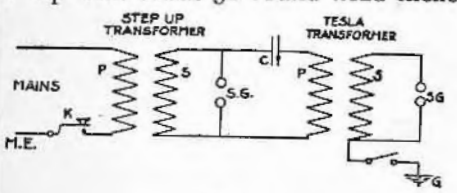


FIG. 3

plated wood screws. This box should either be finished with dead black asphaltum or with some other insulative preparation. The finished coil is shown in Fig. 2 and the hook-up to be used as shown in Fig. 3. This transformer can be constructed at an extremely small cost, considering the benefits derived therefrom, and when completed presents a neat and businesslike appearance. It is especially adapted for demonstrative purposes.

Contributed by

Edward A. Werner.

A HOME MADE BURGLAR ALARM

The construction of this apparatus is very simple, as the drawings are self-explanatory.

Fig. 1 shows a plain block of wood and gives its dimensions. Start the block by making it ¾ inches square and 2 inches long, then shape it, keeping its top surface ¾ inches square, but slanting it so that its bottom surface will measure ⅜ by ¾ inches. At A drill a hole clear through the block large enough to draw a bell wire through same. At 1 and 2 drill smaller holes. These holes are for the purpose of fastening with nail or screw the block to the window frame. Drilling a hole first will prevent the wood from splitting. After these operations the block may be stained the color of the woodwork.

Fig. 2 shows an ordinary safety pin mounted on the block. At A the cleaned

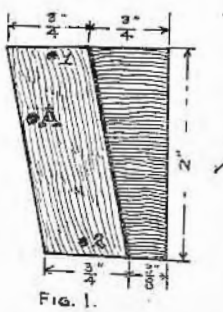


FIG. 1. FIG. 2

end of the bell wire has been drawn through the block and is fastened firmly by a good sized screw. The head of this screw will be the contact point of the circuit when closed. At B the safety pin is mounted very tight by a screw to the block. Underneath the safety pin at this point lies the second wire cleaned of its insulation, as shown in the drawing. At C the other end of the safety pin is mounted to the block with a small tack or screw, only sufficiently tight to hold it in its place, allowing the pin to retain its natural springy qualities. The drawing shows the pin resting on its contact point (the screw A), closing the circuit.

Fig. 3 shows the block as fastened to

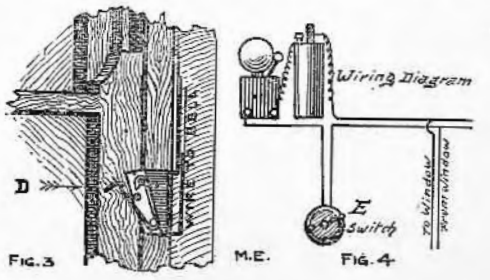


FIG. 3 FIG. 4

the window frame, close to the window sash. The arrow, D, points to a small L shaped screw hook screwed into the window sash. Notice the hook is hold-

ing the pin away from its contact point, A. The circuit is broken, or in other words, the burglar alarm is set, and the slightest movement of the window in either direction will clear the pin from the hook, D, the spring will return it to the point, A, and ring the bell. Furthermore, the bell will continue to ring until it is stopped, either by the switch, E, Fig. 4, or by resetting the alarm. This switch is necessary for breaking the circuit when the apparatus is not to work in the daytime. It may be installed at any suitable place. This apparatus as a whole has many distinctive features not found in some expensive ones. By adding a few hooks up and down along the window frame it will permit one to keep the windows open during the summer months at any desired height.

For the doors, this block may be placed on the framework alongside the doors, fastening the block upside down. A small screweye or ring, F, tied to a strong thread and fastened to the doors will hold the pin away from its contact point. The slightest movement of the door will let the ring slip from the pin, resulting in ringing the bell. Turn Fig. 2 upside down and it illustrates the idea.

By running one continuous set of bell wires above all the doors and windows and by leading down to all the safety blocks from the same, as indicated in Fig. 4, by following this diagram for the connection of the battery, bell and switch, the premises will be burglar-proofed in a manner equal to any system and at a very small expenditure.

Using the apparatus as previously explained are not its limitations. It will equally well protect the distant barn, garage, chicken coop, etc. Running the wires from the house to the same, the bell at home will give the alarm.

The apparatus in its entirety may even be installed in a drawer containing valuables, in an automobile, etc.

The interested reader will find use for it somewhere and undoubtedly will be able to solve the additional problems suited for his purpose himself.

Contributed by *Herman Knutzen.*

Note.—If used to protect the barn, garage, etc., the line wires to the house should be run in a pipe, underground, to prevent their being cut.—Ed.

A SEPARABLE CONNECTOR

A small separable connector, which can be very easily made and is often very useful is shown in the accompanying illustrations.

As can be seen in Fig. 1, it consists of two parts, the plug and the receptacle. The plug is made from a short length of fibre or hard rubber rod, A. In this are drilled two holes, which are then tapped with an 8-32 thread. The pins, B, on the plug are made from two 8-32 brass machine screws, with the heads cut off, and the thread filed away in the lower part. Each screw is then slotted at the upper end with a hack-saw; the ends of the connecting wires, C, are soldered in these. They are then each

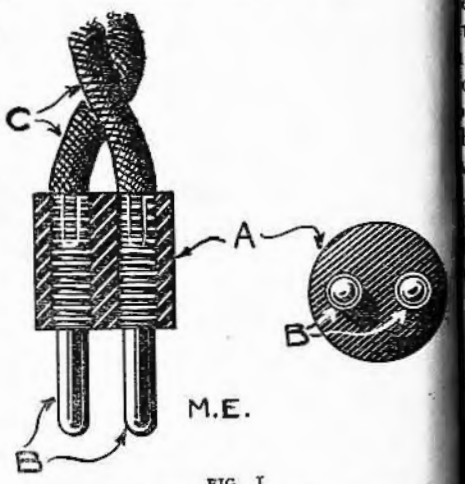


FIG. 1

screwed through a nut, to repair the thread, which may have been slightly damaged during the slotting and soldering. One of them is then screwed into the plug, turning the latter so as not to twist the cord. The other pin is then twisted about 16 turns to the left

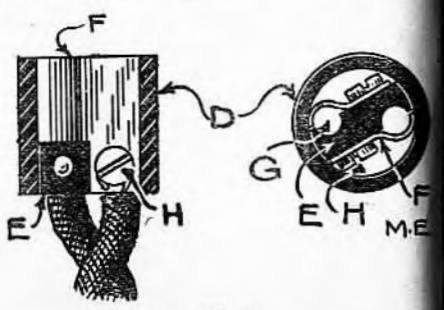


FIG. 2

slipped into the hole, and screwed in, untwisting the cord. If fastened on this way there is little danger of

ver screwing out, especially if it fits ather tightly, as should be the case.

If the flexible cord is already provided with tips, no new ones have to be made. The holes in the plug are simply drilled he same size as the base of the tips, nd these pushed in tightly. If the small nd of the tip is too long, it may be ecessary to cut it down to the right ength.

The receptacle consists of a hard rubber or fibre tube, D, of the size shown, n which tightly fits a rectangular piece, , also of hard rubber or fibre. To this iece are screwed two pieces of thin heet brass, F, cut and bent as shown. n order that the pins may be held more ecurely, grooves, G, are filed in the inulating piece, E. The pieces F are eld to E by means of small No. 2-56 crews, H, which also serve as binding osts. If E is of fibre, the holes for hese need not be tapped, as the screws ill of themselves form the thread. If ard rubber is used, however, the holes ust be tapped. Care should be taken hat there is no electrical contact beween the screws.

The receptacle can now be forced into hole in the wall, box or cabinet, when, fter being connected, it is ready for se.

Wireless amateurs would often like

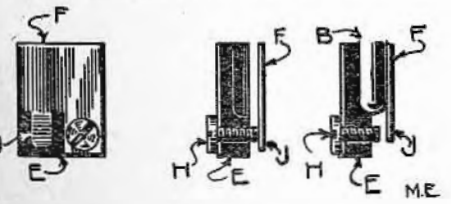
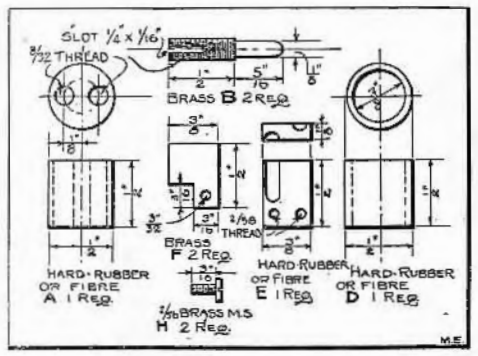


FIG. 3

o have some method by which they ould connect on an extra set of phones o that one of their friends present can sten in at the same time, and disconected when through using it. A very imple way of accomplishing this is to nake as many connectors as above decribed as there are sets of receivers, he following detail being changed in he construction of the receptacles (see ig. 3).

A small tongue, J, is left on one of the rass pieces, F. This tongue is bent in uch a manner that when the plug is not n the receptacle it touches and makes lectrical contact with the end of the crew, H. When the plug is inserted, however, it slightly pushes F away from E. At the same time this separates J from H and opens the connection between these.

The use of having this tongue is to keep the receiver circuit closed all the time. That is, the different sets of receivers are generally connected in series (connecting them in parallel has not



been found so advantageous), so that when the ordinary type of connector is being used and one set disconnected the whole circuit is opened. This is often annoying, but is entirely done away with by the little tongue, J.

Contributed by

P. Mertz.

HOW TO MAKE AN ELECTROPHORUS

An electrophorus that will give a ½ inch spark can easily be made as follows:

Fill a pie pan with melted sealing wax and set it aside until it is hard. Cut a disc of tin a little smaller in diameter than the cake of sealing wax. Make a paper tube about 5 inches long and close one end. Fill this tube with melted sealing wax and when it is hard take the paper off. Fasten this insulating handle to the center of the metal disc.

To obtain a spark rub or strike the cake of sealing wax with fur or flannel, place the metal disc upon it and touch it with the finger. Lift it by means of the insulating handle and upon bringing the finger near a spark may be obtained. This can be repeated any number of times without again rubbing the sealing wax.

Contributed by

C. E. Mielke.

AN UP-TO-DATE LOOSE COUPLER

Although it requires a little work to make this instrument it repays you for your work. You could not wish for a better and more simply adjusted piece of apparatus than this.

This instruemnt has one hundred turns of No. 22 D.C.C. Copper wire wound on the primary. It is wound on a core three and one-half inches in diameter. These dimensions are the same as most all com-

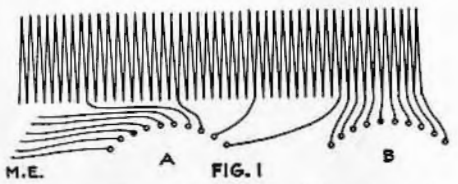


FIG. 1

mercial coils of this type. The secondary taps are taken every 20 turns and soldered to the points of a switch on the end of the coil. The diameter of the secondary is three and one-quarter inches.

The way the primary is tapped is shown in Fig. 1, starting at one end of the primary tap every turn for ten turns These ten taps are soldered to a ten-point

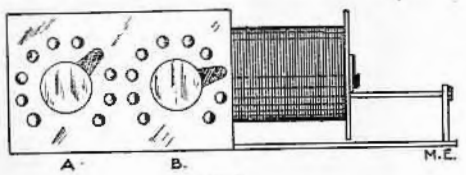


FIG. 2

FIG. 3

switch mounted as shown in Fig. 2-B. After this is done, as shown in Fig. 1, tap off one more turn and then after that tap off every ten turns. This will make ten more taps for the second ten-point switch mounted as shown in Fig. 2-A. This will make ninety-turns on one switch and ten on the other, making one hundred turns.

For the taps on the switch instead of using brass-headed tacks I used small round-headed brass bolts as shown in Fig. 3. The easiest way to tap off the primary, instead of soldering a wire to the primary wire, is to take up some slack of the desired length in the primary wire and twist it. In doing this it will only be necessary to solder the end of the twisted wire to the switch point. T switches can be made by the reader as desires them. Connect one of the switches to the aerial and the other to t ground.

The secondary is connected the sa as other loose-coupled coils.

The primary is boxed up with oak some kind of hard wood and stained reddish color. When this is polished has a very neat appearance and add very good instrument to your set.

To operate this coil tune first on swit A, Fig. 2, which cuts in from 10 to turns of wire. After tuning on swit A, then tune on switch, B, which cuts from 1 to 10 additional turns. It is pl therefore that we can use any number turns of the primary.

With a little practice you will soon able to operate this loose coupler m quicker than with sliders.

Contributed by

John Clark

HINTS ON CONSTRUCTING A WIRELESS KEY

In constructing the wireless key scribed on page 479 of the August is of *Modern Electrics,* I made the follo ing improvements, which resulted in better looking job and made the easier to construct.

In place of the two ¼ by ¾-i brass rods, get a piece of ¼-inch b rod 2¼ inches long. Then, after ting up the two brass end standards, the 2¼-inch piece across the standa and mark on the inside of each. F the center from these lines and mak mark ⅛-inch on either side from ce line. Now, using these lines as a gu file down each end and the center that they will fit the holes previo bored. After filing, cut through ce with a hacksaw. Now fit each piece brass standard and head over.

The lever may now be set in plac fastening one standard to base, t after putting lever in place, put on o standard.

In fastening the contact dimes, a thin battery nut to dime in ce then screw onto bolt in lever. Fix other dime the same way. The holes in the dimes should be cou sunk a very little to hold the rivet w

t is filed off flat with the surface of the lime.

In making the lever, be sure that you bend it to proper shape before boring holes, as it will surely break if you do not.

This makes a very good key, and will be well worth the time and money expended upon it.

Contributed by

Ben T. Elkins.

A SLIDER FOR LOOSE-COUPLER SECONDARY

Since I have been reading *Modern Electrics* I have not noticed a really good device for a slider on the secondary of a loose-coupler. The device which I shall explain has the advantage of being simple, inexpensive and accurate.

First take a brass tube (¼ by ¼ inch

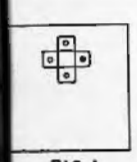


FIG. 1

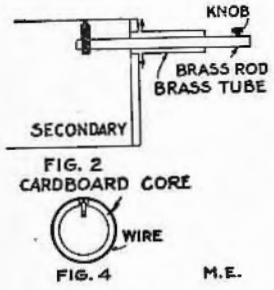


FIG. 2

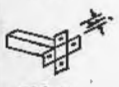


FIG 3

FIG. 4

on the inside) and split it as shown in Fig. 3. This tube should be about 2¼ inches in length. Then bore holes in the sections A, B, C, D, to fit any sized wood screw which the experimenter may have. Fasten the brass tube as shown in Fig. 1 and 2. A brass rod ¼ by ¼ inch is then obtained. To find the length of this rod add 4 inches to the length of the secondary. At one end of this brass rod a hole is bored and a hard rubber telegraph knob is attached, as in Fig. 2. The other end of the rod is passed through the square tube, as shown in Fig. 2. From the other end of the secondary a slider is fastened on the brass rod with sealing wax. Care must be exercised to see that the contact between the slider and rod is not destroyed.

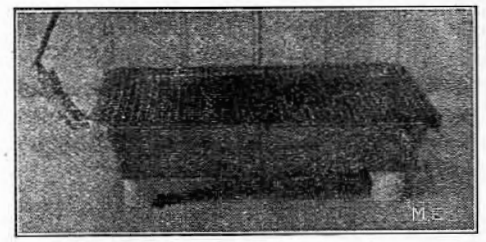
In order that this plan should work it is necessary to cut away the secondary, as shown at A in Fig. 4. The wire exposed, when A is cut away, is scraped in order that the slider may make good contact with the wire.

Contributed by

Leo Behr.

A PRACTICAL ELECTRIC TOASTER

I have seen some descriptions of electric toasters in *Modern Electrics,* but in my estimation they were rather crude in appearances. I am going to describe a simple toaster, the construction of which



will be found most simple and the appearance equal to that of toasters sold at high prices. It not only answers the purpose of a toaster, but can be used for other operations, such as broiling, frying, etc.

Purchase a bread pan (a tin one, for it has the appearance of nickel) 6x10x2 inches deep. Punch four holes in the bottom ½ inch from each corner, large enough for a 3/16 inch bolt. Next get four split porcelain knobs, and, using the long portion, fasten them with bolts to the bottom of the pan, as shown in Fig. 1. These form the legs. Obtain a piece of asbestos board ¾ inch thick and just a trifle smaller than the inside of the pan. Drill ten 3/16 inch holes in same, five at each end and ½ inch from the edge, drilling them at equal distances. Next get ten 3/16 inch bolts 1 inch long,

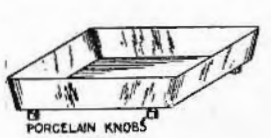


FIG. 1

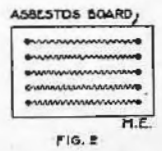


FIG. 2

and 20 small washers. Put the bolts in the holes with the heads all on the same side with a washer under each head. Next procure 24 feet of No. 24 German

silver wire and cut it into five equal pieces, which will be a little less than 5 feet for each piece. Wind each one of the pieces on a ¼-inch rod, leaving a space the thickness of two wires between turns. Stretch the coils between

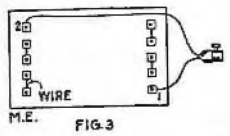


FIG. 3

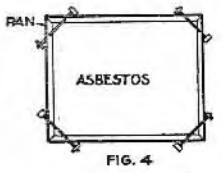


FIG. 4

the bolts, as in Fig. 2, and fasten them there, connecting all the wires together on the other side of the asbestos by putting pieces of wire on to the screws, as shown in Fig. 3. This will give all the heating elements a chance to operate and give the top a better appearance. Next procure two pieces of asbestos covered wire and fasten them to screws 1 and 2, as shown in Fig. 3. Place several sheets of asbestos paper in the bottom of the pan and tighten all the screws. Punch two holes in the end of the pan ½ inch from the bottom and 2 inches apart, fit porcelain bushings in them and put the leads through the bushings and place the

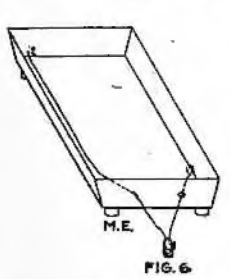


FIG. 6

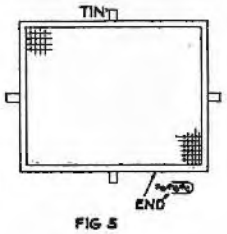


FIG 5

asbestos board in the pan. To hold the board in the pan put a screw in each corner, as shown in the sketch. The asbestos board must be set down ½ inch from the top of pan. Next procure a piece of the finest sand screen 6⅛ x 10⅛ inches. Cut four pieces of tin ½ inch wide and the dimensions of the screen, and fold as in Fig. 5, which gives it a neat appearance. Place this on the toaster, first soldering a few pieces of tin on each under side, so the top cannot slip off. Get a piece of lamp cord that will reach to your supply and connect with toaster and attachment plug. For frying, a piece of sheet iron placed on top of the toaster can be used.

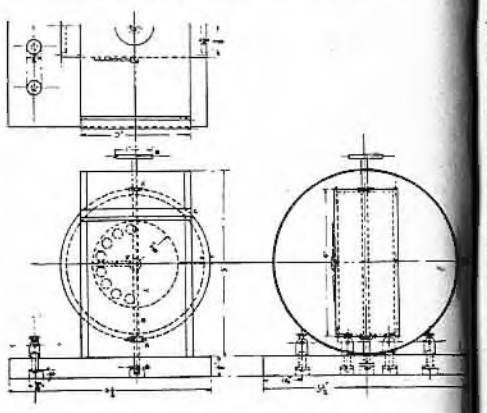
I have had such a toaster for over two years, using it every day, and it is as good as new. In case it burns out, it can always be fixed without much trouble.

