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MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

N. S. E.

MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Edited by H. Gernsback

Volume V | AUGUST, 1912 | No. 5

CONTENTS

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Modern Electrics

VOL. V. AUGUST, 1912 No. 5

The Practical Electrician

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

By PROFESSOR W. WEILER, of the University of Esslingen, (Germany)
Translated by H. GERNSBACK

CHAPTER IV
(Continued)

85. CALIBRATING BY MEANS OF A STANDARDIZED VOLTMETER.

THE method of doing this is shown in Fig. 122. The current from the battery, B, or a dynamo is sent through a variable resistance, W, while the voltmeter to be calibrated, Gv, and the standard voltmeter, GN, are placed, in multiple, between a and b. By changing W, the two instruments are easily compared.

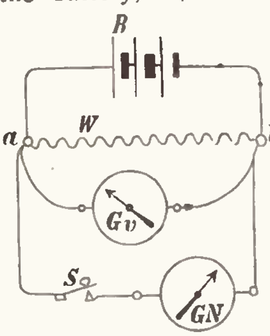


FIG. 122.

CALIBRATING BY MEANS OF AN ACCUMULATOR.

This method is shown in Fig. 123. A piece of German silver wire, from 1 to 2 yards in length, is connected to the poles of the storage battery, the E. M. F. of which is usually about 2 volts providing it has been in use for a little while.

The distance, AB, is divided into 10 equal parts. A is connected with the voltmeter, which is to be calibrated, V; the other end of V is connected to a resistance, R, of about 550 ohms. The contact, C′, can be moved back and forth on B. If C′ is at B the voltage in the circuit is 2. If C′ is moved to the point, C, we will have impressed upon the voltmeter, a voltage of only 0.8 of 2 volts, or 1.60 volts.

CHANGING VOLTMETER FOR HIGHER VOLTAGE.

If an instrument is constructed to be used up to 100 volts and if we put in

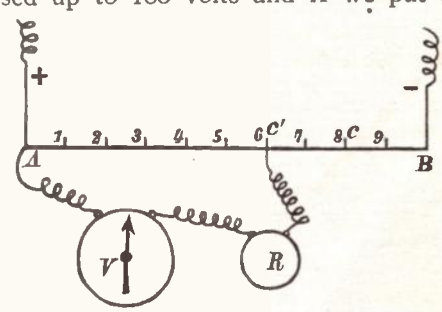


FIG. 123.

series with the instrument, a resistance having the same resistance as that of the instrument itself, we can then measure up to 200 volts. If we use a resistance having 9 times the resistance of the instrument it could then be used up to 1000 volts, and each scale division would then have 10 times its original value, thus, if the instrument indicated 15 volts, the voltage would really be 150. A resistance so used is called a multiplier. It must not be forgotten, however, that by using a multiplier on a voltmeter its sensitiveness is decreased.

EFFECT OF TEMPERATURE ON THE VOLTMETER.

While the effect of the temperature may be disregarded, as far as an ammeter is concerned, the temperature in the case of the voltmeter, is of some importance if accurate measurements are to be taken.

Suppose the copper winding has a resistance of 400 ohms., at 15° C. At 25° C., R_1 is $400 (1 + 0.0038 \times 10) =$ 415.2 ohms. If the windings were made of German silver wire the error would be 16 times less. For this reason voltmeter multipliers are usually wound with German silver wire.

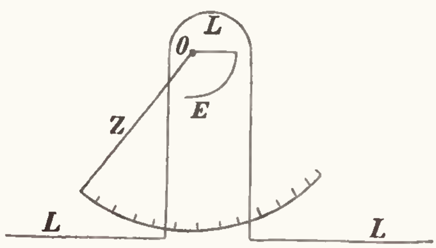


FIG. 124.

86. AMMETER AND VOLTMETER. HUMMEL.

THE. PRINCIPLE: The action of this ammeter and voltmeter rests on the principle that every conductor traversed by an electric current attracts iron.

If, in Fig. 124, L is the conductor, and E a very thin piece of iron foil which turns on the Axis, O, and is rigidly attached to the hand, Z, the center of gravity of E and Z lies below the axis, when the hand, Z, rests at O. When the current flows through the conductor, L, E is attracted, and Z is deflected.

The system will be in equilibrium when the electromagnetic attraction equals the mechanical action of gravitation. As the current varies in L, the hand, Z, will change its position, proportionately. If the loop, at L, is composed of a single turn of heavy wire or ribbon, or only a few turns, the instrument is termed an ammeter.

In order to construct a voltmeter it is necessary to substitute a solenoid containing many turns of fine copper wire for the loop, L.

The Hummel instrument is shown in Figs. 125 and 126. The iron foil, E,

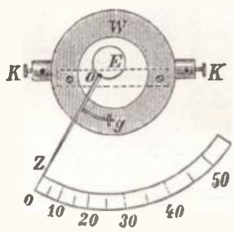


FIG. 125.

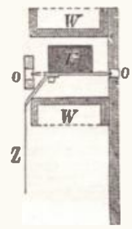


FIG. 126.

which may also be an iron tube having a very thin wall, and being slotted from end to end, turns about the axis, OO, Fig. 126. This axis is parallel with the axis of the solenoid, and is also eccentric, *i. e.*, it does not coincide with the axis of the spool.

The hand carries an adjustable weight, g, which opposes the current action and may be regulated by shifting the weight along the small screw in order that Z may be brought exactly to O. The resistance of the winding on the spool is at least 400 ohms, of which, one-sixth is copper, and five-sixths, German silver. If this voltmeter is to be used for 100 volts the resistance should be about 3,000 ohms of which 500 are copper, and 2,500 German silver. The copper wire should be No. 33. B. & S. single silk insulated, and consists of about 6,000 turns. The German silver wire is for the purpose of reducing the errors due to temperature changes; and, for this reason, such a voltmeter may be used continually in a circuit. Another important feature possessed by this voltmeter is that a very small mass of iron is enclosed in a very

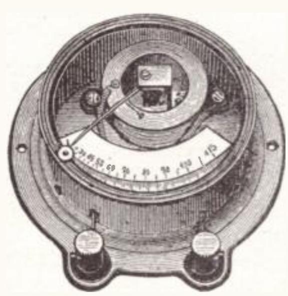


FIG. 127.

powerful magnetic field; and, for this reason, outside magnetic influence can be entirely neglected.

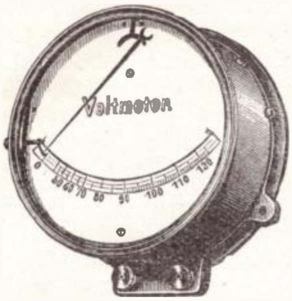


Fig. 128.

Inasmuch as neither the attraction of the spool, nor gravity ever changes, the instrument will read correctly at all times. This instrument may also be used on alternating currents and will also show the same voltage.

Fig. 127 shows an ammeter of the same construction, this instrument having a heavy wire winding of but few turns. The cross section of the wire is determined by the largest current to be measured while the number of turns is calculated from the smallest current which is to be measured by the instrument.

86. INSTRUMENTS WITH PISTON ACTION.

The instruments of the German General Electric Company are made on the principle of the piston action of a piece of iron drawn into a solenoid.

Fig. 128 shows the outside of the voltmeter. Figs. 129 and 130 show the construction. The spool, a, carries a small brass U-shaped piece, b, which carries the axis, c, which, in turn, is mounted in fine bearings. The axis carries also

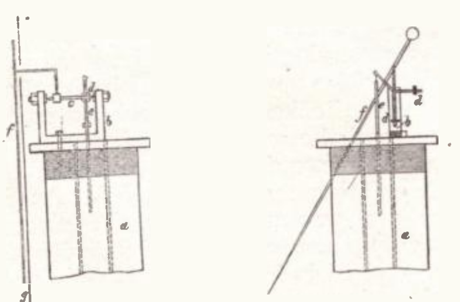


Fig. 129.

the regulating weights, d, and the iron core, e, composed of fine iron wires.

By having a longer or shorter core, a scale of most any size may be constructed. For 110 volts, one part of the scale equals 0.098 inches. This principle may also be used for alternating currents.

In the instrument of Hartman & Brown, shown in Fig. 132, the same principle is used. Also the instrument of Kohlrausch, in Fig. 131, uses this principle. These instruments are built for class-room work and differ only as to their windings.

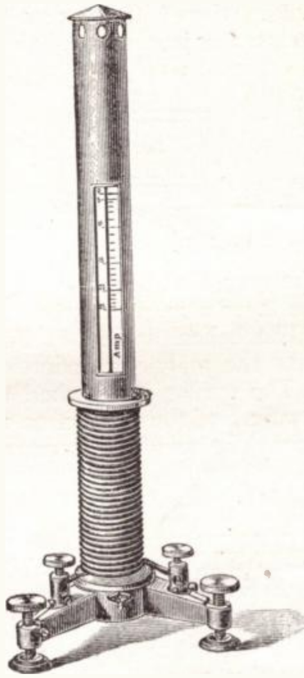


Fig. 130.

In Fig. 131 the solenoid, S, the voltmeter winding is No. 32 B & S silk covered wire, the ammeter winding is No. 18 B & S and the resistances are 3.6 ohms and 0.9 ohm respectively.

The voltmeter has a multiplier, and the ammeter a shunt, the resistance of which is 0.9 ohm, both of which are attached to the back board as shown, dotted at N. With the voltmeter the increase in range

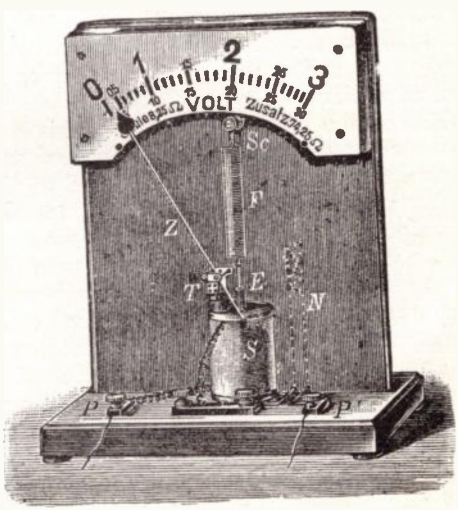


Fig. 131.

is 10 times, *i. e.*, the resistance of the multiplier is $9 \times 3.6 = 32.4$ ohms, while with the ammeter the increase is twice the resistance of the shunt being equal to that of the solenoid, *i. e.*, 0.9 ohm.

The solenoid, when the current is turned on acts on the iron core, E, Fig.

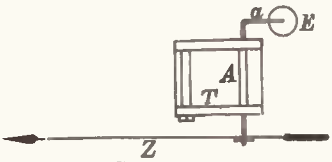


Fig. 132.

131. It will be seen that the core, E, is attached to the lever arm, a, attached to the axis, a. The helical spring F, Fig. 131, counteracts the magnetic action of the core, E. The spring is attached to the brass screw,Sc, and thus the action of the hand, Z, may be regulated conveniently.

(*To be continued.*)

REMAGNETIZATION OF MAGMETOS.

Devices for the purpose can be obtained of most electrical supply houses, and are a necessity as well as a convenience. It is a very common thing to find weak magnetos, and by magnetizing, you can usually make a magneto show up a good hot spark, which is very important with a low gravity fuel. It has been our experience, says the Butler Mfg. Co., Carthage, Ind., that when a magneto shows less than 5 degrees arc and a ¼-inch spark, it is necessary to remagnetize the magneto. Usually a magneto will show a 10 degrees arc and a ⅜-inch spark after being remagnetized.

A device for the purpose consists of two coils of wire around cores of soft iron, the two cores being joined at the bottom by a plate of the same material to form a continuous electro-magnet. The coils are wound in opposite directions and the lower ends connected. The upper ends of the coils of wire are connected to a source of direct current, usually the lighting circuit. The cores may be square or round and when round are usually about 2 inches in diameter. The wire, of course, must be insulated, but the amount and size of the wire coils will depend upon the length and amount of iron in the core and the voltage upon which the charging device is to be operated. Several hundred turns of No. 18 wire is generally employed for 110 volt circuits.

It is of great importance that the north pole of the magnet is set on the south pole of the core and the south pole of the magnet on the north pole of the core. If these conditions are reversed, the magnetism in the magnet will oppose that of the core and the time required to recharge it will be very much lengthened.

If a magnet to be magnetized were to be placed on an electro-magnet with like poles in contact, the polarity of the magnet would be changed and its magnetism greatly weakened. The polarity of a magneto-magnet should not be changed and care always should be taken in removing magnets from a magneto to see that the poles are marked properly in order that they may be correctly replaced.

Opposite poles attract each other, while similar poles repel, and the polarity of a magnet always can be found by holding the magnet near or over the poles of the electro-magnet. If, for instance, the south pole of the magnet be held between the north and south poles of the electro-magnet, it will immediately be drawn to the north pole, and if the north pole of the magnet were to be held between the two poles of the electro-magnet it would be drawn towards the south pole. The most reliable way to determine the polarity of the magnet is by means of an ordinary pocket compass.

There are two ways of using the outfit. One consists of rocking the magnet back and forth for about 1 minute, then laying it flat with the ends pointing away from the operator and then reversing it so that the ends point toward the operator. With the magnet flat the keeper is placed over the ends and the magnet withdrawn. The operation requires about 1½ minutes.

The other method is as follows: Set the magneto magnet on the electro-magnet, then take hold of it and brush the end of it back and forth over the pole pieces of the electro-magnet. After being brushed back and forth from five to twenty times, lay the magnet on its side with the bend close to the electro-magnet and the ends protruding out in front of the pole pieces.

(*Continued on page 499.*)

Two of the World's Largest High Power High Tension Transformers

By Frank C. Perkins.

The accompanying illustration, Fig. 1, shows two high power water cooled transformers for the Great Northern Power Company, of Duluth, Minnesota, each having a capacity of 4,500 K.V.A., designed for 66,000 volts high tension and 13,200-6,600 volts low tension.

The photographs, Figs. 2 and 3,

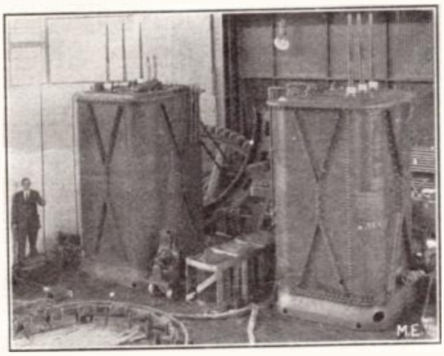


Fig. 1.

show the partly assembled core of one of these 3-phase, 25 cycle, transformers of the Crocker-Wheeler type, and also the coils mounted on the core with low tension leads.

It is said that these are the largest transformers of their kind ever built, the construction being of the core type, with butt joints, and were designed at Ampere, N. J. They are delta connected 66,000 or 33,000 volts high tension and 13,200 or 6,600 volts delta connected low tension. They are water cooled.

It will be noted from photograph, Fig. 2, that the core consists of four magnetic circuits in parallel, separated by large ducts for cooling purposes. Each magnetic circuit is composed of three vertical sets of leg punchings, and two sets of yoke punchings. The joints of this magnetic circuit differ from the usual lap joints employed in other transformers, either core or shell type.

Instead of the punchings lapping over one another their edges meet one another. All the punchings of a section are punched out of sheet steel with a punch and die, and are, therefore, of the same size. They are then assembled into sections, being held between steel end plates by core bolts, which extend through the holes in the punchings.

