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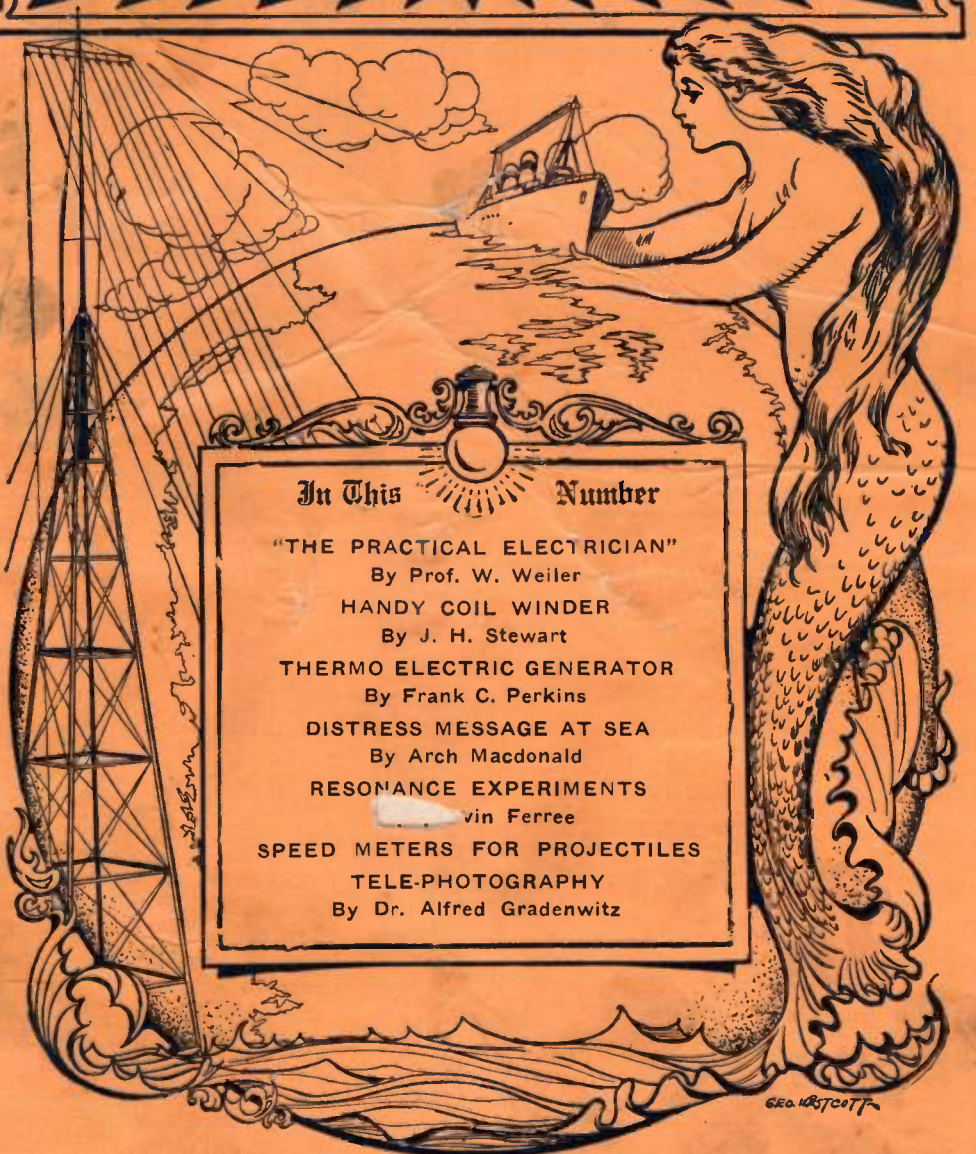
MODERN ELECTRICS



In This Number

THE SPIRIT OF WIRELESS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Wireless Association of America

THE Wireless Association of America has been founded with the sole object of furthering the interests of wireless telegraphy and telephony in America.

We are now on the threshold of the wireless era, and just beginning to rub our intellectual eyes, as it were. Sometimes we look over the wall of our barred knowledge in amazement, wondering what lays beyond the wall, as yet covered with a dense haze.

However, young America, up to the occasion, is wide awake as usual.

Foreign wireless experts, invariably exclaim in wonder when viewing the photographs appearing in each month in the "Wireless Contest" of MODERN ELECTRICS. They cannot grasp the idea that boys 14 years old actually operate wireless stations successfully everyday in the year under all conditions but they are all of the undivided opinion that Young America leads the rest of the world wirelessly.

So far America has led in the race. The next thing is to stay in the front, and let others follow. In fact he would be a bold prophet who would even dare hint at the wonders to come during the next decade. The boy experimenting in an attic to-day may be an authority to-morrow.

As stated before the Wireless Association's sole aim is to further the interests of experimental wireless telegraphy and telephony in this country.

Headed by America's foremost wireless men, it is not a money-making institution. There are no membership fees, and no contributions required to become a member.

There are two conditions only. Each member of the Association must be an American citizen and MUST OWN A WIRELESS STATION, either for sending or for receiving or both.

The Association furnishes a membership button as per our illustration. This button is sold at actual cost. Price 20 cents (no stamps nor checks).

This button is made of bronze, triple silver-plated. The flashes from the wireless pole are laid in hard red enamel, which makes the button quite distinctive. The button furthermore has the usual screw back making it easy to fasten to buttonhole. The lettering itself is laid in black hard enamel. Size exactly as cut.

On account of the heavy plating it will last for years and is guaranteed not to wear "brassy." Beautiful solid gold button, $2.00.

Its diameter is 3-4 inch. This is a trifle larger than usual, the purpose being to show the button off so that it can be readily seen from a distance. The reason is obvious. Suppose you are a wireless experimenter and you live in a fairly large town. If you see a stranger with the Association button, you, of course, would not be backward talking to the wearer and in this manner become acquainted with those having a common object in mind, which is the successful development of "wireless."

The Association furthermore wishes to be of assistance to experimenters and inventors of wireless appliances and apparatus, if the owners are not capable to market or work out their inventions. Such information and advice will be given free. Somebody suggested that Wireless Clubs should be formed in various towns, and while this idea is of course feasible in the larger towns, it is fallacious in smaller towns where at best only two or three wireless experimenters can be found.

Most experimenters would rather spend their money in maintaining and enlarging their wireless stations, instead of contributing fees to maintain clubs or meeting rooms, etc., etc.

The Board of Directors of this Association earnestly request every wireless experimenter and owner of a station to apply for membership in the Association by submitting his name, address, location, instruments used, etc., etc., to the business manager. There is no charge or fee whatever connected with this.

Each member will be recorded and all members will be classified by town and State.

Members are at liberty to inquire from the Association if other wireless experimenters within their locality have registered. Such information will be furnished free if stamped return envelope is forwarded with inquiry.

SEND TO-DAY FOR FREE APPLICATION CARD

SPECIAL.—As seen above, the Association Button is sold for 20 cts. usually. Up to April 15th we will accept 15 cts., coin or stamps, for this beautiful button. This is a special offer, and will positively not be made again.

The Association Numbered March 1, 1911 **11,256** The Greatest Wireless Association in the World.

ADDRESS ALL COMMUNICATIONS TO

WIRELESS ASSOCIATION of AMERICA

233 FULTON STREET

NEW YORK

Modern Electrics

VOL. III. MARCH, 1911. No. 12.

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)

Translation by H. GERNSBACK

CHAPTER I.—Continued.

9. CONNECTIONS.

IF there are several batteries, all of the same kind, one connects them usually in such a manner with a copper wire, that the copper or carbon, positive pole (+) is connected with the

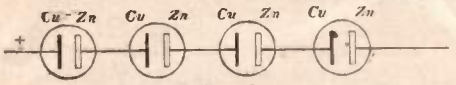


Fig. 8

zinc, negative pole (—) of the next battery, and so on. This is called **series connection**, or connection for tension. fig. 8.

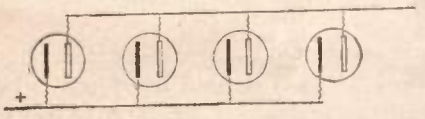


Fig. 9

If one connects all the negative poles together and all the positive poles together, fig. 9, we have the **parallel connection**, or connection for quantity.

10. ELECTROLYSIS: RITTER[1], 1800; CARLISLE[2], and NICHOLSON[3], 1801; H. DAVY, 1802.

With three good batteries, connected in series, we can decompose water into its two chemical elements.

Take two glass tubes of about ½ inch diameter and 6-8 inch length, and close one end of both with rubber corks, fig. 10. Through these corks wires are passed, to which are connected thin pieces of lead strip. Now fill the two tubes with acidulated water (water 20 parts, sulphuric acid 1 part), and place them in a small battery jar containing the same acid mixture. If we connect now the two wires of the tubes with our battery, we will immediately see numerous gas bubbles, which rise from the lead strips. The generation of the gases is always in a certain proportion, namely, for each one part of oxygen (O) there are invariably two parts of hydrogen (H). The chemical symbol of water therefore is termed H_2O.

The mixture of the two gases is highly explosive when brought in contact with a naked flame. During the explosion the two gases re-unite to water. It is to be noted that the positive current flows through the solution to the strip on which the hydrogen is generated; or, in other words, the current flows through the solution to the hydrogen, but in the outside circuit from the copper or carbon to the zinc.

Fig. 10

ANALOGY.

Imagine a pond which is situated high enough and contains enough water so that the outflowing water will be able to operate a mill-wheel for one hour. If the pond has a capacity of ten times as much water, the water of

1 Ritter, John William, 1776-1810, physicist.
2 Carlisle, 1763-1840, physician of London.
3 Nicholson, 1753-1815, civil engineer of London.

the pond will then be able to operate ten mill-wheels placed side by side for one hour. This compares with the parallel connection of a battery.

But if we take the original pond and elevate it to ten times its former height, we can place ten mill-wheels one below the other, and the water will run the ten wheels in the same fashion, for one hour. This is the series connection.

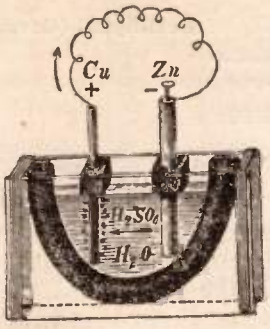


Fig. 11

11. CHEMICAL REACTIONS IN A BATTERY.

(A) Experiment.

Construct a cell as shown in fig. 11. It is made by taking two glass plates between which a piece of soft rubber tubing is held as shown. The plates are pressed tightly against the tubing by means of stout twine wound around the four edges of the plates. The vessel is now filled with acidulated water. If we introduce a clean copper rod or an amalgamated zinc rod into the solution no chemical action is observed.

If we now connect the zinc and copper rods by means of a copper wire as shown, we immediately notice a great many gas bubbles on the copper rod; they contain hydrogen. If we disconnect the rods the gas generation ceases, but recommences at once, even if we connect the rods, inside of the solution.

These phenomena also take place if one uses, instead of the copper, platinum or carbon.

(B) Explanations.

All acids are mainly composed of two parts: one a powerful electro-negative constituent, which may be a simple body, such as chlorine, iodine, bromine, or a composite body, such as NH_3=ammonium, etc., and the other a powerful electro-positive body, such as hydrogen or oxygen.

The constitution of acids is represented as follows: HCl=muriatic acid; H_2SO_4=sulphuric acid; HNO_3=nitric acid, etc.

If zinc acts on an acid, it has the tendency to displace the hydrogen out of the solution, and to take on the electro-negative part of it; the acid thereby loses its power and becomes neutralized.

One atom of zinc is able to replace two atoms of hydrogen, so that it can replace the latter into two equivalents of such acids, which in the molecule contain only one atom of hydrogen.

In all batteries which generate electricity by means of acids, the following processes take place:

$$2\ HCl+Zn=ZnCl_2+H_2;$$

$$H_2SO_4+Zn=ZnSO_4+H_2;$$

or generally, if we term the electro-negative part X:

$$H_2X+Zn=ZnX+H_2$$

We learn from this that no battery can generate electricity without decomposing zinc. On the contrary, the quicker the zinc is consumed in a useful manner, the greater the electrical effects will be. If, however, zinc is consumed when the battery performs no work, this means simply so much waste.

For this reason, ordinary zinc should never be used in acid batteries. Chemically pure zinc, to be sure, is not consumed in a battery during open circuit, but it is too costly to be used to any extent. However, when zinc is amalgamated, it has almost the same properties as chemically pure zinc, and should therefore be used by all means in any battery containing acids.

Sulphuric acid (concentrated) may be cleansed conveniently of all impurities, by mixing 1,000 parts of the acid with 4-5 parts of linseed oil and stirring the contents well, but with care. Arsenic, lead, etc., which attack the zinc and which are usually found in commercial sulphuric acid, are entirely removed by this treatment.

12. CHEMICAL REACTIONS IN A BATTERY AND ELECTRIC CURRENT.

(A) Experiments.

If we place a thermometer between the electrodes of a battery, fig. 12, it

will register a certain amount of heat if we short-circuit the battery.

If we connect one pole of the battery with the top knob of the electroscope, fig. 13, and if we ground the other pole of the battery, the gold leaf of the electroscope will change its normal position, indicating the presence of current.

Referring again to fig. 12, if we connect the poles of the battery with the galvanometer or voltmeter, G, the needle will show a certain deviation, but the thermometer will not register any appreciable amount of heat.

(B) Conclusions.

As long as there is no current outside of the battery, the chemical activity or energy is transformed into heat, or thermal energy; if a current is flowing, however, there is, in addition, a certain amount of electrical energy. The latter, in the inside of the battery, flows to the positive (element)

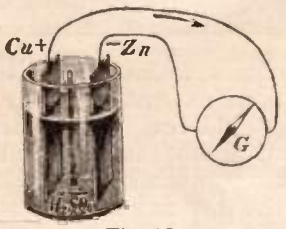


Fig. 12

metal, which is not attacked by the acid from the other negative (element) metal, which is decomposed.

The force which excites a current in a battery and drives this current through the outer circuit, is termed **electro-motive force** (EMF), or tension, or potential difference. It has the symbol **E**; the practical unit is called the volt. The EMF is the cause of the tension; potential difference is the difference of the tension between two different points of a conductor traversed by a current. These terms, also the term **current** itself, can be understood and studied best by comparing with water flowing in pipes.

(C) Analogies.

1. Water driven into a tank which is located higher than the pump will always tend to return to its former level on account of gravity, and according to the law of communicating tubes (water pipes). This tendency of the water, or water moving power, is the greater the higher the water has been driven up, and represents the term electro-motive force. A fountain necessitates a high water power. If one compares the different heights of different water tanks, it is evident that

Fig. 13

one must take the height of one surface as zero, from which the positions of the others may be measured. It is the same with heat, where one has appointed a zero point, (centigrade thermometer), namely, the temperature at which ice melts.

For electricity we have as the zero-point (potential zero) **the earth, the** same as we begin measuring water surfaces from the surface of the ocean.

2. We can furthermore compare any electric generator with an airpump, which presses air into all points of a closed vessel. A gas compressed with a great pressure has an extraordinary tension, a very high potential. From a small container, such a gas will escape with a loud hissing noise all at once; this is well compared with the ordinary discharge of a **Leyden** jar—a single loud report, that is all.

If, however, the compressed air escapes slowly through a very fine nozzle of a large container, under small pressure, there will be hardly any noise. In this way, however, the escaping air may do useful work, such as driving a fan, etc. Such work may be done with a steady flowing electrical current, which has a moderate tension (pressure), and shows itself as light, heat, mechanical movement, chemical work, etc, whichever the case may be.

If, on the other hand, we pump the air out of a container, creating a partial vacuum in it, there will be, nevertheless, a great amount of power in it, because as soon as the air is allowed to flow back into the container, the air can be made to perform work. With air, however, such an under-pressure cannot be carried to a figure very much below the ordinary air pressure. The electrical energy composed of over-pressure is termed a positive charge, the one for under-pressure a negative charge.

3. When water flows through a pipe, we must take into consideration several things; first, the height of the fall; second, the quantity of water which during a given unit of time flows through a given section of the pipe; third, the retardation or resistance which the water meets in flowing against the walls of the pipe.

In the same fashion the electric current finds a resistance not only in the connecting wire, but also inside of the battery itself. The force of a current therefore will be the greater, the higher the EMF (E) and the smaller its resistance.

These three values are expressed in Ohm's[1] law in the formula $C=\frac{E}{R}$ i. e. the current (amperage) grows with the EMF (voltage), and decreases with the resistance.

(D) Nernst Theory.

When two solutions are separated by a porous diaphragm, both will either pass through the diaphragm, although in uneven quantities, or the transit (Osmose) is one-sided only.

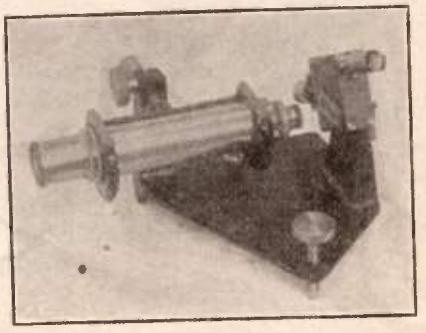
In a Daniell battery, according to Nernst, the zinc atoms have positive charges, and perform an over-pressure; (the diluted sulphate of zinc solution is more effective than the concentrated one, because it passes more quickly through the porous wall); the loose copper atoms separate themselves easily as copper on the copper electrode, and thereby transplant their charges to the latter. When the current flows the zinc sends continuously positively charged atoms (Ions[1]) into the solution, and simultaneously at the copper electrode just as many copper atoms go from the solution. These charges which the atoms lose continuously flow constantly through the connecting wire and thence back to the zinc.

1 Ohm. Simon, 1787-1854, physicist.

1 Ion, from the Greek, to go, to travel.

THE TILTED GOLD LEAF ELECTROMETER.

THE tilted electrometer recently brought out by the Cambridge Scientific Instrument Company was introduced by Mr. C. T. Wilson in 1903. It has a small capacity, and owes its high



sensitiveness to its ability to control the conditions under which a freely hanging gold leaf is attracted out of the vertical by an inclined charged plate in its proximity. It is possible to adjust the instrument so as to work as near as is desired to the region where the conditions give best results for any given kind of test.

The leaf is contained in a metal case and is observed by a microscope, the plate being maintained at a steady potential. The improved pattern of electrometer has been designed with the co-operation of Mr. C. T. Wilson and Dr. G. W. Kaye, and offers a number of convenient points for working. By its means the electrification due to the "splashing" of mercury was demonstrated at the recent Physical Society's Exhibition held in London.

PLATINUM $43 AN OUNCE.

Platinum, which is far more costly than gold, has been advancing rapidly in price in the last few weeks. On March 10th it was quoted in Maiden Lane at $43 an ounce for hard platinum and $41 an ounce for the soft metal. These are the highest prices ever reached, and indicate an advance of about $10 an ounce in the last six months.

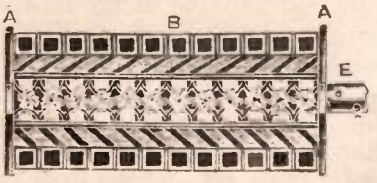
An English Thermo-Electric Generator

By Frank C. Perkins.

FOR more than a quarter of a century it has been known that electricity could be generated by the heating of certain metals in contact with each other, forming the thermo-electric couple or thermo-pile. Various forms of thermo-electric generators have been devised for supplying electricity from the heat of gas, but as the amount of current is small, they have not been extensively utilized.

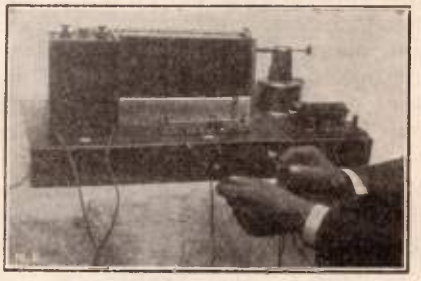
The accompanying illustration shows an English thermo-generator of Davidson type designed and constructed in London, which is said to be a most practical form, by means of which an electric current is generated from the heat supplied by a gas burner, or by means of a vaporized gas generated by a lamp burning methylated alcohol.