Max Hagspiel.

A ROTARY WIRELESS RECEIVING TRANSFORMER

When the wooden parts have been planed to the proper size, and the binding posts mounted on the base, wind the two coils.

The primary coil should be wound



with No. 22 B & S enameled wire on a cardboard tube, 5 inches in diameter and 3½ inches long. The secondary coil should be wound in six sections, each section containing 20 feet of wire, with No. 30 B & S wire, a tap being taken from each of these sections to a point on the switch, F.

Wind the primary to within ¼ inch of each end, thus leaving space to fasten the rod for the slider. The core of the secondary should be turned out with flanges ⅛ inch thick and projecting ¼ inch above the winding space. This is done so that a cardboard cover may be wound around it after the wire has been put on.

After the coils have been wound mount the primary on the base by means of screws, I and J. Next put the secondary in place by means of rod, G, and fasten with nuts, A and A'. There is a pin on either side of nut, B, which keeps rod, G, from slipping; the slider should be mounted on the primary coil.

After the adjustment screw has been fastened, and the base varnished, the instrument is complete and ready for operation.

The secondary coil is operated by

means of adjustment screw, B, and switch, F.

This instrument will be found very efficient as well as compact.

Contributed by,

S. Coleman.

USEFUL TABLES

The accompanying tables are for computing the feet of wire per linear inch of winding on tuners. In table I, the number of turns per inch is given at the top, and the diameter of the coil, in the hight hand end column. To find the number of feet required to wind a coil 6 inches diameter and 10 inches long, wound with wire having 40 turns per inch, is found in the following manner:

Look along the top until 40 is found. Then down until the number opposite the 6 inch column is reached. This number, 63 feet, when multiplied by 10, the number of linear inches of the coil, will give 630 feet, or the required number of feet for the coil.

Table II gives the number of turns per inch for various kinds and sizes of magnet wire.

Contributed by

Milton B. Sleeper.

USE FOR A NAIL SET

When wiring an "old" house it is necessary to take up the flooring in order to conceal the wires. To do a neat job is not always easy, for in getting up the first board the electrician often splits the wood or otherwise mars its appearance. The boards are nailed to the joists and until the first board is up the nails hold the board securely from being pried out.

An excellent way to accomplish this easily and without destruction to the flooring is to go along with a slim nail set and drive the nails, head and all, down through the floor. After sawing the tongue off between the joists, the board will come out readily enough, since the nails no longer hold it. The nail set does not leave a mark because it is narrow enough to go in the crack or seam and find the nail. It is one of the most useful tools for this work and gives gratifying results. When one board is up, the others are no trouble at all.

Contributed by

Marshall Loke.

TABLE I.

Turns per 1"	20	24	28	32	36	40	45	50	55	60	65	70	75	80	90	100	110	120	130	150	Diam. of Core
	5	6	7	8	9	10	11	12	14	15	16	18	19	20	22	25	27	30	32	38	1 "
	7	8	9	10	12	13	15	17	18	20	22	23	25	27	30	33	37	40	43	50	1¼"
	8	9	11	12	14	16	18	20	22	24	26	28	30	32	36	40	44	48	52	64	1½"
	9	11	13	15	17	18	21	23	25	27	29	31	33	36	41	46	50	55	60	69	1¾"
Feet	11	13	15	17	19	21	24	26	29	31	34	37	39	42	47	52	59	63	68	79	2 "
of Wire	13	16	19	21	24	27	30	33	37	40	43	47	50	53	60	67	73	80	87	100	2½"
per	16	19	22	25	28	31	35	39	43	47	51	55	59	63	71	79	86	94	102		3 "
Linear	19	22	26	29	33	37	41	46	50	55	59	64	69	73	82	92	101	110			3½"
Inch	21	25	29	33	38	42	47	52	57	63	68	73	79	84	94	105	115				4 "
	27	32	37	43	48	53	60	66	73	80	87	93	100	107	120						5 "
	31	38	44	50	56	63	71	79	86	94	102	110	118	126							6 "
	37	44	51	59	66	73	83	92	101	110	119	128	138								7 "
	43	51	60	69	77	86	96	107	118	129	139	150									8 "
	47	56	66	75	85	94	103	118	129	141	153										9 "
	52	63	73	84	94	105	118	131	143	157											10 "

TABLE II.

Size B. & S. Gauge	Turns per Linear Inch: Enameled	Single Cotton	Double Cotton	Single Silk	Double Silk
20	29	25	23	27	26
21	32	28	26	31	29
22	36	31	28	34	32
23	41	34	31	38	36
24	45	37	33	42	39
25	51	41	36	47	43
26	56	45	39	52	46
27	64	49	42	57	52
28	71	54	45	63	56
29	79	58	48	70	62
30	88	64	56	77	67
31	100	69	57	85	72
32	112	75	60	93	78
33	134	81	64	102	84
34	140	87	68	112	91
35	156	94	73	120	97
36	178	101	78	130	104
37	201	108	84	141	110

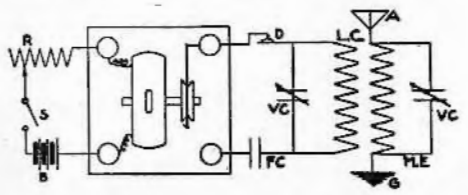
Size B. & S. Gauge	Turns per Linear Inch: Enameled	Single Cotton	Double Cotton	Single Silk	Double Silk
38	225	115	89	151	117
39	256	122	95	163	123
40	288	130	102	178	129

Size B. & S. Gauge	Double Cotton: No. Turns per Linear Inch	Size B. & S. Gauge	No. Turns per Linear Inch
4-0	1.70	7	6.08
3-0	2.00	8	6.80
2-0	2.32	9	7.64
1-0	2.65	10	8.51
1	2.99	11	9.56
2	3.36	12	10.60
3	3.80	13	11.88
4	4.28	14	13.10
5	4.83	15	14.68
6	5.44	16	16.35

POULSEN TIKKER

I have noticed several articles in *Modern Electrics* on the construction of tikkers. All of these had faults, while the following described tikker has few, if any. It is of the same construction as the ones used by the Federal Wireless Co., the only difference being in the size of the motor.

Get a small battery motor; one which has a metal pulley wheel on the shaft.



Mount the motor on a base and fasten a binding post about 1½ inches from the pulley wheel, as shown. A piece of fine steel wire is fastened to this post and rests in the grooved pulley wheel. Connect the frame of the motor to another binding post. Procure a small battery rheostat and connect in series with motor. By changing the speed of the motor, the tone of the incoming signals can be varied. In most cases loading coils in the primary and secondary of the loose coupler must be used. The connections are shown in the diagram.

Contributed by

Charles E. Richardson, Jr.

HOW TO LACQUER BRASS

Most experimenters believe that lacquering brass is a very difficult and expensive proposition, so that they either nickel plate the brass parts on their instruments or else just polish them without lacquering. As a matter of fact, it is quite easy, even for a beginner, and in appearance it surpasses nickel plate, especially when the base of the instrument is hard rubber or some dark shade of wood.

A very good formula for a brass lacquer that has been successfully tried and used by the writer is as follows:

Liquid shellac.....8 parts
Wood alcohol.....8 parts
Turmeric .....1 part

All quantities are by volume. The liquid shellac should be of about the same degree of thickness as when used in ordinary electrical work. If a gold hue is desired to be given the brass, a small amount of spirit mahogany sta (not containing turpentine) or red co tar dye, should be added.

Before being lacquered the bra should be well polished, if possible on buffer, using Paris red. The lacquer then applied with a small brush, t same as paint. Care should be tak in applying that there are not too ma air bubbles in the lacquer or the finish surface will appear spotty. It will noticed that a good amount of alcohol mentioned in the formula, making t lacquer very liquid. This is done that with a little care striping of t surface, which is so difficult to do aw with in many lacquers, can be eas overcome.

If the color is not dark enough wh one coat of lacquer has been appli more can be added. Care should taken that each coat is thoroughly d before the next one is put on.

Sometimes the lacquer takes on a d frosted surface. If a piece of cloth rubbed over it rather vigorously, t frostiness will disappear and a fi bright finish will be obtained.

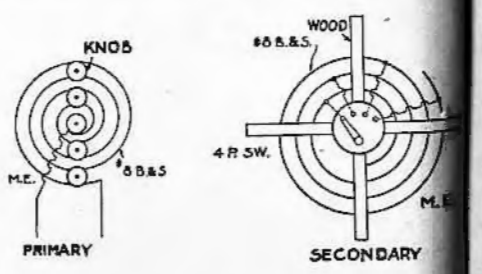
This type of lacquer should not b baked, as this would burn the shell The surface is quite hard enough wit out baking, being difficult to scratch ev with the finger-nail.

Contributed by

P. Mertz.

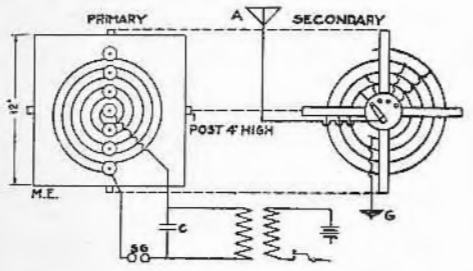
A CHEAP AND EFFICIENT OSCIL LATION TRANSFORMER

The accompanying diagram shows cheap but serviceable oscillation tran former. The primary is built on a ba



12 by 12 inches, of pine. The wire o the primary is No. 8 B. & S. aluminu (about eight feet of it) wound in

spiral, and fixed to the base by means of two-wire split porcelain knobs or insulators. The center of the spiral is fastened to the spark gap, and the outer end is connected to the condenser. On the base are fastened four upright posts four inches high, to hold the cross-pieces of the secondary. The cross-pieces of the secondary are 12 inches long and one inch thick. Twelve holes must be bored in the cross-pieces for the wire to pass through. After the cross-pieces are fastened, string through the holes (starting about 1½ inches from the center) about eight feet of No. 8



B. & S. aluminum wire. Then mount in the center of the cross-pieces a four-point battery switch. Connect the first post with the outermost wire and also connect the third wire to the second post, the sixth to the third, and the ninth wire to the fourth. The lever of the switch is connected to the aerial, and the center of the spiral is connected to the ground. The wiring of the secondary can be concealed by running the connections along the cross-pieces. The transformer can be made for about 50 cents. Besides being cheap, it is compact, and suitable for portable sets, wherein the wave length can be changed by means of a switch mounted on the box. This transformer is adapted only for coils from ½ inch to 1 inch.

Contributed by

Joseph Gorman.

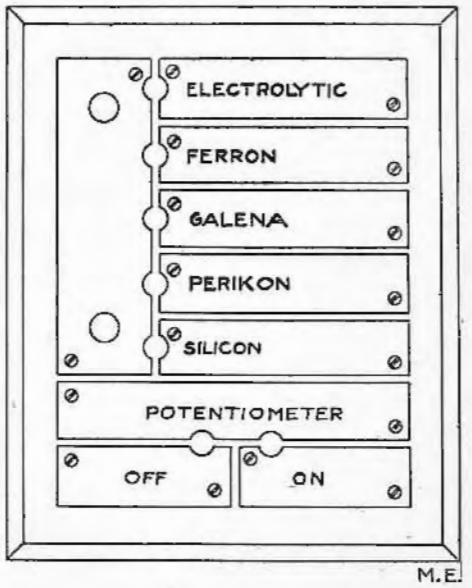
A PRACTICAL DETECTOR SWITCH

The accompanying plan and hook-up of connections are for a detector switch of my own design. The switch is made of sheet brass and the connections are made by means of little plugs, such as are used on telegraph cut-out switches and lightning arresters. These plugs, two of which are required, may be bought of any supply house carrying telegraph instruments.

To make the switch, first procure some heavy brass as near as possible to No. 20 B. & S. gauge. From this cut one piece 2¾ inches by ½ inch, which is labeled "potentiometer" on the drawing; two pieces 1⅜ inches by ½ inch for the parts "off" and "on," as many pieces 2 inches by ½ inch as you have detectors, and one piece ¾-inch wide and as long as the combined widths of the last-named pieces, plus the spaces between them.

Now drill holes in the corners for small brass screws, to hold the parts to the base. If desired, the various names may now be etched on the plates. First coat each piece with wax and then scratch the lettering through the wax with a sharp instrument. Then place the pieces in a dilute solution of nitric acid for a time, and after a thorough washing the wax may be scraped off, and the pieces are ready for assembling.

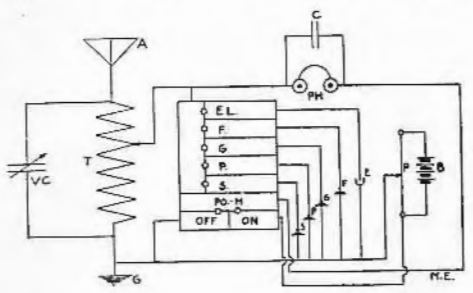
The base may be made of hard rubber, fibre or wood, or the parts may be assembled directly on the switchboards.



The pieces are now mounted on the base with a space of 1/16 inch between the adjacent parts, connections being made through small holes beneath each plate, the wire being soldered securely before fastening them down.

Holes are now drilled at the points of junction of the plates, as shown in the drawing, made deep enough to allow the plugs to fit snugly. The whole is now polished and lacquered if desired.

In operation, if the electrolytic detector is desired, the first plug is placed opposite the plate on which is the word



"Electrolytic." This connects that detector in circuit. Now to connect the potentiometer, place the second plug between the plates "potentiometer" and "on." When not in use the plugs may be kept in the holes in the blank plate, provided for that purpose.

If desired, the base may be made larger and binding posts mounted upon it for making connections.

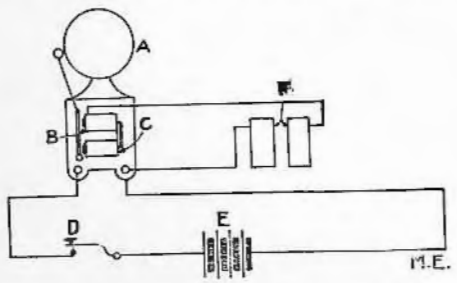
If properly made and finished this switch will be a worthy addition to any switchboard or instrument table.

Contributed by

Bryan G. Barker.

A NOVEL SHOCKING DEVICE

The other day while experimenting I discovered how a shocking machine could be made from simple apparatus,



and I believe it would interest the readers to know how it is done.

The only apparatus that is needed is an electric door bell, a switch and a few cells of battery, connected as shown in the diagram.

With three batteries I received all the shock I desired. It is surprising how this simple apparatus can give such a shock.

The diagram being lettered and accompanied by a chart is self-explanatory for those desiring to try this experiment.

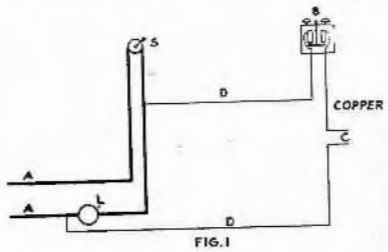
Contributed by

Russell Black.

AN ALARM FOR LIGHTING CIRCUITS

The accompanying diagram represents an alarm for cellar or basement lights, which, if left on, will ring a bell. I have read one or two accounts of how to turn off cellar lights, but they were either too complicated or did not work, so I constructed this plan myself after experimenting about a week.

The regular lighting circuit is shown in heavy lines, while the wiring I added



is represented by light lines in the diagram. AA are service lines and S is a snap switch at the head of stairs leading to the cellar. L is a light or many lights. C is the contact made at the door, which is shown in detail in Fig. 2. One wire is connected at F and the other at G. B is an ordinary telephone magneto bell, either of 600 or 1,000 ohms, mounted on a block of wood.

When the lights are turned off and the door is closed the bell will not ring, but if the lights are on and the door is closed the bell will ring.

Contributed by

Leo C. Reichert.

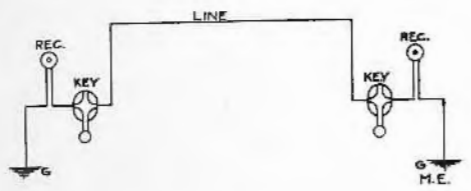
TELEGRAPH WITHOUT BATTERIES

It is very hard to explain why this telegraph works, but if you follow the directions here given it can be put up with very few materials and little cost.

The articles needed for one station are as follows:

A watch-case receiver, about 75 cents; telegraph key, about $1.75; enough No. 14 galvanized iron wire to reach once between the two stations.

In the first place put up your wire between the stations. If your houses are not very near together, run it through



the trees, insulating it from the ground as much as possible.

If you follow diagram carefully it is sure to work.

If you live very far away from any other electrical wires batteries will have to be used.

Contributed by

J. Alexander Pool.
Granville Worrell.

Note.—If the line wire is parallel to a street lighting circuit the current in the telegraph line is due to induction from the lighting circuit. In some parts of the country the set would work satisfactorily on "earth currents" if the line happens to run in the right direction.—Ed.

NEW VOLTMETER METHOD FOR THE MEASUREMENT OF INSULATION RESISTANCE

It may be profitable at the beginning to outline briefly the voltmeter method in its simplest form. Suppose, in Fig. 1, that X is the device the resistance of which is to be measured. A voltmeter is connected as shown. Terminal P is connected to M and then to N, a reading of the instrument being made at each connection. Suppose when at M the reading is 120 volts and when at N the reading is 20 volts; then if the resistance of the voltmeter is 15,000 ohms, the resistance X may be computed from

$X = \frac{E-e}{e} Rv$, where Rv = voltmeter resistance, E = reading with P on M, e = reading with P on N.

In this case $X = \frac{120-20}{20} 15000 =$ 75,000 ohms.

In employing this method a reading of 1 volt is considered as the lowest one may care to use, then the highest resistance this voltmeter can measure is

$X = \frac{120-1}{1} 15000 = 1{,}785{,}000$ ohms.

It is possible to purchase voltmeters the "sensibility" of which is greater, but they are bulky, expensive and so essentially delicate as to be undesirable for most purposes.

The range of high resistance meas-

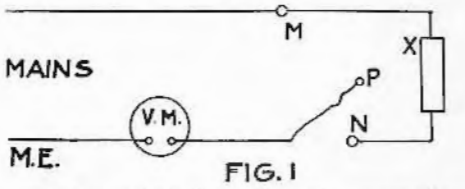


FIG. 1

urement possible by using the everyday voltmeter may be increased very much by employing my method, which is given below.

Connect R a resistance of 1,785,005 ohms in parallel with the device the resistance of which is to be measured, as shown in Fig. 2; now when terminal P is at M suppose the reading is 120 volts, and when at N its reading is 1 volt, then the joint resistance (J.R.) $= \frac{120-}{1} \times$ 15,000 = 1,785,000 ohms. Hence X,

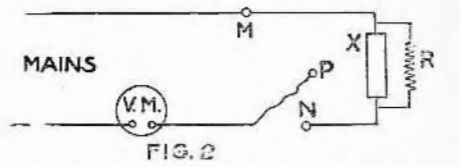


FIG. 2

the unknown resistance may be computed from $\frac{1}{(J.R.)} = \frac{1}{R} + \frac{1}{X} \therefore X = \frac{R \times (J.R.)}{R - (J.R.)}$.

In this case we have

$X = \frac{1{,}785{,}005 \times 1{,}785{,}000}{1{,}785{,}005 - 1{,}785{,}000} = 637{,}246{,}785{,}000$ ohms, or X = 637,247 megohms (approximately).

This method is therefore worth consideration, for the highest resistance the Evershed Bridge Megger measures is 2,000 megohms, and then, when measuring the insulation of apparatus having considerable capacity, the measurement is not reliable, for the E.M.F. is not constant, because it is impossible to turn the crank with constant speed.