These core bolts are insulated from the laminations, and from the end plates, so that no eddy currents are produced in the core due to them. As there are the same number of punchings in all the sections of one of the magnetic circuits, and as they are all clamped down to an equal thickness, it follows that the edges of the leg punchings must meet the corresponding edges of the yoke punchings. The result is, that the flux traverses directly from one section to another without cutting any of the laminations transversely. This has a twofold advantage. One is due to the fact that the air gap in the joints are thus very uniform and very small, and, in addition, all the laminations are subjected to the same flux density, at the ends, near the joints, because there is no spreading of the lines of force into adjacent laminations, and thereby greatly increasing the flux density in them. As a consequence the exciting current is extremely low (in these

Fig. 2.

transformers it was 2 per cent.). Another advantage is the elimination of humming in the transformer. Humming is produced when the flux cuts the laminations at an angle, the tendency being to shake them apart.

The construction of a core in this manner permits the ready assembling and disassembling of the transformer. In case of a short circuit in any of the coils, the parts affected may be quickly removed, it requiring only a few hours to take the transformer out of service and put it back in again, whereas with the lap joint type it would take several days.

It may be stated that both high and low tension windings, shown in Fig. 3, consist of two sets of coils per phase, which permit the windings to be connected, either in series or in parallel, for 66,000 or 33,000 volts. The windings are separated from the core and other parts of the transformer by heavy oil impregnated wooden coil supports. Furthermore, the two groups of coils of each phase are separated from each other by a wooden spacing frame. The connection between the coil supports and the core clamps is not a rigid one.

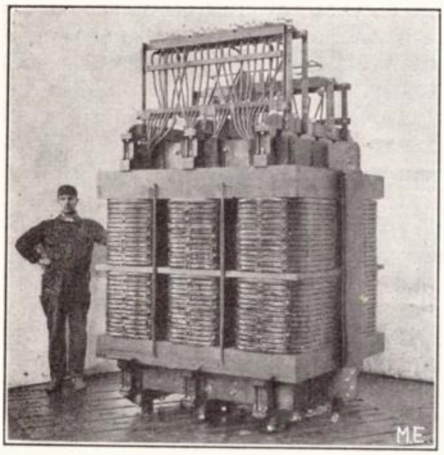


FIG. 3.

A certain amount of elasticity is imparted to the supports by means of heavy springs whose tension is adjustable. The coils, therefore, are always under the same pressure whether the transformer is operating under no load or overload. The high and low tension windings are arranged in the form of concentric cylinders, the coils being of rectangular form. The low tension is placed inside of the high tension winding. The windings are insulated from each other and from the core by heavy insulating barriers. Also the windings of adjacent phases are insulated by similar barriers. Both the high and the low tension windings are subdivided into a large number of thin sections composed of several turns of rectangular wire wound one turn per layer. These sections are thoroughly insulated from one another, and in addition the end sections are extra heavily insulated to protect them against line surges, and furthermore, the sections are separated from each other by horizontal oil ducts, thus permitting the oil to reach all parts of the windings and effectually cool them. The transformer is thus able to carry heavy overloads without dangerous overheating, because no hot spots can develop in such a type of winding.

It is pointed out that large power transformers are very often placed in generating stations which have several thousand K.V.A. capacity. If a heavy short circuit should occur on a line to which such a transformer is connected, there is a momentary enormous rush of current through the transformer, and, as the capacity of the station for the time being is practically unlimited, enormous mechanical stresses are set up in the transformer. In order that the transformer may stand up against such forces, it must be of very rugged construction throughout. This has been attained in a high degree in these transformers. The stresses set up in a transformer due to heavy short circuit tend to separate the high and low tension windings both in an axial and a radial direction.

It will be seen that the heavy coil supports already mentioned prevent the motion in an axial direction. Between high and low tension windings, between low tension windings and core and between the high tension windings of adjacent phases there are heavy spacers, which prevent motion in a lateral direction. In addition, on the sides of the transformer, there are vertical coil braces, which prevent the deformation of the windings in an outward direction. The coils are thus compelled to retain their normal shape.

It will be noted that all leads are brought to two terminal boards mounted on the top of the transformer and submerged below the surface of the oil. A change in connections can be made very quickly. The transformers are mounted in substantial boiler iron tanks, reinforced on the sides to prevent buckling. The cooling coils are of seamless brass tubing built to withstand a pressure of 250 pounds per square inch.

It is maintained that the tests show the full load efficiency, based on all losses within the transformer at operating temperature was 98.8 per cent. The regulation at 100 per cent. power factor was 0.63 per cent. At 80 per cent. power factor it was 2.4 per cent. The rise above temperature of incoming water was 26° C. in the hottest part for continuous full load operation. When carrying a 50 per cent. overload for four hours immediately following the full load run, the rise was 40° C. in the hottest part. These results show that the transformer is rated very conservatively and that it can carry a considerable overload without approaching guaranteed temperature rise which was 40° for the full load operation and 55° for the 50 per cent. overload operation.

It is claimed that the transformers successfully withstood an insulation test of 120,000 volts between high tension windings and all other parts for one minute; a similar test of 26,400 volts between low tension windings and all other parts for one minute. In addition, double voltage was impressed across the low tension winding for one minute.

The two high tension windings of each phase were connected in parallel and low tension winding was excited to 50 per cent. over voltage, a pressure of 45,000 volts existing between the two high tension groups of coils. This test was continued for one hour and then normal voltage again impressed on the windings for several hours to insure that the transformer had not been injured.

It is held that the mechanical construction is especially adapted for very severe service, and heavy overloads. The electrical characteristics are not sacrificed in attaining this much desired result. In fact, the electrical characteristics are much better than any similar transformer of the usual shell or core type that has been built thus far. The weight and space occupied by these transformers is exceedingly small for their output.

A WHITE LIGHT MERCURY ARC.

By Dr. Leonard Keene Hirshberg.

The intense, greenish tinted light of the mercury arc, the great efficiency of which is so offset by the ghostlike tinge, is at last to be obviated. The mercury electrodes make this lamp so intense, and it is otherwise relatively so cheap as a source of illumination, that the new discovery by M. E. Urbain, of Paris, who has been investigating these arcs, together with ultra-violet lights, will be hailed with delight by the commercial world.

Monsieur Urbain makes the anode of tungsten, which does not melt below 3,000 degrees centigrade. It was seen to be impracticable to use tungsten for both the anode and cathode, since the arc will not light between them unless some oxygen is formed.

The tungsten anode is one-fifth of an inch away from the mercury and the arc will burn intensely either in a vacuum or an inactive gas. Iron anodes are separated at greater distances.

The tungsten anode—unlike the iron which must remain cold and dark to prevent melting—becomes white hot, and exhibits an undiluted white light. The lamp takes twelve volts, and the power necessary is about half a watt per candle power. To obtain strong ultra-violet rays, it is only necessary to have a quartz glass tube for the lamp, instead of ordinary glass.

FINED FOR VIOLATING THE WIRELESS LAW.

Captain L. D. Johnstone, of the steamer "Sabine" of the Mallory Line, which steamer is in the coast trade, was on May 22 fined $100 by Judge Mayer in the District Court, New York, for going to sea without a wireless operator. The offense occurred December 28, 1911.

Wireless Telegraphy

By Guglielmo Marconi

(Concluded.)

Another very curious and interesting fact has been noticed only quite recently at the wireless station at Glace Bay. It is, that when the signals from Clifden are at their minimum strength, the signals from Coltano, Italy, situated 1,000 miles further away and at the other side of the Alps are not by any means at their minimum, although the two last mentioned stations employ approximately the same wave length.

The improvements introduced at Clifden and Glace Bay have been the result of greatly minimizing the interference to which the wireless transmission over long distance was particularly exposed in the early days.

The signals arriving in Canada from Ireland are, as a rule, easily read through any ordinary electric atmospheric disturbance. This strengthening of the received signals has moreover made possible the use of recording instruments which not only give a fixed record of received messages, but are also capable of being operated at a much higher rate of speed than could ever be obtained by means of an operator reading by sound or sight. The record of the signals is obtained by means of photography in the following manner: a sensitive Einthoven string galvanometer is connected to the magnetic detector or valve receiver and the deflections of its filament—caused by the incoming signals—are projected and photographically fixed on a sensitive strip, which is moved along a suitable speed. On some of these records it is interesting to note the characteristic marks and signs produced among the signals of natural electric waves or other electrical disturbances of the atmosphere which, on account of their doubtful origin, have in England been called "X's."

* * * * * *

One of the objections made against wireless telegraphy is in regard to the possibility of interference betwen various stations and the confusion likely to arise when a number of stations are simultaneously operated in the vicinity of each other. Although this confusion rarely occurs in practice with proper up-to-date stations and apparatus, yet even with the old instruments, when it did occur, it was not by any means such a serious matter as generally appeared to the imagination of the public. In most countries the operation of wireless telegraph stations, in regard to ship and shore communication, is subject to judicious rules tending to prevent mutual interference. And, I am glad to know that the American Government now intends to promulgate regulations which should greatly increase the efficiency of wireless working.

But there is danger of governments hampering the devlopment of this new art by the imposition of too many rules and regulations. We must not allow the waves of the ether and the space to become bound up in red tape. Telegraph engineers know perfectly well that without proper organization and discipline serious difficulties due to interference would occur with the great majority of ordinary land wire telegraphs which work several offices by means of a single wire.

I should further say that in the case of wireless telegraphy it is often an advantage that any station should be able to pick up a message which may not be actually addressed to it. Take for instance the case of a ship in distress calling for assistance.

At present one of the most practical methods of isolating any particular receiver so as to make it sensitive only to signals coming from a certain station, is to avail ourselves to the uttermost of the principle of resonance, to tune the sending and receiving circuits to exact correspondence, and, where possible, avail ourselves of directive methods.

Wireless telegraphy, like aviation, is yet an art as well as a science, and, therefore, personal skill and practical ability on the part of the operators is of the greatest importance in overcoming the difficulties of the moment.

An interesting feature of the Clifden plant, especially from the practical and engineering point of view, is the regular employment of high-tension direct current for charging the condenser. Continuous current at a potential which is capable of being raised to 20,000 volts is obtained by means of special direct-current generators. These machines charge a storage battery consisting of 6,000 cells all connected in series, the largest battery of its kind in existence. The capacity of each cell is 40 ampere-hours. When employing the cells alone the working voltage is from 11,000 to 12,000 volts, and when both the direct current generators and the battery are used together, the potential may be raised to 15,000 volts through utilizing the gassing voltage of the storage cells.

A well-ascertained and confirmed fact remains—that it is easier to communicate over the sea than over land. We fortunately have in this case another instance of nature helping us in the utilization of her forces. Over land where it is easy to erect and maintain the poles and wires of the ordinary telegraph, wireless telgraphy has had some difficulties to contend with; but on the sea where connection and communication between ships is essential for their safety, and where telegraph poles and wires between them are utterly impossible, special facilities seem to have been afforded us for the prompt utilization of this, which is in so many cases the only possible means of communication.

In the same way, that great enemy of the safety of ships, fog, seems to favor wireless transmission, which is usually more essential to ships in foggy weather than in fine. Whether wireless telegraphy will or will not displace the cables is a question which only time will decide. The view that it will soon be one of the principal means of communicating over long distances, is one that is unpopular in England, where many millions of dollars are already invested in cables.

There is no doubt, however, that this new method which knows no frontiers or political divisions, is tending to cheapen and extend our means of communication between distant points of the earth, and to bring telegraph communication within the reach of the great majority of people to whom present telegraph rates are prohibitive. For press service it is already largely used. Nearly all of the European news published in some of the great New York dailies comes across the Atlantic without the aid of any cable or artificial conductor. The New York *Times*, which has done so much to encourage the commercial application of long-distance wireless telegraphy, has received messages in New York from London in less than ten minutes, although these messages have to be repeated over land lines connecting the coast stations with London and with New York, respectively.

With wireless stations in or near the two great cities it should be possible to equal the cables in regard to speed without any sacrifice of accuracy. The facility with which interference has been prevented at the high-power trans-Atlantic stations has to some extent exceeded my expectations; and arrangements are now being made in England for the simultaneous operation of a number of long-distance stations in limited areas.

In eleven years the useful range of the wireless telegraph has increased from 200 miles to more than 3,000 miles. In view of that fact one would have to be a very bold prophet to affirm what it will not do in another eleven years.

The British Government has decided to erect a system of Imperial wireless telegraphy for commercial communication between England and the principal British Colonies—and a contract is already signed to put this scheme in effect.

The following stations are to be erected forthwith: England, Cyprus, Egypt, Aden, Bungalore, Pretoria, and Singapore, and it is expected that others will follow in the immediate future.

Arrangements are now being made for bridging the Pacific Ocean by means of wireless stations, on the west coast of the United States, and in Japan and China.

As soon as these stations are completed, wireless telegraphy will encircle the globe. The statements in the British House of Commons by the British Postmaster-General, to the effect that the British Government was adverse to investing capital in a state-owned trans-Atlantic cable, and that it was going to try wireless telegraphy for communicating with distant colonies, have a very direct bearing upon the relation of cables to the wireless system.

During the Tripoli war, and also in England, tests have been carried out in regard to the question of the applicability of wireless telegraphy to aeroplanes. Aeroplanes have become year by year more reliable means for taking military observations, and, like ships at sea, can only use some form of wireless for communicating over any considerable distance. Successful experiments have been carried out from aeroplanes flying at a distance of a few miles from their base. The method adopted is to employ a wire hanging down, which acts as the aerial radiator and collector, the metallic frame of the flying machine being used as the balancing capacity.

However, apart from the long-distance work the principal value of wireless telegraphy may perhaps at present be divided into two parts: first, when used for transmission overland, many countries, including Italy, Canada, and Spain, have already supplemented their ordinary telegraph systems by wireless telegraph installations. But some time must pass before this method of communication will be very largely used for inland purposes in England or the United States, owing to the network of efficient land-lines—both telegraph and telephone—already existing and which render further means of communication unnecessary.

It is, therefore, probable, at any rate for the present, that the main use of wireless telegraphy will be confined to the sea and to new and undeveloped countries, in some of which climatic conditions and other causes absolutely prohibit the efficient maintenance of land-line telegraphy. A proof of this has been afforded by the success which has attended the working of the stations recently erected in East Africa.

By the majority of people the most marvelous side of wireless telegraphy is perhaps considered to be its use at sea. Up to the time of its introduction, as soon as ships reached any appreciable distance from land they could say "good-bye" to the shore, as they had no means of getting in touch with land throughout the whole duration of the voyage. But those who now make long sea journeys are no longer cut off from the rest of the world; and the quiet and isolation which it was possible to enjoy on board ship have become things of the past. Business men can continue to correspond with their offices in America or Europe; ordinary social messages can be exchanged between passengers and their friends on shore; even a daily newspaper is published on board some of the principal liners, giving the chief news items of the day.

The chief benefit of wireless telegraphy, however, lies in the facility which it affords to ships in distress, of communicating their plight to neighboring vessels or coast stations. One of my greatest gratifications has been to know that it has not yet once failed at the

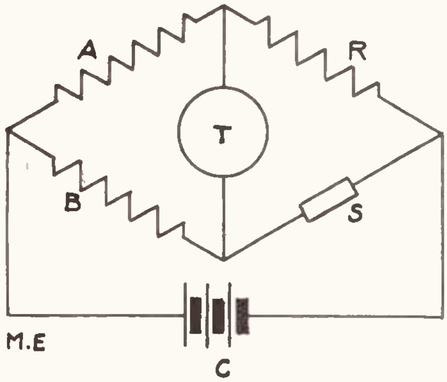
(*Continued on page* 469.)

That The Blind May See

By Dr. Leonard Keene Hirshberg.

So far is Mr. Fournier d'Albe from placing stumbling blocks before the blind, that he has invented a new instrument, just seen at the Johns Hopkins University, intended to give light to the eyes of the blind. That is to say, it will cause people who are blind to discern the presence of light by hearing. Mr. D'Albe calls his instrument an octophone.