As indicated in the accompanying illustration, this thermo-generator con-



sists of two metal plates, the lower parts of which form legs fixed to a base board, with two rows of hollow copper tubes placed vertically between them. These hollow copper tubes are connected at the top, each with a neighboring element, forming a series of electric couples. These are heated by a gas burner or a lamp burning methylated spirit; in the latter case a handle being connected to a round tube which runs directly through the apparatus between the copper tubes, the round tube being perforated at intervals throughout its entire length. The ends of the series of elements of this thermo-generator are connected to terminals supplying the current to a storage battery of two to four volts, for charging the same or for illuminating small surgical lamps operating faradic coils, etc.

It is stated that a steady electric current is provided by this thermo-generator for light cautery work, or for an ophthalmoscopic lamp. When a lamp using methylated spirit is utilized for supplying the heat, a gas is given off which travels through the perforated tubes, and a light is applied to each of these perforations. It is said that within a minute electricity is generated, which may be used for lighting surgical electric lamps or recharging small accumulators. When ordinary illumi-



nating gas or natural gas supplies the heat, it is only necessary to attach one end of a rubber tube to the apparatus and the other to a gas jet, turning on the fuel, and lighting up the gas at the perforations of the tube, when electric current is at once generated, the apparatus operating for hours continuously, doing away with dry batteries entirely for the light service for which it is intended.

A 20 ampere-hour accumulator of two volts is connected to the thermo-generator for cautery service, a two-way switch being provided. It is held that after the gas has been turned on full, or the spirit lamp light for three or four minutes, the flame should be lowered to one-half the normal height, as only sufficient heat should be employed to supply enough current to eliminate the lamp. It is stated that too much heat continually employed will melt the metal connections, while no more electric current will be generated than with less heat. It is held that after awhile an oxide deposit will form between the rows of terminals above the flame and this should be removed while hot, when the gas is still burning. These thermo-generators

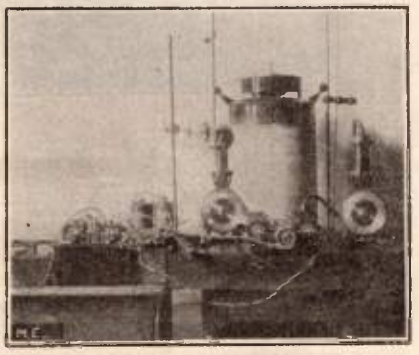
(Continued on Page 711)

Bela Gati Experiments.

By A. C. Marlowe.

(Paris Correspondent "Modern Electrics.")

A NUMBER of interesting experiments upon telephones are being made at Budapest by M. Bela Gati, who is one of the leading engineers connected with the Austrian telephone department. He wished to find out which was the best kind of microphone to use in long-distance work, and for this purpose he experimented with apparatus which produced simple sounds having high or low pitch, and then measured the current which the microphones gave in the various cases. Our present photograph illustrates some of his apparatus, using a sound



producer resembling a siren, of the Stern type, and placed before the microphone, this latter being mounted with a battery and a transformer primary. To the transformer secondary is an instrument for measuring the pulsatory currents which the microphone gives. The air tank seen in the rear is used with the sirens. Instead of using an electrostatic instrument for measuring, he finds that the barretter is much the best. The results of his tests show that we should seek to use a telephone transmitter carrying a high current, thus confirming the method already used by Egner and Holmstrom in Sweden for long-distance work. M. Bela Gati finds that the central battery type of microphone is to be preferred to many others for use on long distances.

Following this work he carried out long-distance transmission on a 1,575-mile loop of telephone line passing around the country between Budapest, Fiume and other towns, and return. As about 18 miles of this is in underground cable, he figures out that compared with the Swedish engineers' test at Stockholm on 1,978 miles, he covers a distance which in practice equals 2,400 miles, and thus claims to have made the record, at least for Europe. He hopes to be able to telephone clear across the continent before long.

WIRELESS FOR MOVING TRAINS.

Wireless telephoning from a moving train is expected to be in successful operation in less than a year, according to Dr. Frederick H. Millener.

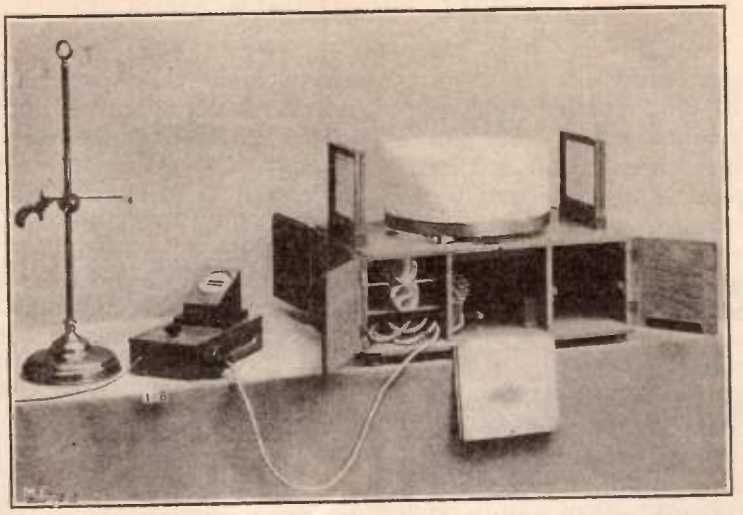
Dr. Millener told of his experiments before several hundred members of the New York Railroad Club at the Engineering Building, 29 West 39th street.

Dr. Millener has been in the employ of the Union Pacific as an electrical expert for five years, and has been at work at Omaha to devise a method of signalling moving trains without physical connections with them. The solution to his problem he found in the wireless telephone.

"Two wireless stations will be established soon," said Dr. Millener, "one at Sidney, Neb., and the other at Cheyenne, Wyo., one hundred and three miles apart, on a single track line. We expect to keep up communication with moving trains between these stations and others that will be established. Wires will be stretched on top of the cars.

"The wireless telephone which we have devised and have been using in Omaha is sufficiently powerful for messages to be received from a considerable distance, simply by attaching the receiving apparatus to an ordinary umbrella held over the operator's head. The ordinary telephone head set is used by the person receiving"

Berlin Letter.



Speed-Meters for Projectiles.

A REMARKABLE apparatus recently designed by Messrs. Hartmann & Braun of Frankfort-on-Main allows the speed of a projectile to be determined simply by its displacement on a rotating cylindrical drum, the speed of which is ascertained by means of a frequency-meter.

It will be readily understood that a projectile traversing the axis of this drum will pierce it at two points, situated at the ends of a diameter, as long as the drum is at rest. However, by setting the drum rotating, the point where the projectile leaves it is displaced by an angle corresponding to the time taken in traversing the diameter of the drum. The displacement of the projectile holes as against the ends of a diameter obviously is the larger as the diameter and speed of rotation of the drum are more considerable. Since these two factors are known, the displacement of the holes immediately gives the speed of the projectile.

The apparatus comprises, in addition to the rotating drum, two screens fixed at equal distances in front and at the back respectively of the drum, for adjusting the position of the trajectory relatively to the axle of the rotating drum, and for making due allowance for any small deviation in calculating the speed.

The direct-current motor driving the drum comprises a current interrupter in the form of a switch breaking a secondary circuit at a frequency corresponding to the number of turns of the drum, as determined by a frequency-meter which allows the speed of the drum to be adjusted to any given figure, say, 2,000 r.p.m.

The whole outfit can be transported in a very handy box of small dimensions.

Sign-Boards for Electrical Fire Alarms.

In connection with the luminous fire

indicator boards designed by Messrs. Mix & Genest of Berlin, the various figures are made up of individual sections similar to those of the familiar electrical sign-boards. The lamps are located in subdivided sheet metal drums arranged behind a transparent glass pane. In addition to numerals there can be produced different kinds of ornamental figures, such as circles, crosses, stars, and the like.

These luminous indicators can be actuated either by a hand indicator, comprising a system of three rotary

(Continued on Page 693)

Cathode Ray Tele-Photography

By Dr. Alfred Gradenwitz (Berlin)

The greatest drawback in connection with tele-photography is the inertia of the selenium cell or other photo-electric element used in the transmission of luminous impressions. Cathode rays, owing to the instantaneousness of their electro-magnetic deflection, allow a tele-photographic receiver free from any inertia to be constructed.

The following scheme has been recently suggested by two German inventors, Messrs. Dieckmann and Glage*: A bundle of cathode rays is limited by a diaphragm pierced with a fine hole, through which only a thin pencil of rays is allowed to pass. The style of the transmitter throws into four electro-magnets, two current components acting on the beam of light so as to cause it to perform the same movements as the style, simultaneously with the latter. The beam of light thus sets up, in some convenient substance, such as chalk, a fluorescence producing in the observer's eye the impression of a continual light line which comprises the various positions of the luminous point. A few seconds are thus sufficient to reproduce in the receiver any signals or handwritten words. In connection with the transmitter the motion of the style is decomposed into two components converted into current intensities, which expedient has long been used in telautography.

The following modification of the same process is more convenient for practical purposes: A small dynamo connected to a voltage regulator produces currents exciting the electro-magnets so as to cause the beam of light continually to perform a vertical alternate motion, each individual movement entailing a small lateral displacement. This is how the luminous point, in about .1 second, lights a square of 3 cms by 3 cms. As each luminous impression lasts beyond the actual duration of the impulse, the eye sees a luminous square made up of individual instantaneous impulses.

The transmitter likewise comprises a square of 3 cms by 3 cms, lighted in succession by minute metal brushes, synchronously with the square of the receiver, the time required for completing the lighting of the square likewise being .1 second only. A battery is connected on one hand to the metal brushes, and on the other, through the line, to two electro-magnetic coils, the working of which is explained in the following:

A small metal pattern intended to be made visible at the receiving station is connected in front of the transmitter square, through the telegraph line, to the other terminals of the electro-magnetic coils. This is how the small brushes will "feel" in succession the various parts of the metal pattern, closing each time the line-current through the electro-magnetic coils. The latter accordingly deflect the cathode rays already in front of the diaphragm so as to cause the luminous point on the screen to disappear at each current closure. At each contact between the brushes and the metal pattern at the transmitting station, all the spots, corresponding to contacts in the transmitter square, thus appear black in the receiver: a silhouette of the pattern appearing on the luminous square.

As the luminous spot, after lighting in 1-10 second the whole of nine square centimeters, again begins the same motion, the silhouette of the pattern on the receiver square will follow accurately and continuously any motion performed by the pattern of the transmitter. According to this arrangement, .0002 second suffices for producing one picture element.

The process above described is the only one in connection with which the time of production of luminous spots can be reduced sufficiently for the first luminous impression not yet to have vanished by the time the whole surface has been lighted, thus producing the illusion of a continuous image. More-

*Zeitschr, f. Schwachstromtechnik, No. 22. 1910.

(Continued on Page 697)

Resonance Experiments with Rotating Electric and Magnetic Forces

By Marvin Ferree.

IN this paper I shall describe some experiments which illustrate how high frequency electric and magnetic fields can be produced in closed circuits, and also I shall show that oscillating currents flowing in a closed circuit are capable of operating a two-phase motor by resonance, and further, that it is possible to derive therefrom a dual tension of different phases which describe trajectory circles at the brush end of the cathode rays in a Braun tube.

The general arrangement of the different devices for demonstrating these rotary currents is shown in Fig. 1. The closed circuit consists of a condenser K, a variable inductance, A B, and a spark gap, S, all of which are connected to an induction coil energized by alternating currents. Inserted in the closed circuit is a small high-frequency two-phase motor, while on the right is a subsidiary closed circuit which serves to recover the rotary electrostatic forces.

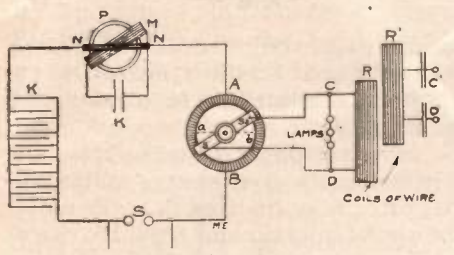


Fig. 1

The inductance, A B, is formed of a circular coil of insulated wire wound spirally upon a wooden spool having a diameter of about 12½ inches and a cross section of 1 1-16 inches, while the copper wire has a diameter of 5-64 inches. The wire spiral is based on its upper surface, so that the contact brushes S_1 and S_2 on the ends of the movable insulated arm make firm contact with oppositely disposed turns of the coil.

When the contact brushes rest on the points A B, the potential difference in the subsidiary circuit will be maximum, but when the brushes are 90 degrees from A B, the potential difference will be minimum, hence by turning the arm to various points the potential difference at C D can be regulated as the reactions of the circuit, which includes the coil R^1 and the condensers C^1 and D^1, require.

In the subsidiary circuit a bank of lamps, L, is placed for regulating the resistance of the circuit; a primary coil of a Tesla transformer is shown at R, while the secondary coil is indicated at R^1. Connected to the condensers C^1 and D^1 are a system of coils, E^1 E^1 and F^1 F^1, Fig. 2, the latter sliding within the former so that the degree of inductive coupling may be varied at will. To the binding posts, 1, 2 and 3, 4 of the coils, is attached the Braun tube by which the two-phase oscillatory currents are rendered visible and which may be photographed. This arrangement permits of close tuning and of varying the phase difference.

The apparatus for producing the rotary magnetic fields is shown in Figs. 1 and 3, and consists of a single turn of large copper wire sustained in a vertical plane and connected to the inductance A and the condenser K. Inside of this turn of wire is a coil of fine

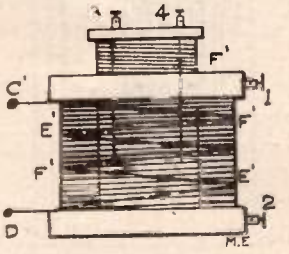


Fig. 2

wire wound in the form of a rectangle, and shunted around this is the condenser K. The windings of this system, when their planes are more or less at 45 degrees, fill the space which they enclose with a rotating field of purely magnetic force, the presence of which is demonstrated by the fact that it can excite a lively rotating in a delicately balanced cylindrical armature made of paper and parallel strips of tin, which have tin commutators, all of which are shown in Fig. 3.

That the rotation of this cylindrical armature is not due to any electro-static force is proven by employing a paper cylinder, without the tin strips, when it will remain absolutely stationary; neither is it due to a revolving field of low frequency produced by the secondary alternating current of the induction coil, for if the spark gap S is opened there will be no tendency to any rotating movement, and, finally, when the oscillating currents in the closed circuit become too intense the tin strips are burned off.

From these facts it is safe to conclude that the rotation is really due to the reaction of the induced magnetic field on the armature.

The experiments may be varied by changing the constants of the closed oscillation circuit. By properly proportioning the oscillation circuit, a stationary half-wave will be developed in the oscillation transformer, Fig. 2, with the potential zero at the middle of the coil and opposite elliptics on the armatures of the condenser, as shown in Fig. 4.

The time of this half-wave will be delayed a quarter of a period after the fundamental oscillation, while the wave itself is always in quadrature in

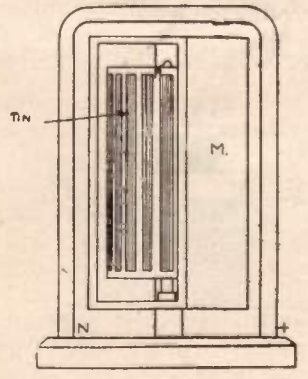
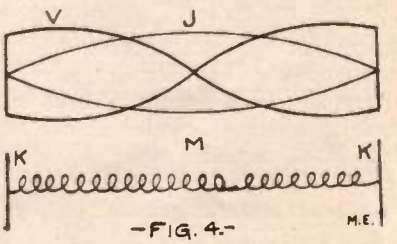


Fig. 3

space with the fixed potential wave which forces the variable condenser, so that for each period of oscillation value for the capacity of K it will produce the greatest number of revolutions of the cylindrical armature, the number being about 33,000 R. P. M., and when this results the circuits are known to be in resonance, and this is also proven by the fact that the open circuit terminals of the transformer (Fig. 2) emit a luminous effluvia.

By decreasing the period of the principal circuit the optimum capacity of the condenser is also diminished when the coil M (Fig. 1) is co-resonant with it, thus producing the rotation of the armature. This is also the case when the single turn N is included in the principal circuit and the value of the condenser K is very much reduced. So sensitive is the paper and tin armature to the conditions of the closed circuit



-FIG. 4.-

that if a glass rod, or even one's hand, is brought near it, the speed of its rotating is accelerated or retarded as the case may be.

In my next paper I shall show how the above method of electro-static motive power may be used in a system of wireless telephony, and how, by use of the above described "static rotation power" all previous conditions in the transmission of the human voice without wires and all interference, both atmospheric and conditional, may be overcome.

WIRELESS ASSOCIATION OF EASTON, PA.

A wireless club has been formed in Easton, Pa., to be known as The Wireless Association of Easton and Vicinity. Its sole purpose is the advancement of wireless telegraphy and telephony among amateurs. The officers are: W. Ballentine, president; John Q. Adams, vice-president; Weikel Jordan, treasurer; E. J. Sortore, recording secretary; James Smith, Jr., 123 North Main street, Phillipsburg, N. J., corresponding secretary.

The club would like to communicate with all other clubs organized for the same purpose.

Address all correspondence to corresponding secretary,

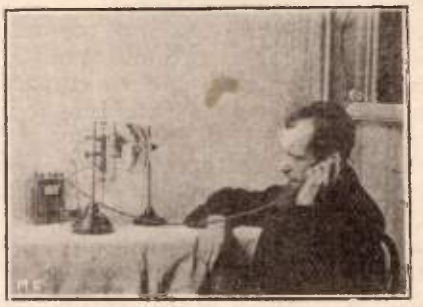
JAMES SMITH, Jr.
123 North Main Street,
Phillipsburg, N. J.

A New Photophone

WE illustrate a new apparatus which has been designed by M. L. Ancel, of Paris, in order to send telephone messages by means of light rays. The question is one which has a considerable interest, at least from a scientific point of view, although its practical application is limited, seeing that a light beam is used for the transmission, so that only short distances can be covered. The first experiments of any great scope were made in this field by Prof. Ruhmer, of Germany, and he succeeded in covering several miles. In the sending station is a parabolic mirror in whose focus is placed an electric arc, and this is fed from the primary of a transformer. In the secondary circuit of the transformer is a microphone transmitter, so that speaking into the microphone causes variations in the current and in the light of the arc, and the beam sent out from the mirror thus varies in accordance with the voice. At the receiving end the beam falls on a second parabolic mirror and is concentrated on a selenium cell. In circuit with the cell is a battery and telephone, so that the resistance of the circuit varies together with the light of the

TRANSMITTER

beam, and we hear the message in the telephone. In the apparatus of M. Ancel, a somewhat different method is used for the transmitter. The voice acts upon a diaphragm placed in a gas chamber, and the chamber is fed with acetylene from a small generator. The gas then passes into an acetylene burner whose flame lies in the focus of the parabolic mirror. Speaking into the mouthpiece causes fluctuations in the gas pressure and in the brightness of the flame, and we thus have a varying light beam. At the other post is a mirror with a selenium cell which has been



RECEPTOR

specially constructed for the purpose by the inventor. By using a very small space between the wrapped wires of the cell, he obtains a low resistance, which gives an advantage. The messages are clearly heard in the receiver.

BERLIN LETTER.

(Continued from Page 689)

switches, or automatically by means of the current impulses produced by the Morse apparatus, and which are made successively to operate switching rollers effecting the variable arrangement of connections as required for each figure.

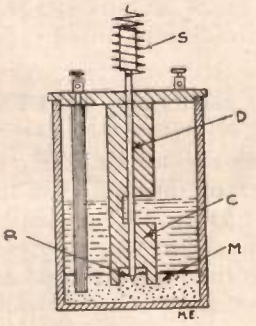
Though the operator after some time knows by heart the location of the alarm corresponding to each light signal, it is desirable, for safety's sake, to entrust a special official with ascertaining from a table the location of each alarm, which obviously entails considerable loss of time. This drawback is obviated by using a special device, viz., a transparent map of the town, lighted from underneath, and on which a red dot corresponding to the location of the fire alarm appears as soon as a fire signal is received.

With the system is combined a set of big alarm bells for advising the men at the very moment the signal is received, the number of strokes indicating the number of the fire alarm set working.

Paris Letter

Mercury Interrupter.