While the voltage used with the voltmeter for testing is commonly the same as that regularly in use on the line, the voltmeter can be used for a number of other purposes, and it is less expensive than an Evershed Bridge Megger.

Contributed by

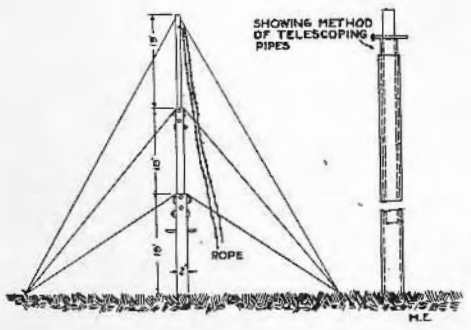
P. W. Etkes.

Note.—This method is very ingenious, but unless a precision voltmeter is used the results are not likely to be very accurate. As an approximate method, however, it appears to be very good.—Ed.

A RIGID AERIAL MAST

A good aerial mast which I have erected and which is very rigid and substantial is shown in the accompanying sketch.

The mast is made of iron gas pipe. The bottom section is 20 feet long and is two inches in diameter. The second section is also 20 feet long and is small enough so as to slip into the bottom



section easily. The third section can be made as long as desired and is small enough so as to slip into the second joint easily. The novel part of the mast is the method by which the sections are fastened at the joints. Two holes are bored at each end of the pipes, one foot apart, and two more bored at right angles to them, as shown in sketch. A step made of strap iron is fastened on the first joint to aid in erecting it.

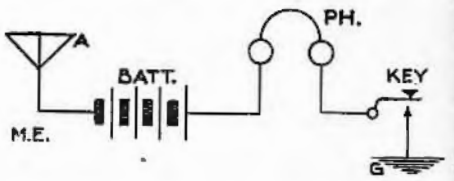
To erect the mast, telescope the pipes and set the bottom one in concrete. Raise the top joint and bolt it onto the second joint, having fastened the guy wires on first. Then raise the pipes and bolt onto the bottom joint. When this is done you will have a mast that will withstand all the storms and is pleasing in appearance.

Contributed by

R. F. Denton.

TESTING AERIAL LEAKAGE

The drawing I am contributing is of a leakage testing method for aerials.



With this arrangement I have detected leakage in my aerial.

Contributed by

Laurence Southwick.

A GOOD ELECTRIC FURNACE

Most boys' chemical laboratories and electric experimenting stations could find good use for an electric furnace, but the cost of the furnace or the inability to get high voltage direct current prevents them from having one.

The furnace described in this article is very simple, having only four parts, and it may be operated with excellent results on 110 volts alternating current.

First procure a firebrick, selecting it as smooth as possible, and measuring as near as possible to 8½ by 4 by 2¼ inches. A hole is then chiseled in the center and two channels running from

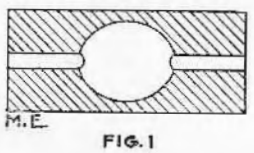


FIG. 1

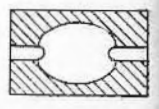


FIG. 2

it, as shown in Fig. 1. This may be as large as circumstances require, but it is usually gauged by how tired the builder becomes.

Another smaller brick is now made

for the top, as in Fig. 2. The hole is made shallow and shaped like a concave mirror to reflect the heat on the object. Care must be taken not to get the channels too deep for the carbons which are

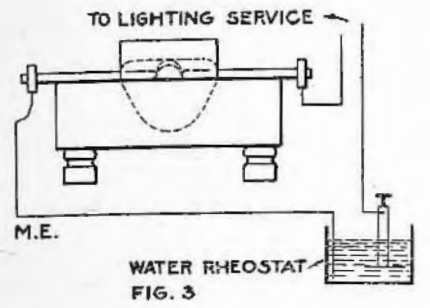


FIG. 3

to be slipped through them to form the electrodes. The carbons may be secured from supply houses, or from arc lamps after they have become too short for further use.

The whole furnace is now set up on four porcelain insulators and connected up with the 110 volt lighting current in series with a water rhoestat. It should not be connected to a lamp socket, but to wires run direct from the meter.

If crucibles are not used, a lip may be formed on the lower block and the melted material poured out.

Be sure to have the furnace protected well with fuses in the circuit.

Contributed by

H. C. Hunter.

EASY METHOD OF FINDING WIRE RESISTANCES

Quite frequently electricians, mechanics or engineers are called upon with short notice to solve problems in which the resistance of copper wires must be known. The table of wire resistances may not be at hand or else it may have been mislaid, and if the person asked is unable to obtain a result it may bring him into an embarrassing position. The problems present themselves in various forms, such as: (1) To find the resistance of a given size and length of wire; (2) To find the voltage drop in a line of given size and length in which the current is known; (3) To find the size wire required for a given length and current with an allowable voltage drop; (4) To find the maximum load or current which a given wire will stand with a given allowable voltage drop.

By remembering a few simple relations which are given below any one may find the resistance of any B. & S. copper wire at 68° F. within a few minutes. The table shows the values from No. 0000 to No. 20 wire only, with the corresponding per cent. error, because these are the sizes which are used most.

Short relations to be remembered:

(a) Let the resistance of No. 10 wire at 68° F. equal 1 ohm per 1000 feet.

(b) To find the resistance of every third wire number from No. 10 wire, going in the direction of the higher numbers, double the resistance of the preceding and when going in the direction of the lower wire numbers use half of the preceding resistance.

(c) To find the next higher resistance from those by (b) add one-quarter of each of these to themselves to get the respective resistances.

(d) To find the next lower resistance from those found by (b) multiply each of these from (b) by 0.785.

Examples to illustrate each of the above (all resistances given per 1000 feet):

(a) Resistance of No. 10 wire equals 1 ohm.

(b) Then resistance of No. 7 wire equals $1 \times \frac{1}{2} = 0.5$ ohm, and resistance of No. 4 wire equals $0.5 \times \frac{1}{2} = 0.25$ ohms, and so down.

Resistance of No. 13 wire equals $1 \times 2 = 2$ ohms, and resistance of No. 16 wire equals $2 \times 2 = 4$ ohms, and so up.

(c) Resistance of No. 4 wire equals 0.25 ohms, then resistance of No. 5 wire equals $0.25 + (\frac{1}{4} \times 0.25) = 0.3125$ ohms.

(d) Resistance of No. 4 wire equals 0.25 ohms, then resistance of No. 3 wire equals $0.25 \times 0.785 = 0.1963$ ohms.

The value 0.785 used in (d) can be remembered very easily, since it is equal to $\pi/4$, which is the quantity by which the square of the diameter of a circle must be multiplied to find its area.

If the calculation in which the resistance is required be a very rough one, then the values found by (d) might even be found by subtracting one-quarter of the resistance found by (c) from

themselves, thereby obtaining the respective resistances. Thus:

Resistance of No. 2 wire equals 0.1563 ohms, then resistance of No. 3 wire equals 0.1563 + (¼ × 0.1563) = 0.1954 ohms. (In the table the method given in (d) was used.)

In the table the resistance from the B. & S. wire tables are given together with the resistances found by the above short relations (a), (b), (c) and (d). The error in ohms per thousand (1000) feet is almost negligible, that the error in the resistances of wires below No. 10 is very minute and that the maximum error is less than 1½ per cent. in any one of the resistances between No. 0000 and No. 20 wire, is clear.

RESISTANCE OF PURE COPPER WIRE.

B. & S. Gauge Number	Resistance per 1,000 ft. at 20° C or 68° F: As obtained by Simple Relations	As Given in B. & S. Wire Table	Error in Per cent.	Error per 1000 ft.
0000	.049	.04893	0.143	.00007
000	.0625	.06170	1.300	.00080
00	.0781	.07780	0.386	.00030
0	.0981	.09811	0.010	.00001
1	.1250	.12370	1.050	.00130
2	.1563	.1560	0.192	.00030
3	.1963	.1967	0.204	.00040
4	.2500	.2480	0.806	.00200
5	.3125	.3128	0.096	.0003
6	.3925	.3944	0.481	.0019
7	.5000	.4973	0.543	.0027
8	.6250	.6271	0.335	.0021
9	.7850	.7908	0.733	.0058
10	1.0000	.9972	0.281	.0028
11	1.25	1.2570	0.558	.0070
12	1.57	1.5870	1.010	.016
13	2.00	1.9990	0.050	.001
14	2.50	2.521	0.832	.021
15	3.14	3.179	1.230	.039
16	4.00	4.009	0.225	.009
17	5.00	5.005	1.090	.055
18	6.28	6.374	1.473	.094
19	8.00	8.038	0.473	.038
20	10.00	10.140	1.383	.140

The great advantages which this method possesses are, that the relations are easily remembered and that not even a slide rule is needed to find the respective resistances, due to the simplicity of the calculations.

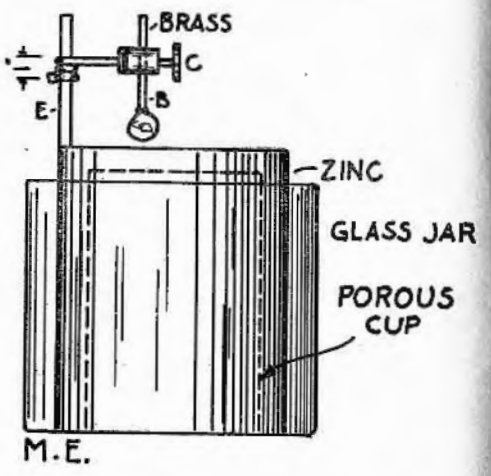
Contributed by

Edwin J. Israel.

A SIMPLE COPPER PLATING OUTFIT

As I have not seen a copper plating outfit in *Modern Electrics* I will explain how to make one with which it is not necessary to use an extra battery.

The jar is an ordinary battery jar. The porous cup is also out of a battery. Make a zinc cylinder a little longer than the porous cup and solder a brass rod, E, 5 inches long on one end as shown in drawing. Then take a piece of copper rod about ⅛ inch thick and make a spring about 1 inch long leaving a piece protruding out like A in drawing. Solder a binding post on the end so that the



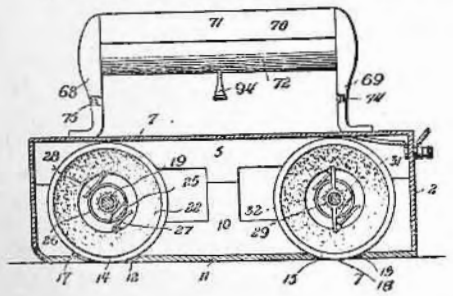
hole of the binding post is over the center of the zinc cylinder. Take a rod about 6 or 7 inches long and put it through the hole in binding post and tighten set screw, C. The spring, A, is made so it will slide up and down rod, E. To operate fill the porous cup with a saturated solution of sulphate of copper, and the jar with water to which has been added a little sulphuric acid. Fasten the article to be plated on rod, B, by means of a small copper wire. Push the spring, A, down until the article is covered with the solution in the porous cup. The plating will go on until the article is taken from the solution. This outfit does not need a battery for it is a cell in itself. If the solution becomes weak add more crystals of sulphate of copper.

Contributed by,

Arthur T. Kupferle.

Note.—The article to be plated should be thoroughly clean and bright or plating will be uneven.—Ed.

Electric flat irons are so well known as to have become more or less of a necessity, but a roll-flat-iron, and one that will heat and propel itself at that, is a decided innovation. The inventor is Edward F. Stegman, of Rollinsville, Colo., and the accompanying view gives a general idea of the device, which is illustrated and described at great length in the Letters Patent No. 1,055,951. The bottom of the outer shell, 2, is closed by the plate, 11, formed with apertures, 12 and 13, through which the supporting rolls, 14 and 15, protrude slightly, so that the lower face of the plate is tangental to the peripheral surfaces of said rolls. The handle consists of curved metal end portions, 68 and 69, and the wooden grip portion, 70, formed of longitudinally split sections, 71, 72, with a hollow centre communicating through the passages, 74, 75, with



the interior of the casing, 2. 94 is a finger contact lever for reversing the motion in the propelling roll, 15, said lever being shown here in its normal, neutral position, in which both the motor and the heating elements are cut out of circuit. The roll, 14, is hollow in construction and is provided with a cylindrical shaft, 19, whose extremities are journaled in suitable bearings carried by the side walls, 10, respectively, of the lower section of the frame. Suitable heating elements, 22, in the form of resistance coils are provided within this roll, and are connected by conductors with the collector rings, 25 and 26, mounted upon the shaft, 19, at one end thereof and exteriorly of the roll. Suitable brushes, 27 and 28, are secured to the corresponding side wall, 10, of the lower section of the frame for a purpose to be described more fully hereafter. 15 is the propelling roll, mounted on shaft, 29, having squared ends, 31, so as to be held rigid within brackets, 32, carried by the side walls, 10, of the lower section of the frame. The central portion of the shaft, 29, is cylindrical. The motor, which is adapted to rotate the said roll, 15, is of the rotary feed type, the armature being rigidly mounted upon the shaft, 29.

Heavy shell and rolls are used for efficiency without inconvenience to the operator, as the device is self-operating, since the user has merely to guide the iron in its course and to operate the switch device, 94, which may be done without removing the hand.

The utilization of magnetism for the separation of mixed liquefied gases is the subject of Patent No. 1,056,043, issued to Abraham Cressy Morrison, of Chicago, Ill., the process being especially designed for the production of gaseous oxygen and nitrogen from liquid air, based on the facts that oxygen is a paramagnetic-element and that its magnetic susceptibility is higher than that of nitrogen. The process comprises the steps of placing liquid air within a strong magnetic field and then allowing the liquid to become heated to a temperature slightly above the boiling point of nitrogen, whereupon the nitrogen distils off, the oxygen remaining by reason both of its relative involuability

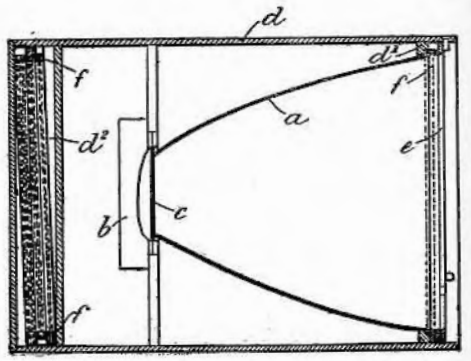
Heretofore when it was desired to ascertain any variation from the original dip and bearing as the hole proceeded the customary method was to employ hydrofluoric acid in a glass tube for the dip, and to mark the drill rods as they went down, for the bearing, a process that was both laborious and inaccurate, and which consumed much valuable time.

In the accompanying views Fig.. 1 represents a longitudinal section of the device; Fig. 2, a perspective of the magnetic indicator used; and Fig. 3, a fragmentary section of a modification adapted for use where the inclination of the bore is unusual. Disregarding the minor details of construction described in the specification and shown and lettered in the views, it is sufficient for an understanding of the invention to say that in Figure 1, 1 represents a cylindrical casing interposed between the head, 3, and the stopper, 5, which latter is attached to the cable, 17, containing an electric circuit communicating with the electric bulb, 15. Arranged in the casing, 1, is a cylindrical sensitized paper, 26, held in place by a transparent cylinder, 27. On the top of the mercury, 28, floats a magnetic indicator, 29, mounted on a pearl ring, 30, to prevent contact between mercury and indicator, which latter has a central opening, 32, by which it is positioned on the point, 33, of a fibre needle, 34. In the modification shown in Fig. 3, flexible connection is made with the lamp, Y, through the member, S, so that a greater degree of inclination is provided for, the arrangement being otherwise essentially the same as in Fig. 1.

In operation the device is lowered into a drill hole the required depth, when time is allowed for the mercury to come to rest and the indicator to assume the magnetic meridian, and the light is turned on, the sensitized paper exposed above the mercury affording a record of inclination as related to the north and south simultaneously registered by the magnetic indicator,—the sensitized paper being of course removed and developed after the device is withdrawn from the bore. In this way an exact record is procured of the conditions at the point at which the exposure was made, which may be filed for future reference.

The advantage of the parabola in the concentration of light or sound waves is well known, and there is nothing basic in the application thereof to a telephonic transmitter. Therefore Patent No. 1,054,581, issued to William John Merchant, of London, England, is necessarily confined to minor details shown in the accompanying longitudinal section of the device, in which *a*, represents a parabola or mouthpiece of suitable material with the inner end cut away, so as to terminate in the focal plane of the paraboloid.

b, represents the box of the transmitter, and *c*, represents the transmitter



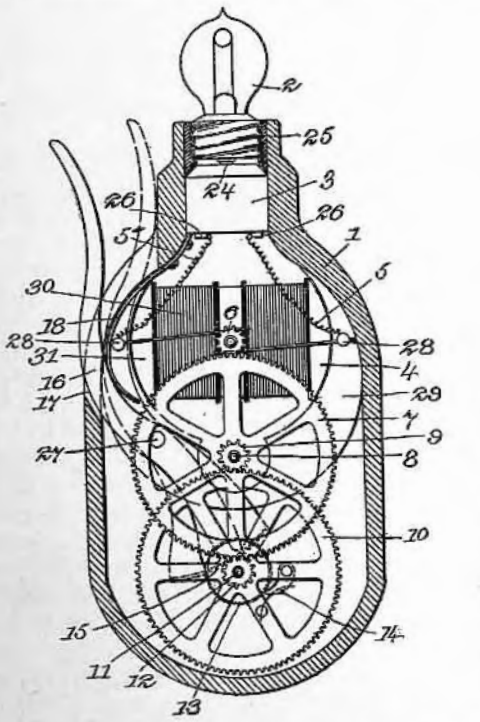
diaphragm which is positioned approximately in the focal plane of the paraboloid and contiguous with the rear edge of the horn.

This apparatus is secured in a casing, *d*, constructed with an annular clamping ring, *e*, adapted to be secured by means of a bayonet catch to an inwardly projecting flange, d^1, of the casing to which the outer edge of the horn, *a*, is focused. The object of the clamping ring, *e*, is to provide means for locking over the mouth of the horn, *a*, one of a series of screens for the purpose of graduating the intensity of sound produced in the receiver. For convenience the box or casing, *d*, is made with a compartment, d^2, at its rear end adapted to accommodate these screens which are made of material of varying thickness or mesh stretched over the rings, *f*, which are of a diameter adapted to fit within the edge of the casing, *d*, and abut against the flange, d^1, when clamped in position by the clamping ring, *e*.

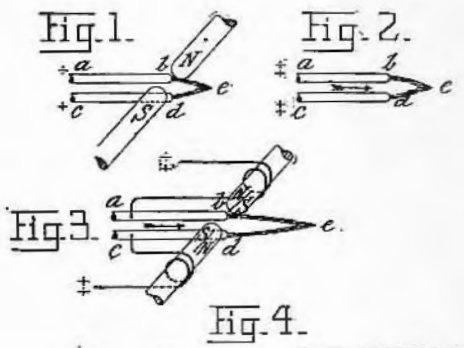
It would thus seem superficially that our English cousin seeks first to concentrate the air vibrations to augment the sound transmitted, and then to muffle and modify his success in this respect by the use of "a series of removable sound graduating screens," which together with "means carried by the casing for the securing of the screens one at a time over the large end of the horn," constitute the limitations of the claim.

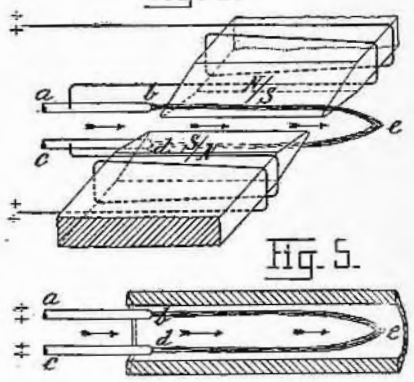
A small portable incandescent hand lamp not dependent on a storage battery is a desideratum because the battery soon runs down and is liable to fail when the light is most needed. Victor Sence, of New York, N. Y., in his patent No. 1,054,872 proposes to obviate this difficulty by the use of a thumb-actuated generator in the lamp-handle, as shown in sectional elevation in the accompanying illustration.