Founded upon the power of selenium to change its electrical resistance when acted on by light, it is planned upon the principle that an electrical current from a small battery can be sent through a network of four conductors arranged in the form of a "Wheatstone



Bridge." Two of these conductors are wire resistances of a few hundred ohms each. The third is a selenium cell (better named "bridge"), and the fourth is an adjustable resistance made of graphite deposited on ground glass or unglazed porcelain.

For the benefit of those who are not familiar with the "Wheatstone Bridge" it may be explained that these conductors are connected as shown in the accompanying diagram, in which A and B are the two wire resistances, R the variable carbon resistance, S the selenium cell, and C and T the battery and telephone receivers mentioned later.

When the first two resistances are in the same ratio as the last two, then no current will flow across the network, through the telephone, T; but a current will flow as soon as one of the resistances changes, as does that of the selenium cell under the action of light.

The octophone consists of two parts: a pair of high resistance telephones, like those employed in wireless telegraphy, and a long box, eighteen by four by six inches, within which are the selenium "cell," the battery, the wire, and adjustable carbon resistances, and a clockwork interrupter. This latter makes the telephone current intermittent and hence audible.

The blind man uses the octophone by attaching the two telephones to the ears, and the box, connected with them by wires, being carried in the hand. The clock, when started, begins ticking, and the sound is heard in the telephones. By adjusting the carbon resistance, this may be gradually reduced to silence. This will be maintained until the light shining into the box has its intensity changed. Either the slightest diminution or increase in the intensity of the light will cause a corresponding sound in the ear pieces.

When the box is adjusted for silence, and then pointed toward a window, a hand or opaque object passed across the open end will be indicated by a sound. In bright light, artificial or natural, a certain sort of sound is "seen." While moonlight is distinctly audible, bright sunlight roars. Windows, cracks, gas lights, lamps and sunlight are thus made "visible" to the most benighted, black-blind persons.

The invention of D'Albe is light and portable and one "refill" answers for several days.

Although only in the baby days of auditory sight, this little invention holds out hope for even greater things for the blind. Thus, D'Albe and others are already at work with a series or mosaic of various sized selenium cells, in order to perfect a method for the blind to distinguish certain tones, notes and pitches as associated with definite lights, colors, shadows, landscapes and pictures. Vision may thus be made a sort of symphony or grand opera to the blind.

To complete this will require a combination of selenium "bridges" of something over ten thousand elements.

Selenium Cells

By Samuel Wein.

The reader, no doubt, is familiar with the extraordinary property of selenium, which varies its electrical resistance on exposure to light. Selenium cells have played a very important part in many systems of telephotography and in similar apparatus.

It is the purpose of the writer to show how to make several cells embodying this wonderful mineral.

Selenium is a widely distributed element found over the whole globe; it occurs in small quantities, and in some instances it is found in the native state.

Selenium is found in iron and copper pyrites, the smoke from the furnaces of silver smelters, the deposit in the leaden chambers at sulphuric acid works, and it has been discovered in the metallic copper of commerce. It appears in two modifications, one soluble and the other insoluble in carbon bisulphide. That soluble in carbon bisulphide has been called "Red Selenium," "Amorphous Selenium," and "Glassy Selenium." That insoluble in carbon bisulphide has been called "Black Selenium," "Granular Selenium," "Metallic Selenium" and "Crystalline Selenium." Solid amorphous selenium is a poor conductor of heat and a non-conductor of electricity. At ordinary temperatures it remains unchanged for years. It is brittle, easily scratched, and pulverized; its surface is red brown, and of a metallic lustre. and its fracture of a brown glass color, dark lead gray and shining.

Solid crystalline selenium is a conductor of electricity, and has a granular, dull fracture. The change from the amorphous to the crystalline state is effected by exposure to a high temperature.

Selenium can be electrified by friction, like glass, and is a dielectric, the specific inductive capacity varying from 7.0 to 8.0. The boiling point is 690 deg. C. The atomic weight is 79.2. The specific resistance of selenium is very high, its value may be placed at about 2,500 megohms per centimeter cube. Its chemical symbol is Se.

As has been pointed out before the specific resistance of selenium is very high; therefore, in order to facilitate experimentation with a cell of this type, it is necessary to use the selenium in such manner that only a small quantity (but of large cross sectional area) of it need be traversed by the current. A further condition is that the selenium

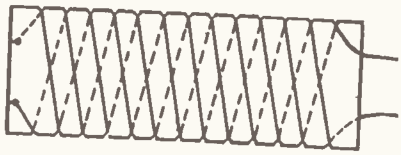


Fig. 1

must be spread on the non-conducting surface in a thin layer so that a comparatively large surface may be influenced by light with respect to its volume.

There are a number of types of cells at present in use, among which are those designed by Bidwell, Ruhmer, Pfund, Gitlay and Hammer and many others.

The Bidwell cell consists of a tablet of glass, mica or slate, 1.7 x 5.5 cms., about which are wound two copper wires in the form of a double helix, as shown in Fig. 1. These wires constitute the electrodes, and great care must be taken in spacing them. To apply the selenium to this tablet proceeds as follows: Lay the tablet on a

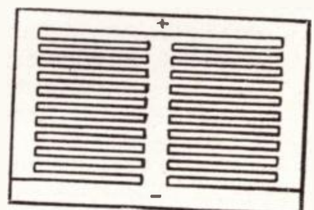


Fig. 2

brass plate (but separated from it by a thin sheet of mica) under which is placed a Bunsen burner, which is to supply the heat. One side of the tablet is first evenly covered with somewhat less than an ounce of selenium, and upon application of heat, the greater part of it will crystallize in hard, gray lumps; with continued heating these lumps disappear. The flame should be adjusted so that the temperature is only just about the melting point, which is 217 deg. C., at which Selenium assumes a plastic, semi-fluid, condition and can be easily spread with a knife or spatula, to yield a uniform thickness over the tablet. When this is done the tablet is then placed in an oven for the annealing. That is, the cell is put in the oven, which is somewhat below 217 deg. C., for about one hour, during which time the temperature of the oven is slowly lowered.

The resistance of a cell constructed as above described lies between 50,000 and 100,000 ohms in the dark.

Another method of constructing selenium cells is given by Pfund. A piece of plane glass 3 x 1 cms. and 1 mm. thick is ground on one side and selenium is applied to this by means of a hot glass rod. The contacts are then made on the selenium. After the contacts are placed on it should be annealed as described before.

A simple method of construction is to coat one side of a glass plate with

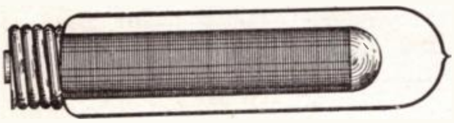


Fig. 3

an amalgam of silver, and trace through this a fine line dividing the plate into two electrically distinct portions as shown in Fig. 2. Copper wires are attached to these portions for terminal connections. The selenium is then applied to this plate, and the annealing process is then followed.

Fig. 3 represents a selenium cell, which the writer believes is the most successful cell made up to the present writing. This type of cell is credited to Ernst Ruhmer, of Germany. He employs two copper wires wound spirally side by side around a cylinder of porcelain, which, after the cylinder has been covered with the selenium and then annealed, is placed inside of a globe, from which the air is exhausted, it is then mounted on an incandescent lamp base, and the proper connections made thereon.

Another form of the Ruhmer cell consists of two fine platinum wires wound on a glass cylinder 1¼ inches long and ¾ inch in diameter. The wires, which are 1-32 inch apart, are coated with selenium, after which the selenium coating is annealed, as already described.

Warning. The red fumes rising from selenium, when subjected to heat, are exceedingly poisonous; they corrode the skin, and have more tendency to affect the nails, coloring them reddish-brown and producing pain, which lasts for hours. They also inflame the nasal channel, and, with delicate natured individuals, bring forth bleeding. Great care should, therefore, be taken when experimenting with selenium.

Selenium provides one of the most promising fields for experiment, and will bring fame and fortune to the inventor who will bring forth an invention that will be of commercial use.

Editorial Note.—Mr. Wein informs us that twice, since the above was written, he has been the victim of selenium poisoning. The second time he was quarantined by the Health Board, who suspected him of having diphtheria, until they learned the nature of his illness. He also made two cells, which, much to his surprise, the resistance of which increased, instead of decreased, under the action of light. He suspects this to be due to impurities that may have gotten into the selenium during the process of manufacture.

DANGEROUS MATCHES.

"Any kind of match is a source of danger," declared C. E. Swingley, veteran chief of the St. Louis Fire Department, in a recent talk before the St. Louis League of Electrical Interests.

"Some kind of matches represent so great an element of risk and cause so large a proportion of the destructive fires that laws are being drafted to prohibit the sale of them."

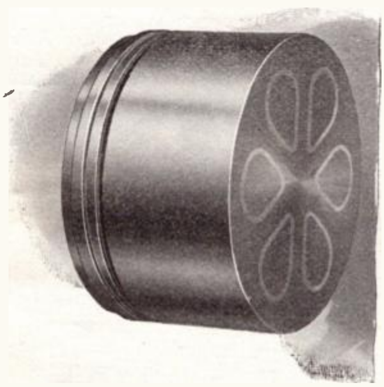
These statements, coming from as high an authority as this, should be received with serious consideration by every business man and householder, and remedial measures adopted.

It is the great good fortune of the people of this age that, with the cost to the consumer of electricity where it is to-day, it is easily within the income of even those of humble means to eradicate forever the deadly evil pointed out by Chief Swingley.

It is quite possible to equip and reasonably operate house, store, office and factory so that a match need never pass the door.—*Electric St. Louis.*

Magnetic Chucks

As a labor saver there is probably no form of electrical device that has proved of greater benefit in the machine shop than the magnetic chuck. It possesses a very wide range of usefulness in holding steel and iron pieces for grinding, planing, shaping and milling. When a large number of pieces are to be machined it will frequently be found that the time and labor saved by the use of this device, as compared with the old time methods of clamping, bolting or holding one piece at a time in a vise, will pay the entire cost of a chuck within the first week or ten days of service.

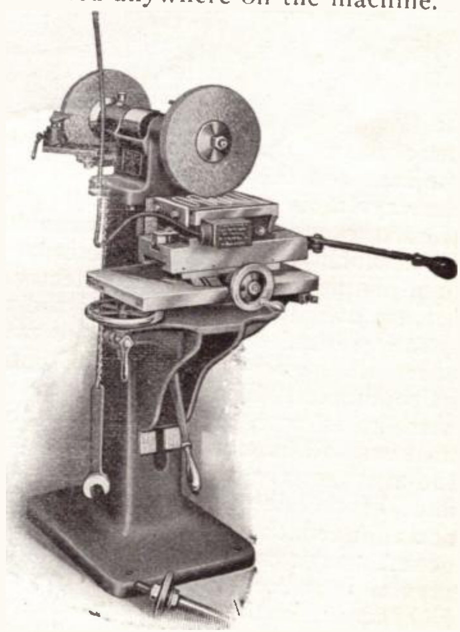


Milling operations can be performed with great facility where the shape of the work is such that the end stop of the chuck can be raised to take part of the thrust. In like manner, the chuck will be found very useful for holding stock undergoing light planing and shaping operations. Planer parallels, keys, and such parts, can be rapidly and accurately produced.

The magnet coils in these chucks are wound with Deltabeston Wire, having a special heat-proof insulation of pure asbestos, which can safely withstand a temperature as high as 400 degrees Fahr.

With the exception of the smaller sizes, the chucks are designed for use directly on 105-125 volt direct current circuits. Where the use of higher voltages is necessary, a separate resistance is used in series with the chuck. The small chucks require the separate resistance on 105-125 volts.

These chucks are oil and waterproof, and are provided with demagnetizing switches for readily releasing the work. These switches are mounted on the chuck wherever possible, but may be mounted anywhere on the machine.



SMALL SURFACE GRINDER EQUIPPED WITH "D & W" MAGNETIC CHUCK

Magnetic chucks can only be operated on direct current circuits, and

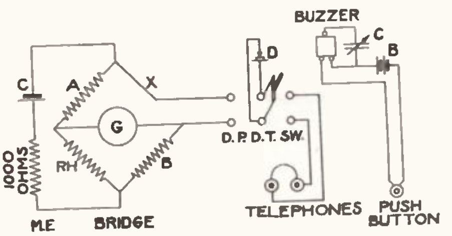
(*Continued on page* 468.)

Resistances of Rectifying Detectors

By Stanley E. Hyde.

The data in the accompanying table will, undoubtedly, be of much interest to wireless experimenters, and were found in the following way: A standard laboratory Wheatstone Bridge (Plug type) is connected up as shown in the accompanying wiring diagram, where A, B and RH are the known ratio arms and X is the unknown resistance. A double pole double throw switch has the detector connected to its middle terminals so that the detector may be connected either to the telephones or to the bridge. Near the detector is mounted a small testing buzzer with a variable condenser connected across the interrupter to intensify the weak oscillations that are formed.

To find the resistance when the detectors are adjusted for electro-mag-



netic waves, the telephone is put on the head and the buzzer started. Then the crystal is moved around till the telephone responds to the maximum buzz which shows that the detector is in adjustment, and then the detector is thrown over to the bridge and the resistance found by balancing the ratio arms till there is no deflection of the galvanometer. The following relation then holds true, A:X::RH:B. Six different adjustments are found and the average taken. To find the resistance of the detectors when they are not adjusted, the same proceedings are gone through as above, except that the crystal is moved around till there is NO buzzing in the telephones. Six adjustments of the detector non-adjusted are also taken, and the average found, thus making twelve different readings of the bridge for each kind of crystal.

In order that the local battery that supplied the current for the bridge would not have an appreciable effect on the adjustment of the detector, 1,000 ohms resistance was inserted in series with the battery, and this necessitated the use of a very sensitive D'Arsonvai galvanometer in the bridge circuit.

The crystals which are in the natural state (unpolished) have less resistance under the influence of the waves; but the polished ones, such as the Silicon and Iron pyrites, have a great deal more. Why this is would be a hard question to answer.

The column of resistances for Iron pyrites shows why it is advisable to take more than one reading, as each one varies considerably.

DATA ON THE RESISTANCE OF RECTIFYING DETECTORS ADJUSTED AND NON-ADJUSTED FOR THE RECEPTION OF ELECTRO-MAGNETIC WAVES.

Resistance Non-adjusted. Ohms.	Detector.	Resistance Adjusted. Ohms.
4870	Perikon	2960
9433	Cat-whisker (Silicon)	3466
4200	Fine wire point (Silicon)	513
101	Brass point (Silicon), Polished	7350
493	Brass point (Silicon), Unpolished	1533
9363	Fine wire point (Galena)	9316
1633	Phosphor-Bronze point (Iron pyrites)	8016
8484	Cat-whisker (Iron pyrites)	492
6320	(Cat-whisker (Silver Ore)*	2100
7500	½ Inch cube (Carborundum)	?
454	Iron pyrites and Chalcopyrite	246
2374	Silicon and Chalcopyrite	1911

1400	* Silver Ore is very	10,000
2000	sensitive and possesses	10,000
2400	more sensitiveness	3,000
1600	than any of the	4,000
1400	above with the	10,400
1000	exception of Perikon.	10,700
6)9800		6)48,100
1633 + Average for Iron pyrites non-adjusted.		8016 + Average for Iron pyrites adjusted.

Magnetic Chucks.

(*Continued from page* 467.)

under no conditions can alternating current be used. Where D. C. is not available, a motor generator set must be provided to supply the current.

INTERNATIONAL RADIO TELEGRAPH CONGRESS.

It has been decided to hold the next International Radio Telegraph Conference at Washington, D. C., in 1919. The leading points in the recommendations adopted at the 1912 International Radio Telegraph Conference in London are as follows: Regulations to prevent interference in crowded areas and designed to make wireless telegraphy of the greatest possible use in saving life and property at sea, and making it also more valuable commercially. Every hour all ships must remain silent for ten minutes, listening for distress calls. A distress ship is to control the magnetic field of her radius, and should many ships answer her distress call she shall determine which is to remain silent, thereby avoiding confusion.