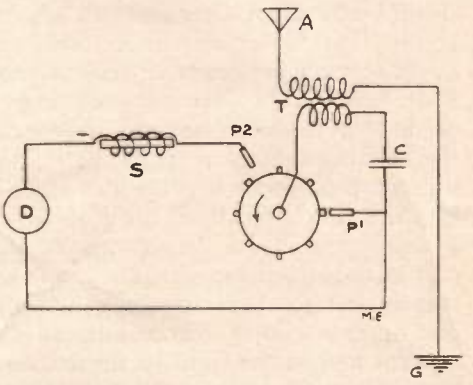
IN the new form of mercury interrupter designed by Reiniger and Schall of Berlin, a suitable closed vessel contains mercury M at the bottom. Into it dips an insulating cylinder C, which is held by the top cover, and it has a cavity B in the lower part. A metal rod D serves as a plunger inside the cylinder, and the pointed end of the rod dips in the mercury. The rod is moved up and down by the action of an iron wire attached to it and working within the solenoid S. When the current is put on through S, D and M, the solenoid draws up the plunger and breaks contact at the mercury. A good break is obtained by partly filling with alcohol so that the heat of the spark gives a gas bubble of alcohol vapor, and as the chamber B is closed.



the gas presses down on the mercury surface and gives the break in the proper manner. The plunger then falls owing to the absence of current in the solenoid, and the action thus keeps up automatically, causing a rapid succession of breaks of the current. If desired, several rods can be used so that their break points are connected in series, and this has a better effect.

Ingenious Revolving Spark Gap.

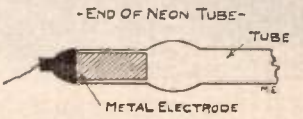
Spark gaps using toothed wheel revolving contacts are being used of late, but they are likely to form an arc at the break at each discharge, and this is hard to get rid of, even when running at a high speed. A new method is illustrated here, and it appears to overcome this. At T is a transformer for the aerial, whose primary is connected in series with a condenser. D is the source of current, and the condenser is charged by the toothed wheel device. But when a tooth is opposite P_1 the contact P_2 lies in the middle, between two teeth. We have a discharge from the condenser in the position of P_1 here shown, and the high tension circuit is



at the same time cut at P_2. On the contrary, the condenser is charged when P_2 lies opposite a tooth. This method prevents D from being short-circuited in any case. Another point is that the charge of the condenser is quite independent of the discharge, so that the apparatus works under better conditions, and a very good musical sound is given. A resistance or a choke coil S can be used in the charging circuit so as to regulate it. The rotating part may be placed in gas or liquid.

The New Neon Tube.

While experimenting with the new gas neon, M. George Claude of Paris

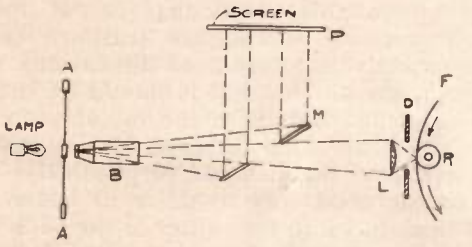


found that a very good light could be obtained by using it in Moore glow tubes. It is not easy to make such tubes, however, seeing that even 1-100th part of nitrogen will act to cut down the light. However, he succeeded in absorbing nearly all the nitrogen by using wood charcoal in a small bulb upon the tube, cooling down by liquid air, and afterward sealing off the bulb.

The color of the new neon tubes is a golden yellow, which gives a pleasing effect. He made some tubes of 2-inch diameter and 20-foot length, using metal electrodes in the ends, which are mounted as shown in the diagram. An interesting point is the small amount of current taken by such tubes. About 1,000 volts is used here, and the current is 0.9 ampere. The light is 220 candle power for a 3-foot length of tube, and the power is 800 watts, thus figuring 0.7 and 0.9 watts per candle power, which is a very low figure. Another feature is that such tubes will work for a long time without needing any attention.

Improved Oscillograph.

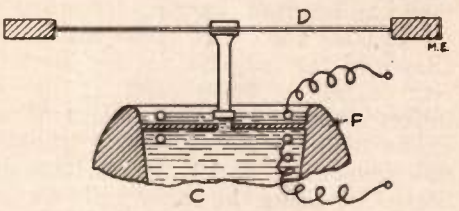
When using a galvanometer or oscillograph so as to make a photographic record on a moving paper strip, it is very convenient to be able to follow the variation of the spot of light with the eye at the same time. An English inventor does this in the following way: The galvanometer AA cuts off more or



less light from the lamp, which is placed behind it, and the beam passes through the lens tube B to the recorder N, consisting of a lens L and a diaphragm D, with the moving band of photographic paper F working over the roller R. Thus we obtain the photographic record. In the path of the beam is a mirror M, which is cut out at the center, but a part of the light is reflected from the mirror on to the screen P, so that it can be seen by the observer at the same time that the recorder is working.

Liquid Transmitter.

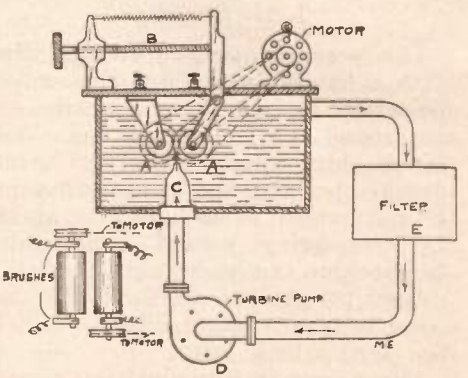
In the new form of telephone transmitter which is shown here, the resistance of a liquid is varied by means of the diaphragm D. It carries a plunger which works before a small opening in the plate P which lies in a chamber C, the whole being filled with a conducting liquid. Wires are led in at one side and the other, and the resistance of the contracted part of the liquid depends upon the position of the plunger, so



that speaking against the diaphragm causes variations in the current. Means must be provided for carrying off the gases which may be formed by the current passing in the liquid, so as to prevent them from interfering with the action.

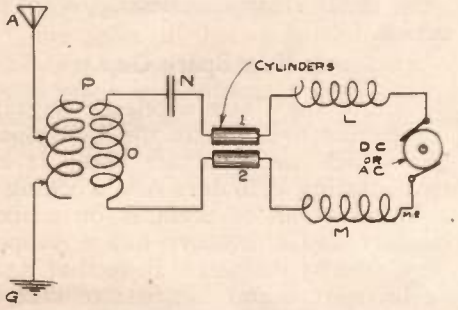
A New Spark Gap.

One of the Paris wireless telegraph companies brings out the new spark gap which we illustrate here. It has two rotating cylinders AA, working in a liquid. One of them is on a fixed bracket and the other has a support regulated by the screw B, so that it can be brought nearer the first to take up the wear. A small electric motor rotates both cylinders by means of pulleys, and a set of brushes brings the current to the cylinders. It is important to keep fresh liquid always in the spark gap, so that it will always have a high insulation. Experiments show that we must renew the liquid and also rotate the cylinders, so as to give them less wear. Any carbon particles



given by the spark must be filtered out as well. Oils or alcohol or even water can be used, and the turbine pump D keeps up a circulation, using the filter E. A nozzle C delivers fresh liquid

just at the point between the cylinders. It is best to use alloys of iron or copper with tungsten or titanium for the cylinders. We obtain an effect like that of the singing arc, but higher voltage can be used, varying from 500 up to 25,000 volts. A good method is shown in the diagram for use with direct current of 2,000 volts on the cylinders, shown at 1, 2. L and M are choke coils, N condenser, O transformer secondary, and P the variable primary. By using the choke coils we prevent a back rush on the dynamo, and cut down the over-voltage at the gap, which might set up an action after the discharge. With direct current we can operate a wireless telephone system as



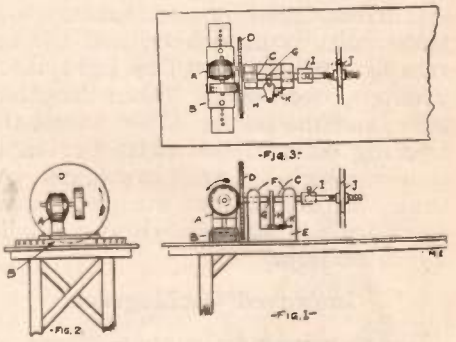
with an arc, but it is claimed to be better. Using alternating current at 200 to 500 periods, we can work it for wireless telegraphy and have a musical note in the telephone, taking care to regulate the size of the choke coils to suit the case.

A HANDY COIL WINDER.

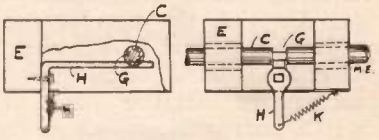
J. H. Stewart.

The accompanying drawings illustrate a handy little "jig" devised by the writer for winding the sections of the secondary of his spark coil. With this machine a large variety of speeds may be obtained, and at the same time the mechanism is so light that should the wire, being wound, run amuck, the machine can be brought to rest by a slight pressure of the hand. The machine is readily reversible, as will be described a little later.

The power is furnished by a small fan motor A, or any other small motor which uses very little current, as compared with that required to run an ordinary lathe. This alone should appeal to the amateur coil maker; in fact, that one phase of the subject was the means of suggesting the idea to the writer. The motor has a flat-faced pulley on the face of which is cemented chamois skin or rubber. The motor is mounted upon the sliding carriage B, the con-



struction of which is evident from the drawing. By moving the carriage back or forward the speed of the shaft C is changed, and by moving the motor pulley past the center of disk D the direction of spin of C is changed. The disk D can be made from a sheet of ¼-inch brass cut to shape, or if this is not available, a disk may be cut from a piece of thoroughly seasoned and perfectly flat wood, of dimensions to suit the builder, but it should be large in comparison with the motor pulley. The shaft C is fastened in the exact center of the disk and perpendicular to it. A good way to do is to fasten a thick block to the center of the back of disk and drill through both disk and block, and then wedging shaft in hole so formed. The shaft is supported by frame E, and passes through brass



bushings F, which serve as bearings. Half way between supports the shaft is grooved, as shown in drawing at G. Upon the outer end of the shaft is fastened the chuck I, which holds the shaft of the section-former J, as shown.

The lever H is for the purpose of throwing out the clutch; ordinarily the spring K keeps the lever H pressing against the left side of the groove G and thus keeps the disk D tightly pressed against the friction pulley of

the motor. However, when it is wanted to stop the machine, the handle of H is pushed to the left (throwing the top to the right), thus relieving the pressure of D upon friction pulley. An enlarged view of H is given in Fig. 4. The frame E can be made of 2x4-inch material, smoothed up with a plane and drilled to receive bearings. By carefully studying the drawings, the amateur will find no difficulty in constructing the machine.

ELECTRIFICATION OF CROPS.

Entire crops as well as beds of beans and turnips are being grown under electric influence. Overhead electric discharges are used. It is possible to obtain discharges of some potency from wires which, instead of being one or two feet above ground, and thus liable to be knocked down by straying animals, are at a height of 15 or 16 feet.

CATHODE RAY TELE-PHOTOGRAPHY.

(Continued from Page 690)

over, this is the only method allowing the image at the receiving station to follow any movement of the pattern at the transmitting station instantaneously and synchronously. In order to eliminate any disturbance due to lengthy transmission lines, the inventor intends utilizing electro-magnetic waves for the transmission of luminous impressions.

The process above described will possibly allow the problem of television to be solved, at least partially.

FOUR OFFERS.

W. A. O. A.

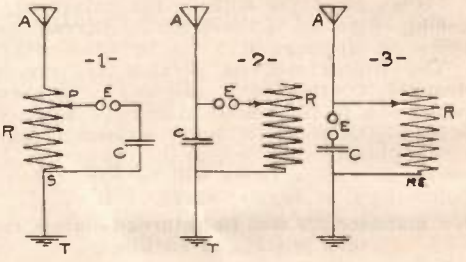
The Wireless Association of America, headed by America's foremost wireless men, has only one purpose: the advancement of "wireless." If you are not a member as yet, do not fail to read the announcement in this issue. *No fees to be paid.*

Send to-day for free membership card. Join the Association. It is the most powerful wireless organization in the U. S. It will guard your interest when occasion arises.

IMPROVED TRANSMITTING HOOK-UP.

By A. C. Marlowe.

IT is found in some cases, and especially in high power plants which use condensers of large capacity, that the connection wires between the condenser set and the resonator have necessarily a great length, so that the oscillation period proper to the wires alone lies near the period due to the aerial, and thus with an ordinary coupler we require the use of a very loose coupling. Sometimes the effect is even overbalanced, and the condensers must be reduced. M. Girardeau overcomes this in the following way: Diagram 1 shows the ordinary mounting, and if the length of the connecting wires PE, EC, CS is such that the effect of this part is nearly equal to that of the aerial circuit, only a small part of R is put in to balance up, so that we have a loose coupling, which is a disadvantage. In the new method (2), A and T are joined directly to the condenser, so that the condenser wires are included in the aerial circuit. Here the amount of coupling on R may be even reduced to zero, but the coupling is not as loose as before; that is, we reduce the oscillation circuit down to the use of the connection wires between condenser and spark gap, but still a good effect is had. But for another reason this method is not advised, as during the charging, say, from a transformer at the ends of C or on E, the aerial has in relation to ground a difference of potential which is represented by the charge, and this is bad for security and insulation. In (3) this is avoided and we have all the advantages of (2). E must be joined to condensers and aerial by very short connecting wires, and here during the charge it is seen that A is at the potential of earth, the same as in (1).



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Vol. III MARCH No. 12

EDITORIAL.

THIS issue witnesses the close of the third year of "Modern Electrics." The writer cannot but feel the deepest gratitude towards his readers, who now number over 52,000, and who to a great extent have made this publication what it is to-day.

It is not the easiest thing in the world to satisfy all readers, but the editor believes that there is no reader who in any one issue will not find a lot to interest him. This may be deduced from the fact that during the last year there were only two complaints, several dozens of suggestions, and hundreds of enthusiastic praises.

The editor has always striven hard to satisfy all tastes and at the same time he has from the start always believed in quality rather than quantity. "Modern Electrics" never publishes anything that has been published previously in the technical press in the U. S., and the readers have learned that each issue means NEW material all the way through, no rehash or warmed-over matter.

In wireless matters "Modern Electrics" to-day is pre-eminent and an authority, without question. Not alone that, but "Modern Electrics" was the only publication that opposed wireless legislation in Washington during 1910, and the fact that no bills have been passed, nor will be passed, at least not for a year to come, must be credited solely to the efforts of "Modern Electrics."

As readers will have observed, Dr. Alfred Gradenwitz, the eminent technical writer, has accepted the post of Berlin correspondent for "Modern Electrics"; we believe he is an important and welcome addition to our long list of contributors.

In closing, the editor wishes again to thank his generous supporters, and for the coming year he promises a better and greater "Modern Electrics" and the enforcement of his three-year-old motto: **"To print what our readers want, not merely what strikes the editor's fancy!"**

A DISTRESS MESSAGE AT SEA.

By Arch Macdonald.

MANY people do not know of the number of messages that are transmitted from a vessel in distress, or their contents. On January 25th the steamer Queen, with one hundred and twenty-five people on board, left San Francisco for Seattle. At 4:15 p. m. she reported herself as being off Point Reyes. At six o'clock she sent out her "SOS" call, for she was afire. Following are the calls and messages as I took them down:

"SOS. SOS. SOS. On fire ten miles north of Point Reyes." Signed "Queen" (GX.)"

The government station at Mare Island (NPH) answered and asked her position again.

"SOS. SOS. SOS. Send us some help. We are afire in forward hold GX."

Six stations answered this call. GX answered, "Don't all answer at once. I won't be able to read anybody. GX."

Hillcrest, the 15 k.w. station at San Francisco, (PH), answered "Have 'phoned your message to Malorin, (chief operator of United Wireless Co.)."

"Is any ship near us? GX."

PH called the steamer President (GW), and said, "Queen afire. Go to her help! PH."

"Get orders and we'll proceed. GW."

GX then gave GW her position and said, "Hurry for all you are worth. Fire gaining. GX."

At 6.25 p. m. GW asked, "Is it blowing much?"

"A small-size gale is blowing. GX."

"Are the passengers in danger? PH."

"No. We have them all out in library and social hall. GX."

At this time the operator on the steamer Norwood (SG) came on duty and asked "What is the trouble?"

"Do you know we are afire? GX."

"Tell your captain quickly, we are afire ten miles north of Point Reyes GX."

GW now called the steamer City of Pueblo (GQ), and said, "Keep sharp lookout for the Queen. She's afire above Point Reyes. GW."

"Will come to your aid right away. SG."

"How badly are you off? SG."

"Don't know. But bad enough. G X."

"Will we have to take passengers off? SG."

"No. The President will be here at eight o'clock, but you can help us, I guess. GX."

"Am leaving to assist," said the Revenue Cutter "McCullough" (RC H).

"Wire full particulars as to what is being done. Is fire under control? P H."

"The fire started in the forward hold among the oil cans. We are getting it under control. GX."

All this time GW had been fighting the gale up the coast, and was near the point given out by GX.

"We are nearly there. Can you see us? GW."

"Wait a minute. I will go outside on deck and look. GX." He then went without his cabin and looked for the President.

"No, cannot see you yet. GX."

"O. K. Have you got it out yet? Are you under way? GW."

"No. GX."

"GW. Have you sighted GX yet? NPH."

"Not the last time I was on deck. GW."

Ten minutes later. "We are right close into you now. Am here when you want anything. GW."

"O. K. GW. Wait a moment. GX."

Ten minutes later. "What's the matter? PH."

"Nothing new, about the same. GX."

R.C.H. now called GX. "We are off Point Bointa bound for you, full speed. Please give us your latitude and longitude. Will be up to you in an hour. RCH."

"On my suggestion, could you go to San Francisco? I will follow slowly if conditions are such that we can do so. Have information by wireless that southeast gale is approaching," said Captain Thomas of the President.

At 10:30 p. m. GX answered, "Tell Captain Thomas we have fire under control and are going to turn around for San Francisco. GX."

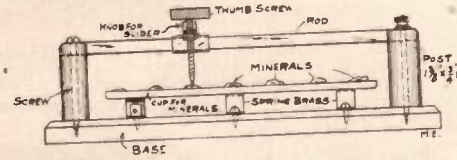
(Continued on Page 715.)

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 from 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.

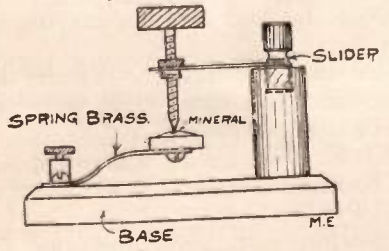
A HANDY DETECTOR.

WHEN you wish to test several minerals in a detector so that you can go from one to another without changing detectors or replacing the



minerals, you will find this one very handy.

Fasten your minerals on a long box about 6 inches by 1 inch by ¼ inch, and then fasten your thumb screw on ad-



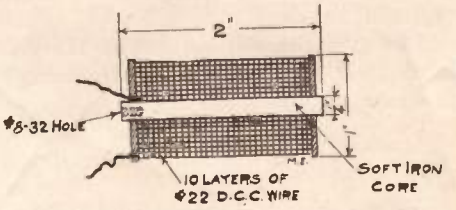
juster to a slider. The slider runs up and down the rod (¼x¼ inch) so that you can go from one mineral to another quickly and without any trouble. The thumb screw is fastened to the slider by a piece of spring brass so that a very delicate contact can be made. The cup is also fastened to the base by means of spring brass.

Contributed by E. S. STULL, Jr.

SECOND PRIZE ONE DOLLAR.

HOW TO MAKE AN INDEPENDENT INTERRUPTER.

One of the greatest troubles the amateur has with his wireless transmitting set is his vibrator for the coil when



batteries are used. This trouble can be easily remedied by having an independent interrupter. The following instructions will enable the experimenter to make an interrupter at a very small cost:

The materials needed are two electro-magnets, two pieces of clock spring, both being two inches long; five inches of one-quarter-inch brass rod, four binding posts, a hardwood base 4x5¾ inches, some 8-32 threaded brass rod,

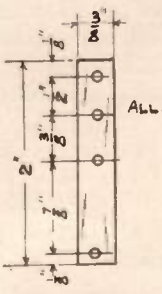


Fig. 2 A.

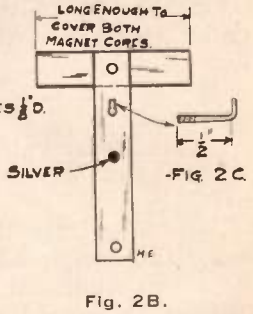


Fig. 2B.