In use the operator holds the flask 1 in his hand and periodically forces lever 16 into the position shown in dotted lines by pressure of the thumb of the hand in which the flask is held. On releasing the pressure spring 18 forces the lever back. Each inward movement of the outer projecting end of the lever spins the armature of generator 4, through action of the pawl and ratchet gearing, and generates a current which charges battery 3. This battery transforms the pulsating current so generated into a constant current supplied to lamp 2, incandescing the same. In this way the power necessary to generate a useful amount of light can be easily and continuously exerted by a person of ordinary muscular development for some time without fatigue.



It is a well-known fact that an electric arc is affected in such a manner by a

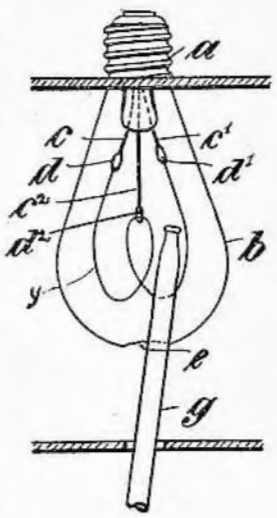




magnetic field, that the arc—in case the same passes through the magnetic field across the direction of the lines of force—is forced out to one or the other side perpendicular to the magnetic lines of force according as the electric current flows in one or the other direction in relation to the direction of the magnetic lines of force. If the electrodes should be in alignment with each other, so that the ends of the arc have an opportunity of moving along the electrodes, the so-called "Birkeland"—arcs are formed on account of the physical law above referred to. But if the ends of the arc are prevented in some manner from moving along the electrodes, which in such case

different metals, respectively, and coiled within the soft iron rings in the shape of the letter C, with one end rigidly secured to the ring, *4*, and the other end operatively connected to the ring, *14*.

Patent No. 1,052,065, issued to Ernst August Kruger, of Seehausen, Germany, assignor of one-half to Sigbert Bloch, of Charlottenberg, near Berlin, Germany, is for a method of regenerating burnt out electric glow lamps by providing them with new filaments, the novelty consisting in the manner in which the cemented joints connecting the filament to the electrodes are dried while removing the black deposit from the interior of the glass bulb.



The method hitherto adopted consists in making the cemented joint conductive by drying it with the aid of an electric arc, which frequently results in damage to the filament joint, and in removing the black deposit inside the bulb by heating the latter with a blow lamp, which causes intense and rapid local heating and is also liable to cause breakage. These drawbacks are obviated by the present invention, according to which the cemented joints are only heated to an accurately regulatable temperature of approximately 270 C., whereby the black deposit in the bulbs is simultaneously removed. The heating is gradual and well distributed as regards the bulb, so that there is no risk of breakage.

The lamp *b*, held together with a number of others, not shown, in the box, has its cap *a*, outside the box and has three leading-in-wires, *c*, c^1, c^2, to which the new filament is fastened by cement joints, *d*, d^1, d^2. The cemented joints are in this case dried and heated by introducing highly heated air into the bulb by means of the tube *g*, inserted in the opening *e*. The current of air may be directed against the cemented joints so that the same are rapidly dried. As the whole lamp, with the exception of the cap, is inclosed in a chamber, the heat is concentrated as much as possible, and the deposit in the lamp bulb is likewise removed. The drying of the cement and the removal of the black deposit may be synchronous or successive operations. In the latter case the temperature in the inclosed chamber, or of the air introduced thereinto, is at first only raised sufficiently to dry the cemented joint, whereupon the temperature is gradually increased until the black deposit entirely disappears. In the first case the temperature is somewhat higher to begin with, so that the cemented joint is dried and the deposit is removed from the bulb simultaneously.

Patent No. 1,053,390, issued to Albrecht Heil, of Frankfort-on-the-Main, Germany, assignor of one-half to Conrad Hubert and one-half to Samuel Stern, both of New York, N. Y., relates to a galvanic battery which is characterized by a high output with small weight and long life, hitherto not obtained. These characteristics are obtained by employing as the substance acting as the depolarizer, not manganese dioxide, for example, pyrolusite or suitable sulphate, chloride or the like, but the dark brown manganic hydrate, which is the hydrate of the sesquioxide of manganese, and which corresponds in chemical composition to the formula $Mn(OH)_3$, and which readily conducts electricity. If this dark brown powder is intimately mixed with finely powdered carbon (graphite) and used in the ordinary manner as the depolarizing electrode in a porous envelope with a carbon element opposed to a zinc element in ammonium nitrate or ammonium chloride solution or the like, a battery is thus obtained whose depolarized electrode, with the same weight and the same electrolyte, has about 100 per cent. greater efficiency than a depolarizing electrode of the best and purest pyrolusite. Experiments have shown that 70 parts by weight manganic hydrate can advantageously replace 240 parts by weight of the highest percentage of pyrolusite. Such batteries give a very constant and strong current, keep excellently during periods of rest and produce no fumes, for which reason dry batteries can also be very advantageously manufactured in this manner. The electromotive force is 1.6 volts. The internal resistance is somewhat smaller than in the pyrolusite battery, while its recovering capacity is greater than in the Leclanche battery.

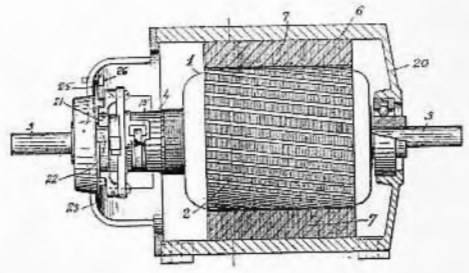
Patent No. 1,053,940, issued to James Burke, of Erie, Pa., assignor to the Burke Electric Co., a corporation of Pennsylvania, relates to an electric motor which is adapted to be actuated by either single phase alternating currents or direct currents, and to a method of varying the speed and changing the direction of rotation of the motor when supplied with alternating current of the same voltage.

Thus, a motor may be applied to any commercial alternating or direct current circuit without the use of any accessory apparatus or any change of adjustment by simply applying the alternating or direct current voltage to its terminals, and will in either case give the same speed and high torque; is capable of being operated at a high efficiency for either character of current, and may be readily regulated without auxiliary devices. Furthermore, the motor is free from all injurious sparking of the brushes and all excessive heating, and requires no additional parts, such as resistance leads, auxiliary field windings, or extra brushes. The above highly advantageous results attained are substantially independent of the number of cycles of the single phase alternating current.

A salient feature of the construction, which is of great utility, is that under conditions of the same applied potential and equal load, substantially the same speed of rotation is attained when said motor is supplied by a single phase alternating current or by a direct current, and at substantially the maximum efficiency for either character of current.

The view shows the stator and frame in central vertical section, the rotor, commutator and brush elements being shown in elevation.

The rotor, 1, comprises a laminated core, 2, of magnetic material, said core being fixedly mounted on a shaft, 3, the commutator being shown at 4. The laminae of core, 2, are provided with openings at or near their periphery to form slots, which in the present instance, are twenty-two in number, and in which are mounted the insulated



conductors, 5, constituting the coils of the armature winding. Each slot contains windings of two coils, the windings of one coil at the end of said slot passing in one direction and the windings of the second coil at the ends of said slot passing in the opposite direction. One coil passes from the first slot to the fourth slot, and the second coil passes an equal number of slots in the opposite direction, namely, from the first slot to the twentieth slot, and so on around the core; thus completing the arrangement of armature windings to be connected to form a series-wound armature.

The slots in the armature core are disposed at a suitable angle to the axis of the armature core, which angle in the instance cited is sufficient to bridge one stator tooth. This slant in the rotor core slots in relation to the field gives such uniform relationship as to assist in permitting a large range of flexibility in brush position without injurious sparking because of the gradual entrance of the rotor teeth into the fields of the stator, and thus assists in securing uniform action with either direct or alternating currents.

All business houses and dwellings in the city of Stavanger, Norway, will be heated by electricity derived from a nearby waterfall if present plans are carried out.

BUG NUMBER

The Wireless Screech

OUR MOTTO . . —— . . . . . —— .

THE ETHER: SLIPPERY

No. Naughty 1. N'YAWK, MAY ONCET. Price: One Grin

The Wireless Screech

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Idiotorial

Has the Electricity Bug bitten you?

Has the Wireless Weevil wormed its way into your inner works?

Then join the *Wireless Screechers* and let's all go crazy together!

THE EDITOR

Even if we amateurs are limited to a 200-meter wave, you can gamble your last copper on it we are going to make some splash in the ether!

Here is a

Recipe for Becoming a Screecher.

To an old kitchen table add one flexible transformer, a rotary spark gap, a sending condenser, transformer coil, electrolytic interrupter, oscillator, wireless key (may be taken from any old bunch of keys), a tuner (a piano tuner will do in a pinch), a silly con-detector, a receiver (get the court to appoint a receiver for you), batteries (any baseball team can supply you), and a few switches (hair goods counter four aisles to the left!). Stir thoroughly in a bread mixer, add dash paprika, eight ohms of electric currents (which may be obtained free by skillfully tapping the electric light power wires any dark night), and bake in slow oven.

When done, serve on sixty foot aerials garnished with copper wires. Swallow in big doses, take a pink pill, throw a fit and subscribe for the *Screech*.

Wiry Willie, the Wireless Wiz

An Operetta, Chock Full of Throbs and Thrills, Pirates and Poils

CAST

Wiry Willie, Wireless Wiz.
Dip the Blood, Leader of Crooks.
Hy Jinx, Captain of Steamship *Papeete*.
Chorus of Pirates, Disguised as Sailors.
A Hertzian Wave.
Atmosphere.
Ether.
U. S. Revenue Cutter *Sneakbox's* Column of Smoke.

ACT I

Scene opens aboard steamship *Papeete*, two days out from Tahiti with cargo of pearls.

Dip the Blood: Sh-h-h-h!

Chorus of Crooks: (Tune—"Never Throw a Lighted Lamp at Mother.")

Bold pirates are we (tee hee, tee hee!),
The scourge of the sea (tee hee, tee hee!),
And we plunder treasure ships wherever they may be.

Dip the Blood: Sh-h-h! In an hour we will reach Raratonga Reef. We will scuttle the ship, cop the poils, toss the captain and that meddlesome wireless wiz to the sharks, and be rich for the rest of our lives.

Wiry Willie (Hiding behind a Hertzian wave): Oomps!

ACT II

Ten minutes later an hour elapses. Wireless Willie discovered in standing position, seated at radio instrument with phones to ears.

Wiry Will: Excelsior! Also Eureka! They are coming! They are coming! Got an answer at last! Now, let those inhuman piratical fiends do their worstest!

Enter chorus of crooks on tiptoe, to tune of that sneaky, freaky, ever melodious (BING!), "Mysterious Rag."

Chorus (Singing — tune, Stein Song, opera of Anhaeuser-Busch):

We sailed out from Papeete
In the Island of Tahiti,
And our ship is loaded down with poils, poils, poils;
We're gona cop the treasure,
And live a life of pleasure—
We will be as rich as fruit cake from the spoils, spoils, spoils.

Dip the Blood: Have you anything to say before we croak **yuh?**

Chorus (Singing):

Before we croak yuh,
Before we croak yuh!

Wiry Willie: Gee! I never leave that door open but a lot o' rubbish blows in!

Dip: Chop that vaudeville stuff! You die at sundown. Have you any favorite method of dying? We have seized this ship and the poils, and it's good-night, nurse, for yours.

Chorus (Singing):

Good-night, nurse;
He's going for a ride,
He's going to ride inside;
Here comes the hearse,
So, good-night, nurse!

Wiry Willie (Whipping two ten-inch rapid-fire guns from his vest pocket): Hands up! The first one that moves an eyelash is a dead man! Now, you listen to me. I got wise to your little scheme. You didn't know the revenue cutter *Sneakbox* passed us an hour ago, did you? Well, she did; and she was just out of sight. I was talking with her, and she has your number. Take a peep out that window and you will see her smoke now! In half an hour you'll all be wearing bracelets! You will now join in the chorus and sing that beautiful ballad to the tune of "The Bowery":

The wireless, the wireless,
They do such things and they say such things
On the wireless, the wireless,
We'll never rob ships any more.

Shells from *Sneakbox* screech across the ship's bows. Pirates run up the white flag.

Quick Curtain.

The Grattle

I wish you would announce to a waiting world that I have discovered a wonderful alloy. It is a conductor nearly 100 per cent. efficient, just what the electrical world has been seeking.

J. M., Lincoln, Neb.

Ans.: Marvelous! This ought to make you rich enough to hire Carnegie for a scrub lady. Send us full particulars, and we will make a feature article in next month's *Screech*.

(Just as we go to press the following letter comes from J. M.: "I neglected to state that the place I discovered this wonderful new conductor, cupric-boronsuboxide was on page 22 of the April number of *Modern Electrics*.")

Advertisements

(Rates, one dollar a word; no ad less than one word received.)

WANTED: Position as lineman for wireless telegraph company. Q. X.

HELP WANTED: Amateur operator, who fell from aerial poles onto wires sixty feet above ground requires services of any person with a sixty-foot ladder. No references required. B. Z.

Daffy Patent Department

The Electro-Magnetic Perpetual Motion Power Plant

As soon as the patent is granted on my Electro-magnetic Perpetual Motion Power Plant I will explain the full details and publish working plans. At present, however, I can give to my fellow *Screechers* only a few hints as to the general mechanism.

This machine, as finally perfected by yours truly after eighty-nine years of ceaseless labor, is a device for furnishing power to motor vehicles or boats. It consists of a powerful electric coil magnet supported in front of the boat or vehicle on non-conducting rods. A large steel bar across the front of the vehicle a few inches from the electro-magnet is attracted by said magnet, and, obeying the impulse, moves forward, drawing the car with it.

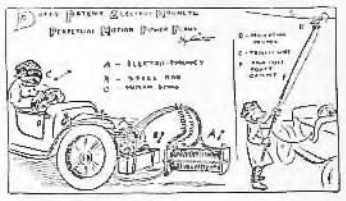
The magnet is charged and controlled by storage batteries, and the speed of the car is regulated by the amount of current allowed to enter the coil.

I conceived this wonderful idea one time when I saw an old darkey cure an obstinate mule from balking by tying a bundle of hay on a pole attached to the animile's head. The hay dangled in front of the mule's nose, just out of reach, and, in his efforts to catch up with the eats, he forgot the balks.

An important part of this patent is the device for recharging the batteries without any expense whatever, making the cost of operation absolutely nothing. In hilly country, and very few roads are without hills, the batteries are kept charged by the self-starting motor-generator device now being installed on all new cars. In coasting the generator is turned on by automatic switches, and is run by power taken direct from the wheels. In all but very level country there is more than sufficient to keep the batteries charged.

But we have provided auxiliary means for making assurance doubly sure. We have invented a jointed fish pole apparatus supporting a feed wire hooked at the upper end. This may be used on country roads, where there is a trolley. The wire on the pole may be hooked over the trolley wire, and the current is run into the batteries.

This also may be used on any non-insulated feed wires from power



plants. For an insulated feed wire, we have an attachment to fit the pole which works on the principle of a pruning knife. The pole is hooked over the wire, the lever of the pruning knife is jerked a few times, which cuts through the insulation, and allows the current to be taken by the hand and led gently into your storage batteries.

Wireless Club Directory

Until further notice we will publish here from time to time a list of wireless clubs. These notices are inserted free upon receipt of proper information. Notices of the organization of all new clubs, as well as any changes of officers, etc., should be sent to us promptly.

Allegheny County (Pa.) Wireless Association—Leetsdale, Pa.

Alpha Wireless Association—Box 57, Valparaiso, Ind.

Amateur Experimental Association — Spokane, Wash.

Amateur Wireless Association of New Bedford—84 Dunbar Street, New Bedford, Mass.

Amateur Wireless Association of Schenectady—R. F. D. Route No. 49, Schenectady, N. Y.

Amateur Wireless Association of Schenectady—405 Lenox Road, Schenectady, N. Y.

Amateur Wireless Club of Geneva — 448 Castle Street, Geneva, N. Y.

Amateur Wireless Telegraphy Club of California—Box 55, Capitola, Cal.

Arkansas Wireless Association—216 West 20th Street, Little Rock, Ark.

Atlanta Wireless Association—159 Capitol Avenue, Atlanta, Ga.

Austin Wireless Association—406 West 10th Street, Austin, Texas.

Back Bay Wireless Club of Boston—295 Walnut Street, Brookline, Mass.

Berkshire Wireless Club—18 Dean Street, Adams, Mass.

Boise Radio Club—715 North 9th St., Boise, Idaho.

Boys' Experimental Club — Box 214, Virginia, Minn.

Bridgeton Wireless Club—275 Bank Street, Bridgeton, N. J.

Bronx Wireless Association—500 East 165th Street, Bronx, N. Y.

Brooklyn Wireless Club — 131 Ryerson Street, Brooklyn, N. Y.

B. W. T. A. Wireless Department—Scarsdale, N. Y.

Canadian Central Wireless Club—9 Central Avenue, Armstrong's Point, Winnipeg, Man., Canada.

Cantabridga Wireless Club — 351 Harvard St., Cambridge, Mass.

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

Chicago Wireless Association—4418 South Wabash Avenue, Chicago, Ill.

Cincinnati Wireless Signal Club—1839 Hopkins Street, Cincinnati, Ohio.

Colorado Wireless Association—1545 Milwaukee Street, Denver, Colo.

Danvers Wireless Association — Franklin Street, Danvers, Mass.

De Kalb Radio-Transmission Club—205 Augusta Avenue, De Kalb, Ill.

Detroit Y. M. C. A. Radio Club—Detroit, Mich.

Dorchester Wireless Association—222 Harvard Street. Dorchester, Mass.

East Buffalo Wireless Club — 701 Walden Avenue, Buffalo, N. Y.

East Glenville M. E. Wireless Association —634 East 124th Street, Cleveland, Ohio.

East Side Y. M. C. A. Radio Club—162 East 66th Street, New York City.

East Tennessee Wireless Association—723 North Third Avenue, Knoxville, Tenn.

Electric St. Louis Wireless Club — 2009 Allen Avenue, St. Louis, Mo.

Electro and Mechanical Association of Columbus, Ohio—512 West State Street, Columbus, Ohio.

Everett Wireless Association—2716 Grand Avenue, Everett, Wash.

Ever Ready Wireless Club—167 East 71st Street, New York, N. Y.

Experimental Club of Cincinnati—1214 Jackson Street, Cincinnati, Ohio.

Fargo Wireless Association — 518 Ninth Street, Fargo, N. D.

Flushing Wireless Association—24 Madison Avenue, Flushing, N. Y.

Franklin Wireless Telegraph and Telephone Association—Bronx, N. Y.

Frontier Wireless Club — 1034 Elmwood Avenue, Buffalo, N. Y.

Fruitvale Wireless Club—2510 Fruitvale Avenue, Chicago, Ill.

The Germantown Wireless Club—5801 Germantown Avenue, Germantown, Pa.

Glenville M. E. Wireless Club—1262 Woodside Avenue, Cleveland, Ohio.

Gramercy Wireless Club—207 East 25th Street, New York, N. Y.

Granby High School Electricity Club, Granby, Mass.

Greater Boston Wireless Association—4 Lawrence Street, Wakefield, Mass.

Guilford County (N. C.) Wireless Association—Greensboro, N. C.

Hamilton Wireless Association—405 Franklin Street, Hamilton, Ohio.

Hamlin Wireless Association—2729 Nobl Avenue, Chicago, Ill.