During the sessions, lasting one month, the proposals submitted by the United States were received with great interest and were generally accepted, particularly the provisions tending to insure safety at sea, compulsory inter-communication between all systems, and the reporting of meteorological data.

Weather observations are to have the right of way over commercial dispatches.

The following wave lengths were adopted for commercial business: Short and medium distances, 300 to 600 meters; longer distances, 1,800 meters. The military interests of Great Britain and France prevented the adoption of the American proposal for a general commercial wave length of 800 meters.

The congress adopted an elaborate code governing the interchange of business between rival wireless companies, which are no longer to be permitted to disregard each other.

The Russo-American combination against Great Britain's claim to six votes in the conference on account of her colonies has resulted in the more important powers receiving equality of votes. Thus at future congresses the United States, Great Britain, Russia, Germany and France are each to have six votes, Italy is to have three, Spain and Portugal two each, and the other nations one each.

Following the close of the conference on July 5 the delegates were entertained by Dr. and Mrs. William Marconi at Cedarhurst, their country home, near the Isle of Wight. The guests were conveyed by special train between London and Southampton. A luncheon at Cedarhurst and a cruise on the Solent were among the entertainment features.—*Electrical World.*

HEAVY WIRELESS TELEGRAPH VERDICT IN MASSACHUSETTS.

Prof. Reginald A. Fessenden, well known as the inventor of many wireless telegraph devices, has been awarded a verdict of $406,175 in the United States District Court at Boston, in a suit against the National Electric Signaling Company. Professor Fessenden sued the company for alleged breach of contract in connection with his services as general manager and as the inventor of wireless equipment. The case has been appealed.

Wireless Telegraphy

(*Continued from page* 463.)

critical moment in successfully conveying the all-important demand for help. That it is now considered indispensable for this purpose is shown by the fact that several governments, including that of the United States, have passed a law making a wireless telegraph installation a compulsory part of the equipment of all passenger boats entering their ports.

In view of the fact that the attention of the American public, and indeed, of the whole civilized world, has very recently been fixed in painful anxiety on the greatest disaster known in the annals of navigation, it would be impossible for me not to make at least passing reference—reluctantly as I do—to that grim and awful catastrophe whose details we first learned by wireless across hundreds of miles of ocean.

I know you will understand me if I say tnat all those who have been working at the problem of wireless telegraphy — many of whom, like myself, are so often brought in close touch with the wonders and perils of the sea—entertain deep feelings of gratitude that telegraphy through space has again contributed in this instance (the sinking of the *Titanic*) to the saving of hundreds of precious lives.

Allow me also to take this opportunity of expressing my sincere recognition of the generous sentiments that have been expressed towards it by the American press at this moment of profound grief.—*Abstract of paper read before the New York Electrical Society.*

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Vol. V. AUGUST No. 5

EDITORIAL.

WE are in receipt of the following letter:

Galveston, Tex., July 2nd, 1912.

Editor Modern Electrics:

I have an only son, 18 years of age, who for some time past has been rather interested in electricity, more particularly "Wireless." He now wants to take up the study of Wireless in earnest, intending to become a Wireless Engineer. I would of course rather see him enter another field, as to my mind Wireless is as yet something very vague and uncertain. Naturally I have serious misgivings over the outlook and I would like to have your frank and honest opinion, as well as unprejudiced advice on the subject.

Respectfully yours,

B. De L.

In answer to this letter—which we reprint with permission of the writer—we would say: The art of Wireless to-day is some twelve years old. Only during the past eight years has the art been exploited commercially. We may safely say that even to-day it is as yet partly in the experimentation stage. When the telephone was twelve years old nobody had even thought of trying to exploit it commercially. It was regarded as a scientific toy, interesting but useless. The first public telephone exchange appeared in 18—, years after it had been discovered. We need not speak to-day about the miraculous success of the telephone; the facts are too well known. Fortunes upon fortunes have been acquired and our national wealth directly through it has increased to a truly incalculable extent.

Wireless Telegraphy, Wireless Telephony, and transmission of energy by Wireless, embrace such a stupendous field that generations must pass before the field is exploited even to a small extent. Wireless will no more supplant the wire telegraph and the wire telephone, than the two latter displaced the railroads and street cars. Quite the contrary, as one grows, the other must grow in direct ratio to it.

It is estimated that already at this early stage, Wireless as a separate industry gives to-day employment to over 6,000 people in this country.

There are in the United States alone between 75 and 80 separate companies exploiting Wireless in one form or another, where last year there were not 40. Is this not a sure sign of the times? Immense fortunes will be amassed in the Wireless business during the next 20 years and nobody can possibly foresee how many different branches will be directly dependent upon Wireless.

It is our honest as well as sincere belief that there is to-day no branch in the entire technic which offers greater chances to the wide-awake young man, than Wireless Engineering. Nor do we know of a branch that is more honorable and interesting or in which greater laurels will be plucked in the next two decades.

Aside from all selfish motives we can truthfully say that we heartily endorse every young man who takes up Wireless Engineering and we would pledge ourselves to all parents that they will not have any regrets if they let their sons study Wireless as a profession.

The Metallizing and Electroplating of Flowers and Insects

By Paul Horton.

THE reader doubtlessly has noticed, in jewelry stores, metallized rose buds mounted on hat pins, and, very likely, has wondered how they were made. The average bud is made merely from sheet metal, and is the product of French skill and art. But in the following article directions will be given, which will enable any one to turn out work to please the most exacting. This method, which is simply an application of electroplating, is applicable to insects and all objects which are non-conducting, and are too delicate to stand the usual brushing on of powdered graphite. Before proceeding further with the directions, it is necessary to describe the apparatus used in the process. A plating tank is to be provided, and should be of glass, or a waterproof box. A generator, which will be described later, is necessary, to generate hydrogen sulphide gas, which is used in the process. The solutions required will be given as they are needed.

All the articles should be coated with copper first, and then with silver or gold, taking care that the objects are free from grease. To render the surfaces conductive, it is necessary to dip them in the following solution: Dissolve ½ ounce of silver nitrate in 25 ounces of grain alcohol, with the aid of gentle heat. After drying, they should be exposed to the fumes of hydrogen sulphide, under a hood. The H_2S generator may be a glass bottle with a one-hole stopper fitted with a glass tube to carry the gas to the hood.

The action is started by placing some iron sulphide, which may be made by heating iron filings with sulphur, in the bottle and pouring in some strong muriatic acid. After the exposure, the object should be placed in the plating bath (suspended by the stem if a flower, and by a pin run through the body if an insect), made up of the following copper solution:

Dissolve 4 ounces of copper sulphate in 12 ounces of water, add ammonia until the green precipitate, which is first thrown down, is redissolved, giving an intense blue solution. Now add a saturated solution of potassium cyanide until the solution becomes colorless, and then add one-fourth as much again in excess.

The flowers should be connected to the negative pole and a copper plate to the positive, the current must be started up slowly and the anode should be a clear pink color, thus indicating the condition of the solution. After the copper is plated heavy enough, the gold or silver should be plated on next.

If gold is too expensive, a solution of lead acetate and sodium hyposulphite, in the proportion of 4 ounces of the first to one of the latter, may be used to give the object the regular color. The color is a mere film, and should be protected by a coating of white shellac. The solution is heated nearly to boiling and the articles dipped in and watched until the required color is reached. This solution will also color to blue steel and black, thus furnishing a color applicable to many insects. Articles of many colors must be plated over the copper with a sponge in order to furnish the necessary color. The sponge may be made of a piece of heavy copper wire fitted with a handle and having a piece of sponge bound on the other end, the sponge should be connected to the positive wire. To use, dip into the required solution and lightly rub the sponge over the spot to be colored. A greenish hue may be obtained with a mixture of the cyanides of silver and gold; red or pink, according to the percentage of copper with silver cyanides. Or the color may be obtained with oil colors.

A green color, excellent for leaves, is produced by the following solution: Ammonium carbonate, 3 ounces; ammonium chloride, 1 ounce; water, 1½ pints. To give the required depth of color apply as many times as may be needed. Apply a coat of white shellac to prevent fading.

The silver solution is made as follows: Dissolve 3½ ounces of silver ni-

(*Continued on page* 554.)

Simple Experiments in Chemistry

By Philip Edelman.

5. Nitrogen Compounds.

In part four the importance of certain nitrogen compounds to the soil was discussed. It is now in order to consider a few nitrogen compounds and sub-compounds which are related to the latter. The first of these to receive attention is ammonia.

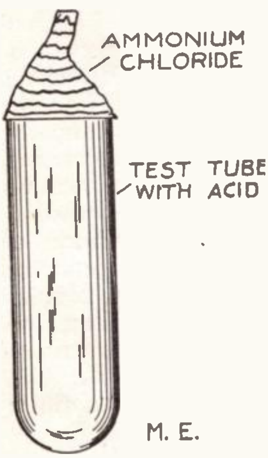


Fig. 1.

Ammonia

Ammonia is a compound of nitrogen and hydrogen. There are many sources of ammonia, the chief one being the gas liquor which is a by-product of gas works. For the present purposes the solution known as aqua ammonia (Ammonia gas dissolved in water), which is very cheap, will suffice as a source of ammonia.

Ammonia is very soluble in water, a given volume of water absorbing nearly 700 times as great a volume of the gas, at ordinary temperatures. Aqua ammonia, then, is simply a convenient solution of the gas in water. The desired ammonia gas is obtained by heating a little of the solution, and, since the gas is less soluble at a higher temperature than it is at normal temperature, it is readily freed from the solution.

Experiment.—Heat a small quantity of the solution in a test tube.—*Result.*—White fumes will form if an open vessel of hydrochloride acid is near, or if another test tube containing hydrochloric acid is brought near to the tube of heated ammonia. This experiment can be varied by heating the acid in a tube and then putting a cloth or blotter soaked in ammonia solution over it. The result of the combination of the ammonia, which is freed, and the chlorine, which is also freed, is the formation of ammonium chloride. The writer has made the experiment in a closed compartment in a similar manner by exposing a test tube of the acid to ammonia, freed from solutions, and allowing the action to continue for a day. The ammonia then combined with the freed chlorine and formed a coating of ammonium chloride on the ridge of the tube containing the acid. Some of the specimens obtained were very well formed and took the shape of a circular chimney extending up from the open end of the tube containing the acid. (See illustration, Fig. 1.)

Experiment.—Heat a quantity of the solution until all of the ammonia has disappeared. The ammonia can be

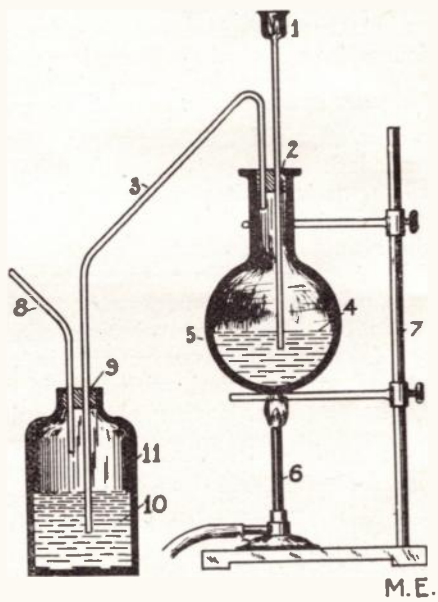
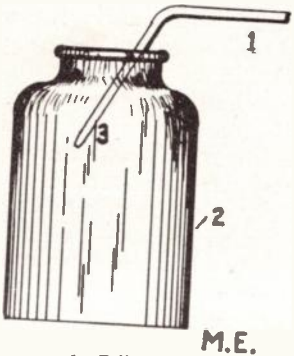


Fig. 2.

1. Thistle Tube.
2. Two Hole Cork.
3. Delivery Tube.
4. Ammonia Water.
5. Flask.
6. Burner.
7. Stand.
8. Delivery Tube.
9. Cock.
10. Lime Water.

told by the peculiar odor, or by using red litmus paper, the latter turning blue in the presence of ammonia. In this experiment it will probably be found that the ammonia does not all disappear until the solution is evaporated. About one-third of the solution is ammonia (by weight). The gas itself is colorless and is harmless when not taken into the human system too suddenly or in too great a quantity.

Experiment.—Arrange apparatus as illustrated in Fig. 2, and collect a few bottles or tubes of the gas by upward displacement. Bring a flame near one tube and try to ignite it. Result: It will not burn. Put a lighted stick into another tube (as in the oxygen experiment). Result: It goes out. Ammonia gas does not burn or support combustion under ordinary conditions.



1. Delivery Tube.
2. Bottle of Oxygen.
3. Jet.

Fig. 3a.

Experiment.—Collect a bottle of oxygen gas. Connect the jet used in the hydrogen experiments to the ammonia generator. (See Fig. 3a.) Put the ammonia jet into the oxygen as illustrated and ignite the ammonia at the end of the jet. The ammonia burns with a yellow flame and goes out after a brief time. This proves that ammonia can be made to burn.

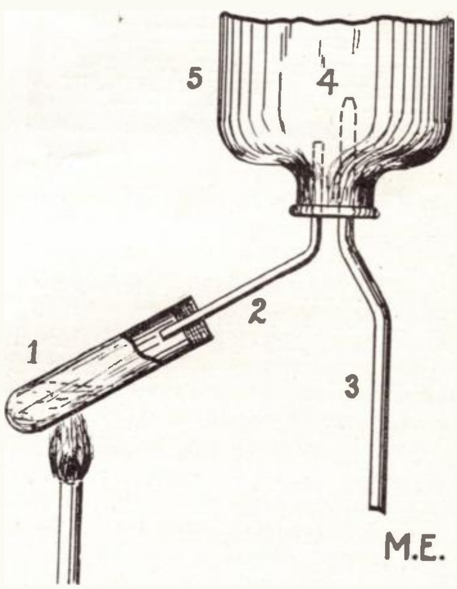
It may be necessary to use the apparatus shown in Fig. 3b to show this. The ammonia is dried by passing it through lime water as shown. (See previous experiments for the preparation of lime water.) Heat the oxygen and the ammonia apparatus simultaneously and test for each gas. (Glowing splinter test for oxygen.) The ammonia jet can then be lighted and will burn with a yellow flame.

Experiment.—Set up apparatus as indicated in Fig. 4. A tube of ammonia is first collected and then closed with the cork containing the jet, as shown. Hold a finger over the jet and insert it in a vessel of water or a solution of red litmus. Expose the jet to the liquid and the water or litmus will rise into the tube at once. When red litmus is used the solution becomes blue when it spurts into the tube. The fountain effect is due to the solubility of the ammonia, and the color change is due to the fact that ammonia is a strong alkali.

Ammonia gas can be liquefied easily, and, in this form, is very useful as a refrigerant. The cold is obtained from the liquefied gas by allowing it to evaporate into pipes. It absorbs heat from the pipes, and this fact is utilized in making artificial ice in cold storage plants and for similar purposes. The gas liquefies at a temperature of —34 degrees C. without pressure.

Ammonia is a strong alkali and can be used to neutralize acids, etc. It would undoubtedly be suited to use with positive and negative electrodes as a battery, but such a combination would not be practical, on account of the fact that the ammonia is not stable in solution. The gas, in the solution form, and in other absorbed forms, is widely used for cleaning and for a number of other important purposes.