Fig. 2C.

screws and nuts, two electrose binding post knobs, one inch of No. 12 gauge hard drawn silver wire, etc.

Obtain two large bell magnets or make two magnets as specified in Fig. 1. Now take a piece of clock spring. Hammer it flat and drill four holes in it as specified in Fig. 2A. Rivet a piece of clock spring, one and one-half inches

long, which has had the temper taken out of it by heating it to a cherry red and allowing it to cool slowly, to the

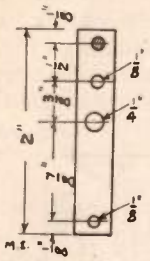


FIG. 3A.

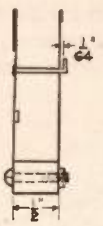


FIG. 3B.

top of the spring by means of the top hole in the spring, as seen in Fig. 2B. Solder a piece of stiff brass wire shaped like in Fig. 2C to the second hole by means of a few drops of some good soldering flux. Now hammer a one-

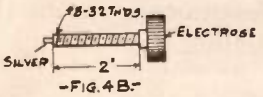


FIG. 4B.

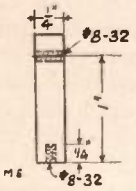


FIG. 4A.

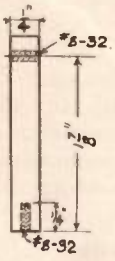


FIG. 4A.

eighth-inch piece of silver wire into the third hole; see Fig. 2B. Next take the other piece of spring and drill it as seen in Fig. 3A. Hammer another piece of silver into the first hole. Screw both pieces of spring on to a block of wood so that the brass hook on the

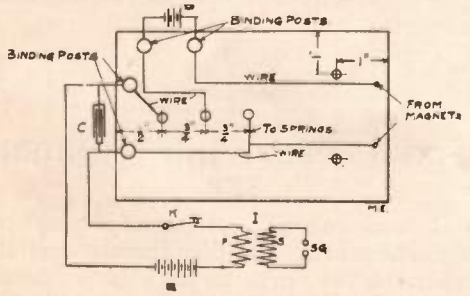


Fig. 5

first piece slips through the second hole on the second, allowing the hook to have about one-forty-eighth of an inch play. See Fig. 3B.

Cut the ¼-inch round brass rod into two parts, one being 1½ inches long and the other being 2½ inches long; tap them with an 8-32 thread for a quarter of an inch in one end of each of them; also tap them with an 8-32 one inch from the bottom in the small one, and one and seven-eighths from the bottom in the large one. See Fig. 4A. Take two two-inch pieces of the

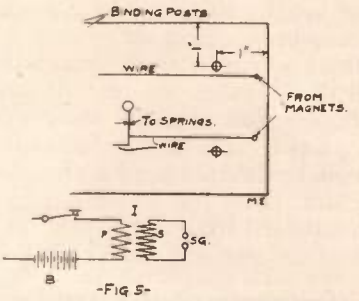


FIG. 5.

threaded 8-32 rod and drill a one-sixteenth-inch hole in one end of each for about one-eighth of an inch, then hammer a 3-16-inch piece of the silver wire

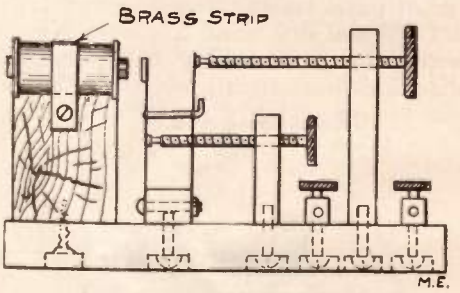


FIG. 6.

in each of them. Screw an electrose knob on the other end, as in Fig. 4B.

Drill and countersink the base board as in Fig. 5. Fig. 6 shows how the parts are to be arranged on the

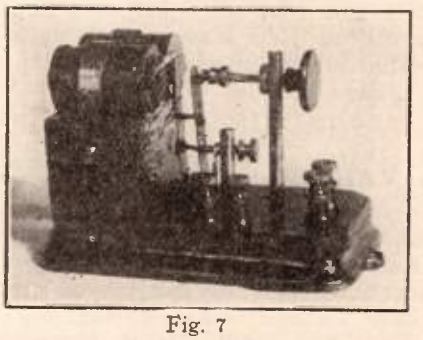


Fig. 7

base, the magnets being fastened to the supporting block by a piece of ½-inch strip brass drawn tight over both the magnets and screwed to the block. Fig. 5 shows how the interrupter is

to be wired up and also how it is to be connected with the rest of the instruments.

To operate, connect four dry cells in series on to the binding posts, as shown in Fig. 5. Adjust the thumb screw A till the springs vibrate the highest, then adjust the screw B till you get the hottest spark. Fig. 7 gives a picture of the complete interrupter.

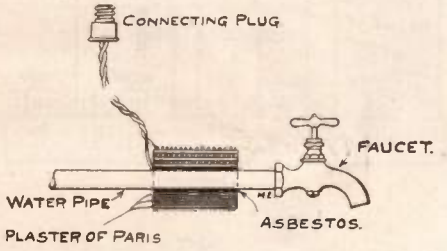
If the experimenter has carefully followed these directions he will have an interrupter that will not stick or balk if the proper capacity condenser for the size coil is shunted across the binding posts 1, 2.

Contributed by

J. H. STEURER.

ELECTRIC WATER HEATER.

First, wrap a layer of asbestos around the pipe as near the faucet as possible, making the covering about 4 inches long. Place a thin layer of plaster of paris on the asbestos and let it dry. When dry wind a coil of No. 36 wire around it, taking care that the wire does not touch itself at any point,



yet winding as close as possible. Put another layer of plaster of paris on this, and allow to dry, and again wind the wire around it. Continue this process of alternate layers of plaster of paris and wire until 500 feet of wire have been used, leaving both ends extended for connections, as shown.

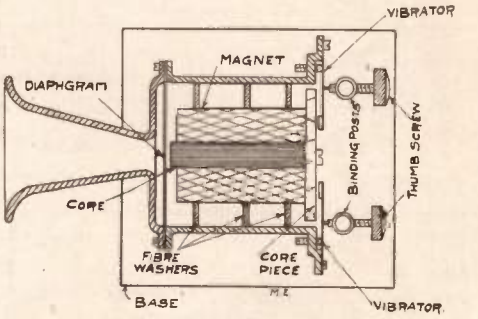
Contributed by

R. C. OERTEL.

A VARIABLE TONE ELECTRIC HORN.

An apparatus, constructed as per enclosed sketch and connected as per instructions, may be used to advantage where a variety of tones that may be varied at the will of the operator are desired. The sketch is nearly self-explanatory.

The fibre washers around the magnet are used to support the magnet inside the brass shell. There are eight vibrators spaced around the edge of the brass shell. The binding posts are also screwed to the edge of the shell, but insulated from it. One end of the battery is connected to the insulated binding posts. The other end of the battery is connected to one terminal of all the



eight push-buttons. The other terminal of the push-buttons is connected one to each vibrator.

The operation is as follows: When a button is pressed, a vibrator is set in motion. This, exciting the coil, causes the core to become magnetized and demagnetized. This in turn causes the diaphragm to vibrate slowly or fast, according to the tension upon the vibrator spring. This tension, and consequently the tone of the instrument, may easily be changed by simply turning the thumb screws.

Most of the above may be made at home. The horn is to intensify the sound, but, of course, may be left out.

One dry cell will work the above, but two or more should be used where more volume of sound is desired. The core is of soft iron, and also the core piece, which is simply screwed onto the core.

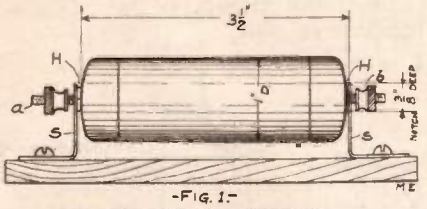
Contributed by

GEORGE N. GARRISON.

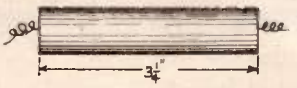
FIXED RECEIVING CONDENSER.

From an old telephone or motor switch procure an old fusible cut-out about 3½x1 inch, as in Fig. 1. After taking all fuse wire out, bore two holes (H), one in each end, in the center of the brass ends. In these holes insert binding posts, A and B, which are to be the terminals of the condenser. Then cut two sheets of tinfoil 2x3, and two sheets of paraffine paper 2¼x3¼.

One piece of tinfoil is laid down with a piece of wire on top of it so that it extends far enough over the edge to make connection with one of the binding posts. One sheet of paraffine paper is laid over this, and then the other sheet of tinfoil with the wire laid in the opposite direction, followed by the last sheet of paraffine. Then all is rolled up as in Fig. 2. This is encased as in Fig. 1, one wire connecting to binding post A, and the other to binding post B. From some 32-inch copper cut two 1½x1-inch strips (S). Round both



-FIG. 1.-



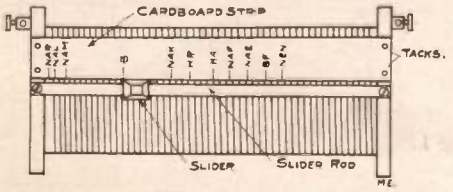
-FIG. 2.-

ends of these put a slot (C) in one end in which to set the binding posts. These are screwed to the table, the condenser set in the slots, and then it is ready for work.

Contributed by
JOHN B. BRADY.

TUNING COIL ATTACHMENT.

Enclosed is a sketch of an idea of mine, to be used in connection with tuning coils. It consists of a strip of heavy cardboard about an inch and a half wide and the length of the coil. This is tacked to the ends of the coil so that it will be close up to the slider.



As the various stations are heard, they are tuned as loud as possible, and a mark is made on the cardboard, opposite one corner of the slider. The call of the station is now marked down at the same place. For example, see illustration; the coil is now tuned for B. I find this very handy when I want to tune in quickly, as the station wanted can be found immediately by moving the slider to the mark of that station.

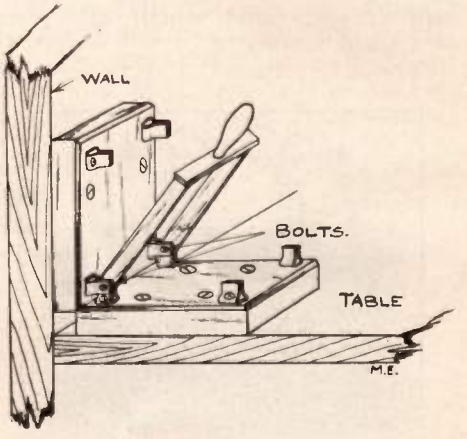
Contributed by
PERCY D. LOWELL.

AERIAL SWITCH.

Two double pole, single throw knife switches may be joined together, making a quick-action switch, which requires half as great a throw as a D. P. D. T. one.

First, procure two D. P. S. T. switches of the same size and remove the bolts, nuts, and one of the handles and pair of blades. Then insert the clamps of the switch (with the handle left in place) into the clamps of the other, as shown in figure, and bolt together.

Last, the base of one switch is screwed to the table, next to the wall, and the base of the other to the wall or other support. This makes a very



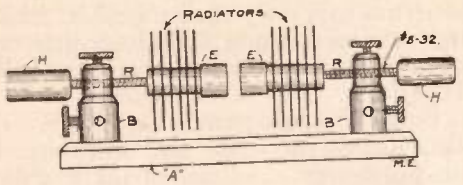
handy switch for wireless or other purposes. Two T. P. S. T. switches may be used in the same way.

Contributed by
WILLARD HERRON.

AIR-COOLED GAP.

Enclosed please find a picture of a very efficient spark gap for use up to two k.w. The base A is of tile 6x3 inches; the binding posts B are large double posts 1½ x ½ inch; the handles HH are of hard rubber 1½x½ inch, one end being drilled and tapped for the 8-32 rods RR. The radiators are copper disks 1½ inches in diameter, and separated by copper washers. The radiators should be of copper because copper is a very good conductor of

heat. They should not be highly polished because a highly polished surface holds the heat. The electrodes EE are of zinc ½x⅜ inch. Holes may be drilled in the enameled tile base with an ordinary steel drill. The gap should not be muffled, as the formation of zinc ox-



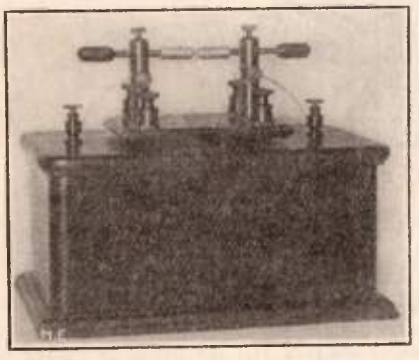
ide in the muffler cuts down the efficiency.

Contributed by
HAROLD T. MOORE.

A SENDING CONDENSER.

Enclosed please find photo of a sending condenser sealed in case, with zinc spark gap mounted on top, which I built recently and which has given very good results.

Condenser consists of twenty 4x5



plates, with tinfoil 3½x2½ inches on one side of each plate, with lugs leading from each piece of tinfoil, alternately and connected to two binding posts on top of case. As will be seen, a condenser of this type takes up by far less room than one of the "jar" type, and I think gives just as good results. The enclosed photo shows condenser connected in shunt, with spark gap, but when a sending helix is used it is of course coupled in series, with gap and helix.

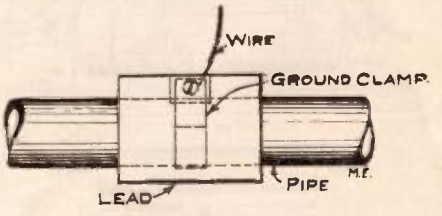
I hope this may benefit some of the readers of your wonderful magazine, "Modern Electrics."

Contributed by
ROBERT F. ADAMS.

A GOOD GROUND CONNECTION.

I enclose a sketch and description of an "unrustable ground." First, procure an E. I. Co.'s ground clamp. Then file the water pipe bright and apply the ground clamp. Next get a small pasteboard box, just big enough to go round the pipe; cut slots in the ends and attach to the pipe. Paste pieces of paper closely around it, so no lead will run out. Then pour melted lead in until flush with the top of box; let set, cool, take off box, and you have a perfect ground.

1=Ground clamp.
2=Water pipe.

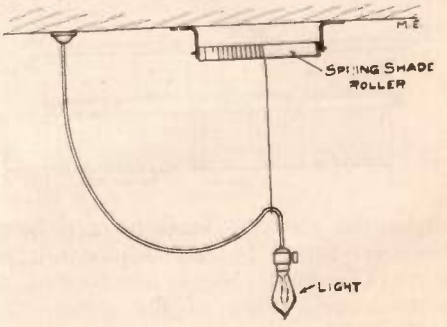


3=Lead round pipe.

Contributed by
RAYMOND H. SHAW.

AN ADJUSTABLE DROP LIGHT.

Cut a spring shade roller to any convenient length for attaching, by the usual sockets at each end, to rafters or other supports over the spot where you wish an electric light to be suspended. Attach a cord to the roller and wind it so as to coil the spring when it is pulled down, just as a shade would do. Tie the other end of the cord to the insulated wire of your

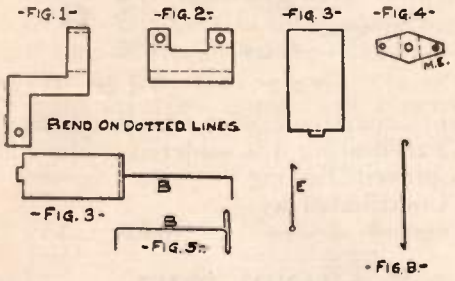


electric lamp. Of course the latter can now be made to hang at any desired elevation.

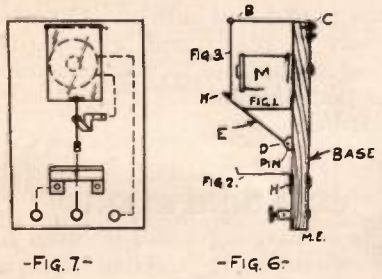
Contributed by
P. MURAWSKI.

CONTINUOUS-RING CIRCUIT CLOSER.

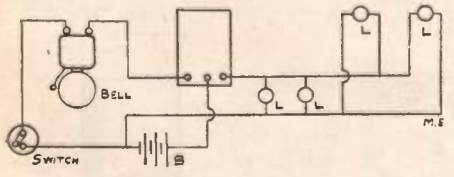
Some time ago I wired the doors and windows of my home so that a bell would ring when contact was made. This worked all right, but the bell



would only ring when contact was made, so I constructed a continuous ringer. Dimensions may be made to suit the builder. Figs. 1, 2, 3 and 4 are made of tin, bent as shown. The magnet M is fastened to the base one inch from the top. The armature support B is made of copper wire and is bent as shown at Fig. 5, and secured to the



base as at C. The armature (Fig. 3) is bent into a hook at the top and bottom and hooked into the armature support (Fig. 5), so that it swings freely 3-16 of an inch from the face of the magnet.



-FIG. 8-

Fig. 4 is fastened in the center of the base, and the ends are bent up to form a clip. E is a piece of copper wire flattened at one end, with a hole punched in it. After being inserted in the clip a pin is put through it as at D; the other end is bent so as to engage the bent end of the armature as at K.

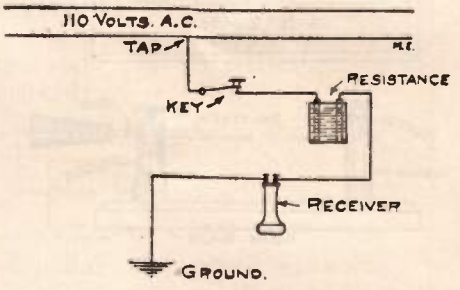
Fig. 1 is bent and placed so that it makes contact lightly upon E.

Fig. 2 is bent and placed below D so that when E falls it will rest upon H. The ringer should be wired as in Fig. 7, and placed in an upright position. The action is as follows: When contact is made the armature is attracted by the magnet, releasing E, which, falling, makes contact with H, completing the circuit. A switch must be used to cut out bell.

Contributed by
HERBERT MEYER.

SIGNAL PRACTISER.

A few nights ago I was trying to devise some satisfactory means for practising the telegraphic codes in order to become familiar with the reception of wireless messages. After trying the buzzer and several other common methods, I hit upon the following idea: Connecting a wire to a light wire, I led the current through an ordinary key and thence to a simple water rheostat. For this a tumbler half full of water was used, dipping the ends of the wires in the water. From the resistance I led a wire to a 75-ohm telephone receiver, and from there to the ground.



-FIG. 1-

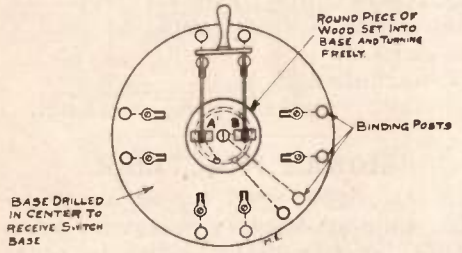
When the key is pressed a buzzing much resembling the sound of a wireless message is made in the receiver, but somewhat louder.

Contributed by
JAS. LEROY HODGES.

MULTIPLE THROW SWITCH.

The enclosed drawing shows a double pole switch with four throws. The same design may be used for 8 to 10, and even higher numbers of throws. The switch is made of a large round disc of wood with a large hole drilled in the center, into which another block

of wood fits. This second disc is turned enough smaller that it turns easily in the larger one, and the two are held together with a machine bolt. Knife contacts are then spaced around the base as shown, and binding posts provided. The connections to the knives are made through the bolt and a pair of thin brass rings in the center, one on



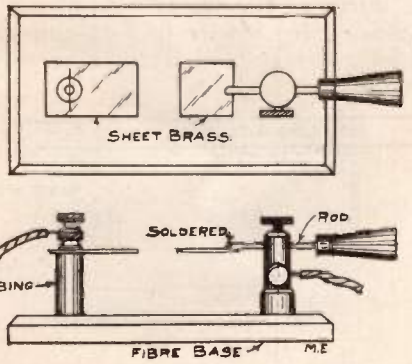
the base, and the other on the revolving block. This switch is extremely useful for wireless connections.

Contributed by

EDWARD N. HORR.

A GOOD SPARK GAP.