Hannibal Amateur Wireless Club — 130 Hill Street, Hannibal, Mo.

Haverhill Wireless Association—Haverhill Mass.

Harriman Wireless Association—801 Clinton Street, Harriman, Tenn.

Hartford Wireless Association—320 Wethersfield Avenue, Hartford, Conn.

Independence Wireless Association — 21 South 6th Street, Independence, Kas.

Irving Park Wireless Club—4908 Byron Street, Chicago, Ill.

Italian-American Wireless Experimental Club—146 Bleecker Street, New York, N. Y.

Inter-Mountain Wireless Association — 21 5th Street, Salt Lake City, Utah.

Killington Radio Club—36 Lincoln Avenue Rutland, Vt.

Lane Radio Association—2147 Lincoln Place Chicago, Ill.

Lexington Electrical and Wireless Club—517 Throop Avenue, Brooklyn, N. Y.

Long Beach Radio Research Club — Long Beach, Cal.

Madisonville Wireless Club — 5609 Tompkins Avenue, Madisonville, Ohio.

Manchester Radio Club — 759 Pine Street, Manchester, N. H.

Massachusetts Wireless Association — 245 Commonwealth Avenue, Boston, Mass.

Metropolis Wireless Association—181 West 63d Street, New York, N. Y.

Metropolitan Wireless Association — 181 West 63d Street, New York, N. Y.

Mowa Wireless Club — 331 Pacific Street, Brooklyn, N. Y.

Murray Hill Wireless Association—334 East 34th Street, New York City.

New England Wireless Association, Inc.—125 Milk Street, Room 99, Boston, Mass.

New Haven Wireless Association—27 Vernon Street, New Haven, Conn.

Northern New Jersey Relay Club—102 High Street, Passaic, N. J.

North Jersey Wireless Association—Hawthorne, N. J.

Oklahoma State Wireless Association—Box 627, Tahlequah, Okla.

Oakland Wireless Club—916 Chester Street, Oakland, Cal.

Oregon State Wireless Association—Lents, Oregon.

Pacific Radio Communicating Association—1109 Washington Street, Vancouver, Wash.

Pacific States Wireless Association — 288 Wilcox Avenue, Los Angeles, Cal.

Pacific Wireless Club of Oregon—405 East Market Street, Portland, Ore.

Pittsburg Wireless Association—6031 Kirkwood Street, Pittsburg, Pa.

Plaza Wireless Club—156 East 66th Street, New York, N. Y.

Power City Wireless Association—Niagara Falls, N. Y.

Progressive Wireless Club — Poplar Bluff, Missouri.

Progressive Wireless Club—Seattle, Wash.

Radio Club of Baltimore—904 N. Fulton Avenue, Baltimore, Md.

Radio Intercommunication Club—25 Terrence Street, Springfield, Mass.

Ranger Nautical Signal and Wireless Club —Nautical Training School, State House, Boston, Mass.

Rochester Wireless Association—Rochester, N. Y.

Rockland County Radio Wireless Association—54 Catherine Street, Nyack, N. Y.

Roslindale Wireless Association—962 South Street, Roslindale, Mass.

Sacramento Wireless Signal Club—2119 H Street, Sacramento, Cal.

St. Paul Wireless Club—1911 Ashland Ave., St. Paul, Minn.

Santa Cruz Wireless Association—184 Walnut Avenue, Santa Cruz, Cal.

Southern Wireless Association—1435 Henry Clay Avenue, New Orleans, La.

Springfield Wireless Association—323 King Street, Springfield, Mass.

Spring Hill Amateur Wireless Association —2 Benton Road, Somerville, Mass.

Stoneham Radio Association—33 Warren Street, Stoneham, Mass.

Sullivan Wireless Association—Sullivan, Ill.

Technical Wireless Association—1206 East Capitol Street, Washington, D. C.

Texas Wireless Association — 1212 Prairie Avenue, Houston, Texas.

Toledo Wireless Club—1024 Erie Street, Toledo, Ohio.

Tri-County Wireless Association — Greenfield, Ohio.

Tri-State Wireless Association—Room 101, Falls Bldg., Memphis, Tenn.

United Wireless Relay Club — 102 High Street, Passaic, N. J.

Waterbury Wireless Association—26 Linden Street, Waterbury, Conn.

Waynesburg College Wireless Club — Waynesburg College, Pa.

Welcome Wireless Association—185 Chauncey Street, Brooklyn, N. Y.

Westchester Wireless Association—37 West Main Street, Tarrytown, N. Y.

Western Division High School Wireless Association—Milwaukee, Wis.

Wildwood Wireless Association—110 East Pine Avenue, Wildwood, N. J.

Wireless and Electrical Association—Lindsborg, Kans.

Wireless Association of Atlantic City—Atlantic City, N J.

Wireless Association of Buffalo, N. Y.—142 Dorchester Place, Buffalo, N. Y.

Wireless Association of Canada—189 Harvard Avenue, Notre Dame de Grace, Montreal, Quebec, Canada.

Wireless Association of Central California —860 Callish Street, Fresno, Cal.

Wireless Association of Central Pennsylvania—409 Kelker Street, Harrisburg, Pa.

Wireless Association of Easton, Pa.—123 North Main Street, Phillipsburg, N. J.

Wireless Association of Greater Fort Smith —Greater Fort Smith, Ark.

Wireless Association of Illinois—303 North 8th Street, Marshall, Ill.

Wireless Association of Keene — 172 Elm Street, Keene, N. H.

Wireless Association of Milwaukee — 824 Nineteenth Avenue, Milwaukee, Wis.

Wireless Association of Montana — 309 South Ohio Street, Butte, Mont.

Wireless Association of New Orleans — 2022 State Street, New Orleans, La.

Wireless Association of Pennsylvania—Odd Fellows' Temple, Philadelphia, Pa.

Wireless Association of Savannah—303 Price Street, Savannah, Ga.

Wireless Association of Southern California—935 Denver Avenue, Los Angeles, Cal.

Wireless Association of Woodbury — 28 Penn Street, Woodbury, N. J.

Wireless Club of Newtonville—47 Gibson Road, Newtonville, Mass.

Wireless Society of Springfield—P. O. Box 562, Springfield, Mass.

Wireless Telegraph & Telephone Association of U. S.—Boys' Club, 161 Avenue A, New York, N. Y.

Young Edison Society—Rogers, Ark.

Young Experimenters' Society—Box 251, Coaticook, P. Q., Canada.

Young Marconis' Wireless Association—1024 Erie Street, Youngstown, Ohio.

Y. M. C. A. Wireless Club—211 West Fourth Street, Williamsport, Pa.

Zanesville Wireless Association—105 South Seventh Avenue, Zanesville, Ohio.

Flying Sparks

CORRECT

Teacher—By what is the Earth surrounded and by what is it lighted?

Pupil—It is surrounded by air and water and lighted by gas and electricity.

HAPPY THOUGHT

Office Boy—"There are two men out there, sir, who want to see you; one of them is a poet and the other a deaf man."

Editor—"Well, go out and tell the poet that the deaf man is the editor, and let them fight it out between them."—*Tit-Bits.*

MISSING

Two farmers of Kansas were discussing a recent cyclone. "Was your barn damaged any?" asked Si, "Wal, I dunno; I ain't found that barn yet."—*Electroforce.*

THE QUESTION

First Doctor—"I operated on him for appendicitis."

Second Doctor—"What was the matter with him?"—*Life.*

EPITAPH OF A SPEEDER

No more he'll run a buzz machine
Gone where they don't use gasoline.—*Judge.*

NEW POWER UNIT

"Is you gwine ter let dat mewel do a he please?" asked Uncle Ephraim's wife "Wha's you' will power?"

"My will power's all right," he answered. "You jest want ter come ou hyar an' measure dis here mewel's won' power."—*Christian Register.*

GOOD EXERCISE

It was a very hot day and the fa drummer who wanted the twelve-twent train got through the gate at just twelve twenty-one. The ensuing handicap wa watched with absorbed interest bot from the train and the station platform At its conclusion the breathless and per spiring knight of the road wearily too the back trail, and a vacant-faced "re cap" came out to relieve him of his grip

"Mister," he inquired, "was you tryin to ketch that Pennsylvania train?"

"No, my son," replied the patient man "No, I was merely chasing it out of th yard."—*Electroforce.*

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three (3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

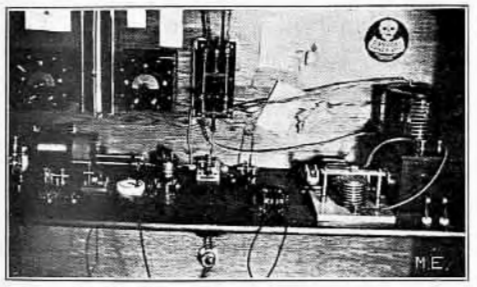
This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE, THREE DOLLARS

I am submitting an arc light photograph of my radio outfit.

The antennae is of the T type, consisting of five wires of phosphor bronze, 80 feet long, 50 feet high, with 12-foot spreaders.

The receiving set consists of one



HADDEN STATION

Bunnell three-slide tuner used as a loading coil, a Murdock receiving transformer, a small Murdock variable condenser, two large Amco variable condensers, audion, galena and perikon detectors, with necessary switches, receptacles for two sets of phones, one pair Mesco receivers and one pair Holtzer-Cabot new type receivers, which is not shown in the photograph.

The sending end consists of a ¼ kw. Amco transmitting set, an Amco quenched gap, a Murdock line protector and a plug cutout under table.

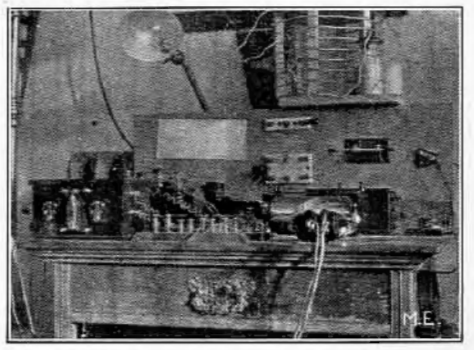
One Amco transfer switch, a testing buzzer and a shelf full of *Modern Electrics* completes my set.—*Weston Hadden, New York.*

HONORABLE MENTION

The engraving shown herewith is reproduced from a photograph of my wireless station, taken by myself.

My receiving set consists of a loose-coupler, two variable condensers, a loading coil, and a Wallace valve and silicon detectors.

My sending set consists of a 1½-inch spark coil run by a 6-volt, 60 ampere-hour storage battery, and a helix, leyden



KALTENBACH STATION

jar, spark gap, and a key, as well as the necessary switches.

The aerial is 110 feet long, composed

of 4 strands of copper wire, the strands being spaced 2 feet apart.

With this set I pick up the important naval stations along the coast from Portsmouth, N. H., to Key West, Fla., and on two occasions I have heard the naval station at Guantanamo, Cuba (NAW). My sending range is about five miles.

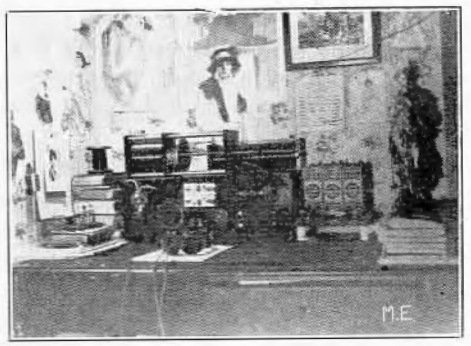
I think *Modern Electrics* is a fine magazine, and recommend it to any amateur.—*Henry Kaltenbach, Jr., New York.*

HONORABLE MENTION

The accompanying view shows my wireless receiving set.

As I have no sending station, I have concentrated my attention and have succeeded in obtaining a remarkably efficient receiving outfit. The wiring is extremely short, and is of stranded wire, with all connections securely soldered. The set consists of a loose-coupler, home-made, with the exception of the primary, which was wound by the Clapp Eastham Co.; a 1500 metre loading coil, and a double-throw switch, giving me a choice of using an audion or a perikon set made from Pickard's licensed crystals.

With this set and my aerial, which is 150 feet long, comprising five wires



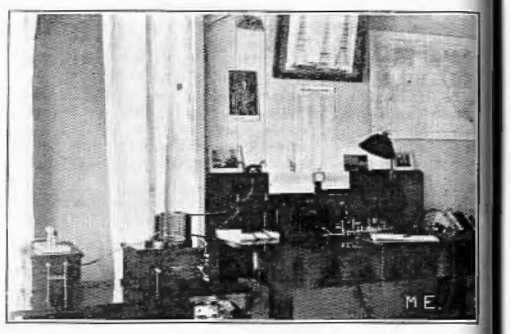
METCALF STATION.

spaced three feet apart, I have heard nearly every Government station on the coast from NAB (Cape Elizabeth) to NAM (Norfolk, Va.), and nearly every night hear NAR (Key West), and NAL (Washington). These latter two stations come in clearly, although not loud, and I have no difficulty in reading them. I use Murdock AM phones. This set has such a high minimum wave length that I rarely, if ever, hear amateurs.—*Herbert E. Metcalf, Massachusetts.*

HONORABLE MENTION

In the accompanying view may be seen the various instruments comprising my wireless station.

The small table on the left holds the sending set, while the large table holds the receiving set. The sending set consists of Clapp Eastham Blitzen ¼ kw



COLT STATION

sending transformer, condenser, helix and a Murdock ½ kw. spark gap.

The instruments on the large table from the left to the right are: Home-made aerial switch, Murdock variable condenser, receiving transformer, home-made variometer, Clapp Eastham Blitzen variable condenser, Murdock sending key, buzzer key. In front of the receiving transformer is a Murdock fixed condenser, 2000 ohm phones and short circuiting switch. In front of the variometer is the Clapp Eastham Ferron detector, with silicon crystal. The aerial is 75 feet high and 80 feet span. I have received about 1,500 miles and sent about 20. As the picture is very plain, it will speak for itself.—*Fay E. Colt, Washington.*

HONORABLE MENTION

The accompanying view of my wireless station was taken some time ago, and since then I have made several changes.

My receiving set consists of loose-coupler of 1500 meters range, two rotary variable condensers, fixed conden-

ser, silicon detector and 2000 ohm Murdock AM phones.

My sending set comprises a one-inch coil, helix, glass plate condenser (not shown), rotary spark gap and key.

All instruments except coil are homemade. I have copied several coast sta-

FOX STATION

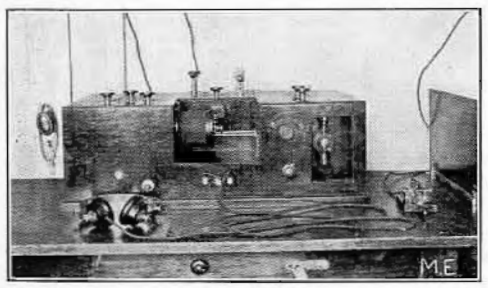
tions, Key West, University of Michigan and numerous other stations.

My aerial consists of four aluminum wires, No. 14, 200 feet long, 50 feet high at one end and 55 feet at the other. It is of the inverted L type.—*Corbin C. Fox, Ohio.*

HONORABLE MENTION

The two accompanying illustrations show both my receiving and transmitting apparatus.

The receiving apparatus I have set up in a mahogany cabinet with hard rubber



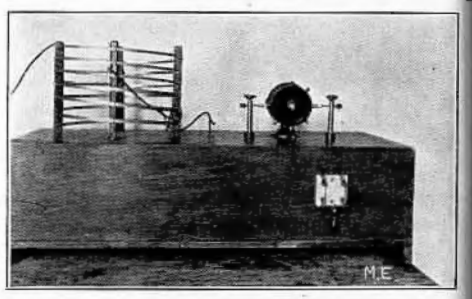
OSBORN STATION—RECEIVING

top. The loose-coupler and loading coil were made by myself and are operated by three 10-point switches. A ferron and silicon detector are mounted on the center of the cabinet and an audion is in the pigeon hole on the right side, regulated by a rheostat and switch. A variable condenser is fitted inside the case and is operated by a rod, the handle of which is shown to the left of the audion. Receivers are of 3000 ohms resistance.

The sending apparatus is also constructed in a case. Helix and rotary gap I have built myself. The helix I made from quarter-inch brass ribbon wound round four ebony posts, and the rotary gap consists of a ⅛ h. p. high speed motor with hard rubber wheel four inches in diameter. In the case is a ½ kw. closed core transformer and a set of 12 plate glass condensers in a rack, which I also constructed. I use an ordinary telegraph key fitted with heavy silver contacts.

My aerial is of the straightway type, consisting of six copper wires spaced two feet apart and 60 feet long. Height on one end is 80 feet and on the other end 50 feet.

With this set I do very satisfactory



OSBORN STATION—SENDING

work, the sending averages from 60 to 100 miles and receiving from all large stations between San Diego and Seattle. —*Chas. W. Osborn, California.*

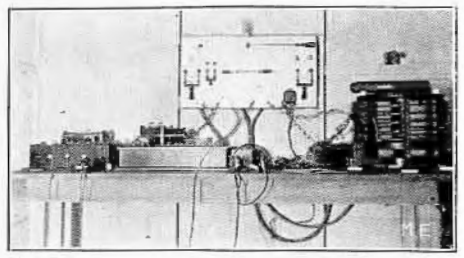
HONORABLE MENTION

The accompanying illustration shows my wireless station, which is located in the attic of my house. It consists of the following instruments: On the left is seen a United Wireless Telegraph Company type B tuner, to which I added a variable condenser. A potentiometer, battery, detector and shunt switches are on the top. Two detectors—one carborundum and one perikon, with an 1800 ohm phone complete the set.

To the right of this set is another that I made myself. It is composed of the following: An Adams-Morgan inductive tuner, variable plate condenser, fixed condenser, three detectors—car-

borundum, perikon and galena—also a potentiometer, battery, detector and shunt switches. With this set I have covered 1,500 miles with the aid of Brandes phones.

The sending consists of a Splitdorff



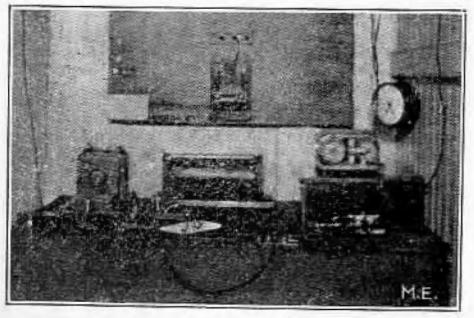
AUSTIN STATION

one-inch spark coil, which is operated on a six-volt 60-ampere-hour storage battery, a commercial leyden jar and a United Wireless small type helix. My spark gap is mounted on the center of the switchboard. To the left of it is a double-pole, double-throw switch, which is used for changing sets. The switch on the left of that is used for breaking the battery circuit. The one on the right of the board is my transfer switch, and the large one at the top is my grounding switch, which is supplemented by another outside of the house.

I would like to hear from any amateurs, either by person or wireless. My call is WA or 2CI—*Edward C. Austin, New Jersey.*

HONORABLE MENTION

In the accompanying illustration may be seen a view of my radio station. All the instruments are of my own make



WUNDER STATION

with the exception of the telephones.

The receiving set comprises a loose-coupler, single slide tuner, used as a loading coil; four detectors—two silicon, one galena and one perikon—a condenser, a pair of 1,000 ohm Brandes 'phones and a solid receiver which I employ for friends desiring to listen in.