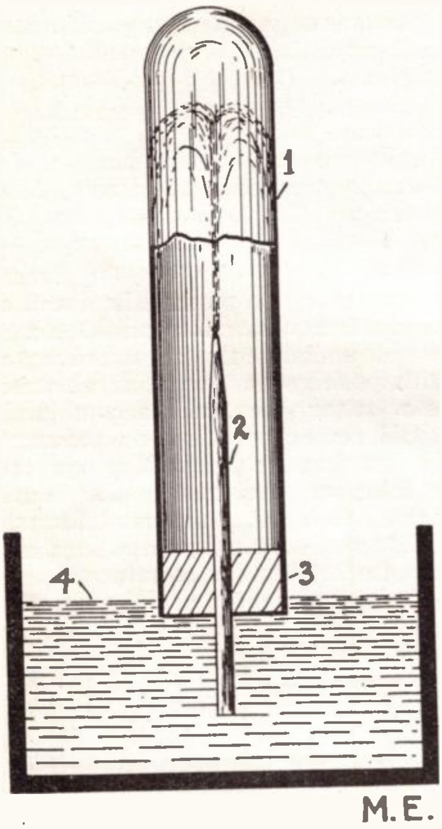
Perhaps the most useful ammonium



1. Oxygen Apparatus.
2. Delivery Tube—Oxygen.
3. Delivery Tube to Ammonia Apparatus.
4. Jet.
5. Broken Bottle—Open.

Fig. 3b.

compound, from the electrical viewpoint, is ammonium chloride. It has already been shown that this com pound is the result of the combination of ammonia and chlorine. The salt, in a pure sublimed form, is known as sal-



1. Tube of Ammonia.
2. Jet.
3. One Hole Cork.
4. Litmus Water.

Fig. 4.

ammoniac, and is used extensively in open circuit batteries.

Experiment.—Put a little of the ammonium chloride in a little water. It dissolves at once and at the same time the temperature of the liquid is lowered. Solutions of this compound, in water, are useful for water rheostats, electrolytic interrupters, and similar conductive purposes, and have the advantage of not corroding or fuming. (See part 3.)

Some of our readers may be pleased to know that nearly all of the soldering fluxes on the market are based upon the use of ammonium chloride. A paste suitable for electrical connections and similar joints, is made by mixing together: 1 part of ammonium chloride, 1 part of alcohol, and 2 parts of petroleum jelly (vaseline).

There are several other ammonium compounds, but since experiments with them would be repeating many former experiments, all excepting ammonium nitrate will be neglected. The lattter will shortly be used for preparing nitrous oxide.

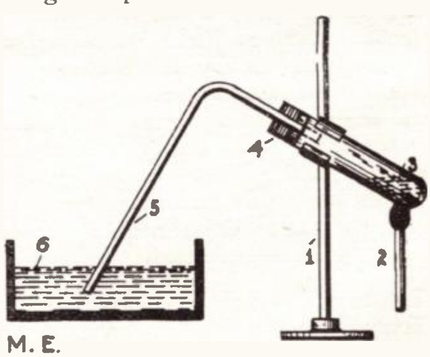
Oxides of Nitrogen.

When nitrogen and oxygen are mixed the result is air, as was shown in part 4 We shall now see how nitrogen and oxygen form certain compounds called oxides when combined.

Experiment.—Put a little ammonium nitrate into a test tube fitted with a delivery tube as illustrated in Fig. 5 and collect the resulting gas, over water which has been previously warmed. Heat the apparatus gently. The ammonium nitrate soon decomposes, upon melting, and *nitrous oxide* and water form.

Experiment.—Collect a tube full of nitrous oxide and put a piece of burning sulphur (roll sulphur) into it. If the sulphur has been well heated it should burn in the nitrous oxide. Other combustibles may be tried, as in the oxygen experiments. The nitrous oxide is not as active as oxygen in this respect.

Nitrous oxide is better known perhaps as laughing gas, and, when breathed by human beings, it causes a form of nervous excitement, and, when used in large quantities, it makes the subject insensible. This fact is utilized in dentistry and other mild forms of surgical operations.



1. Stand.
2. Burner.
3. Ammonium Nitrate.
4. One Hole Cork.
5. Delivery Tube.
6. Water.

Fig. 5.

Experiment.—Put a small strip of copper into a test tube and pour some nitric acid over it. Allow the action to completely finish. *Results.*—The liquid bubbles violently and the temperature rises. The liquid turns blue, because of the copper nitrate which is formed. The most important thing to notice is that reddish brown fumes are given off. The brown fumes are due to the *nitrogen peroxide* which is produced. This peroxide is not produced directly, but is the result of a second combination, as will presently appear. *Nitric oxide* is formed at first, which is a colorless gas, but, as soon as it comes into contact with the air, it is changed into the brown nitrogen peroxide. The three oxides are all compounds of the same elements, nitrogen and oxygen, but differ in the proportion of the elements which they contain. Thus, nitrous oxide consists of two parts of nitrogen to one of oxygen, nitric oxide has one part of each, and nitrogen peroxide has one part of nitrogen to two of oxygen.

Nitric Acid.

Nitric acid is formed when electrical sparks are passed through moist air. It is manufactured by this method, in Norway, and is then converted into nitrates or fertilizers. It is also prepared chemically.

In handling nitric acid care should be taken not to spatter any on the clothes or the skin, because it is very corrosive. The concentrated solution fumes when exposed to the air.

Experiment.—Heat a small quantity of the acid in a test tube. (About ½ inch is enough.) Fasten a piece of charcoal to the end of a wire and heat the charcoal. When the heated charcoal is thrust into the hot acid, it should burn brilliantly. This is due to the fact that the acid is a good oxidizing agent. (See Fig. 6.)

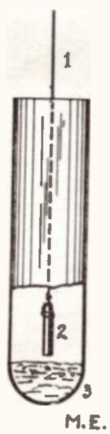
A mixture of nitric and hydrochloric acids (half and half, 2 to 1, or 3 to 1, excess being hydrochloric) is called aqua regia, and is used to dissolve gold, platinum, and many other substances which do not dissolve in ordinary acids. It is not a stable mixture, and, since it is easily spoiled, it should only be made up as needed.

Nitric acid is used in a wide variety of industries, from etching of copper plates to the manufacture of nitroglycerine and gun cottton. It is employed as a primary batterly electrolyte, particularly with zinc-carbon couples. It is also used, to a small extent, as the electrolyte for electrolytic detectors for wireless telegraphy. It is a very useful laboratory acid.

Nitric acid acts upon a large number of metals, and forms metallic nitrates with them. This has already been illustrated in the preparation of nitrogen peroxide, when copper nitrate was also formed.

Nitrates are very soluble, for the most part, and are very useful.

Experiment.—Heat a small quantity of potassium nitrate in a test tube. Heat a piece of charcoal at the same time. Drop the charcoal into the melted nitrate. The charcoal will jump about from the strong action. When the action is nearly completed, reheat the test tube, and this time put a piece of sulphur into the tube. Intense heat and light result and the bottom of the test tube may drop out. This is a very pretty experiment.



1. Wire.
2. Heated Charcoal
3. Heated Acid.

Fig. 6.

Experiment. — Dissolve some copper nitrate crystals in water. Put an iron nail, a knife blade, or other iron pieces into the solution and they become coated with copper. This experiment is, in effect, a single electrode battery. If a copper electrode is also provided and a current is sent through the solution between the copper and another metallic electrode, we have a simple electroplating outfit. (Copper sulphate is perhaps a more convenient salt for this purpose.)

Experiment.—To make slow burning gunpowder. Mix charcoal, sulphur, and potassium nitrate together in the following proportions:

Potassium nitrate	75%
Charcoal	15%
Sulphur	10%

The mixture should be well intermixed. It can then be ignited or exploded in suitable vessels, care being taken to avoid injuries.

Simple Experiments in Alternating Currents

(*Continued.*)

By P. Mertz.

14. In the last installment of this article, you will remember, it was said that the principle of the D'Arsonval meter could not be used for measuring alternating currents. This is true, but you will now see how the same principle, modified, is successfully used on a number

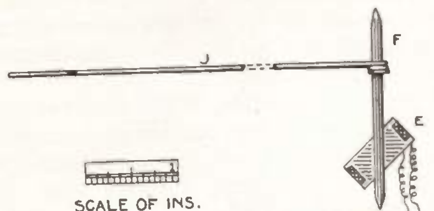


FIG. 23

of A. C. meters, among them the Weston.

The construction of this meter will be very simple, if you have already made one of the inclined-coil type (§ 13)*, for the only parts necessary to be changed are the scale, K, and axis, F, on which the vane, E, and needle, J, are mounted (Fig. 22)*. You will have to replace the latter with the arrangement shown in Fig 23. This consists of a shaft, F, and needle, J, the exact duplicate of those shown in Fig. 22. Upon the shaft, F, is mounted the coil, E, the form for which is turned from a piece of wood. This coil should be mounted so that its axis is at an angle of 45 degrees to the center line of the shaft, and arranged so that it is parallel to the field coil when the needle, J, is at the extreme right of the scale. This coil, E, should be wound with exactly the same number of turns as coil, M (Fig. 22), with wire one size thicker. This will give the greatest accuracy, provided the dimensions have been kept the same as those in the illustrations. The connections from this coil are made through two wires, A and B, flexible enough to let F move freely. The connections with the rest of the apparatus must be such that E is in parallel with M, and in series with O, and are shown in Fig. 24. You will notice that the circuit for measuring volts includes coil M; it would be preferable not to have it so, but this would necessitate the use of either a switch or two coils like E. Besides the increased accuracy would hardly be noticeable. The principle of operation is, as was stated before, very similar to that of the D'Arsonval meter. The only difference is that the field of the coils, M and O, alternates, together with that of the coil, E, so that the relative polarity of the two is always the same. The needle is, therefore, always pulled in the same direction and does not sway. From the above it will be seen that this meter is just as good for measuring direct as well as alternating current.

The construction of the actual Weston meter is somewhat different from the one described above, in that the shaft, F, is perpendicular to the axes of both coils. The type given here was used because it did not necessitate the construction of a new field coil, A, standard, D, etc., while it illustrated the principle just as well as the other.

You can also put this meter to practice, the same as the inclined-coil meter. If the capacity is not high enough, you can increase it, as was mentioned at the end of § 13. This meter will not measure high-frequency currents, as the great amount of wire used would choke the

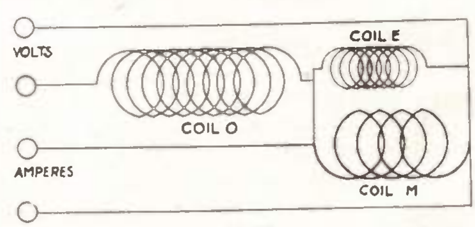


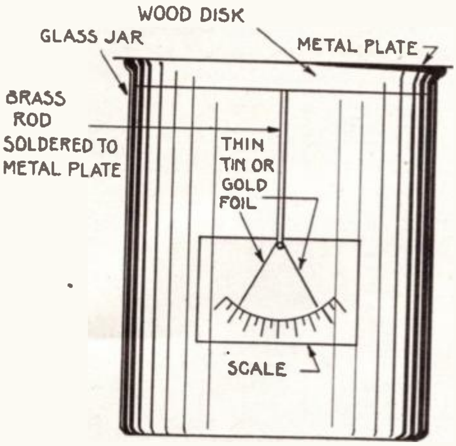
FIG 24

current back.

15. Another type of voltmeter used on A. C., works on about the same principle as the electroscope. You will remember that if an electroscope is connected to an electrified or charged body, the two leaves will separate, being electrified with like charges of electricity.

* See pp. 363 and 364, July issue.

The same will result if you connect it to a high-tension current, direct or alternating, if the potential is high enough to charge the electroscope appreciably. If now a scale is placed back of the leaves so that the amount of separation can be measured, as shown in Fig. 25, you will



M.E. FIG. 25 ELECTROMETER

have an *electrometer* or very crude form of *electrostatic voltmeter*. This, however, will hardly be accurate, even when the potential exceeds several thousand volts.

A far more accurate form is shown in Fig. 26. The base of this meter is the same as used for the meter described in the previous section (Fig. 22), the scale, K, and posts, L, also being kept. On the base is mounted a baking-powder can, A, cut into quadrants, as shown. The lower end of the box is shown in Fig. 27. The upper end should be cut below the beading, while the cover should be cut as shown and a dent made in it with a center-punch, at the center (as one pivot for the moving element, the other pivot is also a dent, made in the center of the lower end of the box). It can then be soldered over one of the quadrants that is in electrical connection with the lower pivot *not* any other.

The moving element consists of a smaller box, B, with cover, trimmed to the shape and dimensions shown. Through the center of this passes a steel needle, C, serving as a shaft. On the upper part should also be soldered an indicating needle, D, moving over the scale, K. This indicating needle, D, should be as light as possible, as if it is too heavy it will hinder the rotation of the box, B, which will decrease the range of the instrument. A spring, E, which is soldered, at one end of the shaft, at the other to the upper or lower bearing, should tend to turn the needle, D, to the left. It should be very weak, indeed, a spiral spring from the escapement of an old watch will be just right for this.

The opposite pairs of quadrants, one pair, of course, being electrically connected to the box, B, are connected together. Each pair is then connected to a binding-post. The instrument is shunted across the wires, the difference of potential of which is to be measured, as shown in the illustration, the same as with any voltmeter.

The principle of operation of this meter is slightly different from that of the electrometer, spoken of before. The box, B, is not only repelled by the pair of quadrants connected to it, but also attracted by those connected to the opposite pole of the circuit, because the two are electrified with opposite charges at each alternation. From this you will see that this meter can be used on direct as well as alternating current, either high or low frequency.

You must understand that this voltmeter cannot be used with your battery current, inasmuch as the potential is not high enough to turn the indicating needle.

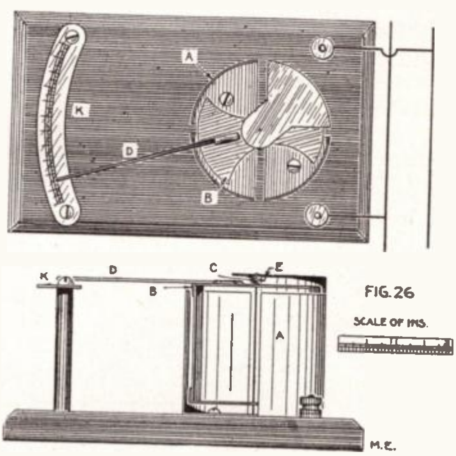
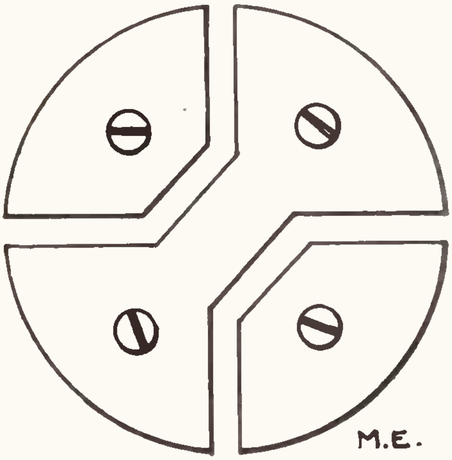


FIG. 26

The lowest voltage will vary from 75 to 150 volts, according to the care you have used in building the instrument, the strength of the spring, E, and the weight of the moving element, B.

On the other hand, it cannot be used on extremely high voltages unless the design is somewhat altered, so that the air-space between the quadrants of the box, A, is large enough to prevent the current from sparking across.



LOWER END OF BOX.

FIG. 27

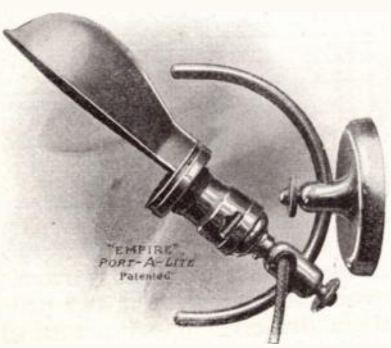
The most important advantage of the electrostatic voltmeter over all other forms is that it takes almost no current at all to operate it, just enough to charge the quadrants and box, B, these acting as a low-capacity condenser.