A spark gap of this kind is very efficient, and gives a much steadier and



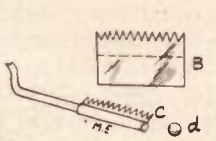
nicer spark than round rods, and will not heat up as badly.

Contributed by

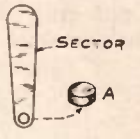
"F. K."

HELPFUL HINTS.

Figure 1 shows a good way to get rid of the brushes wearing through the sectors on a Wimshurst machine. Procure a small quantity of metal punchings A, copper or bronze, and stick one on each sector with shellac. Get them all on the same ends of the sectors, so that the brushes will touch each as they pass. Although shellac is an insulator, the sharp edge of the punchings will touch the tinfoil and make a good contact. Then the sector may be shellacked all over and leakage prevented. Fig. 2 shows an easy way to make collecting combs. The piece of tin b, has notches cut in one edge, and then is



-FIG. 2-



-FIG 1-

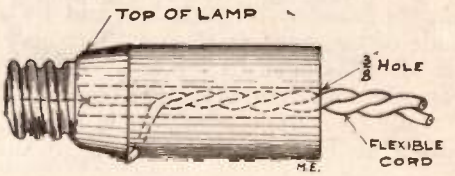
bent around the wire C and soldered. A ball-bearing d is soldered to the end to prevent leaking.

Contributed by

TOREN GAY.

HANDY PLUG.

Take a burnt-out 100-watt tungsten lamp and break all glass away. Cut a



wooden plug to fit into it. Then bore a 3/8 hole in plug; pull wire through hole and solder one to side and one to top, as per diagram.

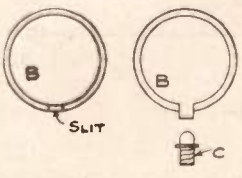
Contributed by

W. J. HANS.

CHARGING STAND.

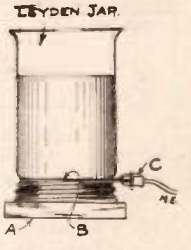
A good charging stand is often necessary when using Leyden jars, and the one here described is much easier to make than a glass-legged stool.

Three things are necessary—glass Mason fruit jar cover A, tin cover of jelly glass to fit same B, and battery binding post with nut C.



-FIG. 1-

-FIG. 2-



-FIG. 3-

Make two slits in rim of cover and bend up. Solder a binding post from the zinc of an old dry battery onto same (fig. 2) as in B; fit tin onto glass,

and the stand is complete, the tin forming excellent contact with the outside of the Leyden jar, as shown in fig. 3.

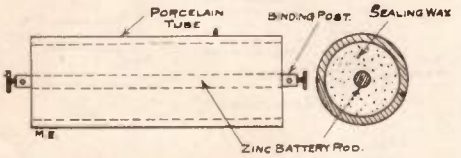
Contributed by
AUG. VAN DEVENTER, Jr.

A VERY GOOD LEAD-IN.

Procure a porcelain tube, a zinc battery rod, and two binding posts such as used on dry cells.

Stand the tube upright on a table, and hold the zinc so that it runs

-FIG. 2.



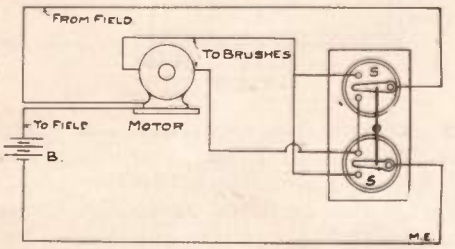
-FIG. 1-

through the center. Fill in the space between the zinc and tube with sealing wax and let cool. Now solder the two posts to each end of the zinc rod, and you have as good and serviceable a lead-in as can be made.

Contributed by
JOSEPH HOVEY.

REVERSING SWITCH.

The diagram of "A Reversing Switch for Battery Motors" in the January issue of your excellent magazine is incorrect, as it changes the direction of the current through the whole motor when it should be changed only in the armature.



I enclose a diagram which I believe to be correct, also a drawing of an arrangement for controlling a motor without the useless waste of power when using resistance. This diagram needs no explanation.

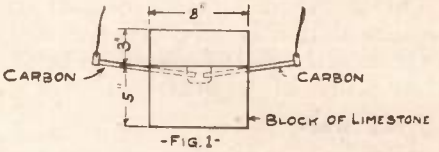
Contributed by
K. W. BROWNING.

ELECTRIC LABORATORY FURNACE.

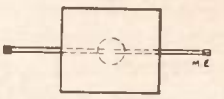
Enclosed herewith please find an article on the construction of a fairly practical electric furnace.

A block of limestone 8x8x8 inches or larger must first be obtained. This block is split in two pieces, one three inches high, the other five inches. This may be done by chiseling a groove around where it is to split, and gradually deepening the groove until the block cracks through. See Fig. 1.

In the center of the larger block a round hole two inches in diameter and one and a half to two inches deep should be chiseled out. Grooves should be dug from the edge of the block to the center hole for the carbons to fit in. See Fig. 2. Then the smaller block may be placed on the larger, covering up the hole, and the furnace is ready to be connected up.

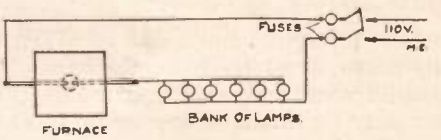


-FIG. 1-



-FIG. 2-

Connect up as in Fig. 3, using a bank of six or eight 32 candle-power lamps in series multiple, or an arc lamp rheostat may be connected in series instead.



-FIG. 3-

This furnace will reduce most of the metallic oxides. The material to be reduced is placed in a small crucible and set on the carbons just over the arc. An amateur's laboratory may hardly be considered complete without a furnace of this kind.

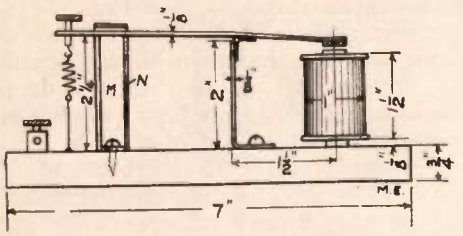
Contributed by
OTTO H. SCHULZ.

AUTOMATIC CUT-OUT.

The following is a description of an automatic cut-out which I found very valuable in automatically opening and closing the circuit. It has often saved the current of the battery from flowing

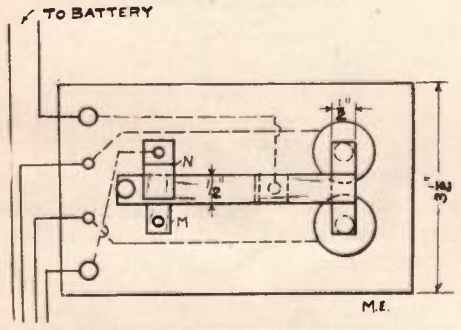
back into the generator after the dynamo has stopped.

First, procure a well-seasoned piece of hard wood for the base ¾ inch thick, 3½ inches wide and 7 inches long. The back must be so cut as to connect wires, as shown in diagram. The magnets are wound to suit voltage; they



must be of high resistance. I used No. 36 wire for 12 to 20 volts.

The armature is made of soft iron. Be sure that it is soft, because if it is not it may forget to release. The strip X is made of a brass bar ⅛x½x5



inches; a slight bend must be given to this piece so as to make the armature parallel with magnetic core. The contact may be made of copper or worked in a mercury cup. The latter is the best when the current is heavy. The copper strip is ⅛x½x2½ inches; add 1 inch for base and contact shown by letter N in diagram.

Another strip of the same width and thickness must be made to keep the contacts closely together. It is fastened just under the brass bar, as shown in diagram. A brass spring is then attached at the end of the brass bar to release the magnet when the voltage drops.

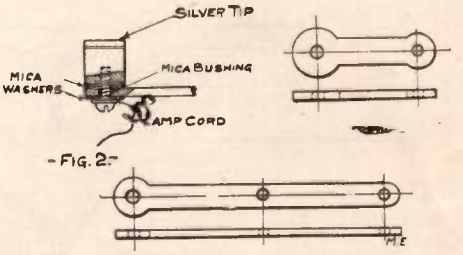
The connections are all shown in diagram. It is best when wiring the cut-out to run the two wires that connect the two inside posts on a separate line to generator or heavy feed, on account of the droppage on the main line. By adjusting brass spring the cut-out may be used as a load regulator, preventing a short circuit.

Contributed by

CRAIG COWLEY.

A WIRELESS KEY.

A great majority of the wireless amateur stations of to-day are pretty well equipped as far as the working qualities go, with the exception of the key, which, when used on a transfor-

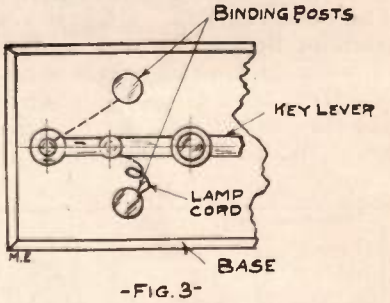


-FIG. 2-

-FIG 1-

mer or a large induction coil—owing to the large amount of energy which is to be carried by them—is usually subject to more or less trouble.

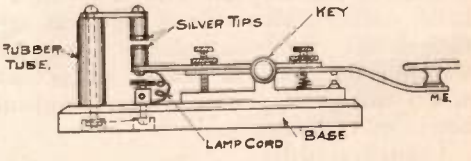
A key of the following type, capable



-FIG. 3-

of breaking large currents, can easily be constructed from an ordinary key.

Figure 1 illustrates the two levers; Fig. 2, the insulated part; Fig. 3, connections; Fig. 4, when finished. No di-



-FIG 4-

mensions are offered, as some keys vary in height.

When a key of this type is properly constructed, it will break almost any current in reach of the amateur opera-

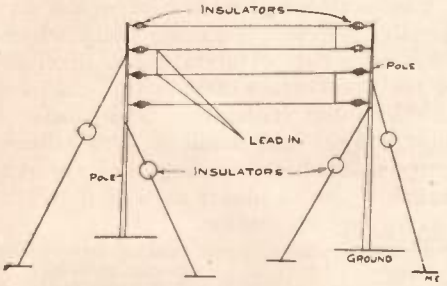
tor which his transformer or induction coil will carry.

Contributed by

CLARENCE J. CARNEY.

NEW IDEA AERIAL.

The accompanying diagram illustrates a new idea for an aerial. It consists of two poles and the wires fastened and insulated on the poles, thus



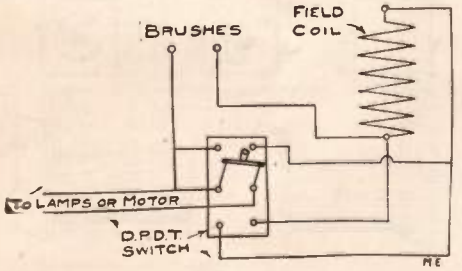
using no spreader. The lead is from the two lower wires.

Contributed by

H. E. STOUT.

REVERSING FIELD WINDING OF DYNAMOS.

Enclosed please find diagram of simple method of wiring a small dynamo



so that the experimenter can change it from shunt to series wound by simply throwing the switch. This makes it possible to get best results in using the current for different things. The only material needed is the wire and a D. P. D. T. switch or two two-point battery switches, connected as in Jos. L. Wurm's description of a reversing switch in January number of "Modern Electrics."

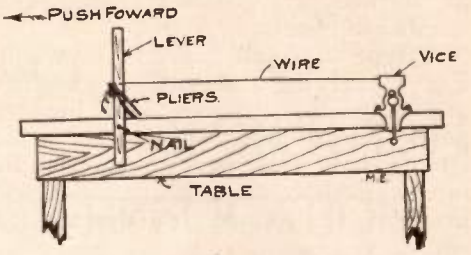
Contributed by

CHARLES SCHLIFF.

WIRE STRAIGHTENER.

A very simple way for straightening soft iron wire for induction coils and transformer cores is as follows:

Cut the wire the right length, then



put one end of it in the vise and hold the other end with a pair of pliers. Hold the pliers in front of the lever and then push it forward until it stretches about half an inch, then take it out of the vise carefully.

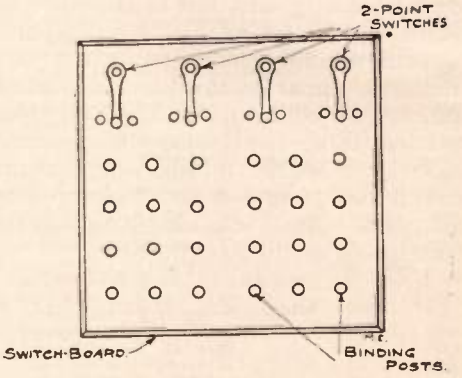
Contributed by

WILLIE LYLE.

SWITCHBOARD CONSTRUCTION.

Every experimenter's group of electrical instruments, whether a wireless set or an experimental outfit of another sort, should be arranged so that necessary changes of connections may be quickly and easily made, without shifting the instruments around or creating an unsightly tangle of wires.

A switchboard adds greatly to both the appearance and convenience of any installation. Its size, arrangement, etc., depend of course on the necessities of the case, and the builder must decide them himself. Small panels, one or two feet square, may be made from



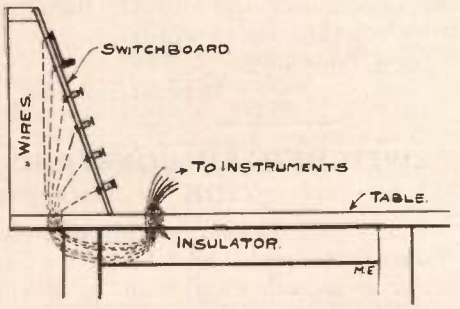
-FIG. 1-

selected pieces of roofing slate, cut to size with a hacksaw. The edges may be beveled with a file, and the necessary holes drilled with a sharp twist drill. A

fine finish can be secured by rubbing with linseed oil. Larger boards may be formed by grouping together a number of panels.

A type of small panel is shown in Fig. 1, carrying a set of four switches and a group of twenty-four binding posts. Connections are quickly made from one binding post to another by means of short pieces of flexible cord, fitted with telephone cord tips at each end.

This panel may be used for a wireless receiving set, in which case the switches are used to cut in or out the



-FIG. 2-

battery and potentiometer, sections of the fixed condenser, different detectors, etc. Leads are brought from all the instruments to the binding posts, and the change from one "hook-up" to another can be made in a few seconds. The different terminals may be labeled or marked, using white enamel paint and a fine brush.

A similar board may be used for small sending sets, but in this case the slate should be as heavy as possible and the binding posts spaced a greater distance appart. Pirelli cable should be used for connectors. For a complete station three panels may be mounted side by side, the middle one carrying aerial and ground switches, lamp bracket, etc., with a receiving panel on one side and a sending on the other.

If the instrument table stands against the wall, the switchboard may be mounted as in Fig. 2. The panel or panels are screwed to a frame at the back of the table, leaning back at an angle to make them more accessible. The wires from the instruments are led down through one or more porcelain insulators set in the table just in front of the switchboard, and come up behind it through a second set of holes. The back of the frame is open and the rear of the switchboard may easily be reached by moving the table out a little way from the wall.

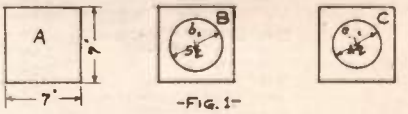
Contributed by

RICHARD BAKER.

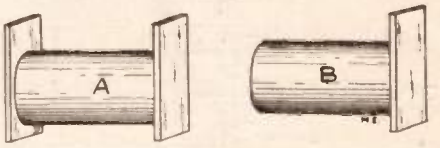
A UNIQUE RECEIVING OUTFIT.

The following is a description of a portable wireless receiving outfit which I made at a cost of about $2.50, exclusive of the receivers which in my case were two 500-ohm receivers. This outfit, although light and small is very efficient, being a combined tuning and receiving transformer. I like it so well that I use it at my regular station.

First procure three pieces of ¼ inch soft wood, 7 inches square and bore a small hole through the center of each of them, to use as a guide in putting together. In one piece saw a circle 5 inches in diameter with a keyhole saw. This circle should be tacked on one of the square pieces of board, with the holes directly opposite each other. (Figure 1.) In the third piece of board, saw a circle 4½ inches in diamerter.



-FIG. 1-



-FIG. 2-

Now get two pieces of heavy cardboard, one 8" x 17" and one 8" x 15". The piece 17" long is tacked on the outside edge of the circle which was tacked on A, Fig. I., and on the inside of the hole which was left in B, Fig. I., thus making a cylinder 8" long with square end pieces as in A, Fig. 2. The other piece of cardboard is tacked on the edge of the smaller circle which was cut out, and on the inside of the square piece of board that was left, thus making a second cylinder with one square end, as in B, Fig. 2.

The largest cylinder is now wound with one layer of No. 24, B & S enameled wire, about three-quarters of a pound being needed. Three binding posts are now put

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NOTE.—Black face type indicates articles of especial interest.

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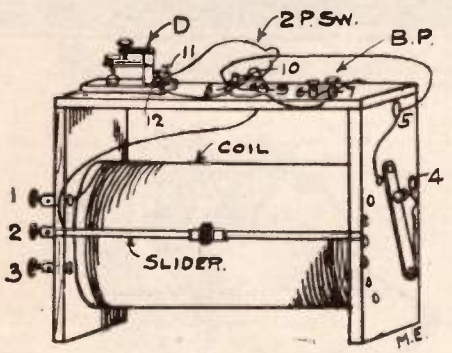
on the left-hand square end of this cylinder and the beginning of the coil connected to the upper one, the end of the coil simply being fastened down out of the way. A brass rod and slider are now



-FIG. 3-

put on the side of this coil, the primary of the transformer, and connected to the second binding post. (Fig. 2.)

Now take cylinder B, Fig. 2, and wind with No. 28, B and S enameled wire, one layer, a lead being run through the cylinder every inch of the winding. These leads are connected to brass tacks on the square end of the cylinder as in Fig. 3.

Slip the small cylinder inside the larger and hold it by a screw put through the holes in the center of each board. Make a switch of a piece of spring brass and

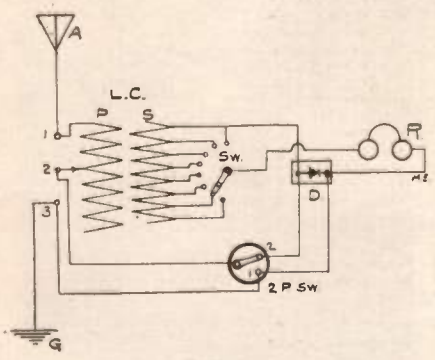


Fig. 4

fasten to the right end of the apparatus.

Be sure and wind these cylinders in the same direction, otherwise they will not work.

A ¼ inch board, 9 x 7 inches is now nailed across the top of the apparatus on which is put a silicon detector stand such as has been described in former issues of the MODERN ELECTRICS, a two-point batswitch, and binding posts for the recievers. (Fig. 3.)

Referring to Figures 3 and 4, connect the beginning of the large or primary coil to the upper binding post, the slider to the second post and to the lever of the two-point switch, the third post to one point of this switch and to one side of the detector, to this side of the detector also connecting one side of the telephone receivers, the other side of the receivers being connected to the switch of the small or secondary coil. The tack to which the first lead of this coil was connected, is now connected to the other side of the detector, the other point of the two-point switch being connected to this side of the detector.

TO OPERATE.

(As a tuning coil circuit.)

Connect the aerial to binding post 1, as per sketch in Figure 4, the ground being connected to post 3. Throw the two-point switch to the side numbered 2 in Figure 4, this side being connected straight to the detector. Be sure the secondary switch is on the first tack of the secondary. This apparatus is used without a battery.

(As a receiving transformer.)

Have the aerial and ground connected the same as in the tuning coil circuit. Throw the two-point switch to the other side, numbered 1 in Figure 4, and move the secondary switch from point to point until the message comes in the loudest.

The way I operate it, I use the tuning coil connection moving the slider back and forth until I find the right spot. Then I change to the transformer circuit quickly and bring the secondary switch up to the last tack when the message comes in loudest.

I find that the transformer hookup will cut out most of the induction caused by the electric light wires.

Contributed by

STANLEY C. BATTLES.

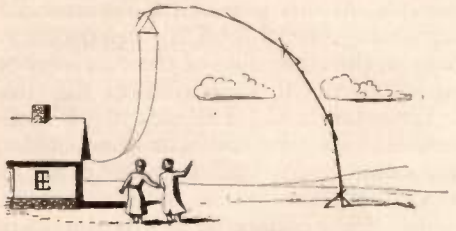
AN ENGLISH THERMO-ELECTRIC GENERATOR.