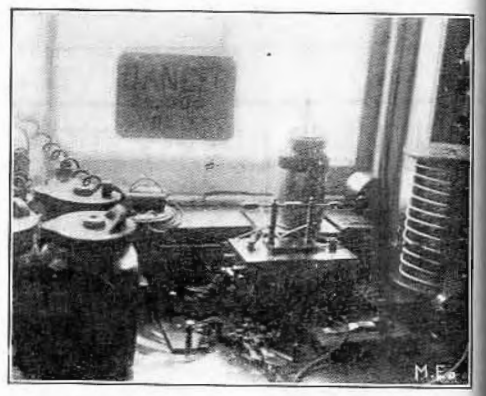
The sending set consists of a two-inch coil of my own make, spark gap of the stationary type, two sections of Murdock condenser and helix. The helix and condenser belong to my portable set and are contained in the box on the table.

On the shelf above the table I have wire and motors which I use in trying new hook-ups and for general experimenting.

I am a constant reader of *Modern Electrics*, from which I have copied the designs for different instruments of my set which have been published from time to time.—*William Wunder, Pennsylvania.*

HONORABLE MENTION

The illustration shown herewith is a



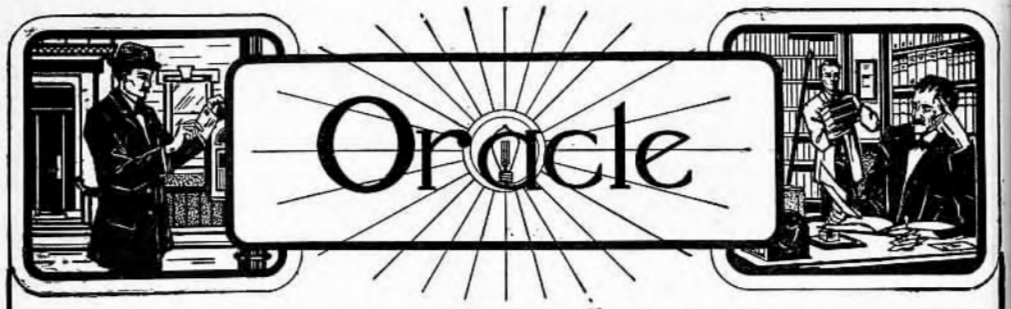
FLINDT STATION

reproduction from a photograph of my wireless station.

The transmitting set consists of a ½-inch spark coil, spark gap, helix, leyden jars and telegraph key. The spark coil is run on four bichromate cells, which appear in the photograph. The helix and spark gap were made by me.

The receiving set combines a silicon detector, tuning coil, two condensers and a 1,000 ohm receiver.

The aerial consists of four strands of aluminum wire spaced 1½ feet apart, and is about 50 feet high. I have obtained good results from my station.—*Walter Flindt, Pennsylvania.*



Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing.

Common questions will be answered by mail if 10 cents to cover expenses have been enclosed for each question. This class of correspondence has grown to such proportions that we can no longer answer questions by mail free of charge.

Owing to the additional labor required in the gradual advance of the date of publication of this magazine, there will be more or less delay necessary in answering questions and we therefore cannot undertake to furnish quick replies, for the next few months at least.

Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

WE CANNOT ANSWER QUESTIONS REGARDING SENDING AND RECEIVING RANGES.

SHARP WAVES FROM TRANSMITTERS

(2373) Franklin Dulany, New Jersey, states:

Q. 1.—I am using the following instruments to transmit: One inch spark coil, glass plate condenser, zinc spark gap, helix and key. I have a friend of mine with whom I communicate a great deal, and he informs me that he can hear my station on almost every portion of his tuning coil. Why is it, and how can it be remedied?

A. 1.—This is a very common characteristic of most transmitters using helixes, and is due to the close coupling of the oscillating and aerial circuits, which react upon each other and cause aerial oscillations which are highly damped. As a result, the signals emitted have no pure wavelength and in consequence may be heard over a wide range of your friend's tuning coil. You might obtain a purer wave from your transmitter by replacing the helix with an oscillation transformer, which will reduce the interplay of energy between the aerial and oscillation circuits to a considerable extent, depending on the degree of coupling between them. In this manner a sharp wavelength can be secured and your trouble eliminated. In the article on Quenched Spark Systems appearing in the February, 1912, issue of *Modern Electrics*, you will find the subject of sharp tuning discussed at length.

UNDERGROUND WIRELESS SYSTEM

(2374) Frank Merritt, New Jersey, writes:

Q. 1.—Will you please tell me where I can buy a book on wireless suitable for an advanced person, who knows practice but not theory? The book must contain formulæ for figuring out wavelength of coils, for calculating capacity, etc. If there is any such book on the market, kindly let me know the name and author.

A. 1.—What is perhaps considered the best authority on wireless telegraphy thus far published is entitled "The Principles of Electric Wave Telegraphy," by J. A. Fleming, M. A., D. Sc., F. R. S. It contains between 600 and 700 pages, profusely illustrated with diagrams and engravings of instruments and stations and covers the subject thoroughly in both theory and practice. Calculations and formulæ for every phase of wireless telegraphy and telephony are comprised in this

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work. Copies of the 1910 edition, the latest, may be obtained from our Book Department at the price of $7.50 net.

Q. 2.—In a book not long ago I noticed an idea for short distance wireless telephoning using two wells. Will you please tell me how far this will work and also if I can employ a gas and water pipe for short distances for my circuit? Below is the diagram of the well telephone system.

A. 2.—The telephone system employing the wells would only be practical for fair distances, perhaps up to a mile, with satisfactory conditions, but we are unable to estimate the definite range that it might cover. This system is very similar to that of the Murgas wireless telegraph system, in which no aerial was employed. Instead, a connection was made to a certain stratum of earth perhaps 10 feet under the surface, and another connection at 100 feet below the surface to another stratum. As a result of these two strata with separating earth between them, it was possible to send high frequency current through the two layers in sufficient quantity as to be detected at the receiving end by means of a sensitive receiving set. While there was naturally a large percentage of leakage from one stratum to the other, a sufficient amount of current reached the receiving end to be detected by the sensitive instruments. The use of the two wells is based on a similar principle, namely, the utilizing of two sections of the earth which are sufficiently separated so as to form distinct conductors to a greater or lesser degree. It would depend entirely upon the mineral condition of the earth, as well as the nature of the separation between the strata reached by the wells and other ground connections in the system shown in the diagram, as to the actual distance that could be secured. Water and gas pipes may be employed successfully for a telephone system, provided that they are not absolutely short circuited by actual contact or by damp earth.

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THE NEW ARLINGTON STATION

(2375) Geo. Y. Barnes, Canada, states:

Q. 1.—Although I have a receiving range of over 2,000 miles, I have not heard the new Arlington station (NAV), which is 600 miles away from me. Is it because they use a very long wavelength? I can tune to 3,200 meters. When is the best time to listen in for them, and do they send noon signals.

A. 1.—The wavelength of the Arlington station is 4,000 meters, so you will have to increase your receiving wavelength in order to tune in with that station. However, to our knowledge, the station is not, as yet, in regular operation, but the preliminary testing and adjusting of the transmitting apparatus is in progress. Therefore there is no definite time to listen in for them. They transmit noon signals on a 2,500 meter wave length.

Q. 2.—When Cape Cod (MCC) starts sending press, he states: "To ships equipped with Marconi and D E B E G apparatus and subscribing to," etc. What is the meaning of D E B E G?

A. 2.—These letters are the abbreviation for the name of the German company controlling the Telefunken stations on certain steamers. The name in full of the firm is—Deutsche Betriebs Gessellschaft für Drahtlos Telegrafie, M. B. H.

DIRECT CURRENT MOTORS ON ALTERNATING CURRENT

(2376) Frank C. Watson, New York, writes:

Q. 1.—I have a small 110 volt direct current motor, which naturally refuses to run on alternating. What could I do to make this motor run on alternating current?

A. 1.—There is no practical method by which you can adapt this motor to alternating current. The only successful method would be to use a rectifier, across the D. C. terminals of which is placed a battery of storage cells. Naturally, such an equipment would be far more expensive than a regular alternating motor. Small D. C. motors of the series type winding can be employed on A. C. current with fair results, and, as a rule, their field poles are lamin-

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ated to withstand the action of the alternating current.

Q. 2.—What is the definition of alternating current?

A. 2.—Broadly considered, an alternating current is one which reverses its direction of flow at fixed and regularly recurring intervals.

WIRELESS LAW. ELECTROLYTIC INTERRUPTER

(2377) John Sigvaldson, Minnesota, asks:

Q. 1.—Must I use a rotary spark and oscillation transformer with a one inch coil operating on 110 volts A. C. with an electrolytic interrupter, though I am located over 100 miles away from the nearest station, to comply with the law?

A. 1.—You might better take up the question of licensing your station with the radio inspector at Chicago. Considering your distance from the nearest station, it would appear that a license for your station is not necessary, nor do you necessarily have to employ a rotary spark gap and an oscillation transformer. If you will refer to the December and January issues of *Modern Electrics* you can find detailed information on the new law.

Q. 2.—Does an electrolytic interrupter cause the lights to flicker in a house, when used with a one inch coil?

A. 2.—Not if a suitable choke coil is employed in series with the primary of the coil, and the primary leads run direct to the meter.

GLACE BAY STATION

(2378) H. M. Hammett, Massachusetts, writes:

Q. 1.—I have a 200-foot aerial, loose coupler and a loading coil six inches in diameter and 23 inches long. I use about 10 inches of the coil, which brings in SLI very clear, but I have never been able to hear Glace Bay. Do you think that I should get him with my outfit?

A. 1.—Your receiving wavelength is probably not long enough. Glace Bay operates on a wavelength of 7,100 meters. Furthermore, it has a directive aerial and for this reason its signals do not carry very strongly to the south, in which direction you are located. However, this station can be heard by some amateurs in New York

City, and you should have little difficulty to hear it if you increase your wavelength.

INTERRUPTER ROD. CONDENSER

(2379) Wm. S. Graves, New Hampshire, asks:

Q. 1.—Should the metal rod furnished with an electrolytic interrupter wear away to a point? I have one in which the rod fails to wear away to a point and if I file it to a point it becomes blunt again in a short time.

A. 1.—The metal rod is supposed to wear evenly and maintain the point. If in proper working order, the point will not become blunt. Perhaps your solution is not mixed in proper proportions, and the manufacturers can advise you as to your trouble if you communicate with them, giving all the details.

Q. 2.—How large a condenser is needed for an open core ½ kw. transformer working with an electrolytic interrupter on a 104 volt, 60 cycle, A. C. circuit, and how far apart should the spark gap be?

A. 2.—The condenser should contain 1,360 square inches of tin foil if 0.05 inch thickness of glass is employed. This area can be divided among 17 glass plates measuring 12 by 14 inches, coated with 8 by 10 tin foil on both sides. This is the maximum capacity that can be employed with the interrupter working at utmost efficiency. The spark gap should not be drawn over ¼ inch.

Q. 3.—Does the new Arlington station have any special time to send? Can a person compete over once for the prize in the wireless contest?

A. 3.—For the first half of this question, see answer to No. 2375, this issue. As to competing for the wireless contest prize, a person may enter his station only once. However, if through subsequent changes of apparatus the station is so modified as to be greatly changed from the previous description submitted, it may again be entered in the contest, with a photograph showing its appearance at this time.

RECEIVING SET HOOK-UP

(2380) Henry Fisher, New Jersey, inquires:

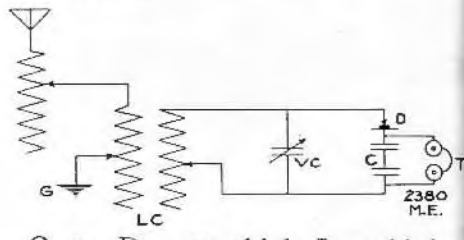
Q. 1.—What is the matter with my station that I do not receive? I have

an aerial consisting of two wires 75 feet long and 35 feet high. My set comprises a loose-coupler, loading coil, silicon detector, two condensers and 150 ohm 'phones.

A. 1.—You should be able to pick up all the local stations and have a receiving range of at least 100 miles. You might improve your receiving set by using higher resistance telephones. If your connections are correct and the instruments are in proper shape, you should have good results.

Q. 2.—Please give me hook-up for the instruments.

A. 2.—We are giving you the hook-up herewith.



Q. 3.—Do you think I could hear Cape Cod with these instruments?

A. 3.—It barely seems possible. By substituting a higher resistance set of head-phones, and a galena detector, you would probably be able to hear that station without much difficulty.

INDOOR AERIALS AND RECEIVER WIRING

(2381) Clifford Jones, Oklahoma, asks:

Q. 1.—If I have my aerial under a tin roof will it work?

A. 1.—The tin roof decreases the effectiveness of the aerial to a great extent, though you may still be able to receive signals from some stations, provided they are sufficiently powerful.

Q. 2.—Are there any wireless stations near me, and if so what are the names?

A. 2.—We do not know of any commercial or Government stations in your State. The nearest stations are located along coast of the Gulf of Mexico and in Texas, with the possible exception of army posts, which perhaps have wireless stations.

Q. 3.—What kind and size of wire should I use to connect my receiving instruments?

A. 3.—There is no particular size or kind of wire for this purpose. The most suitable for connections, how-

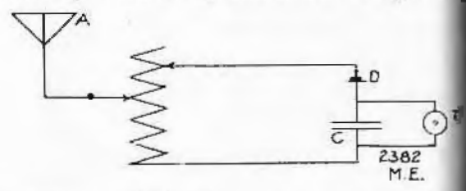
ever, would be either standard lamp cord or stranded conductor cord, which can be obtained at local supply houses.

DIAGRAM FOR RECEIVING INSTRUMENTS

(2382) Wayland Alfred, Texas, asks:

Q. 1.—Please tell me how to connect the following: Double-slide tuner, fixed condenser, 1,000 ohm 'phones, galena detector and potentiometer.

A. 1.—We are giving the correct hook-up herewith, but omit the potentiometer, which is unnecessary when using galena detector.

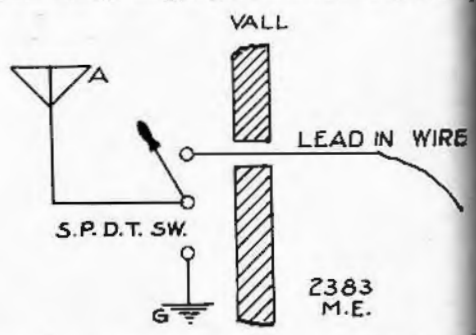


WIRELESS STATION LIGHTNING ARRESTER

(2383) Phillip E. Selden, South Dakota, states:

Q. 1.—A friend and I are erecting small wireless stations, and we are going to employ lightning arresters to protect our instruments. This device consists of a small spark gap placed between the aerial and the ground just before the lead enters the building. A fuse is placed in the lead-in wire circuit. Will this arrangement protect the instruments satisfactorily?

A. 1.—It has been stated time and again in this publication that the only safe protection against lightning is to ground the aerial through a substantial and heavy single pole switch. The connection running to the ground from this switch should be as straight as possible, with no sharp turns or abrupt bends. A diagram is appended here-



with showing the necessary connections. We would advise you to abandon the idea of using the spark gap, for in the event of lightning striking the aerial, the charge would pass both through the spark gap as well as through the instruments and totally destroy them.

Q. 2.—I have a wind-mill at home, the platform of which is about 45 feet from the ground. It is about 330 feet from the house. I wish to place an aerial between this structure and the house. Will the arrangement give a greater wavelength than that laid down by the law?

A. 2.—Yes, the natural wavelength would be over 400 metres. This can be cut down, however, by using a series condenser for sending, as discussed in the article on the Wireless Amateur and the Wireless Law in the December, 1912, and January, 1913, issues of *Modern Electrics*.

Q. 3.—Are there any Government stations near me?

A. 3.—We do not know of any stations in your State operated by the Government.

TRANSMITTING CONDENSER AND RANGE

(2384) J. W. Durbin, Pennsylvania, inquires:

Q. 1.—Are 16 sheets of tin foil 5 by 5 inches, and 17 plates, single thickness window glass, 6 by 6 inches, sufficient capacity for a sending condenser for use with a two inch coil?

A. 1.—This condenser is of sufficient capacity if the coil is operated on battery current.

Q. 2.—With an aerial composed of four wires spaced two feet apart, 100 feet in length and 50 feet high, will there be much difference between the range of my set situated between two mountains, and another set like it situated in open country near Philadelphia?

A. 2.—Other conditions being equal, the station located in the open country will have perhaps a greater range, for mountains, especially if they contain mineral deposits, act to a greater or lesser extent as screens to wireless waves. This effect, however, depends largely on the nearness of the mountains to the station and their height.

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CONSTRUCTION OF OZONE GENERATOR

(2385) John Hadler, Ohio, requests:

Q. 1.—Could you tell me how an ozone generator is made, and give the principle?

A. 1.—The principle of the ozone generator is based on the use of a silent high tension electrical discharge, which creates the ozone gas. In their simplest forms ozone generators comprise one or more sheets of heavy glass separating metal surfaces which are connected to a high tension transformer. The charge being unable to pass through or around the glass, forms a violet glow or silent discharge, identical to that formed in transmitting condensers of wireless stations, known as the "brush discharge," when they are strained by a heavy charge. An electric fan maintains a current of air between the metal plates and the glass, which passes through the opening in the generator case into the surrounding atmosphere. An excellent description of the construction of a simple ozone generator is given on page 411 of the October, 1911, issue of *Modern Electrics*.

INDUCTION INTERFERENCE

(2386) Wayne Bonser, Washington, writes:

Q. 1.—My aerial is about 30 feet away from a telephone line, and when I send it is almost impossible to talk over the telephone. I only have a one inch coil. How can I stop this?

A. 1.—This is a very common trouble and there is practically no remedy that we know of. If your aerial is running parallel with the telephone line at the present time, you can decrease this interference to some degree by swinging the aerial at right angles to the telephone line.

Q. 2.—We have a gasoline electric lighting outfit and when it is in operation the click of the spark can be heard in the telephones of my receiving set. Can this be avoided?

A. 2.—This is another difficulty in which we cannot aid you.

Q. 3.—How can I fix my set so that it will be passed by an insurance company?

A. 3.—By securing a copy of the

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booklet published by the National Board of Fire Underwriters, you can secure detailed information on the rules for approved wiring and electrical installations.

REMAGNETIZING MAGNETO MAGNETS

(2387) W. L. Clunie, Wisconsin, asks:

Q. 1.—Will you please explain a method by which I can magnetize the magnets of an ignition magneto by the use of storage or dry cells and give the voltage and amperage necessary as well as the size wire?

A. 1.—There is no practical method by which you can remagnetize the magnets with either storage or dry cells. At the factory the magnets are magnetized by a large pair of electromagnets operating on 110 volts and drawing a very heavy amperage. It requires an extremely powerful magnetic field—impossible for you to secure with your facilities—for the magnetizing of the steel magneto bars.

TELEPHONE RECEIVERS

(2388) William Bernstein, New Jersey, asks:

Q. 1.—Whose type of telephones are the most sensitive wound to 2,000 ohms? How much would they cost, and where could they be bought?

A. 1.—We are not open to controversy regarding the relative merits of either telephone receivers, wireless instruments or other apparatus, and accordingly can state no opinion in this matter. However, we have in our advertising columns a number of manufacturers making the highest grade receivers and refer you to them for further information and prices.

COMPLETE WIRELESS EQUIPMENT

(2389) Lawrence Jakes, Ohio, states:

Q. 1.—Being a beginner and wishing to purchase a good wireless outfit that will send about 30 to 40 miles, and receive from 500 to 600 miles, will you kindly advise me what instruments I will need, where I can buy them, and what power to use?