You can put this meter to practical use by making it measure the comparative voltage output your wireless coil or transformer is delivering under different conditions.

(To be continued.)

THE PORTALITE.

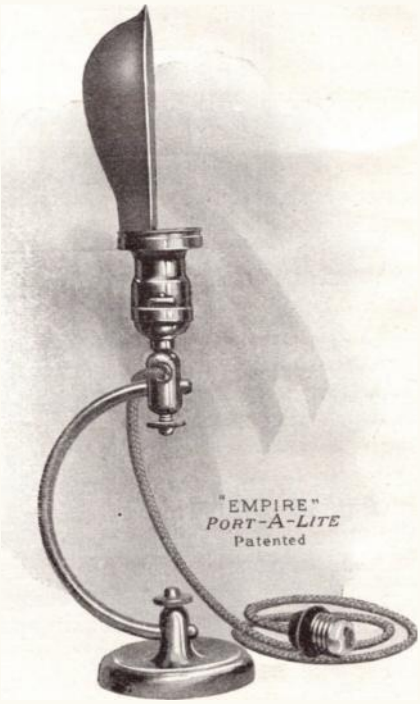
This is the name given to a recently patented lighting fixture that has some



unique and useful features.

The construction is such that any desired adjustment may be obtained in a moment, and the light directed where needed. It is claimed by the manufacturers that the Portalite has a greater range of adjustment than any other portable lighting fixture on the market, while possessing the advantage of being quickly and easily taken apart and packed in a small space for carrying.

In addition to making a convenient and practical desk, piano, reading, or study lamp, it can be made into a dressing table, or dining-room light,



or hung up on the wall or bed, if desired.

The manufacturers pride themselves on the fine workmanship and materials used. The lamps are finished in old brass, polished nickel, polished silver and old bronze, with shades and cord to match. Each lamp is neatly packed in a heavy cardboard box, and is ready for use when you receive it.

IN KY.

There was a young man of Ky.,
With ladies was almost too ly?
Wherever he'd go
They would bother him so,
By calling him "darling" and "dy."

June Woman's Home Companion.

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

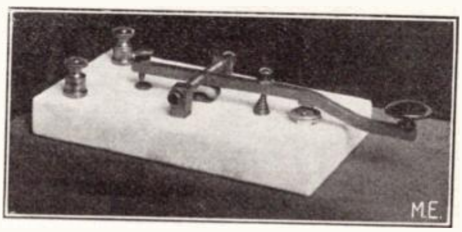
A GOOD WIRELESS KEY.

The wireless key described below can be made for less than one dollar, and will give as good results as keys costing four or five times as much, and besides, it adds to the appearance of a station.

The materials needed to make this key are as follows: One marble base 7 x 4 x 1 inch, one piece ¼ inch square brass rod 7 inches long, two pieces ¼ inch round brass rod, each ¾ inch long, two pieces ⅜ inch square brass rod, each ¾ inch long, one piece thin brass sheeting ¼ inch wide, about 2 inches long, one key knob, two binding posts, one spring, two dimes, and the necessary bolts and wire.

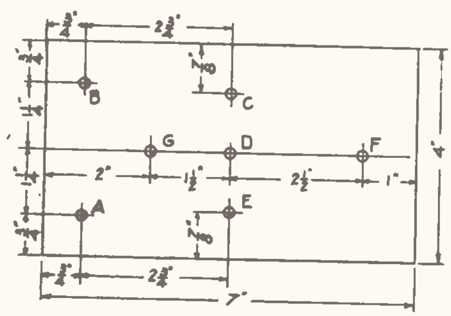
The marble base can be obtained from a marble works for about 25c. After you get the marble base, drill seven holes in according to the dimensions shown in Fig. 1, where a, b, c, d, e, f, and g represent the holes. All holes in the marble are to be made with a 3-16 inch drill. The ¼ inch square brass rod is to be bent as shown in Fig. 2. Drill a hole through the rod from one side 1¾ inches from one end, as in Fig. 2. All holes in the brass are to be drilled small enough so that they can be tapped with a No. 8-32 tap. tap. Drill and tap holes with 8-32 tap, as shown in Fig. 3, which shows the top view of Fig. 2.

The two pieces of ¼ inch round brass rod are each to be drilled and tapped in one end for about ¼ inch, the remaining end of each piece has a small hole drilled in to make a bearing. Fig. 6 shows these pieces.



The two pieces of ⅜ inch square brass rod are to be drilled and tapped for about ¼ inch in one end of each piece. About ¼ inch down from the other end on one side a hole is to be tapped and drilled, as shown in Fig. 5.

The thin brass sheeting, ¼ x 2 inches, is to be bent as shown in Fig. 4. The spring is shown in Fig. 7.



M.E. FIG. 1

The two dimes are to be drilled and tapped with an 8-32 tap in the center.

Get a piece of 8-32 threaded brass rod about ¾ inch long. Screw this into one end of the ¼ inch round brass rod, then screw it through the hole, which is 1¾ inches from the end of the lever, then screw on the other piece of ¼ inch round brass rod. In the end nearer the bend screw the key knob in the hole which was drilled and tapped for it. In the other end screw

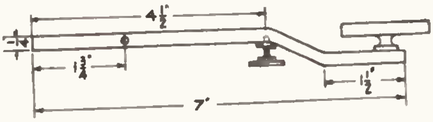


FIG. 2

FIG. 3

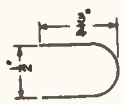


FIG. 4

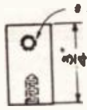


FIG. 5

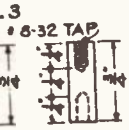


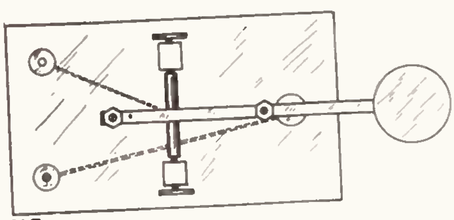
FIG. 6

FIG. 7

M.E.

in the hole which was drilled and tapped an 8-32 screw which can be obtained from the carbon of an old dry cell. At the place where the spring goes place a similar screw. Next fix one dime to the lever, as shown in Fig. 2. Then rivet the thin brass sheeting to the lever.

Secure the two pieces of ⅜ inch square brass rod to the base at places marked c and e, Fig. 1, by screwing 8-32 bolts through the holes drilled there up into the brass. At hole f



M.E

FIG. 8

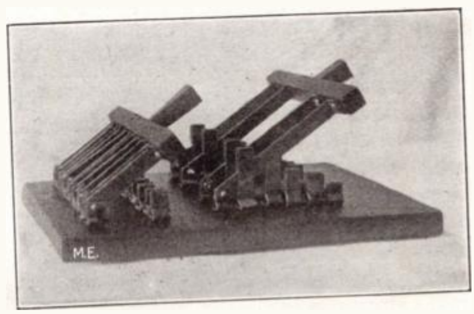
(Fig. 1) secure the other dime to the base in the same manner as the ⅜ inch square brass was fixed. At g fix a bolt for the screw at the end of the lever to hit on when the lever is worked. In the two holes in the sides of the ⅜ inch square brass rod screw bolts with lock-nuts. Then put the lever in place and screw up the lock-nuts after the bolts have been adjusted so that the lever works easily. Next put a bolt through the thin brass sheeting and the base, at hole d (Fig. 1). At holes a and b put the binding posts. Then connect the lower dime and one of the binding posts with a wire; also the other binding posts and the brass sheeting. Then put the spring, Fig. 7, under the lever, and the key is complete. See that the dimes come together squarely. Fig. 8 shows the top view of the key. This key gave excellent results on a ½ kw. closed core transformer and can be used on a larger transformer.

Contributed by

CLARENCE LYNN.

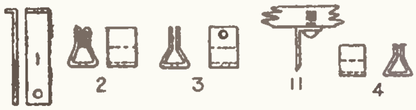
SECOND PRIZE—ONE DOLLAR.
GROUPING SWITCH.

The sketch and photo herewith show a grouping switch for connecting ten cells, in either series, or parallel, by a throw of the switch handle. The following description, and photo, is sufficiently



clear, to give an idea of the instrument.

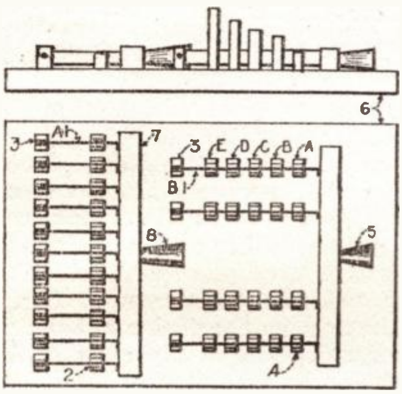
The blades and contacts are made of 5-16 inch brass strip, about 1-16 inch thick, bent as shown in Figs. 1 to 4; four are made of No. 1, 3⅜ inches long, and four are made 2 inches long; four of No. 4 are made so as to be ⅜ inch high, four are made ⅝ inch high, four are made ⅞ inch, four 1⅛ inch and four 1⅜ inch, forming steps for the large switch. They have No. 42 holes drilled in them and are fastened to the base by ¾ inch No. 2-56 iron machine screws, fastened with two nuts on the bottom. Holes are bored in the base, which is made of hard fibre, with a No. 42 drill at places marked "o," in Fig. 12. The blades are fastened to the hinges by ¼ inch iron machine screws and nut. On the under side of the base, as shown, 20 No. 2-56 machine screws, ½ inch long, are screwed into holes tapped in the base; these screws have two nuts screwed on them before they are put in place, forming a kind of binding post, to



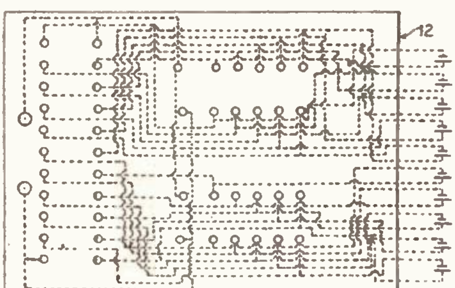
NO.	SIZE	NAME	MAT'L	NO.	SIZE	NAME	MAT'L
A1	2 × 3/8	BLADE	BRASS	E4	2 × 3/8	CONTACT	BRASS
B1	3 3/8 × 3/8	"	"	9	5 × 1/2 SQ.	BAR	FIBRE
2	1 3/4 × 3/8	CONTACT	"	5	3/4 × 1/2 "	HANDLE	"
3	1 3/8 × 3/8		"	6	6 × 9 × 1/2	BASE	"
A4	1 × 3/8	"	"	7	5 1/2 × 1/2 SQ.	BAR	"
B4	1 1/4 × 3/8	"	"	8	1 × 1/2 "	HANDLE	"
C4	1 3/8 × 3/8	"	"	12	CONNECTIONS		
D4	1 5/8 × 3/8	"	"	11	METHOD OF FASTENING SWITCH BLADES		

M.E.

which the wires are connected. If the switch is to be mounted on a switchboard this is all there is to be done; if, however, it is to be placed on the table, four fibre blocks 3/4 inch long by 1/2 inch



square, one at each corner, must be screwed on, to raise the base from the table; two binding posts are fastened at "X," from which the current is taken. When the 4-pole switch is open and the 11-pole switch closed, all cells are in series. When the latter is



M.E.

opened and the 4-pole switch closed one step, 2 cells are connected in parallel; second step gives 4 in parallel, and so on to 10 in parallel. The blades are fastened to the handle by 1/4 inch No. 2-56 machine screws, holes being tapped into the handle. Connections should be made, under the base, between contacts as shown, crossings being separated by a piece of paper soaked in shellac, and the whole covered with several coats of shellac to hold wires in place. Wires should be No. 20 to 24.

Contributed by

ERVIN J. TROJAN.

ELECTROPLATING GLASS FOR CONDENSERS, LEYDEN JARS, ETC.

Leyden jars, or glass plate condensers, coated with tinfoil, are unsatisfactory, for the reason that it is difficult to make perfect contact between the tinfoil and the glass over the entire coated surface. Even if in good contact at first, the foil often blisters, causing weak spots, at which the glass is liable to puncture. Applying a metal plating directly on the surface of the glass gets rid of these difficulties, and makes a much better condenser. Any of the following methods may be employed:

Prepare a mixture of sulphur and oil of spike (Lavendula spika), having it of the consistency of molasses; also a saturated solution of chloride of gold in sulphuric ether. Mix the two and evaporate at a gentle heat to the consistency of paint. After thoroughly cleaning the glass paint a thin coating of this mixture on the surface to be plated and bake in an oven or furnace to drive off the sulphur and other volatile ingredients. The result is a very thin metallic film which adheres very closely to the surface of the glass, which film may be reinforced by electroplating with copper in the ordinary manner. This makes a very good coating, suitable for sending condensers and the like.

A somewhat simpler method is to roughen the surface of the glass by means of hydro-fluoric acid, sand blast, or grinding, and to paint the surface with a saturated solution of silver nitrate. After this dries, the treated surface should be electroplated.

The third method differs from the second only in painting the roughened surface with a very thin film of prepared Acheson graphite, instead of the silver nitrate solution.

Contributed by

SAMUEL WEIN.

A ROTARY ADJUSTABLE TUNING COIL.

This coil is of the rotary type, which the reader will recognize as an improvement used more and more each year. The contact arm rotates in a spiral and the coil should have about 40 contacts arranged in the form of a spiral.

The diagrams given, illustrate an instrument which replaces a one-slide tuner—to make it equivalent to a double slide tuner, add another arm and set of contacts, connecting each tap from the coil, which is inside the case, to two contacts, one in each set.

The construction of the slider can be plainly seen from the diagrams, but a little description of the materials will be in line. The arm proper is made of sheet brass as shown in Fig. 3. Procure a piece of brass rack and a piece of brass

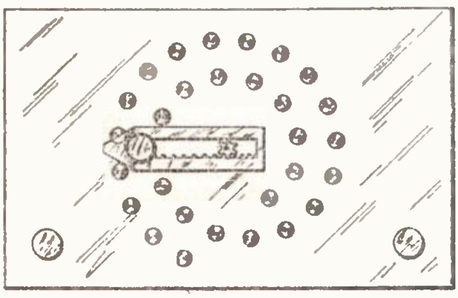
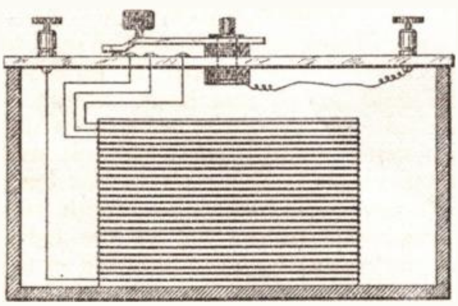


FIG. 1



M.E. FIG. 2

pinion wire to fit, each about 2½ inches long, from any supply house.

The rack is soldered on to one side of the arm, as shown in Fig. 4. The width of the slot should, measuring from the bottom of the ridges, be equal to the outside diameter of the pinion, and is about ¼ inch. A ¼-inch hole should be bored in the centre of the top board to hold the pinion. Before placing the pinion, file off the teeth

FIG 3

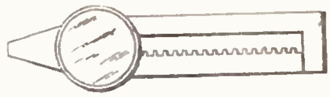


FIG. 4

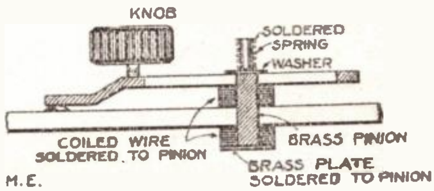


FIG. 5

smooth for a distance of about ¾ inch all around one end. Now place a washer on this smooth shank and coil a brass sping around the shank, thus holding the washer firmly against the butt of the filed place and solder the upper end fast, as shown in Fig. 5. Slip the arm up the pinion against the washer and hold in place by coiling and soldering wire around the pinion. The wire coil should be thick enough to hold the arm in the right position to make good contact. Now slip the pinion through the board and secure by another coil of wire. This is all shown in Fig. 5.