(Continued from Page 687)

weigh from 4½ pounds to 8¼ pounds, and measure from 15 to 22 inches in length and from 6½ to 7½ inches in height, with a width of from 4¼ to 5½ inches, according to the size and output of the generator.

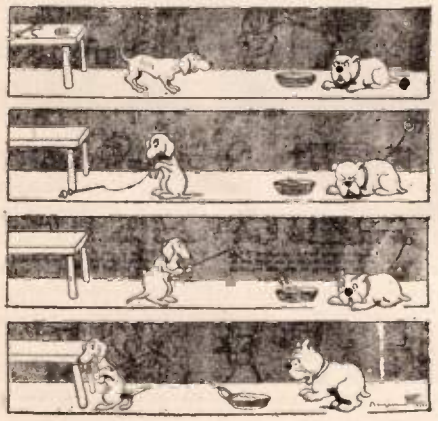
Flying Sparks

STRONGER THAN IT LOOKS.



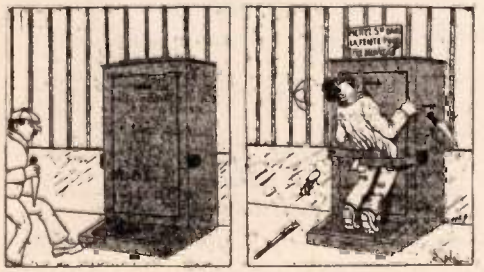
"Your aerial don't look very strong."
"Nonsense. Last week I caught a battleship on it and today even Cape Cod!"

THE MAGNET, THE STARVED PUP AND THE TIN DISH.



A story without words.—Pêle Mêle.

BURGLAR CATCHING SAFE.



Banker De Clever now may sleep in repose thanks to his electric safe which catches the burglar and does not release him until he deposits $1.00 in the slot.—Pêle Mêle.

"GETTING THAT DISTANT STATION"

By W. F. Crosby.

GETTING SQUARE WITH US.

What the fish would do if he caught a man. And what the frog would do, who has not forgotten Galvani's experiment.—Pêle Mêle.

AUTOMATIC EXTINGUISHER.

Mr. Sleepqueek, who always falls asleep when reading in bed has hit upon this new wrinkle to extinguish his candle, so it won't burn all night.—Pêle Mêle.

Wireless Telegraph Contest

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.

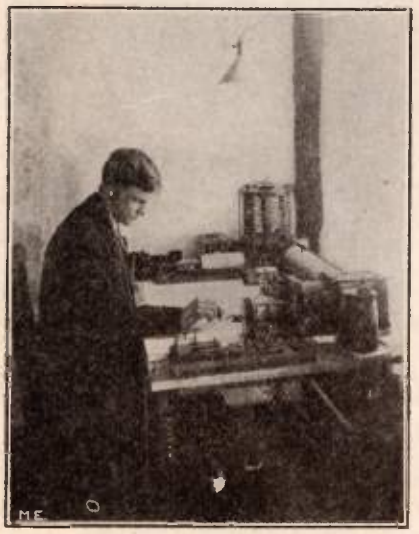
This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE THREE DOLLARS.

Please find enclosed a photograph of my wireless set.

For receiving, I use a large loose-coupler, 1,000 meter, 3 slide tuner, two variable condensers (rotary and tubular), two fixed condensers, silicon, electrolytic and perikon detectors, 2,000 ohm phones, and potentiometer.

For sending I use a 2½ inch coil, interrupter, Morse key, glass plate condenser, zinc gap, and a helix composed



of about thirty feet of number six brass wire, one half inch between turns. To change from sending to receiving I use a triple pole double throw switch made from a double pole double throw one.

My aerial is made of six number 14 aluminum wires spaced two feet apart. One end is fifty feet high and the other forty feet. It is about eighty feet long. I am a member of W. A. O. A., and have had good success with my outfit although I have been interested in wireless but a year. My call letter is B. H. C., and I would be glad to have any amateurs in the vicinity write or communicate with me.

Yours respectfully,
De Kalb, Ill. BAYARD H. CLARK,

HONORABLE MENTION.

I began the study of electricity about five or six years ago. Wishing to have a place to keep my apparatus, I built a little shack near my father's barn. About two years after I had begun the study of electricity, I was seized with an uncontrollable desire to study "Wireless Signalling." I did not do much the first year with wireless, as I did not know of any magazine on such a subject, getting my knowledge from newspapers, encyclopedias, etc. At last I made a discovery: it was "Modern Electrics." Yes, it was "Modern Electrics" that carried me through difficulties and things that seemed impossible for me to understand before. I still keep my old outfit as a souvenir. At the present time I have a professional outfit, which you see in the picture inclosed.

The outfit consists of a one kilowatt, closed core, transformer, the primary taking 116 volts, 60 cycles and 10 amperes, also a 1 k.w. helix, a marble base radiator spark gap, a marble base key and a milli-ampere meter not shown in the picture. Also I have a complete reception outfit. I now have my outfit in my bed-room, as I have outgrown my old shack, I being too tall to stand up inside, and too wide to crawl in at the door. I also own many other electrical apparatus, but I keep these in our basement, so as not to have things confused. I hope to present you with the picture of my wireless telephone set in the near future, and hoping world-wide

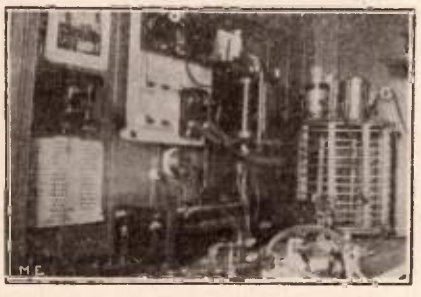
success to the readers, in every country of "Modern Electrics," I remain,

Yours wirelessly,

Michigan. ROY H. COLLINS.

HONORABLE MENTION.

Enclosed please find photo of my wireless set. The entire apparatus, except the phones, spark coil and key, are home-made. The receiving set consists of a large double-slide tuning coil, silicon, carborundum, and electrolytic de-



tectors, fixed and variable condensers; aerial is 60 feet high, 58 feet long, consisting of four strands of No. 14 aluminum wire two feet apart, potentiometer, and a pair of 1,000 ohm receivers; also a loose coupling coil.

The sending set consists of a one-inch spark coil, spark gap, condensers, and a large helix made of No. 4 aluminum wire.

With the above outfit and the help of "Modern Electrics," I am able to obtain good results.

I have also a portable receiving set which gives good results.

HENRY BRYNIARSKI.

New Jersey.

HONORABLE MENTION.

Enclosed please find photo of my wireless station with which I have great success. At the left is my receiving set, which consists of a tuner, three fixed condensers, E. I. Co. electrolytic detector, my own combination detector, and a set of 1,000 ohm receivers. Next to the receiving set is my telephone, which is very handy, as it runs to my bed-room. In front of this is my Eureka 20 ohm sounder, beside this is the sending set, which consists of a 1 inch spark coil, glass plate condenser, (underneath coil). The spark gap is seen on top of the coil, on the side of this is a double

pole switch which I use to throw from receiving to sending. Beside this is my key and the blue book.

My aerial consists of two parts, five wires each. Behind my spark coil is a copy of "Modern Electrics," which I give credit to for my success.

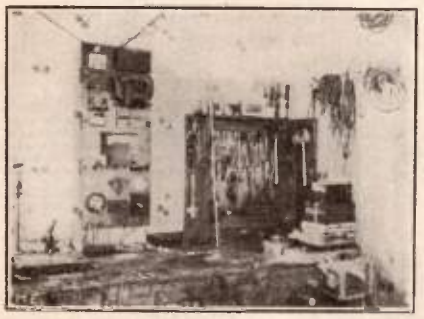
My battery power is derived from a 6 volt-60 ampere hour storage cell.

FRED. BESSERER, JR.

Brooklyn, N. Y.

HONORABLE MENTION.

The enclosed is a photograph of my electrical laboratory. At the top of the switch-board is a transformer by which I can get nearly any voltage between five and one hundred ten, either alternating or direct current. The latter is made possible by using glass jars underneath the bench. Directly below the transformer is the board by which the necessary connections are made to obtain the different voltages. To the left is the D. P. D. T. switch by which I change from alternating to direct current. Below these is an ammeter with mercury switches, which changes the ammeter and voltmeter from the electric light circuit to the battery circuit. The number of batteries used can be controlled by the



six-point switch under the ammeter.

All the instruments mentioned I have constructed myself. The round white disk to the right of the battery switch is the E. I. Co. voltmeter. This meter has been treated very roughly, yet it still registers accurately. Below it is a switch, by which it may be used to read up to forty-eight volts, although it is made to read to twelve volts only. On the left side of the switch-board is a rheostat made by E. I. Co.

The fine set of tools and the useful switch-board are very handy.

ALAN S. DANA.

Portland, Me.

Book Review.

STORAGE BATTERIES.

By A. E. Watson, E. E., Ph. D.

Storage Batteries: Their Theory, Construction and Use. By A. E. Watson, E. E., Ph. D. Bubier Publishing Company, Lynn, Mass.; 160 pages; 63 illustrations. Price, $1.50.

This book by Dr. Watson deals with the construction of storage batteries for the amateur in very plain, practical language, easily understood by the layman.

It also contains an article on the theory of the chemical actions occurring in the cell, and gives the ordinary equations describing these.

Complete instructions are given for the installation and care of storage batteries, as well as practical examples regarding the use of them.

This book has been revised in every detail, and deals with the subject in an up-to-date manner.

A DISTRESS MESSAGE AT SEA.

(Continued from Page 699.)

The operator on the Queen assured himself that all would be safe. "Will you follow us closely? GX."

"Yes, we will. GW."

"We are trying to make San Francisco now. GX."

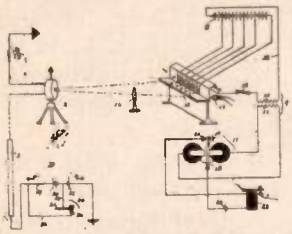
"Can we be of any more help? SG."

"Have fire under control now. Many thanks. GX."

In about five minutes came the message, "We are now under way with fire under control. Good-by. GX."

Electrical Patents for the Month

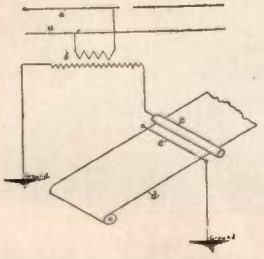
985,760. TELEGRAPHIC RECEIVING ORGANISM. Isidor Kitsee, Philadelphia, Pa. Original application filed Dec. 6, 1909, Serial No. 531,595. Divided and this application filed Jan. 27, 1910. Serial No. 540,417.



1. In cable telegraphy, a receiving device inserted in the line of transmission, a source of light, means at the receiving device to deflect the rays from said source, a selenium organism, a source of current comprising a number of individual electric cells and a series of taps from said electric cells to said selenium organism, each tap embracing a number of electric cells differing from the number of cells embraced by the other taps.

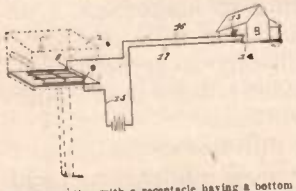
2. In cable telegraphy, a receiving device inserted in

983,536. METHOD OF REMOVING STATIC ELECTRICITY. William H. Chapman, Portland, Me. Filed Jan. 23, 1908. Serial No. 412,231.



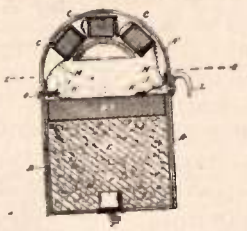
1. The herein described method of removing static electricity from a body consisting of charging an insulated conductor of relatively large area the surfaces of said conductor being insulated with an alternating charge of high voltage, placing the body to be treated within the electrostatic field thus produced and placing a conductor of relatively small area within said field and connecting the same with earth, said small conductor being separated from said body by an unobstructed air space.

983,403. ELECTRICAL SIGNALING DEVICE. Jay Glenn Schafer, Brighton, Iowa. Filed May 24, 1909. Serial No. 497,695.



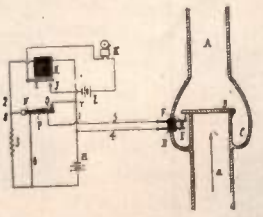
The combination with a receptacle having a bottom; of an insulated plate placed upon said bottom, a series of spring fingers extending across said receptacle each having one end secured to said plate, said ends being all alined on the plate, spaced lugs on each of said fingers, each lug being provided with an opening extending transversely of the respective finger, the lugs on each finger being in alinement with the lugs on the remaining fingers, and yieldable rods extending through the openings in said lugs and terminating adjacent the ends of said plate, a series of contact terminals mounted upon said plate, there being one of said terminals located beneath each of the fingers, a wire connected to all of said terminals, a second wire connected to said fingers, and a signal and battery connected to said wires.

983,766. TORPEDO OR BOMB. Walter J. Turnbull, New Orleans, La. Filed June 14, 1910. Serial No. 566,736.



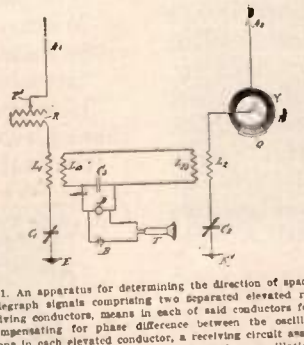
1. A bomb substantially as herein described, comprising a casing open at its top, an explosive within the casing and time fuse mechanism for exploding the charge, a battery in the upper open end of the casing and having contact points, a shell open at the bottom and fitting at the bottom over the casing and having a dome-shape top and provided with contact points movable into connection with the contact points of the battery, an insulator movable between two of said contact points, and a magnet within the dome-shape top of the shell, an air space being provided within the shell whereby to give buoyancy to the bomb, substantially as set forth.

983,861. THERMOSTATIC ALARM. Clark H. Pool, New York, N. Y., assignor to International Electric Protection Company, a Corporation of New York. Filed Mar. 9, 1910. Serial No. 548,126.



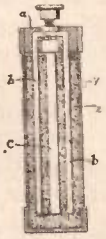
1. A conduit for fluids, a valve therein, circuit terminals in said conduit one of said terminals being a spring and normally held in contact with the other terminal directly by said valve when seated to close said conduit and separating from said other terminal to break circuit upon the lifting of said valve, an alarm device operating by said breaking of circuit, and means for retarding the operation of said device for a predetermined period of time.

984,108. APPARATUS FOR DETERMINING THE DIRECTION OF SPACE-TELEGRAPH SIGNALS. Oscar C. Roos, Cambridge, Mass. Filed Apr. 15, 1909. Serial No. 490,135.



1. An apparatus for determining the direction of space telegraph signals comprising two separated elevated receiving conductors, means in each of said conductors for compensating for phase difference between the oscillations in each elevated conductor, a receiving circuit associated with each elevated conductor, and an oscillation detector associated with said receiving circuit.

985,368. ELECTRIC SECONDARY BATTERY. Parnell Rabbidge, North Sydney, New South Wales, Australia. Filed Sept. 20, 1907. Serial No. 393,832.

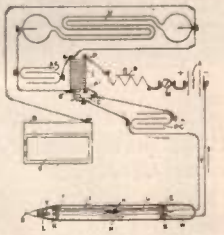


An absorbent for electric cells comprising suitably washed, screened and dried copra, treated with a liquid electrolyte.

984,762. APPARATUS FOR RECEIVING ELECTROMAGNETIC WAVES. Francis A. Hart, New York, N. Y. Filed May 6, 1910. Serial No. 559,768.

1. In a device for the reception of electromagnetic waves, an antenna, two alternative paths to the earth from the antenna, one of said paths consisting of an inductance and a capacity and the other of a capacity and two inductances so arranged that one of the two shall be placed in parallel with a portion variable at will of the other.

983,703. ELECTRICAL WRITING APPARATUS. Dinshah Pestanji Framji Ghadiali, Surat, India. Filed May 21, 1909. Serial No. 497,502.



1. An apparatus of the class described comprising a normally open circuit including a source of electrical energy, a writing desk connected to one pole of the said source of energy and forming one contact element of the circuit, and a pen having one end connected to the other pole of the said source of energy and the other end provided with a needle and forming the other contact element of the circuit.

985,193. CONTACT FOR INDUCTION-COILS. John McIntire, Jersey City, N. J. Filed Nov. 17, 1908. Serial No. 463,024.

1. As an article of manufacture, a contact, and a spring on which the said contact is secured, the contact consisting of a tubular holder, a platinum point having a reduced shank extending through an aperture in the said spring and into the said tubular holder, the shank having a rivet head within the said tubular holder for permanently securing the said platinum point to the said holder and the contact to the said spring.

Original Electrical Inventions for which Letters Patent Have Been Granted for Month Ending February 28, 1911

Copy of any of the above Patents will be mailed upon receipt of 10 cents

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 promptly answered by mail if 10 cents to cover expenses have been enclosed. We can no longer undertake to furnish information by mail free of charge as in the past. There are as many as 150 letters a day now and it would be ruinous for us to continue acting as a free correspondence school.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without renumeration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

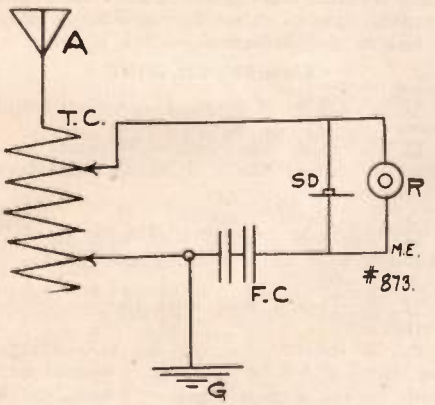
NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT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

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

WIRELESS QUESTIONS.

(873.) Homer Jaggers San Francisco, Cal., asks:

Q. 1.—Is the diagram, which I inclose the best way to hook up the following instruments; Double slide tuner fixed condenser, silicon detector, and two hundred and fifty ohms receivers?



A. 1.—The enclosed diagram is very good and it should give as good results as could be expected with your instruments. A variable condenser connected between the two sliders on your tuner would increase the efficiency of your station.

Q. 2.—Please tell me how to make a Variometer.

A. 2.—In April, 1910, issue of "Modern Electrics" you will find a very good description of a Variometer.

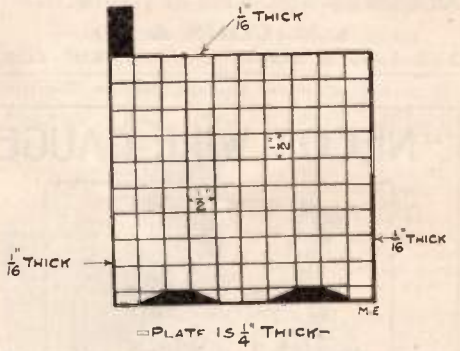
Q. 3.—Will the Electro Importing's ½ K. W. transformer coil with a vibrator send a hundred miles?

A. 3.—No. About 20 miles, using a storage battery, 100 miles with electrolytic interrupter.

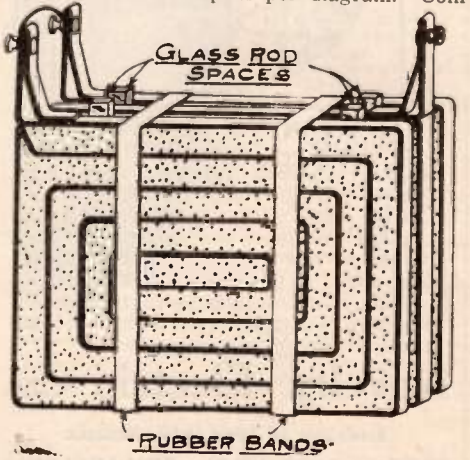
STORAGE BATTERY CONSTRUCTION.

(874.) Henry M. Bille, N. Y., writes:

Q. 1.—I am constructing a storage battery, and would like to know how to construct a mold to cast the lead plates. The plates are the same as enclosed diagram?