A. 1.—For receiving we would rec-

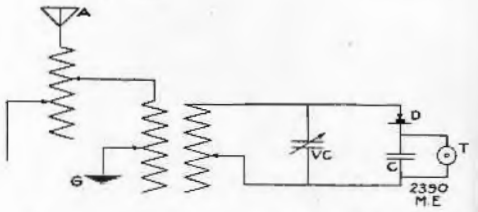
ommend: Loose-coupler, variable condenser, galena detector and 2,000 ohm telephones, all of which should be of the best grade. . For sending: 250 watt closed core transformer operating on 110 volts A. C., oscillation transformer, rotary or quenched spark gap, key, condenser and aerial switch. As stated in the previous answer, we can form no opinion or suggest any particular firm from whom you might obtain these instruments. If you will refer to the advertising columns you will find the names of firms making the instruments enumerated in the foregoing list.

EFFECT OF DUAL AERIAL

(2390) Charles Burton, Michigan, writes:

Q. 1.—Will you tell me the best way to hook up my set, which consists of a loose-coupler, variable condenser, a fixed condenser, galena detector, two slide tuner and 2,000 ohm receivers?

A. 1.—We are giving you a diagram herewith in which you will note that the two slide tuner is being used as a loading coil.



Q. 2.—I have two aerials, one a four-wire and the other a two-wire aerial. Both are connected to the same lead-in. Do you think that the small two-wire aerial cuts down my sending and receiving range?

A. 2.—If the two aerials differ much in length you will find it difficult to tune both your sending and receiving sets, sharply, on account of the difference in the natural wavelengths of the aerials. If the two aerials are parallel, increased receiving efficiency may be obtained by using separate lead-ins and receiving on the larger aerial and grounding the smaller aerial at the same time through a single slide tuner by which it may be tuned to the same wavelength as that of the signals being received. If the aerials are not parallel, but the two leads can be made parallel, nearly as good results may be

obtained. The reason for the increased efficiency lies in the fact that the second aerial, having little or no damping, oscillates freely on the wavelength of the incoming signals and re-radiates energy which is picked up by the aerial to which the receiving set is connected. This method is used to some extent at the Marconi Transatlantic stations at Glace Bay and Clifden to strengthen the received signals, the sending aerial being tuned to the incoming wave and then grounded.

CONNECTIONS FOR LOADING COIL

(2391) Chas. Snyder, Pennsylvania, writes:

Q. 1. Kindly advise me how I can connect a loose-coupler with a single slide tuning coil so as to increase the receiving wave-length of my station.

A. 1. Place the single slide tuning coil in series with the aerial and the loose-coupler, so that the slider of the tuning coil is connected to the aerial and one end of the winding to the loose-coupler.

QUENCHED SPARK GAP, COIL CONNECTIONS, WIRELESS SCHOOLS

(2392) C. Challman, New York, asks:

Q. 1. Is it possible to construct a square quenched spark and obtain as good results as with the round form?

A. 1. We have no available data regarding square plates for quenched spark gaps, but believe that if the plates are made embodying the same principles as the usual round type, the results should be about the same.

Q. 2. Can I connect two one-inch coils in order to obtain a two-inch spark? I intend to connect the primaries in multiple and the secondaries in series.

A. 2. Provided you connect the primaries together in the correct manner so that the current (if it is D. C.) does not flow in opposite directions in both coils, and the secondaries likewise, you will obtain satisfactory results. However, both coils if operated on direct current must be operated by one interrupter common to both. Probably the spark produced will not be as long as the sum of both separate spark lengths of the coils indicates.

Q. 3. Are there any places in New York City where one can learn the telegraph and wireless codes?

A. 3. Yes, there are several schools where telegraphy is taught and by referring to our advertising columns you will find the names of a number of well-known institutions, located in New York.

INTERRUPTER TROUBLE AND PILOT LAMP CONNECTIONS

(2393) Glenn Howe, Illinois, states:

Q. 1. I have an interrupter which I have attached to a lamp socket and upon pressing the key the first time secured a fairly good sized spark from my coil. The second time, the socket badly fused, and the third time I could obtain no results whatever. What is the trouble?

A. 1. The interrupter in the first place drew a heavier current than the socket could withstand, with the result that the metal parts of the socket melted. As a result, the connections of the socket were probably broken rendering your set inactive. When using the form of interrupter containing a metal rod within a porcelain tube, a choke coil should be employed in series to reduce the amount of current taken from the supply lines. Better still, both a choke and a resistance coil will be found more satisfactory as they will prevent the excessive amperage drawn from the supply lines when the interrupter and coil are connected directly to the lines through a key.

Q. 2. When the key was pressed using the above-mentioned interrupter all the lights in the house were nearly extinguished. What was the trouble and how can it be remedied?

A. 2. The answer to the first question applies likewise to this question.

GLENVILLE M. E. WIRELESS CLUB.

At a recent meeting of the Glenville M. E. Wireless Club, the following new officers were elected: president, George Aldridge; vice-president, James Stuart; secretary, Howard Campbell; treasurer, James Battles; instructor, Dr. Aldridge.

Address any communications to the secretary, 12620 Woodside Avenue, Cleveland, Ohio.

Advice on Patents

DECTOR STAND

(101) Oliver Metzler, of Wymore, Nebraska, sends in a sketch of a universal detector stand and wants to know if a patent can be obtained on same, or if it infringes on any other detector.

(A.) This detector closely resembles detector stands which are already on the market and we feel quite sure no patent can be obtained on same.

As a matter of fact we believe it would be impossible to secure a fundamental patent on any detector stand, and any other patent which might be secured could cover only details of construction and would therefore be worthless as it is a comparatively simple matter to make up a detector stand which would do all what one which was patented would do, and still not infringe upon the patent.

LOOSE COUPLER

(102) Chas. E. Apgar, of Westfield, N. J., states that he has devised a small loose coupler which, in connection with a small aerial allows, him to tune in distant stations having wave lengths up to 2,800 meters, the loose coupler being equipped with a special form of winding which permits of this. He wants to know if we would recommend securing a patent and also, what the commercial possibilities of the device would be.

(A.) It is possible that a patent could be secured on the winding, but we think that except for portable sets such a loose coupler would have no advantage over ordinary loose couplers of the same tuning capacity, and therefore it would appear that the commercial possibilities would not be great enough to warrant the securing of a patent on it.

PERPETUAL MOTION

(103) Owen Lowe, of Baltimore, Md., sends in a sketch of a device to be attached to the pulley of a dynamo and furnish the power necessary to drive the dynamo by means of atmospheric pressure.

(A.) An examination of the device shows that it is similar to attempting to lift oneself by pulling up on one's boot straps. It is simply a perpetual motion scheme and it will not work. In all probability the patent office would not

even accept an application for a patent on the device.

BINDING POST

(104) David Kuskin, of New York City, sends in two sketches of spring binding posts and ask if they can be patented.

(A.) We do not think that either of these posts could be patented as Type 1 resembles the spring clip used on a well-known battery conector while Type 2 resembles one of the forms of binding post shown in the Fahnestock patent described in our March number.

LOOSE COUPLER

(105) Sam Place, of Norristown, Pa., sends us a drawing of a loose coupler of ordinary design and wants to know if he would infringe any patents if he made and sold such a loose coupler.

(A.) We do not think he would be running any more risk in making and selling this instrument than does practically every other manufacturer of wireless apparatus.

LOOSE COUPLER

(106) F. R. Peebles, of Lincoln, Nebraska, asks if it will be necessary to get a patent on a new style loose coupler the shape being entirely different and having two sliders on both primary and secondary.

(A.) Unless the loose coupler gives much better results than those now on the market we do not think it would be necessary or even advisable to spend the money necessary to secure a patent.

PHOTOMETER

(107) R. Michaelis, of Ridgway, Mo., sends in a design for a new form of photometer and asks if we think a patent could be obtained on it.

(A.) This looks like a good device and would be worth patenting if the scheme has not already been patented. It would be well to have a search made of the Patent Office records for photometers embodying the principles disclosed in this one, before spending much money for a patent.

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WILL EXCHANGE ENCLOSED BATTERY motor, Golbs 32 cal. hammerless revolver and pocket flash light for a Brandes superior head set or anything else in the wireless line, also a 75 ohm receiver for buzzer. W. C. Powers, 3114 N. Carlisle St., Phila, Pa.

WHAT HAVE YOU TO EXCHANGE FOR THE following: Clapp-Eastham Ferron detector condenser (rotary), helixes, relays, dynamos, motors, perikon detector, key spark coils, books, $20 elec. engineering set, oscillation transformer, receiver, hand-drive dynamo. All of these are new. C. E. Gill, 81 Winthrop St., Brockton, Mass.

3½x3½ Eastman kodak, Locke adding machine, new Ford acetylene generator and outfit, pair short line (battery) telephones, to exchange for 6 volt 60 A. H. storage battery or small transformer 6 to 10 volt from 110 volt. E. P. Ferte, 1107 W. Augusta Ave., Spokane, Wash.

WILL EXCHANGE 18 LESSONS OF THE Electro Importng Co.'s wireless course, electrolytic detector, Jr., fixed condenser, for variable receiving condenser. F. S. Kriger, 32 E. Third St., Corning, N. Y.

WANTED, DODGE'S AUTOMATIC TRANSmitter or omnigraph No. 2, in exchange for 1-inch spark coil, 150 ohm relay, key, telegraph transmitter and receiver, D. P. D. T switch and several volumes of electrical magazines, H. E. Leigh, 416 B East, Hutchinson, Kan.

ONE 5 HP. MARINE 2 CYCLE COMPLETE with valves, reverse gear costing $45, propeller coil, high tension leads, etc., will exchange for best offer; motor cycle preferred. Loftus E. Sparling, 333 Dawson St., Sault Ste. Marie, Mich.

FOR EXCHANGE—Have several telephones and parts, stereo-camera, also other things; everything in good order; some never used. Send for list. Want Blitzen variable condenser, Blitzen tuner and Brandes Navy type phones. Amateur, Box 419, Silver Creek, N. Y.

MOVING PICTURE MACHINE IN GOOD order, one film; also place for slides with twenty-two slides included; electric light attachment if desired; want wireless supplies or dynamo. Spencer W. Slawson, Greenwich, Conn.

WANTED—UNITED WIRELESS OR A BLITzen variable condenser; have a Key on Marble base, large Contacts; Electrolytic detector; Pure transformer iron cut to correct size for converting ½ K. W. Trans. Coils to close core; also have typewriter; Core and Primary of ¼ K. W. trans., etc. Arthur S. Riley, 147 Bank St., Bridgeton, N. J.

I HAVE A REVOLVER FLASHLIGHT AND A $3 Waterman fountain pen, both in good condition; will exchange for liquid or mineral Detector or Potentiometer. W. Lyon, Hempstead, L. I.

WILL EXCHANGE 1 SILICON DETECTOR, 1 sectional condenser, 1 Clapp Eastham type variable condenser rotary, 1 Murdock rotary variable condenser, brand new, 1 Pancake tuner in excellent condition, 1 Westinghouse Ammeter Hot wire worth $25, 1 two kilowatt quenched spark gap brand new, 2 two pole single throw switches for cutting out 'phones, 1 three pole, 500 volt, 75 am. switch worth $8.75, 1 Combination ground switch case of hard rubber, 1 Tuning Variometer 2,000 M. capacity, 1 Spark gap for ½ K. W. or under, 1 Plug sectional sending condenser, 1 Spark coil K. W. make weighing 12 lbs, worth $16; a sectional condenser mounted in a case of Mahogany with an adjustable pointer, for other instruments or apparatus. Loftus Sparling, 333 Dawson St., Sault Ste. Marie, Mich.

WANTED—A TUBE-TYPE SECONDARY VARIable condenser in exchange for three new ½" coil secondaries; the secondaries never used, and are suitable for 1½" coil or transformer secondary; also spark-gap worth about $1.50 wanted for a 1½" coil vibrator, or both secondaries and vibrator for a variable receiving condenser. A. Plauries, 1326 Southern Blvd., Bronx, N. Y. City.

WILL EXCHANGE ONE NEW PAIR 1,000 OHM 'phones, 1 No. 1 Brownie camera and finder, 2 practically new sets of telegraph instruments, 1 Stevens Little Scout rifle in perfect condition, 1 ¼ in. coil, 1 mica fixed condenser in fine condition and appearance, 1 two slide tuner on a 4 in. tube 8 in. long, No. 24 wire, 1 book "Harper's Electricity for Boys," value $1.75; want a ferron detector or other wireless goods; also have a 110 volt A. C. stepdown trans. Neill H. Martin, 1918 Eye St., N. W., Washington, D. C.

WILL EXCHANGE A 3¼x4¼ FOLDING PREMO camera, 3 section metal tripod, daylight developing tank, triple cell medical battery, tungsten flashlight, pocket ammeter for a ¼ or ½ gasoline engine or motorcycle. A. H. Bennett, 1227 Darlington Ave., Beaver Falls, Pa.

WANT ½ K. W. TRANSFORMER COIL AND interrupter in good condition for one 4x5 plate camera, cost $10; 1 doz. 4x5 plates, 1 75-ohm receiver and 1 pocket flashlight, cost $1.50; the camera takes fine, clear pictures and will hold 10 plates; plate holders given with camera. Maurice J. Craven, Box 248, Spring Valley, Ill.

When writing, please mention "Modern Electrics."

KNAPP TYPE "S" DYNAMO, TWO 2 V. 10 A. Storage Batteries in exchange for a good 1 inch spark coil. Emil Rohracker, 1719 N. Laundale Ave., Chicago, Ill.

WILL EXCHANGE A ¼-INCH SPARK COIL for a rotary protetiometer. P. Kemper, 420 Franklin St., Butler, Pa.

WILL EXCHANGE STORAGE BATTERY, 6 volts, charging rate 5 amps. for 14 hours, standard make, Helix, double slide tuner, key, detector, spark gap, 1,000 ohms receiver, 5 ohms sounder, Leyden jar, D. P. D. L. switch, aerial masts, insulators and pipes, small steam engine, voltammeter, for motor cycle or gas engine. Sylvester H. Davis, 712 Fairview Ave., Grand Rapids, Mich.

WILL EXCHANGE 110 V. 16 A. CONNECTICUT dynamo, first class condition, or a 5 x 7 Rochester plate camera with tripod, etc., for ½ K. W. wireless transformer. Norman C. Cowper, P. O. Box 102, Lynbrook, L. I.

A NEW 50 V. MOTOR, NEVER USED, COST $20, and 20 V., 10 V., 6 V. motors; make offer on receiving apparatus and a small coil from ¼ to 1 inch. R. D. Schlichter, Sellersville, Pa.

A 22 CAL. 1902 MODEL WINCHESTER RIFLE as good as new and a 22 cal. Hopkins & Allen revolver which I can guarantee, to exchange for a pair of 2,000 ohm head band wireless receivers. William Rocheleau, 71 Church St., Westbrook, Me.

WILL EXCHANGE FOR MOTORCYCLE THE following: 1 small motor, 1 helix, 1 .22 rifle, 1 camera, 1-2,000 ohm head set, 1 tuner wound with No. 30 wire, bare on maple roll 12 in. long, 6 in. dia., 1 one point rubber base switch, 1 each D. P. D. T. and S. P. D. T. switches, 1 set of xylophones (low pitch). J. W. Scott, 238 Chelmsford St., Lowell, Mass.

WILL EXCHANGE 1 SMALL WIRELESS REceiving set for ¼-inch spark coil. J. Cummins, 853 Amsterdam Ave., New York City.

COMPLETE RECEIVING SET CONSISTING OF loose coupler, double slide tuner, variable and fixed condensers, silicon and galena detectors, and 2,000 ohm phones; will exchange for Blitzen tuner or professional receivers, audion or ferron detectors, or will exchange separately for anything in wireless. Albert Perkins, 4008 West Prospect St., Kansas City, Mo.

WILL EXCHANGE 100 WATT HOME-MADE step-down transformer, in case, secondary voltages 6, 8, 10, 12, 16, with small rotary gap suitable to be run by same for a Blitzen rotary variable condenser or pair of Brandes' Superior 'phones in good condition. E. C. Jackson, 52 Hillcrest Ave., Yonkers, N. Y.

WILL EXCHANGE WITH ANYBODY IN THIS city: 3 size A Red Seal dry batteries and 1 pound tinfoil, for porcelain tubes, cleats and insulators of all kinds. Howard S. Pyle, 3316 York Road, Seattle, Wash.

WILL EXCHANGE A $75 COLLECTION OF postage stamps of all nations mounted in Scott's large International album, also a double slide coil, electrolytic detector, two inches of Wollaston wire, a potentiometer, a small motor and many kinds of crystals, for a Blitzen ring tuner, Brandes navy 'phones, oscillation transformer or small magnetic leakage transformer. Morton W. Sterns, 29 N. Main St., Bethlehem, Pa.

WILL EXCHANGE A FOOT POWER SCROLL saw, cost $3.50, for a pair of receivers in good condition or wireless goods. Edmund Kimmel, 24 Kensington Pl., East Orange, N. J.

FOR EXCHANGE—IN EQUAL VALUE, A COMplete wireless set; sends 5 to 6 miles; receives 250 to 300; good condition; also a good, complete set of electric trains; prefer a small gasolene engine at least ¼ horsepower. George Robinson, 353 W. 56th St., New York City.

WILL EXCHANGE — HOT WIRE AMMETER, high frequency type; 8-v. 80-a.h. storage battery; Manhattan 3-in. spark coil; Eastman kodak, 3½x3½; Western Electric 2000-ohm pair phones; Gillettee electric clock; want rotary converter about 1-h.p., or standard wireless apparatus. C. H. Stone, 230 W. Division St., Chicago, Ill.

WILL EXCHANGE ELECTROLYTIC INTERrupter and $1.25 key for a wireless key retailing at $2.50 or home-made, loose-coupler. Edward Jackson, 52 Hillcrest Ave., Yonkers, N. Y.

TO EXCHANGE—COMPLETE CORE PRIMARY and tube for 1 kw. open core transformer, 1 No. 8 B. S. micrometer; want variable condenser. Albert Anderson, 1373 Carroll Ave., Chicago.

WILL EXCHANGE ONE 3-BAR TELEPHONE magneto (very powerful), 1 "Ferron" model detector, 1 75 ohm receiver, with German silver head band, cord and connection plug and other electrical apparatus, for Winchester or Marlin .30-.30 rifle in good condition. W. E. Hagemann, 301 7th St., Brooklyn, N. Y.

WILL EXCHANGE A FINE STAMP COLLECtion in a brand new album that holds 10,000 stamps for a good make transatlantic head set or other wireless apparatus; write me what you have. Melvin Danheiser, 406 W. Holmes St., Huntsville, Ala.

HAVE A 1 INCH COIL (WITHOUT VIBRATOR) and interrupter, both in good condition; will exchange for Ceco Tuner, Brandes Superior Receivers, or Ferron Detector. James Reed, Kennewick, Wash.

LOOSE COUPLER, NEVER BEEN USED, FOR an Audion detector or for apparatus either sending or receiving or for accessories of an Ives Electric Railway; have a $45 bicycle. C. B. Weed, 346 Willow St., New Haven, Conn.

WILL EXCHANGE 110 V. 6 A. DYNAMO FOR ¼ kw. transformer and will exchange a carrom board for a volt-ammeter. Clarence V. Purssell, 1257 Morton St., Dorchester, Mass.

A 110 V. D. C. MOTOR, A PAIR OF 3,600 OHM 'phones in exchange for a rotary gap; write me. W. Van Slyck, 836 Main St., Lake Geneva, Wis.

HAVE AN OXYDONOR AND BOOK OF INstructions in first class order, for which I paid $25; will exchange for a wireless set. A. R. Coleman, Palmyra, Va.

WILL EXCHANGE EIGHT LARGE BALL porcelain insulators, have never been used for instruments. Arthur Haake, Closter, Bergen County, N. J.

TYPE "S" KNAPP MOTOR, EUREKA TELEgraph set, two Geissler tubes, core and primary 4 in. coil, well insulated and taped, Helics, 11 turns No. 6 aluminum 14 in. in diameter Pilot Light, interrupter for 1 in. coil for Murdock 3,000 ohm receivers, ½ kw. transformer coil rotary spark gap, or hot wire ammeter. J. L. Knapp, Evansville, Wis.