To place the contacts, hold a lead pencil in the middle of one side of the contact shoe, and, after setting the arm out as far as it will go, rotate the arm, thus drawing a spiral line. The contacts may be made of brass-headed tacks, and should be driven on the line as above drawn.

To set the arm at the starting point it is not necessary to rotate it; just lift it up and slide it out to the starting tack and let it fall back in place again. The spring is to hold it in place. The tuning coil may be of any type. The turns are connected to the contacts, as shown in the sectional view. The dimensions of the box and the number of turns between taps are regulated by the size of the coil.

Contributed by

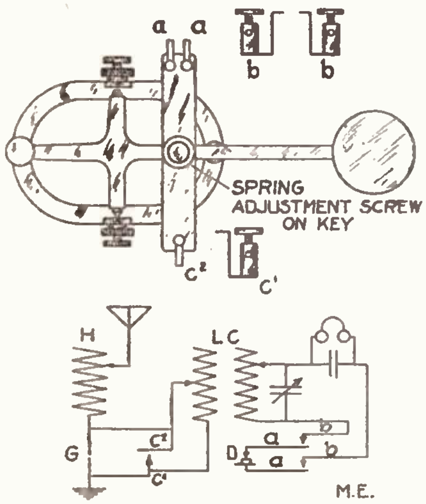
PAUL H. HORTON.

BREAK-IN KEY.

Having been a reader of your experimental department for some three years, and, as yet, having failed to see a break-in system that would not put the detector out, I would like to contribute an article on one.

This key is very much in use among the amateurs out here, and causes no interference, as one can always hear when he lifts his key, not to mention the advantage of not having to throw a lot of switches. As seen in the sketch, the cross piece marked h is a piece of 1/8 inch fibre, and can be made any suitable length, as keys differ in size. The pieces a, a, and b, b, are made from hard rolled phosphor bronze, as are c^1 and c^2. These springs, a, a, and b, b, are so placed that a, a, make connection with b, b, when the key is up, and cut the detector out of circuit when it is down, while c^1 and c^2 are short circuiting the tuner and thereby grounding the helix.

There is no danger of burning out the detector or phones as long as c^1



and c^2 are kept in working order; but it is well to be sure that they make good connection when the key is down.

This key may be made a great deal handier by placing this break attachment on a telegraph sounder and placing an extra insulated contact on the back of the key, to work the sounder. The fibre strip marked H is placed on the aluminum bar, under the adjustment screw.

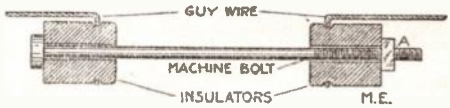
In the diagram, H is the helix, or the secondary of the oscillation transformer; G, a small spark gap in the ground lead. The receiving hook-up is for a silicon detector or any mineral detector requiring no battery, in connection with a loose coupler. The key may, however, be used with a D. S. tuner and any other detector.

Contributed by

W. DONELSON, Jr.

AN INSULATED TURNBUCKLE.

Here is an easy way of combining the insulators and the turnbuckle on the guys



of a wireless pole into one piece, thus strengthening the guys by not breaking them up into several parts to insert insulators and a turnbuckle.

It consists of three parts two (large) standard porcelain insulators—$0.02 and one machine bolt 1/4 x 7 inches, $0.01. Total, $0.03 apiece. The slack of the guy is taken up by turning the nut, A, with a pair of pliers. The drawing explains the rest fully. Because of their cheapness all of the guy wires of the mast may be equipped with them.

Contributed by

JOHN B. BRADY.

PILOT LAMP ATTACHMENT.

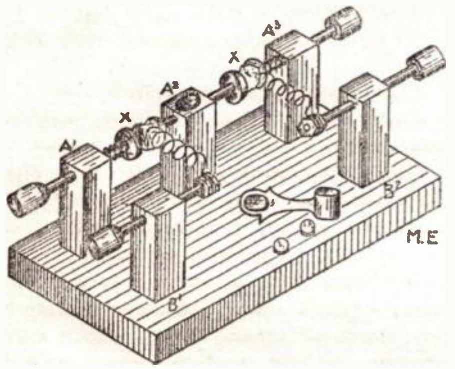
Take fifteen feet of No. 26 enamel or silk covered wire—copper preferably—and make a coil just large enough to fit inside the top of the helix for which it is being made. Tape the coil well and leave leads about six inches long. Drill two 1-16 inch holes about two inches apart in the top of the helix. Put the coil under the top board of the helix, running one wire through each hole and fasten coil with two or three small staples. Procure a miniature base socket and fasten on top of the helix and the attachment is done except for the lamp. For coils of one-half to one inch a four and one-half volt lamp is good; for larger coils the proper size of lamp is best determined by experiment.

Contributed by

CHAS. STRUBE, JR.

COMBINATION GALENA DETECTOR.

This detector is used in case a quick change is necessary. If one of the points of this detector happens to be knocked out of adjustment by static or other means the other detector can be easily thrown in the circuit by making use of the two point switch. The arm of this switch is connected to one side of the circuit while the points are connected to B1 and B2. The base of this detector, or A1, A2, A3, are all connected together and led to the other side of the circuit. You will find that this detector can be



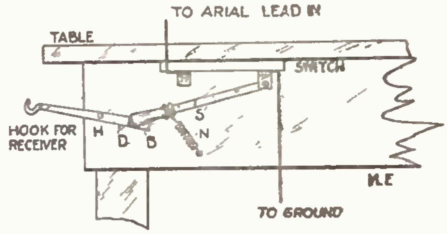
adjusted to the highest degree of sensitiveness, and is easy to construct, its dimensions being made according to your liking; but I would suggest, for the uprights, ½ inch square brass rod, each 1 inch high. The distance between A1 and A2 1¾ inches, and 1 inch between A1 and B1. The springs between X and A1 will hold the mineral in tight adjustment, while the check nut in A2 holds the other rod from slipping.

Contributed by

JESSE SAUTER.

A SELF-GROUNDING AERIAL SWITCH.

This switch will ground the aerial for you whether you forget it or not. The switch used is an ordinary porcelain base, S. P. S. T. switch fastened underneath the table, as shown in the illustration. The spring, S, is fastened to the handle of the switch, and to a nail driven in the side of the table, at N. The hook is made of brass, and is bent outward at B, so that it will strike against the switch handle. A notch is made in the switch handle where it strikes. The hook is pivoted, at H, and a nail is driven in, at D, to keep



the hook from coming down too far. In this way the aerial is always grounded when the receiver is on the hook, so there is no danger of the instruments being destroyed by lightning.

Contributed by

GILBERT WALKER.

STATIC MACHINE PLATES.

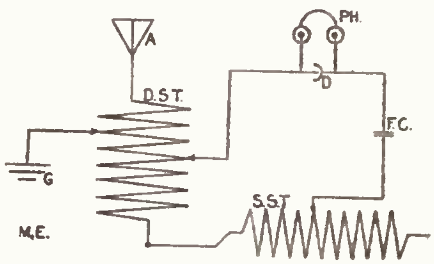
Many experimenters, like myself, who wish to build a small static machine, undoubtedly find it difficult to procure the plates for it. Old 14-inch talking machine records, with music on one side only, are excellent, and will be found to run very true.

Contributed by

A. S. VAN DEUSEN, JR.

STATIC ELIMINATOR.

The following is a new "Hook Up" I discovered while experimenting. The instruments used are a double and single slide tuner, also silicon detector, fixed



condenser and 'phones. With this "Hook Up" I am able to tune out all interference and static as well as a loose coupler.

Contributed by

EARL L. NORCROSS.

Note: If anyone tries this hook up we would like to know of the results.—Ed.

A GALENA DETECTOR.

The following sketches show the parts of an efficient galena detector.

Any surface of the galena may be

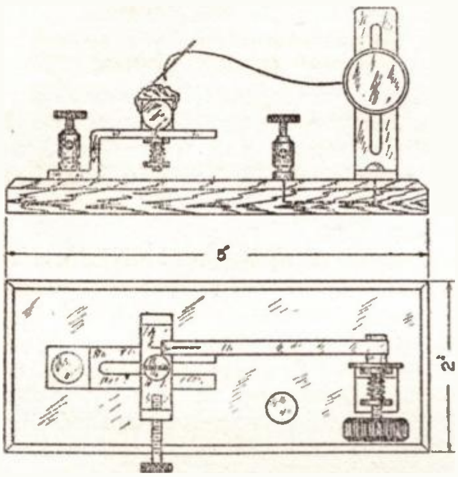
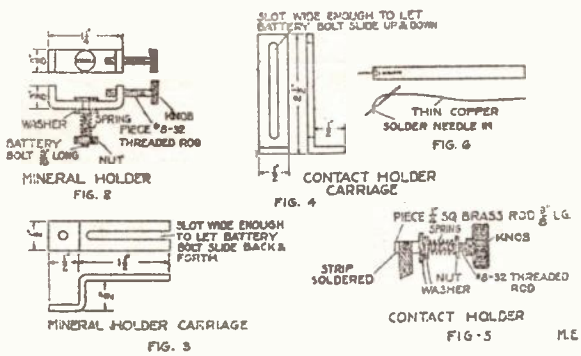


FIG. 1 M.E.

used at will and any tension of the contact may be had, by adjusting the mineral holder and raising and lowering the contact holder.

The mineral holder should meet favor with those who have tried to use an irregular piece of galena in a cup. Any shaped piece may be clamped



MINERAL HOLDER FIG. 2 — CONTACT HOLDER CARRIAGE FIG. 4 — FIG. 6 — MINERAL HOLDER CARRIAGE FIG. 3 — CONTACT HOLDER FIG. 5

in the holder, and a stable adjustment will result.

Contributed by

LINAS WORDEN, JR.

TO SOLDER TINFOIL.

Here is a good way to solder tinfoil. Take a smooth, flat piece of any kind of metal, lay your tinfoil on top of this, apply flux, then place the wire to be soldered on the tinfoil, applying a drop of solder with a moderately hot iron. I have successfully soldered No. 14 copper wire to the thinnest grade of tinfoil, such as is used in telephone condensers. I think the explanation is due to the fact that the metal under the foil conducts away the heat so rapidly from the foil that it does not get a chance to melt.

As a good many experimenters no doubt have had considerable trouble in this matter, they would probably appreciate this method.

Contributed by

F. W. KEELER.

A GOOD BICYCLE LIGHT.

Material:

Two three and one-half volt Mazda tungsten lamps with opal backs.

Two miniature sockets, not receptacles.

One small battery switch.

About three feet of green silk covered lamp cord.

One four and one-half volt three-cell "Special Tungsten Battery," made by Ever Ready Co., costing 30c.

Two feet of insulating tape.

Suspend the battery, wrapped in black cloth, beneath top cross-bar, just back of handle bars. Place switch on top of bar, and wire up and put lamps and sockets in a bicycle lamp.

If you have an oil lamp, take off the burner and oil reservoir and solder a piece of metal over the bottom of lamp. Have reflector nickel-plated and highly polished, and you will have a lamp equal to any, except gas, which is a trouble maker, as I have found.

I use this arrangement one and one-half hours steady, for three nights a week, and have had the battery six weeks, and it is good yet.

This is the best arrangement I have used and I have tried many. The battery *must* be a "Special Tungsten Battery" for good results.

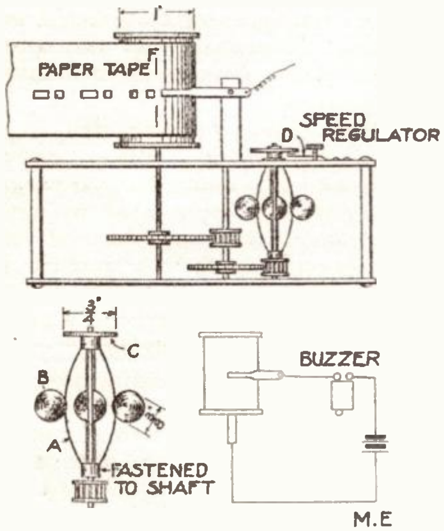
Contributed by

FRANK X. KEILING, JR.

AUTOMATIC TRANSMITTER.

Many amateurs, after having put up a wireless station, cannot communicate because they do not know the code well enough to receive from the experienced amateurs.

Get a set of old clock works, an eight



day is best, remove the escapement and escapement wheel. Then make a governor as shown in the drawing. B shows the brass balls, of which there are three, each three-eighths inch in diameter. A shows the three narrow strips of phosphor bronze, about No. 30, and as long as the spindle of the clock will allow. C is a disk with a hub on one side, and may be turned up on a lathe, or a solid clock wheel could be used; it should slide freely on the spindle.

The phosphor bronze strips should be soldered to the hub of C, and the other end should be soldered to another hub fastened to the shaft. This may be easily done if the strips are first bound in place with a fine wire.

The balls are then soldered to the middle of the strips by heating them and putting a small drop of solder on one side and then sticking it on the spring and holding it till the solder cools.

A spring, d, must then be mounted, as shown, with an adjusting screw to regulate the speed.

Then mount a metal roller, F, as shown, for the paper tape.

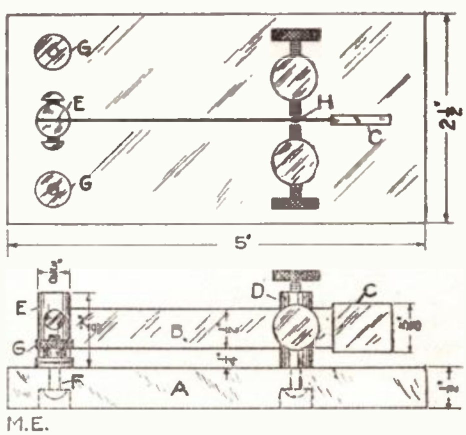
For the record, first make two punches, one with a square end and one with a rectangular end, the si:e you want the dots and dashes. Then mark a guide line on the tape, and by laying the tape on a piece of sheet lead, the dots and dashes for any message may easily be punched.

The two ends of the paper are then glued together and the paper is passed over the metal roll on the clock work, and over an idle roll. Small springs drop in the spaces cut by the punches, thus making contact with the metal roll. A buzzer may be connected in, or it may be connected in place of the push button of the buzzer test, and the signals will be heard in your head phones.

Contributed by
EDWARD H. THINEMAN.

A GOOD KEY.

The materials required for this key are as follows A, is a soft pine baseboard, 2½ inches wide by 5 inches long by ½ inch thick, only one required. B, is a piece of spring brass, ½ inch wide by 4⅛ inch long by 1/64 inch or 1/32 inch thick, one required. C, insulation of rubber or tape. D, front adjusting posts, two required. E, back post which holds the spring brass, one required. It has a slit 3/64 inch wide by 11/16 inch deep to hold the spring brass. F, machine screws which hold upper posts to base, five required. G, two battery bind-



ing posts. H, is a small piece of silver, for a contact, which is riveted in the spring brass. When these materials have been obtained they may easily be put together as per drawing. This makes quite a handsome key when the base is stained. It gives good results with instruments up to ⅛ kw. I think this key will be a help to any experimenting amateur.

Contributed by
ARTHUR C. ARNOLD.

A SIMPLE SLIDER.