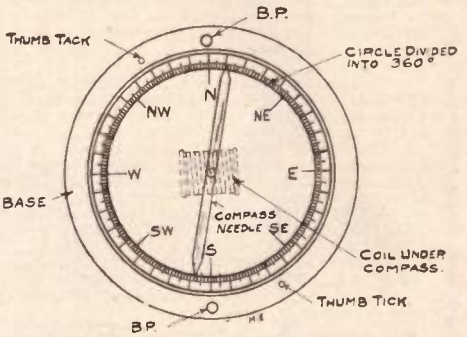
A. 1.—It would not pay you to make a mold. Use lead strip as per diagram. Complete information on this is found in the July, 1909, issue of "Modern Electrics."



GALVANOMETER READINGS.

(875.) V. R. Fox, Buncie, La., writes:

Q. 1.—I have enclosed illustration of a galvanometer. The base is about 2½ inches in diameter. The instrument is in form of a compass. Around the edge of the ring as illustrated, there are marks up to 360 degrees I suppose, divided into 360 parts. Then it is divided into two's, making every mark represent 2. Now what I want to know is this:



I connected this instrument with a dry cell; it registered 50; then connected coil in series with instrument and it registered 4. What is the difference? What does every mark represent and how many to an ohm? There is a coil of fine wire directly under the compass.

A. 1.—As you do not give the dimensions of your instruments, we cannot give you the value of the reading on same. The reading on this style of meter is not directly proportional to the deflection of the needle.

ENAMELED WIRE.

(876.) Wm. Mintzer, Jr., Pottstown, Pa., writes:

Q. 1.—How much enameled wire, No. 26 does it require for a 3 K. W. transformer of the closed core type?

A. 1.—About 29 pounds.

Q. 2.—Does enamel wire have to be run through wax while winding the pies?

A. 2.—No.

Q. 3.—If not how does the pie hold together?

A. 3.—Before winding lay two strings in the winding. When the pie is wound tie the ends of the strings together which will hold the pies in shape. They may then be paraffined to make them more rigid.

DETECTOR MINERALS.

(877.) Jesse K. Jones, Pottsville, Pa., asks:

Q. 1.—What are the most common wave lengths used just now for wireless telephony?

A. 1.—400 to 1,000 meters.

Q. 2.—Please name the minerals now known in the order of their sensitiveness and with chemical formula which exhibit the property of a solid rectifier.

A. 2.—Bornite (sulphide of copper) and Zincite (red oxide of zinc); zincite and chalco-pyrites (copper and iron sulphide), silicon, (Si), molybdenite (molybdenum disulphide), Galena (lead sulphide), carborundum (SiC). The chemical names and symbols are shown in parenthesis.

CHOKE COIL QUERY.

878.) J. C. Moons, Detroit, Mich. writes:

Q. 1.—Will two E. I. Co.'s No. 8050 ½ K. W. transformer coils, in series with a "Gernsback" electrolytic interrupter, affect or flicker the adjacent lights on an ordinary alternating 110 volt city lighting current?

A. 1.—Yes; but by inserting choke coils in series with the transformer, this will prevent the flickering of the lights.

RECEIVING DISTANCE.

(879.) Geo. D. Smith, Jr., Hempstead, L. I., asks:

I have installed a wireless system consisting of a Murdock loose coupler, E. I. C. variable condenser, electrolytic detector, one pair of 3,000 ohm receivers; this consists my receiving side. One 2-inch spark coil, one E. I. C. interrupter, two one-pint Leyden jars, one zinc spark gap and key. We operate with 110 volt, 60 cycle A. C. current. My aerial consists of 7 aluminum wires 120 feet long, high end about 40 feet and low end 25 feet. Please let me know about how far I can receive and my capacity for sending?

A. 1.—You should be able to receive about 400 to 500 miles and send 12 to 18 miles.

MOTOR QUERY.

(880.) D. Kasanof, New York, writes:

Q. 1.—A motor making two thousand R. P. M. is geared to run a circular saw which makes six thousand R. P. M. If the same motor still making two thousand R. P. M. is geared to run the same saw at three thousand R. P. M., will there be a saving of current consumption, and if so, what per cent.?

A. 1.—There will be no saving of current as long as the same work is done with the saw, or in other words, you can saw twice as fast with the high speed and therefore you will do twice as much work in the same time.

THE WALKER PRIMARY CELL.

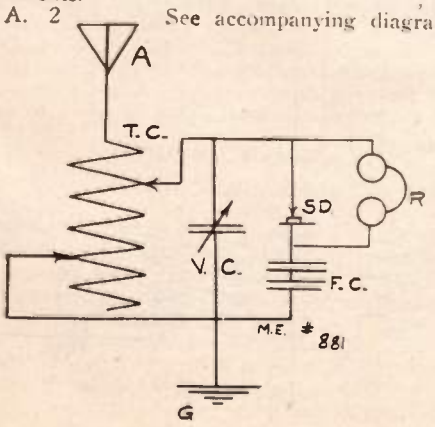
(881.) James Karuza, San Francisco, Cal., asks:

Q. 1.—What would be the receiving range of following instruments? Aerial 40 feet high and 50 feet long composed of 4 wires 1½ feet apart, double slide tuning coil 12x2 inches, fixed condenser, tubular and slide plate variable condenser, silicon detector, and "Mesco" 500 ohm receiver?

A. 1.—100 to 125 miles.

Q. 2.—Give diagram for connection of instruments.

A. 2 See accompanying diagram.



Q. 3.—Is the "Walker" tinpot cell a good battery? It is composed of tincan filled up with iron borings except in centre where there is a porous cup with zinc rod. Solution of caustic potash is used. Give voltage and amperage.

A. 3.—This battery should give an average service on closed circuit. As you do not give the size of the cell we cannot state the amperage. Its voltage is about .07 volts.

1½-K.W. TRANSFORMER.

(882.) Geo. E. Ross, New York, asks:

Q. 1.—Please give data for a 1½ k.w. closed core transformer for use on 110-volt, 60-cycle A. C., giving size of core, amount of wire necessary and number of sections.

A. 1.—Length of core, 16 inches; diameter of core, 2 inches; primary wire No. 12, B. & S. D. C. C.; two layers in primary; secondary wire, S. S. C. No. 30 B. & S.; number of pies ¼ inch thick, 52; weight of secondary, 18 lbs.; thickness of wall of hard rubber tube over primary of same length, ¼ inch.

Q. 2.—Can the above coil be used with a 2-k.w. generator, with lights also used—lights are 40 watt?

A. 2.—Yes.

Q. 3.—Please tell me what number of plates 10x12 inches covered with foil 7x9 inches must be used for above coil.

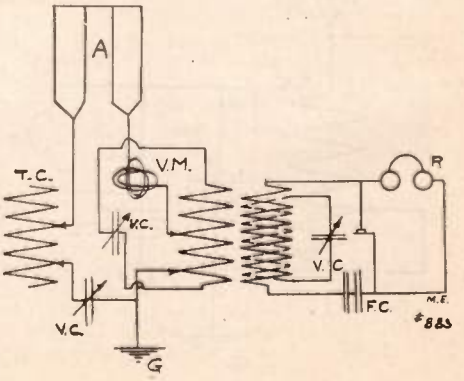
A. 3.—124 glass plates connected in series parallel.

WIRELESS HOOK-UP.

(883.) Eugene F. Naegele, Helena, Mont., says:

A. 1.—Will you please answer in your next issue of "Modern Electrics" whether or not the enclosed diagram is correct; if not, please show me the proper hook-up for the instruments mentioned below.

The loose coupler, of my own make, has two secondary windings, both of which are wound on the same tube side by side. No. 1 secondary is No. 28 B. & S. enameled wire, this winding is used for the detectors and phones, etc. No. 2 secondary is No. 26 B. & S. enameled wire; this winding is used as a kicking coil or choke coil, and a condenser of the rotary variable type is bridged across the whole. In your answer if you find my diagram incorrect kindly publish a correct one, using as many switches as necessary. The following are the instruments I wish to use: Single slide tuner, 400 meters; variometer, made after article in "Modern Electrics";



loose coupler; two variable condensers, rotary type; iron pyrite, silicon and molybdenite detectors; 1500 ohm, Holtzer Cabot receivers; 2 fixed telephone condensers, large capacity.

A. 1.—See accompanying diagram, which gives the proper hook-up for your instruments.

RECEIVING RANGE.

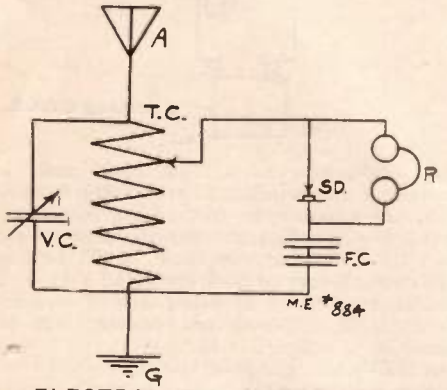
(884.) Hal E. Hoss, Bend, Ore., asks:

Q. 1. Will you kindly tell me what instruments I will need to receive from a commercial wireless station 150 miles away? I have a single slide tuning coil with a wave length of 1,500 meters, and a crystal detecter; can I use these to receive this distance?

A. 1.—Yes; in combination with a fixed, variable condenser and a 1,000 ohm phone.

Q. 2.—Can you send me a diagram showing connections for tuning coil and detector, as I can't make them work?

A. 2.—See diagram.



ELECTROLYTIC INTERRUPTER.

(885.) Geo. E. Joyce, Chicago, Ill., asks:

Q. 1.—I am using an E. I. Co.'s electrolytic interrupter, and I would like to know how far up on the porcelain tube, on the inside of the jar, the solution should come, and whether there should be a flame when the interrupter is connected up direct on 110 V. A. C., in the jar, and in operation.

A. 1.—Half way up the tube. There is a flame-like spark at the end of the rod, which is correct.

Q. 2.—How should two spark coils be connected in series to get the best results, and is it well to connect two coils of different length sparks, in series?

A. 2.—Connect the primary coils in series, and block the vibrators. Connect secondaries in series. Never connect coils of different make or spark length in series.

SENDING RANGE.

(886.) Lewis E. Stoyle, Stoughton, Mass., writes:

Q. 1.—Please advise how far I could send with the following: E. I. Co.'s ½-inch coil, spark gap made from two ½-inch brass balls, aluminum wire helix and four wire aerial 46 feet high and 55 feet long?

A. 1.—One-half to one mile.

Q. 2.—How far with a 1-inch coil?

A. 2.—Two to three miles.

Q. 3.—Please give total wave length of

station having 4 wire aerial 46 feet high and 55 feet long, single slide tuner wound with 400 feet No. 24 enameled wire.

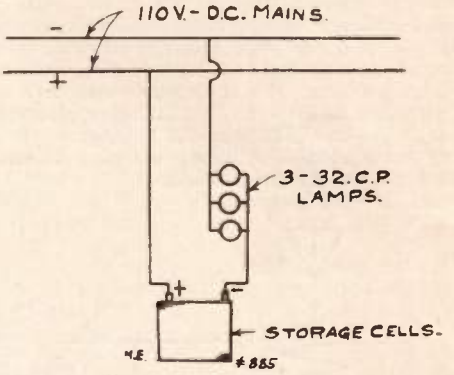
A. 3.—540 meters.

SWITCHBOARD CONNECTIONS.

(887.) Warren E. Lincoln, So. Easton, Mass., says:

Q. 1.—Please give diagram showing how I may enter 3 amperes into a storage battery for 22 hours, using 16 c. p. lamps, to cut down a 110-volt current.

A. 1.—See diagram below.

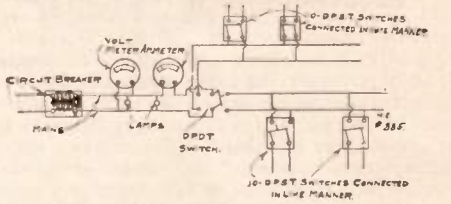


Q. 2.—Where could I get cases made for my alarm and wireless instruments?

A. 2.—Consult our advertising columns.

Q. 3.—Give diagram showing how to connect the following: 20 D. P. S. T. switches (10 on each part of switchboard); a D. P. D. T. switch to throw in either side of board; a D. P. S. T. main circuit breaker; volt and ammeter, and lights if needed.

A. 3.—Diagram given below.



A WIRELESS LIGHT.

(888.) Henry S. Small, York, Pa., asks:

Q. 1.—How would you account for the following: While working in my wireless station I had my d. c. arc light burning and was startled to hear my call repeated distinctly in the arc light. Some one was sending to me. I did not have any aerial or ground connected, simply the arc light burning. The only description I can give of the sound was that resembling the bark of a grey squirrel, decidedly clear and distinct. My arc light was connected in series with a rheostat and connected to the 110-volt, d. c. mains. By putting in my aerial and ground and cutting out the arc I could hear the message in my receivers. The person sending had direct current from the same power house?

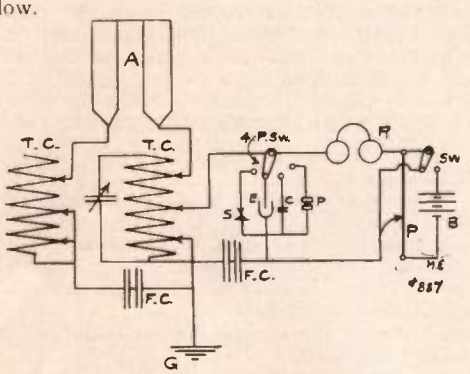
A. 1.—The phenomena which you describe has been observed by a good many people who are located in towns that have one of the dynamos in the power house grounded, or where the lighting current is used for sending. This accounts for the action.

WIRELESS HOOK-UP.

(889.) Alfred J. Hanks, Jersey City, N. J., writes:

Q. 1.—Give me a good hook-up for two three-slide tuning coils, a variable condenser, six detectors, potentiometer, and four fixed condensers, using a loop aerial. How great should be my range, using a loop aerial 75 feet high and 200 feet long?

A. 1.—500 to 800 miles. Diagram given below.



FIRST LEYDEN JAR.

(890.) X. N., New York, asks:

Q. 1.—Where may I find directions for making a perikon detector?

A. 1.—See "How to Make Wireless Instruments," by 20 wireless experts, which we will send for 25 cents postpaid.

Q. 2.—Who made the first condenser?

A. 2.—It was accidentally discovered in 1745 by Peter Van Muschenbroek, in Leyden, Holland.

POTASSIUM BICHROMATE BATTERY.

(891.) Herman C. Kohl, Angola, Ind., says:

Q. 1.—What is the solution for the bichromate of potash cell?

A. 1.—Three parts potassium bichromate, 18 parts water and 4 parts sulphuric acid.

Q. 2.—Is No. 16 B. & S. S. C. C. wire too small for the primary of a 2-inch spark coil, the core of which is 10x1⅛ inches?

A. 2.—Yes; use No. 12 or No. 14.

Q. 3.—Is No. 30 B. & S. copper wire too small for the secondary of a loose-coupled tuner?

A. 3.—Yes; use No. 28 B. & S.

BATTERIES ON WIRELESS OUTFITS.

(892.) M. V. Brant, Nyack, N. Y., asks:

Q. 1.—Will a ½-k.w. transformer run on batteries send just as far as a ½-k.w. transformer run on 110-220 A. C. or 110-volt direct current, using the same instruments in both cases?

A. 1.—If an open core transformer, refer to query No. 873, this issue.

Q. 2.—Which is the best aerial wire, aluminum or copper?

A. 2.—Aluminum. It is cheaper and can be stretched further with less sagging

Q. 3.—Which is the best for wireless, dry batteries or storage batteries?

A. 3.—Storage batteries by all means.

1-K.W. TRANSFORMER.

(893.) Arthur Reutlinger, Grand Island, Neb., asks:

Q. 1.—Is it necessary to have an anchor gap between the helix and the aerial?

A. 1.—No.

Q. 2.—How many volts and amperes does the secondary of a 1-k.w. transformer coil give?

A. 2.—About 20,000 volts and 1/40 ampere. The voltage and amperage depends on the size of the wire, but our answer is for a standard transformer.

Q. 3.—How far can I send with the following instruments: A 1-k.w. transformer coil, electrolytic interrupter, helix, 60 glass plate condenser, with tin foil on both sides 7x9 inches, and an aerial 75 feet high on one end and 35 on the other.

A. 3.—100 to 150 miles.

STORAGE BATTERIES.

(894.) Raymond Stevens, Terre Haute, Ind., inquires:

Q. 1.—Can a 10-volt 60 A. H. storage battery be tested with an E. I. Co. combined volt ammeter (0-12 volts, 0-25 amperes)? If not, what size will it require?

A. 1.—No. A storage cell should never be tested with an ammeter.

Q. 2.—What size fuse will be required for the storage battery?

A. 2.—10-ampere fuses should be used.

Q. 3.—How long will a charge last of a 6-volt 60 A. H. storage battery with moderate use?

A. 3.—2 to 3 weeks, depending how much current you use.

WIRELESS IN MOTOR BOATS.

(895.) A. J. Adams, Jr., New York, writes:

Q. 1.—Would you kindly let me know the distance I can receive with the following instruments on a motor boat at sea: Aerial, 10 feet above water and 20 feet long, composed of four No. 14 B. & S. aluminum wires; receiving instruments, E. I. Co.'s large sized double slide tuning coil, one pair transatlantic type receivers, peroxide of lead and silicon detectors, fixed and variable condensers, potentiometer and batteries?

A. 1.—300 to 400 miles.

Q. 2.—Sending instruments, E. I. Co.'s 1-inch coil, helix, three 1-pt. Leyden jars, key and batteries?

A. 2.—6 to 8 miles over salt water.

Q. 3.—Is propeller a good ground?

A. 3.—Yes.

SENDING RANGE.

(896.) Earl Grant, Boise, Idaho, says:

Q. 1.—How far can I send with a ¼-inch spark coil, spark gap, sending key, one 2-cell storage battery, helix wound with No. 4 aluminum wires, 8 turns, and fixed condenser; receiving, one pair 2,000 ohm receivers, one 300-meter tuning coil, electrolytic and carborundum detectors, one battery, also fixed condenser?

A. 1.—Sending ⅛ to ¼ mile, receiving 200 to 300 miles with a 50-foot aerial.

CONDENSER QUERIES.

(897.) Arthur Lukach, New York, writes:

Q. 1.—I have, made a fixed condenser which consists of 24 pieces of tinfoil 2x4 inches, and 23 pieces of paper 2x3 inches. The tinfoil extends first to one side and then the other. Is this the right amount of tinfoil?

A. 1.—Yes.

Q. 2.—Will shellacking the paper between the tinfoil improve it any?

A. 2.—Yes, but a better method is paraffining the paper.

¼-K.W. TRANSFORMER.

(898.) N. Grubman, New Orleans, La., writes:

Q. 1.—I have just completed a wireless transformer and want to know what rating in k.w. it is. Description: The core is 14 inches long, 2 inches diameter, ⅛-inch hard rubber tube over core. Primary, 2 layers of No. 19 d. c. c. wire, each layer separated by a layer of empire cloth, ⅛-inch hard rubber tube over primary. The secondary is made of 4½ pounds of No. 28 S. C. C. wire, wound in 2 sections; each section has 17 layers, being separated by a layer of empire cloth. After it was finished I boiled the whole thing in paraffine. The transformer is run with an interrupter of my own make and draws less than 3 amperes. It gives a heavy ¼-inch flame at the secondary; it will fuse ⅛-inch brass rods ⅛ inch apart. I can light 3 to 4 16-candle-power lamps on the secondary.

A. 1.—Your transformer is not proportioned very good, especially for a wireless transformer. Its rating is about ¼ k.w.

OPERATING RANGE.

(899.) H. C. Rosen, Monroe, Wash., writes:

Q. 1.—What is the receiving range of the following instruments: Silicon and peroxide of lead detectors, D. S. tuning coil, 1-var. condenser and two fixed condensers, potentiometer, etc.; aerial composed of four aluminum wires 40 feet high and 100 long?

A. 1.—100 to 125 miles.

Q. 2.—What would be the necessary transmitting instruments for a distance of three miles under all conditions?

A. 2.—1-inch coil, adjustable condenser, zinc spark gap, sending helix, key, five dry cells, D. P. D. T. switch.

Q. 3.—Could a storage battery be used for a 4-inch coil; if so, what kind?

A. 3.—Yes. A 10-volt 60-ampere battery.

REWINDING SPARK COIL.

(900.) Boyd Sweet, Guthrie Center, Iowa, asks:

Q. 1.—If a spark coil having fifty times as many turns on its secondary as on its primary would have the secondary terminals connected and a third winding of twenty times the number of turns in the secondary properly insulated, would the voltage be one thousand times that of the primary, providing that the wires were thick enough?