WILL EXCHANGE MURDOCK RECEIVER cord, 7 ft. mercerized cotton, 6 tips, carbon holder for arc light made of brass, mfd., with carbon, 2-5 ohm "Eureka" Sounders complete less magnets, 1 porcelain candelabra receptacle, adapter for charging to miniature base furnished also; total value $2.30. Want in exchange any of the following: 4 10½ in. electrose insulators for antenna, 4 fixed condensers or detector. Howard S. Pyle, 3316 York road, Seattle, Wash.

WANTED—A SET OF STANDARD RESISTance coils for a Wheatstone bridge; describe fully in answering and name manufacturer and value; have good assortment of wireless and experimental apparatus to exchange; can also use 110 v. motor or meters. Lee B. Clark, Vici, Okla.

WILL EXCHANGE FOR MOTORCYCLE ½ KW. transformer coil, .095 mf. sending condenser, oscillation transformer, spark gap, vibroplex, regular key, receiving extra large double slide tuner, silicon, galena, pyrite detectors, 2 semi-variable and one fixed condenser, necessary switches, six wire aerial with 12 strain insulators, two horsepower engine and ten volt D. C. magneto. Arthur Carden, Gen. Del., San Jose, Cal.

I HAVE 2 VARIABLE CONDENSERS, SLIDing plate type, 1 large size, cost $3.75; the other, small size, cost $2.25; 1 fixed condenser, cost $1;; also have a ½ in. coil and 1½ in. coil; former is of Spitdorf make; a tuner (2 slide); all instruments are in splendid condition except the tuner, which is a bit marred; will exchange all (except spark coils) for a Blitzen rotary condenser and good spark gap. Rey W. Neville, 37 Darwin St., Rochester, N. Y.

When writing, please mention "Modern Electrics."

WILL EXCHANGE A REMINGTON TYPEwriter in first class condition for a wireless receiving set; I prefer a set equipped with a pair of Brandes' navy type, 2,000 ohm 'phones. Carl D. Mason, Oak Grove, Mich.

I HAVE A FINE INTERRUPTER AND ONE-half inch coil without vibrator to exchange for good 10 ampere key (Boston preferred), or antenna-switch; interrupter nearly new, and coil secondary blocked in paraffine; also home-made marble base spark gap with ¾ inch zinc plugs; photo on request. Bryan G. Barker, Box 563, Marshall, Minn.

WANTED—A SMALL SINGLE PHASE INDUCtion motor, 1-30—1-6 h.p. for 110 volts, 60 cycles; speed 3,000-3,600 r.p.m.; have 1-10 kw. transformer, .22 cal. Winchester, numerous large and small sizes of wire tuners, detectors, etc. D. B. McGown, 1247 47th Ave., San Francisco, Cal.

WILL EXCHANGE A GOOD RECEIVING SET, comprising loose coupler, electrolytic and silicon detectors, fixed condenser and a circular potentiometer, for a Blitzen receiving transformer or good pair phones, or anything of equal value, for the set or any of its parts. James J. Quinn, Jr., corner Stenton and Atlantic aves., Atlantic City, N. J.

WILL EXCHANGE HIGH GRADE RECEIVING set for complete G. E. ¼-kw. transmitting; value, $50; Murdock loose coupler, Marconi potentiometer, two perikon, combination silicon and galena detector, 21-plate variable; also fixed condensers by means of fan switch, loading coil, 3-in. diameter, 18 in. long; 16-stud variation; all wiring concealed; mahogany cabinet; photograph for stamp. A. J. Sceley, 241 N. Wilton st., West Philadelphia, Pa.

A D'ARSONVAL GALVANOMETER, COST $8; home-made loose coupled tuner, size 17x7x6; 9 wet batteries; battery motors for rotaries; Mesco portable receiving outfit, excluding detector; 30 feet of Pirelli wire; large amount of copper and aluminum wire; galena; spark coil vibrator (French); to exchange, part or all, for a 110-volt A. C. power motor; sending transformer; small gas or gasoline engine, or a set of telephones. Albert Massimo, Bellcourt, Bayside, L. I.

WILL EXCHANGE ONE K. & D. GENERATOR for one Ferron or other good detector; generates 6 volts, 6 amperes at 2200 r.p.m; it may be used as motor also; cost $8. Geo. B. Storer, Jr., 2249 Glenwood ave., Toledo, Ohio.

WILL EXCHANGE KODAK, 4x5; CAMERA with stand, developing and printing apparatus, worth $8; for a ½-kw. transformer coil with vibrator or a loose coupler, or a good make detector or other wireless instruments of equal value. George R. Conover, Riverview Hotel, Box 285 Bordentown, N. J.

AN ELECTRIC POST CARD PROJECTOR, projects pictures 6 feet in diameter; has 2 lights; in first-class condition; in exchange for a pair of 2000-ohm amateur phones; must be in good condition. C. G. Weir, Springfield, N. Y.

WILL EXCHANGE 3 DESK TELEPHONES, worth $7 each; Splitdorf spark coil, magneto, aerial switch, ammeter, headband, sounder, spark gap, Tesla coil, laboratory supplies, switchboard, lamps and brackets, coils, etc., value $40; or separately, for Eastman kodak, typewriter, encyclopedia or rifle. W. Mueller, 1312 Benton St., St. Louis, Mo.

WILL EXCHANGE 4-OHM GIANT TELEgraph sounder with key, value $4, for a 1-inch spark coil. Wm. Merritt, Wardner, Idaho.

A 3-INCH SPARK COIL IN EXCHANGE FOR a loose coupler or aerial switch; also have ½-kw. transformer and 3 lbs. of No. 32 wire, which I will trade for wireless goods. W. G. Harsy, 519 Andover St., San Francisco. Cal.

WANT A GOOD SPARK COIL, 3 OR 4 INCH spark, or storage battery, 6 volt, 40-60 amp., for a first-class perikon detector stand, marble base, nicely finished; a first-class detector, similar to the Feron, but with movable mineral cup, 4 bare wire-wound tuning coils, single, double and 3 slides; all O. K., and of correct dimensions; would like to trade A1 galena for good quality perikon. Willard Hurley, R. F. D. No. 4, Box No. 34A, Hillsboro. Ore.

WILL EXCHANGE A GOOD COMPLETE WIRELess outfit for a motor cycle. Steve Miller, P. O. Box 371, Calument, Mich.

WILL EXCHANGE 1 STEVENS CRACK SHOT rifle, in good condition; shoots 22 short and long; for anything of equal value. Eugene Henderson, P. O. Box 102, Jackson, Ga.

PERFECTION PRINTING PRESS WITH TYPE, cost $9; 2-inch Americoil, cost $9; Murdock tuner, cost $4; shocking coil, cost $1.25; 2 spools No. 36 enameled wire, 50c.; wireless books; all in good condition; want camera, variable condenser, dynamo, audion. Brandes superior phones, water motor, torch. James Bean, Jr., 1775 Alameda Ave., San Jose, Cal.

FOR EXCHANGE—A SMALL GAS ENGINE, aluminum crank case, in fine shape; weighs only 20 pounds; also a fine magnet magneto. Write me if you have anything in the wireless line, John Straub, Fayetteville, N. Y.

FOR EXCHANE—ONE ROBBINS & MEYERS 110-v., 60-cycle, 1-10 h.p. motor, in good condition, with 3-groove pulley for step-up transformer. step-down transformer, 6-v., 100-ampere-hour battery, good make, or an electric horn, to operate on 6-v., good condition. Glenn Thomas, 170 Cedar St., Corning, N. Y.

DESIRE TO EXCHANGE A MURDOCK $3 rotary variable condenser for a 9-light decorative outfit, 8-14 volt colored lights connected on 12-foot cord with sockets, attachment plug and extra light; cost $3.50; or will take anything electrical. Howard S. Pyle, 3311 37th Ave. So., Seattle, Wash.

WILL EXCHANGE THE FOLLOWING MAGAzines for wireless instruments: Modern Electrics, 4 copies, 1912, 1913; Shop Notes Quarterly, 2 copies, 1910, 1911; best offer takes them. D. K. Cooper, 18 Audubon St., Rochester, N. Y.

FOR EXCHANGE — HELIX, MAHOGANY mounted, with pilot lamp, loose coupler, potentiometer, electrolytic detector, sending condenser, 6 tubes, electric bell, D. P. D. T. switch; all brand-new; cost $16; will exchange for a good 6-volt, 100-ampere storage battery or 3-inch coil. Write W. W. Avera, Box No. 6, Watkinsville, Ga.

HAVE A 1000-SHOT AIR RIFLE, IN GOOD condition; very powerful; and a target of daisy make and about 75 target cards; the target has a gong that rings when bull's eye is hit; can be used in the house or elsewhere; will exchange for a condenser. Write for full particulars. Otto Farrill, 200 West 37th St., New York City.

WILL EXCHANGE AN ELECTRIC SOLDERing iron, 500-ohm receiver, 3-bar telephone magneto, a ½ and ¾ in. spark coil, 1 lb. of No. 36 silk wire and 3 lbs. of No. 16 D. C. C. wire, 1 Little Hustler motor and a Porter motor, K. & D. No. 1 primary and secondary of a loose coupler; I desire a rotary variable condenser, audion or ferron detector. John Stadler, 210 Plymouth St., Toledo, Ohio.

WANTED—A ½-KW. CLOSED CORE TRANSformer for the following: ½-kw. transformer coil, equipped with a vibrator, electrolytic interrupter, Emmerson's ⅛-h.p. motor for 220 D. C., new runs at 3000 r.p.m. 1-6 h.p., 220 D. C. motor, which needs new field winding, large home-made loose coupler, which has received 1000 miles, 2 detectors, a 10-volt, 5 cells, storage battery and a rheostat for 110 volts. L. Falconi, 617 Crawford St., Portsmouth, Va.

HAVE A 1-IN. SPARK COIL AND 2-IN. SPARK coil; also electrolytic interrupter; will exchange 1-in. coil for 2000 or over ohm phones. Brandes or Holtzer Cabot preferred; also 2-in. coil for a good hot-wire ammeter or regular ammeter for 110 volts; will also trade interrupter for anything I can use in wireless goods; will trade any two of them for a good ⅛ or ¼ h.p. motor; both coils and interrupter are brand-new. Oliver Wilhelm, 1616 E. 82d St., N. E., Cleveland, Ohio.

WILL EXCHANGE LOOSE COUPLER, PRACtically new; has been used on distances of 1000 miles and up; No. 20 primary, No. 28 D. C. C. secondary, for folding kodak and tripod. C. Coleman Berwick, 1935 Hearst Ave., Berkeley, Cal.

CROCKER-WHEELER 110-VOLT, D. C. MOTOR generator, ⅛ h.p., good condition; will exchange for wireless instruments. D. H. Volland, 2918 Sherman Ave., N. W., Washington, D. C.

DESIRE A 2-KW. TRANSMITTING SET, COMplete, standard make, rotary or quenched gap, in exchange for 1-kw. Clapp Eastham Type E set, complete; 1-kw. Worts-McKisson transformer liquid condenser; 2-h.p. Detroit electric light gasoline engine; detectors, motors, dynamos, induction coils, condensers, and receiving transformers. H. Y. Baines, P. O. Box 500, Port Hill, Idaho.

WILL EXCHANGE A SET OF A. S. OF COR. Modern Engineering Practice, of 12 vols.; also A. S. of Cor. Books on Motion Pictures, of 2 vols.; exchange for high-grade instruments. Geo. Junkin, W. A. B. Co., Dept. E, Wilmerding, Pa.

I HAVE A 2000 OHM SET OF RECEIVERS OF Western Electric make; will exchange them for a good loose-coupler or a hot-wire ammeter; also have 500-ohm potentiometer, wound with Gergan silver wire; I will exchange this for something of equal value. Stanley Strauss, 5225 Lexington Ave., Chicago, Ill.

WILL EXCHANGE ⅛ - H.P. BRAND - NEW water motor for a 6.60 or 6.40 storage battery. M. F. Binis, 177 Lovejoy St., Buffalo, N. Y.

HAVE A MURDOCK DOUBLE-SLIDE TUNER, cost $4; also ¼-in. coil, cost $2.20; both in fine condition; would like a Mesco 10-volt Pony dynamo and water motor to run same, in good condition. Edgar Darlington, 25 So. 45th St., Philadelphia, Pa.

TELEGRAPH KEY AND SOUNDER WANTED IN exchange for two 75-ohm wireless receivers. Edward French, Peekskill, N. Y.

WANTED—1600-OHM BRIDGING TELEPHONE, parts unmounted; have 4-in. Geissler tube, 1000-metre loading coil, bell, buzzer, 150-ohm Standard relay, 1-in. spark coil, detector, 32 cal. revolver, potentiometer, camera, film 3¼x2¼, etc. John Burleigh, New Stanton, Pa.

50 GOOD READING BOOKS AND CAMERA for the equal value in wireless sending and receiving sets; value of books is $15; will exchange all for $14, with a good camera. Geo. Tranwell, 308 E. Sixth St., Seventh Ward, Rome, Ga.

WILL EXCHANGE FOR BLITZEN VARIABLE condenser, in good condition and original capacity, high frequency buzzer, oscillation transformer, pancake type, 4-plate sending condenser, and 10-in. Geissler tube, with liquid. William B. Snow, 11 Devon rd., Newton Centre, Mass.

WILL EXCHANGE A PAIR OF HOLTZER-CAbot 2000-ohm phones, 1 Murdock rot. var. condenser, or Chambers 3-in. coil and 1 Murdock rot. var. condenser for a Blitzen rotary tuner or large size Murdock loose coupler; all my instruments are in first-class condition. H. L. Blee, 326 E. Main St., Fort Wayne, Ind.

EXCELLENT LOOSE-COUPLER, FINISHED IN dull dark oak; No. 20 on primary and 30 on secondary; will trade for either a Blitzen variable or a pair of Brandes 2000-ohm phones in good condition. Paul E. Diederich, 915 E. Grand Blvd., Detroit, Mich.

WHAT DO YOU WANT IN EXCHANGE FOR marble switchboard, about 2 feet wide by 4 or 5 feet long? H. N. Swain, 495 Franklin St., Hamilton, Ohio.

ONE DOZEN PIECES SELENIUM, EACH enough for 2 cells; quantity selected long distance silicon points, for like value; also experimental ¼-h.p. motor, copies of Modern Electrics and many other items to clean up; mention what you have and enclose stamp for reply. Philip E. Edelman, 2438 Lyndale Ave., S., Minneapolis, Minn.

WILL EXCHANGE THE FOLLOWING FOR Worts-McKisson ½-kw. set: 2 telephones, $22; 1-in. coil, spark gap, helix, double and single slide tuners, loading coil, potentiometer, 3 detectors, variable and fixed condensers, 1000 and 500 ohm receivers, traction car, medical coil, secondary ¾-in. coil, Conley 4x5 camera and outfit, post card projector, and nameless other things. Carl Kudell, Slane and Elsmere Aves., Norwood, Ohio.

WHAT WILL YOU EXCHANGE FOR 6x9 EXcelsior printing press, 16 type case, type, cards, paper, 1,000 post cards, complete lettering course, complete shorthand course, 4 cloth-bound books on wiring, motor, etc. John Thomas, Box 86, French Lick, Ind.

COMBINATION BILLIARD AND POOL TABLE, complete, good condition, size 3x6, with 3 ivory billiard balls and 15 pool balls, 6 cues; 1-kw. closed core transformer; want induction motor, typewriter, gas engine, saxophone or metal turning lathe. W. M. Hineline, 612 Maple Leaf Pl., Seattle, Wash.

FOR EXCHANGE—A 3-BAR DOUBLE THROW switch, with slate base; has 14 posts; also have 2 magnetos, 2 new battery ammeters; would like a good detector or other wireless instruments. Write me, Ralph Marbury, 9 Greenville St., Newnan, Ga.

HAVE FINE FOOT-POWER SCROLL SAW, tuner and Expo watch camera, for wireless goods; would like storage cells. S. Anderson, Jr., 150 Manhattan Ave., New York City.

HAVE 46 COPIES OF MAGAZINES, COSTING $5, to exchange for 1-in. spark coil, in good condition. Russell Wade, P. O. Box No. 8, La Grange, Ky.

WILL EXCHANGE A ½-IN. SPARK GAP FOR a pair of 1000-ohm phones or 1000-ohm phone and mineral detector. Charles Benesch, 8405 13th Ave., Brooklyn, N. Y.

TO EXCHANGE—FINE RELAY, WITH 5 POLished brass binding posts and a large stromberg-Carlson transmitter; I would like a rotary variable condenser for same; relay alone worth $4 and transmitter worth $1.50. Arthur Funk, 226 W. Liberty St., Savannah, Ga.

WILL EXCHANGE DETECTOR, RHEOSTAT-regulator, double slide tuning coil, Junior fixed condenser, large fixed condenser, 75-ohm receiver, double headband, and 20-ohm sounder and key; need omnigraph, No. 2 Eastman camera, pocket volt-ammeter, relay, telephone transmitter, etc. Send description of articles to William J. Baker, R. R. No. 1, Clayton, Ohio.

WILL EXCHANGE FOR EQUAL VALUE 1 K. & D. motor No. 5 and 1 20-ohm telegraph instrument with crowfoot battery, cost $4; both in good condition and practically new; would like a set of Brandes Transatlantic phones or other wireless instruments. R. Earl Dawes, Bozeman, Mont.

ONE SMALL MOVING PICTURE MACHINE, with 1 100-foot piece of film; also 6 slides and 3 continuous band films; 1 Stevens Crack Shot rifle; also 1 Knapp dynamo motor; Type S; prefer carbide moving picture machine; must be in good shape. Eugene Henderson, P. O. Box 102, Jackson, Ga.

A LARGE 4-6 VOLT, 1-16 H.P. BATTERY MOtor; it is shunt wound, has 12 section commutator and 2 field wound in good insolation; in A1 condition; will exchange for a rotary variable condenser or a ferron detector. Edw. G. Wagner, 458 Layton Blvd., Milwaukee, Wis.

WILL EXCHANGE WITH EACH IOWA AMAteur a typewritten copy of Iowa amateur calls and capacities, for your call and capacity. Enclose stamped envelope for return, Vere M. Moen, 216 Cedar St., Boone, Iowa.

VOLT-AMMETER, 75-OHM PHONE, GEISSLER tube, cut-out, spring binding posts, 2½-in. bell, 2 phone induction coils, 110-v. D. C. fan motor, 1-6 h.p. motor castings, machined; want motor cycle engine or typewriter, in good running condition. Albert G. Weinsz, 327 West 4th St., Canal Dover, Ohio.

WILL EXCHANGE AN EDISON 300 AMPEREhour battery and 3 4-in. gong electric bells for Knapp Type S or Type D dynamo; battery and bells are same as new. Dee A. Yount, 156 W. Main St., Westminster, Md.

WILL EXCHANGE 1 REFLEX-SCOPE, VALUED at $3; contains 2 powerful electric lamps and 1 electric ruby lantern for photographic work, valued at $2; for 1 Type J voltamp Marvel dynamo motor; must be in good condition; will exchange 1 bicycle lamp and pair mud guards, valued at $3, for 1 battery medical coil, giving 3 different currents. Jordan, 1523 N. Main, Scranton, Pa.

"Gee! I'm Glad I Have On B. V. D."

THAT's what the cool, comfortable, *coated* man is thinking, while the cross, comfortless, *coatless* ones are eying him enviously. Don't *you* be caught without B. V. D. when warm days "put you on the griddle." B. V. D. weather is *here*—B. V. D. is sold *everywhere*.

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