A. 1.—Yes; providing the coil is proportioned to receive this third winding, and if the wire added is of the same size as that already on the secondary.

HIGH FREQUENCY CURRENTS.

(901.) C. A. Bilms, N. J., writes:

Q. 1.—Is it better to connect two phones in series or multiple, with the rest of the outfit?

A. 1.—The phones are connected together in series in themselves, but are connected in series parallel with the detector.

Q. 2.—Could I work coil (about 1 inch) formerly used for automobile, on 110 V. A. C.?

A. 2.—Although it is not advisable to use an ordinary spark coil on 110 volts, it is sometimes done by screwing the interrupter up tight. We would advise you not to use your coil in this manner, as it may ruin it, due to the excessive voltage.

Q. 3.—Does low or high frequency current penetrate into the wire? Any different effect on iron wire?

A. 3.—A high frequency current does not penetrate into the interior of the wire, but passes only along the out surface. Iron wire may be used if it is heavily galvanized, but the magnetic effect of it is quite a hindrance to efficient work.

WHO MAY WRITE CONTRIBUTIONS?

(902.) Jacob Landau, Louisville, Ky., asks:

Q. 1.—Must an individual who writes articles for your paper be a subscriber to it? If he is not, will his articles be accepted?

A. 1.—Everybody is invited to write articles for "Modern Electrics." You do not need to be a subscriber, and articles if satisfactory will be accepted and paid for.

Q. 2.—If you say a receiving station can receive 200 miles, what do you give as the power at the sending station?

A. 2.—The sending station must generate about 1½ to 2 k.w.

Q. 3.—What will three strips of lead as described in "Modern Electrics" July, 1909, article on storage battery, cost if purchased from E. I. Co.? Also what will a glass vessel cost that will hold the battery plates for that storage battery?

A. 3.—We advise you to inquire directly of the Electro Importing Co., and they will furnish you with prices on same.

TUNING COIL QUERIES.

(903.) Robert F. Adams, Carmine, Tex.:

Q. 1.—I have my wireless instruments connected up as shown by enclosed diagram, with aerial as shown. The tuning coil is made by winding 65 feet of No. 20 enameled wire on a core 8 inches long by 1¼ inches diameter, which I intended to use in connection with my large tuning coil for closer tuning, but last night I heard Galveston calling AZ, and could tune in very loud by using the small coil alone and with slider only about one-third of the way down. Please explain how you think Galveston, with a wave length of 425 meters, could be tuned in on such a small coil. What seems curious to me is that above station came about twice as loud on the small coil as it did on the large coil, which contains over 1,600 feet.

A. 1.—The answer seems to be that, as far as we can ascertain from the information which you give us, your large tuning coil was too large in connection with your big aerial, and the smaller tuning coil for closer tuning is of course considered better anyhow, than the larger coil for a wave length of 425 meters.

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Advertisements in this column, 2 cents a word, no display of any kind. Payable in advance. Stamps not accepted. Count 7 words per line. Minimum, 2 lines. Heavy face type 4 cents a word. Minimum, 3 lines.

Advertisements under "Wireless" 5 cents a word. Minimum, 4 lines. Wireless books and blue prints not listed under "Wireless," 2 cents a word.

ADVERTISEMENTS FOR THE APRIL ISSUE MUST BE IN OUR HANDS BY MARCH 25.

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WIRELESS

WIRELESS FIENDS.

Phosphor Bronze Aerial Wire as used by Government, the best yet. Just imported 25,000 feet. 1½ cts. per foot. Bornite and Zincite, the most sensitive combination, 50 cts. per set. Zincite and Copper Pyrites, 50 cts. per set. Silver plated brass cup for mounting crystals, 10 cts. each. Sliders (for square rod ¼-in.x¼in.) with ball and spring, 20 cts. complete. Black Asphaltum, Black and White Shellac, liquid ready for use, large bottle, 25 cts. Spool containing 1000 Ohms No. 50 Copper Wire, 60 cts. Silicon or Molybdenite, large piece, 15 cts. Send postage stamp for 128 page Catalog.

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Attention Wireless Experimenters. We have the best assortment of wireless instruments in Detroit. We keep everything in stock, no delay. Send 2 ct. stamp for catalog. Seidler, Miner Electric Co., Detroit, Mich.

FOR SALE: 1 tuner, 1 Silicon detector, 1 zinc spark-gap, 1 12-glass plate sending condenser, 1 fixed condenser, 1 marble switch-board with two double throw switches. Price $5.00 Edgar C. Boydston, Douners Grove, Illinois.

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SEND STAMP FOR INFORMATION of a new detector. A thousand miler. For this month only. Allan F. Beacome, Wireless Expert, 174 West 95th street, New York City.

FOR SALE: 100 mile receiving set with aerial. P. Mertz, Norris avenue, Jamaica, N. Y.

ENAMELED and stranded copper Antennae wire at a big discount. Send for list prices and discounts. Can save you money. B. Kendig, 7th avenue, Mt. Vernon, N. Y.

SPECIAL PRICES. 1,000-ohm wireless receiver, double pole, special thin diaphragm, hard rubber case, wound with copper wire, $1.75. Leather covered head band, double, $1.00; single, 0.60. "National" receiving condenser, $.30. Waterhouse Bros., Bourne, Mass.

IRON PYRITES, known as Ferron, also Finest Pyron. Ferron crystals 15 cents, pyron 50 cents each, thoroughly tested.

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EXCHANGE: Wattmeter for open core transformer. F. Suchemck. 430 East 72nd street, New York City.

FOR SALE: ½ K. W. transformer. open core. Price $12. Geo. D. Mallory, 562 Ogden street, Bridgeport, Conn.

WANTED. ¼ K. W. sending outfit. W. L. Welch, 100 Broadway.

SILVERING MIRRORS bring astonishing profits at little outlay, explicit directions. A. M. Owen, 225 Jackson street, Pueblo, Colo.

HELIX CLIPS! Fit No. 0 to 14, wires; ebony finish; perfect contact; 25c each, 40c pair. We build apparatus to order. The Edelman Laboratory, 2432 Lyndale avenue South, Minneapolis, Minn.

FOR SALE: 2 K. W. oscillation transformer and copper jars; never used. Cost $250. Sale $45. D. F. Bernhardt, New Brighton, S. I.

FOR SALE: 1 1-K. W. closed core transformer, 1 key, 1 condenser. All new. $25.00. Ralph Terry, Lowell, Wisconsin.

FOR SALE: ½ K. W. direct current dynamo. 110 v. 4 amp. In perfect condition. Irving Patridge, Milbank, S. D.

FOR SALE: One complete wireless receiving and sending station. Walter Dziadik, 130 Main St., Derby, Conn.

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LOCAL REPRESENTATIVE WANTED. Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. This is an exceptional opportunity for a man in your section to get into a big-paying business without capital and become independent for life. Write at once for full particulars. Address E. R. Marden, Pres., The National Co-Operative Real Estate Company, L593 Marden Bldg., Washington, D. C.

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Junior Fixed Condenser. Used in all modern receiving sets. Special dielectric giving extra high capacity. Sealed in hard rubber base with binding posts, as shown. Sells for $0.50.

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Electric Scarf Pins. Many unique Styles. Fitted with cord and plug, and attachable to any flashlight by removing the lamp. Scarf Pin sells for $0.45.

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Zinc Spark Gap mounted on hard rubber base. Electrodes fitted with rubber handles. Pure zinc rods. Used in all of the best stations. Spark gap sells for $0.60.

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Voltmeter or Ammeter, 1-15 volts 1-15 amperes. 2½-inch face, heavily nickeled and reliable. Dead beat, a first-class instrument. These meters sell for $2.00.

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Automatic Blow Torch. The handiest torch made. Gives a solid blast of flame for soldering purposes, without any artificial blowing. The very latest. Torch sells for $0.35.

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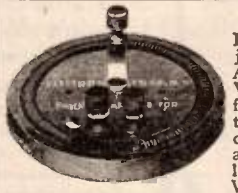

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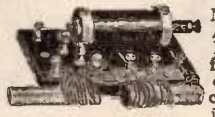

"Electro" Medical Coil. A1 quality. No end of fun with one of these coils, besides its therapeutic properties. Complete with cords and handles. Medical Coil sells for $0.70. Add 12 cents for postage.

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"Electro" Amateur Phones, 2000 ohms resistance. Wound with No. 50 copper wire. Thin diaphragms. Leather covered adjustable headband. Weight 15 oz. 80 per cent. better than 75 ohm phones. Phones sell for $4.50. Add 25 cents for postage.

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Modern Electrics Publication

233 FULTON STREET - - - NEW YORK CITY

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Send us $1.00 cash, stamps, or money order, and in return, we will send you:

1—Modern Electrics for one year (March issue free)	$1.00
2—Book, How to Make Wireless Instruments, cost	.25
3—Book, The Wireless Telephone, by H. Gernsback, cost	.25
4—Book, Construction of Induction Coils and Transformers, by H. W. Secor, cost..	.25
Total.....	$1.75
(If books are to be mailed add 6c. postage)	
TOTAL NET SAVING.....	.75

GREAT WIREESS OFFER NO. 2.

Send us $1.00 cash, stamps, or money order, and in return, we will send you:

1—Modern Electrics for one year (March issue free)	$1.00
2—Wirless Code Chart, cardboard; size 9x12 in., Morse, Navy and Continental codes	.10
3—Wireless chart with 20 Wireless Standard "Hook-ups"	.10
4—Join the Wireless Association of America, and Wireless Pin	.20
5—Official Wireless Blue Book, 32 pages, and 13x10 in. chart of U. S. stations	.15
6—Any one of the 3 books shown in offer No. 1	.25
Total.....	$1.80
(Mail charges for Items 2, 3, 4, 5, 6, 8c. extra.)	
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OFFER NO. 3.

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1—Modern Electrics for one year (March issue free)	$1.00
2—Linen Binder (automatic) holds 12 issues M. E., gold stamped	.50
3—Any one of the 3 books shown in offer No. 1	.25
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(Mail charges for Items 2 and 3, 15c. extra.)	
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Send us $1.00 cash, stamps, or money order, and in return, we will send you:

1—Modern Electrics for one year (March issue free)	$1.00
2—12 back numbers of Modern Electrics, all consecutive numbers, all in good condition, each 10c.	1.20
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Modern Electrics Publication 233 Fulton Street, New York, N. Y.

When writing, please mention "Modern Electrics."

When writing, please mention "Modern Electrics."

E. I. CO.

8000

New Orleans, La.,
Jan. 11, 1911
Electro Importing Co.
Dear Sirs:

It may be of interest to you to know, that I communicate with a friend in Baton Rouge every night with my ½ K. W. Transformer coil, a distance of about 70 miles air line, My coil is working excellent, and anyone wishing to buy a coil, cannot make a better move than by purchasing one like mine.

Hoping this will be good news, I remain,
Very truly yours,
Bernard Oppenheim,
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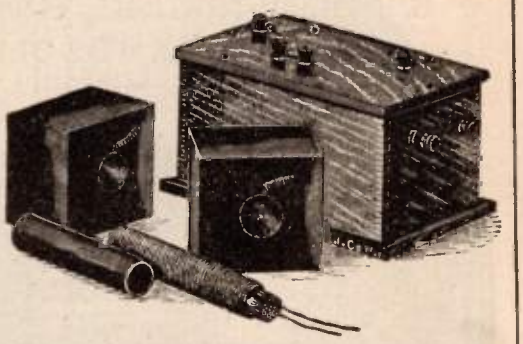
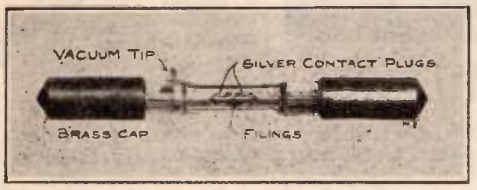


8050

Above letter came **UNSOLICITED.** It is one of the many we have in our files. It seems unbelievable that we can turn out goods that perform such extraordinary service at such low prices. The explanation is: quantity. Any one can possess our ½ K. W. 8050 transformer coil and we guarantee its range. This transformer is used in conjunction with our No. 8000 Gernsback Interrupter on 110 volt circuit, either D. C. or A. C. Price of the transformer is **$7.50**; price of Gernsback Electrolytic Interrupter, **$2.25.** During this month we will send the transformer and the interrupter on receipt of with **privilege of inspection.** **$3.00** The outfit will be sent by express Balance to be paid after inspection If goods are not as represented return them to us and we will refund money. This special offer ought to appeal to you. **ORDER TODAY.**



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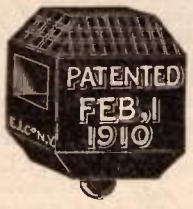
This imported coherer, made by the German Telefunken Co. and used by the U. S Government is the best coherer on the market today. It has solid silver plugs and with a fairly sensitive relay will work up to 300 miles. This coherer is "fool proof" and will stand a tremendous amount af abuse. Heavy nickel tubing for connections at each side. Sells usually for $5.00.

Our Price this month **$2.50** By Mail 5c Extra



SPECIAL WIRELESS OFFER

If you ever wanted to make your own tuning coil, here's your chance.
Positively this Month only! Order Quick.

One pound No. 24 enameled wire	**$1.02**
Two No. 2222 hard rubber sliders (one red, one black)	**.40**
One and one-half feet ¼ inch square brass rod	**.30**
Regular price,	**$1.72**

Special price for above four items **$1.25**

SPECIAL GEISSLER TUBE SALE

We give below a list of some tubes on which our stock is too large at present and the tubes are sold therefore, **almost at cost.** If you have a spark coil you cannot afford to do without a Geissler Tube, and if you have a Wireless set, you should use a **Geissler Tube in your aerial** and when the tube lights up brightest you are radiating the maximum amount of energy. These tubes are the most beautiful ones made and are perfect in all respects. The 4 inch tubes are not catalogued by us but are an odd length which were manufactured by mistake.

4 inch Geissler tube, plain	**25c**
4 inch Geissler tube, with fluorescent liquid	**35c**
No. 1126, 8 inch Geissler tube, with fluorescent liquid, regular price 60 cents	**now 50c**
No. 1128, 12 inch Geissler tube, with fluorescent liquid, regular price 60 cents	**now 69c**

ANY OF THE ABOVE BY MAIL EXTRA 10 CENTS

NEWS

The Phones which SAVED THE "REPUBLIC"

(OR RATHER ITS 500 HUMAN BEINGS)

Operator Binns the famous C. Q. D. man used our Phones

TRANSATLANTIC TYPE

WE GUARANTEE EACH RECEIVER FOR ONE YEAR

1305

These receivers embody the finest workmanship, and in connection with our various Detectors and other instruments are so marvelously sensitive that they will talk loud and distinct where others would not respond at all. We make the broad and sweeping statement that our receivers are absolutely the most sensitive in the world now—without any exception and regardless of price.

The weight is 50 per cent. less than other similar receivers; operators do not tire with these even if carried hours at a stretch on head. The head band is adjustable to fit any size or any shape head; the stirrups holding the phones are made so ingeniously that the phones are pressed tight to the ear, excluding all external noises.

Each receiver is wound to 1000 OHMS with No. 50 single silk copper wire which explains the extraordinary sensitiveness. Some makers use No. 40 silk covered or enameled wire. This is absolutely unfit to use as we found through long experiments. No. 50 wire costs six times as much as No. 40, but we use it because WE INCREASE with its use the AMPERE TURNS and the receivers consequently become infinitely more sensitive. We guarantee each receiver to stand the following extraordinary test: Moisten the metal receiver cord tips. When both are touched the reciever will respond! The voltage generated by the metal tips is less than 1/100,000 the amperage less than 1/1,000,000 (one millionth.) Bands and receivers finely nickel plated. Silk conductor cords, 6 feet long, etc.

1305 Head Receiver (2) with head band (as cut) complete, **$6.35**

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NICKEL PLATING OUTFIT. The neatest thing ever placed on the market. Do your own nickel plating and make money by nickel plating for others. Works on 2-3 wet batteries. Complete outfit with salts anodes, etc..... **$2.25**

COPPER PLATING OUTFIT. Requires No Batteries. You can copperplate beetles, lace, metal parts, flowers, etc, with this fine outfit. Unmatched for simplicity and efficiency. Price **$1.50**

UNIVERSAL DETECTOR STAND

We have 100 of these detector stands left as we discontinued manufacturing them. To clear the lot, we will sell them at **75 Cents each prepaid.** This Detector Stand comes with a pair of tweezers to handle the crystals. This is one of the best detector stands ever sold at this price and we are sure you will like it.

HAVE you a copy of our famous **196 Page Electrical Cyclopedia No. 9,** containing over **400 illustrations?** The most wonderful book ever printed, containing more information on **all** electrical and **Wireless** subjects than a $3.00 text-book. Send 4c postage today and we will promptly mail it. Postal cards NOT answered.

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Experimenting with the Tesla Coil.
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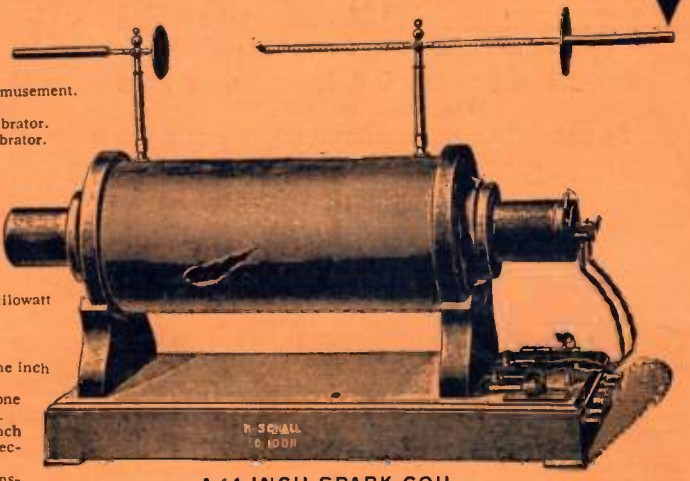
How to build one-half to 3-kilowatt Closed Core Transformers.

APPENDIX

Table of Spark Coil Dimensions one inch to twenty inch.
Table of Spark Coil Dimensions, one inch to twelve inch, *heavy spark.*
Table of Dimensions one-quarter inch to ten inch with enamel wire secondaries.
Table of open and closed Core Transformers ½ to 3 K. W.
Table of Glass Plate Condensers, for Transformers up to 5 kilowatt and spark coils 1 inch to 12 inch.
Table of Sparking Distances for various voltages.
Inductivities of Dielectrics and method of finding condenser capacity.
Tables of turns per inch and feet per pound of insulated magnet wire.
Table of Soft Iron Core Weights.
Tables giving the cost of wire, raw material, etc.



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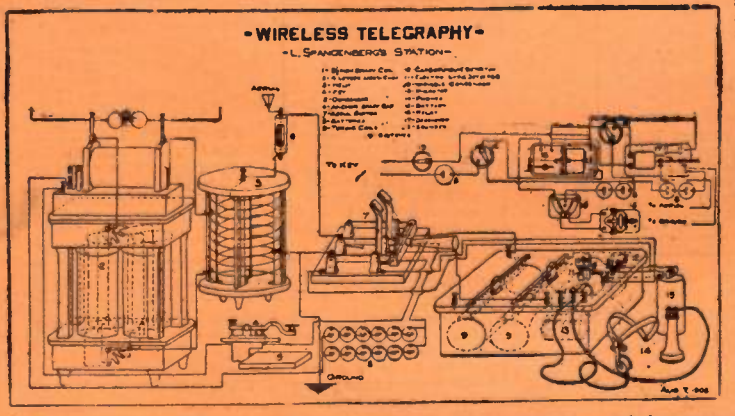

How to Make

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a microphone detector.
a simple antenna.
a spark gap muffler.
a 1000-ohm relay.
a carborundum detector.
a bare point electrolytic detector.
a selective tuner with weeding out circuit.
a coil vibrator attachment.
an electrolytic detector.
suspend and insulate aerials.
an iron pipe aerial.
a tantalum detector.
a small transformer.
a transmitting helix.
a potentionmeter.
an interupter and detector combined.
an electrical resonance apparatus.
a wireless without aerial.
a talking condenser.
a two-mile wireless station.
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