First cut a piece of hard rubber or wood as shown in Fig. 1. Give it two

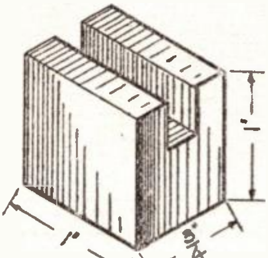


FIG. 1

good coats of shellac or enamel paint. Next cut a piece of copper or brass as shown in Fig. 2. Nail or screw the

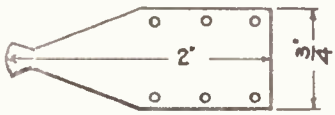


FIG. 2

piece of copper to the side of the block which has the groove in it, and bend

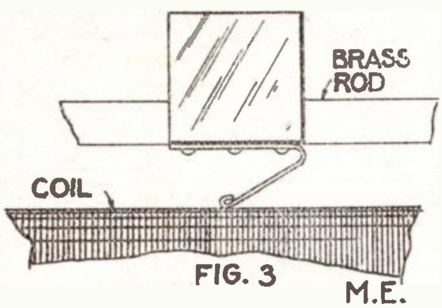


FIG. 3

the projecting part down. Fig. 3 shows the slider assembled.

Contributed by
VICTOR REYNAL.

COIL WINDING.

In none of the articles in your valuable magazine on the winding of secondaries of induction coils and transformers have I seen described the method I have used in the construction of several coils.

According to my notion, this method is easier than the one where the wire is drawn through melted wax and formed into thin pies, holding their shape (sometimes), through the hardening of the wax, and the results, as far as I can see, are just as good, if not better, for the wire is wound in perfectly even layers, which fact, I believe, fully compensates for the space occupied by the paper used in making up the sections.

One coil which I constructed, used an insulating tube 2⅛ inches outside diameter and 8 pounds No. 30 single silk covered wire were used to wind the secondary. This was formed into eight sections, each 1⅛ inches in thickness, and the coil, when completed, gave a 3 inch spark on 9 volts, using a slow-speed interrupter.

The usual form for winding the sections was used, except that the distance between the heads of the spool was 1⅛ inches instead of the usual ¼ or ⅛ inch. A light cardboard cylinder large enough to slip over the separating tube was placed on the form, the central portion of which, by the way, was of the same diameter as the separating tube. The spool being assembled with the cardboard tube in position, a layer of the No. 30 wire was wound on, leaving a narrow margin at either edge without winding. Over this layer of wire was put a strip of paper 1⅛ inches in width, and upon that a second layer of wire, proceeding in like manner until about 55 layers had been wound, each separated from its neighbor by a layer of paper. After the completion of the winding, the section was carefully removed from the spool and immersed for about half an hour, or until the bubbles stopped rising, in a hot paraffine and beeswax mixture. After the section cooled, more of the compound was poured on the ends, filling the small spaces between the layers of paper, thus providing part of the insulation between sections, the rest being made up of rings of bond paper boiled in the same compound, using eight rings between each two sections.

The paper used for the strips was bond paper about .004 inch in thickness, I believe it is known to the printer as 16-lb. bond, and was cut into strips 1⅛ by 22 inches at the printing office where purchased. The rings were slightly heavier, being 20-lb. bond. Empire paper, No. 104, could be used, but it is more expensive and would have to be cut by the builder.

All the other sections were wound and treated like the first and the coil was assembled, the outer end of the first section being connected to the inner end of the second, and so on, the inner ends being brought up between the rings as shown in sketch.

A good test of the insulation of this coil was made accidentally. While operating it on a 12-volt battery, one of the leads to spark gap became disconnected and the coil operated for nearly a minute without any spark in the gap. A humming sound was heard in the coil and I thought it was spoiled, but upon again connecting the gap it gave as long a spark as ever. This occurred several times. I have recently rewound the wire from this coil into a larger one; that is, one with a heavier core, and there was no sign anywhere of a breakdown, either between layers or in the places where the sections were connected together, where the chances for such a thing were best.

A friend of mine snarled up a quantity of wire in a vain attempt to make the other kind of sections, as for some reason the "pies" would not hold together after being wound, so I tried this other method which I first saw used in an automobile ignition coil, though in that the sections were wider than the ones I used.

I have an idea that perhaps a hint of this method through your magazine would be appreciated by some who have either been discouraged by trying the other method or who have hesitated to tackle it. The most inexperienced cannot fail to get a good coil and good insulation by this manner of construction.

Contributed by
HERBERT A. HILLER.

SMALL SWITCHBOARD.

The accompanying drawing shows a small battery charging switchboard, which is easily constructed.

Explanation:

CL, Lamps used to regulate current when charging; TL, Test lamps for testing cells on closed circuit; V, Voltmeter; TS, Test switch; MS, Meter switch; CS, Charging current switch; CC, Charging current; SB, Storage battery.

Operation:

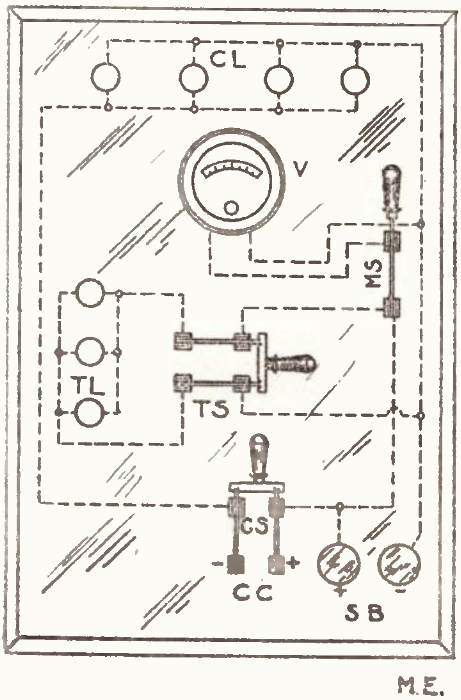
To charge, open MS and TS, close CS. To take readings, open CS, close TS and MS.

When not in use, open all switches.

Test lamps should be of same voltage as storage battery.

Charging lamps should be of same voltage as charging current.

I use this in my own laboratory.



Contributed by
FRANK X. KEILING, JR.

HOW TO MAKE MILLED HEAD THUMBSCREWS.

First cut and thread a piece of rod the length you want the screw to be. Then take a battery thumb nut and cut it as per Fig. 1, then screw it on the end of the rod and put some soldering acid on the end of the rod and screw the rod in and out of the head, so the acid will run into the threads. Then put a drop of solder on as per Fig. 2 and hold in the flame of an alcohol lamp, or a blow torch. The solder will melt and run in the threads and sweat the two together. File off any solder that remains on the outside of the head and you will have as

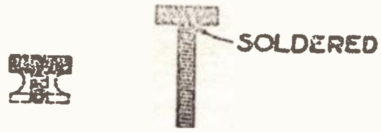


FIG. 1 FIG. 2 M.E

good a thumbscrew for binding posts as anybody wants.

Contributed by

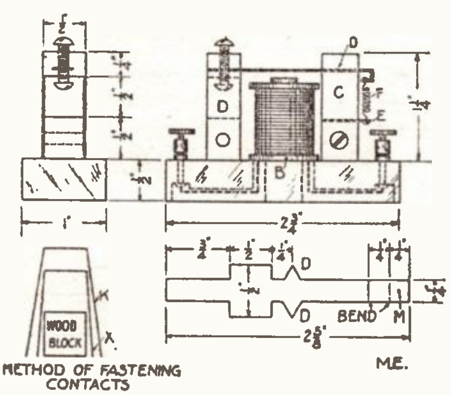
WM. R. LEONARD.

TELEGRAPH SOUNDER.

A cheap telegraph sounder may be made according to the following directions, for 25c. or thereabouts.

Prepare a wooden base 2¾ x 1 x ½ inch. One-half inch from each end mount a block of wood ½ inch square and directly in the center of the base. From an old piece of sheet iron about 1/16 inch thick, cut two strips, C, ¼ x ½ x 1/16 inch. Bore a hole near one end of each strip for screws and near the other end make punch marks to act as bearings for the lever. Screw these pieces, C, to one block.

The contact post, D, is made of two pieces, K and X. Both are sheet iron. K is 3 x ½ inch, and X is 2½ x ½ inch. In the center of each strip bore and tap a hole 8-32 thread. Near the ends of



each strip bore holes. When these strips are bent as shown, the holes should coincide. Mount K and X on the remaining block as illustrated and fit with machine screws (8-32 thread).

The lever, A, is of sheet iron, 2⅝ inches long, and of the shape shown. D, D, are pivots to go into punch marks in C, C. Bend the right hand end of A, as shown in the assembly drawing and bore a small hole, M to receive the end of spring, F, made of brass wire. A spring strip, E, ¾ inch long, holds the other end of the spring, and may be bent up or down to vary the tension.

A magnet, B, is mounted in the space between the two blocks. The magnet may be obtained at the local electrical supply shop, from a discarded bell, or may be made by winding No. 22 magnet wire around a 1 inch piece of iron rod which is about ⅜ inch in diameter. The ends of the magnet windings are brought to binding posts near the ends of the base.

The sheet iron parts may be cut from pieces rescued from the plumbers' scrap heap or from a discarded length of heavy stove pipe.

Contributed by

G. H. McCARTHY.

AN EFFICIENT MODEL AEROPLANE MOTOR.

In view of the fact that a small number of rubber strands, together, allow many more turns than a larger number, this motor was constructed. In this way almost the same power is obtained as when the strands are all together but the number of turns are greatly increased.

Procure two pieces of spruce or pine one-eighth inch thick and three-quarters inch wide, in lengths to suit. Bevel off the sides to within one inch of each end, to lighten the motor. Make a cut, one-eighth inch wide, half way down the center of each piece, as at A, Fig. 1, drill three-eighths inch holes, one inch apart, down the center of the other half, in each piece, as at B, Fig. 1. Sandpaper each piece to weigh less than one-quarter ounce to the foot.

Apply glue, (Le Pages), down the center of each piece, between the holes, bring each end with the one-eighth inch cut together, and force one into the other; bind with twine and see that each piece is in the center of the other, as in Fig. 2, apply more glue if necessary and bind tighter.

Next get a piece of tin, cut out one

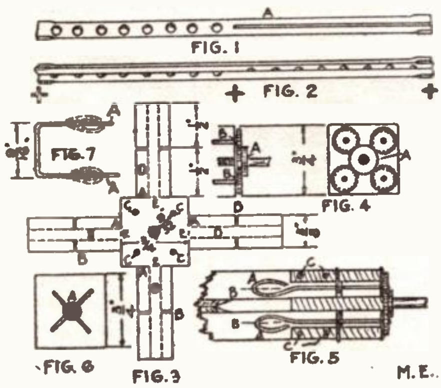
piece as Fig. 3, make all cuts as at A and B, Fig. 3, cut B being as wide as the tin is thick. Cut another piece as Fig. 3, with arms only one-half inch long, cut in as at A, Fig. 3, then cut one piece three-quarters inch square.

Draw diagonals on the three-quarter inch piece, to find the place for the center hole. The other holes are on the diagonals, nine-thirty-seconds inch from the center. Lay the three pieces together, drill the holes for bicycle spoke wire, as at C, Fig. 3.

Bend the two pieces with arms in, on dotted lines at D, Fig. 3, over the side of a flat file. Slip the three-quarter inch square piece in a cut B, Fig. 3, and bend arms in at E, Fig. 3. Bend the piece with one-half inch arms in at E, Fig. 3.

Get old bicycle spokes to make hooks as in A, Figs. 5 and 7. Make four hooks, as in Fig. 5; and two as in Fig. 7, which should be bent after passing through the piece with one-half inch arms, and solder as at A, Fig. 6.

After passing the four hooks through both pieces of tin, as in Fig. 5, place a small washer over each, as at B, Fig. 4. Over this, rivet, or solder, a small gear wheel, one-sixteenth inch thick and five-sixteenths inch in diameter, over all.



On the center shaft, (about one-eighth inch diameter and two inches long), slip a washer, and solder, together with a gear wheel one-eighth inch thick and five-sixteenths inch diameter, five-eighths inch from one end. Thread the long end to fit a suitable nut, pass the short end through center holes, and solder a small washer on the end, allowing a little play. Fasten tin pieces to wood by drilling holes as at C, Fig. 5, pass wire through and bend over.

Contributed by
JOHN B. SCHMIDT.

LEYDEN JAR CAP MADE FROM OLD PHONOGRAPH RECORD.

After measuring the opening of your Leyden jar, make a mould of clay, allowing for an overhang, to prevent cap

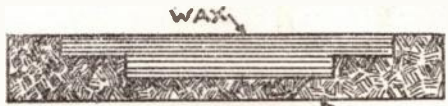


FIG. 1

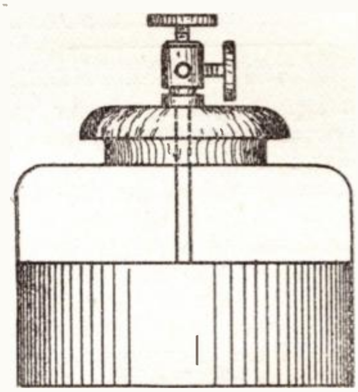


FIG. 2 M.E.

from falling into jar. Next secure an old phonograph record. Melt this and pour into mould, as in Fig. 1.

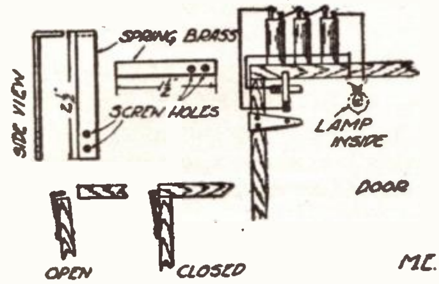
When the wax is cold, the clay can be removed and the cap given a finish, rounding off the edges. This can easily be done by scraping with a pocket knife.

A hole is next drilled through cap to allow a heavy copper to pass through, to which is attached the chain for making a connection with the inner foil. When finished it should be as in Fig. 2.

Contributed by
G. REINHARD.

A TOOL CHEST LIGHT.

The materials needed are a miniature battery lamp, batteries to light same properly and two small pieces of brass, as shown in sketch, with also a miniature socket. The brass should be bent and fastened to the chest and then connected as per diagram. This light will be found indispensable for a tool or medicine chest which is so situated that its contents may not be easily seen without light.



Contributed by
IVAN L. NELSON.

A COMPACT RECEIVING SET.

I designed this receiving set with the view of taking up as little room as possible. It can be screwed to the wall or to a window sill.

The wooden core of the tuning coil is 3½ inches in diameter and 9 inches long and is wound with No. 24 B. & S. enameled wire. The end blocks are 4x 4½x½ inches and are screwed to the core. The slider rods are screwed on top of the ends.

The detector, Fig. 2, is mounted on

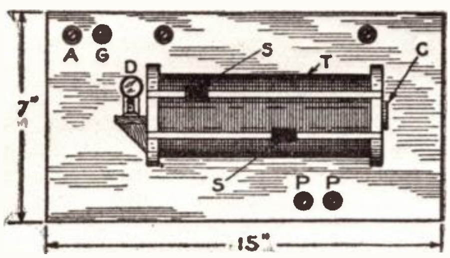


FIG. 1 M.E.

one end of the tuner and on the other end is the condenser.

The detector is made of brass strip, battery screws, a battery cup, and other odds and ends as shown in Fig. 2.

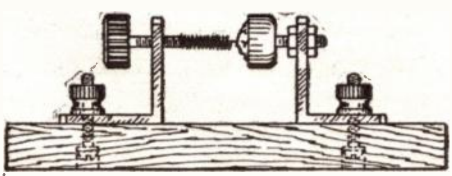


FIG. 2 M.E.

The condenser is of the ordinary tin-foil and paper construction.

All the parts are fastened on the base, as in Fig. 1, which when screwed up lies flat against the wall.

The parts are connected as in Fig. 3.

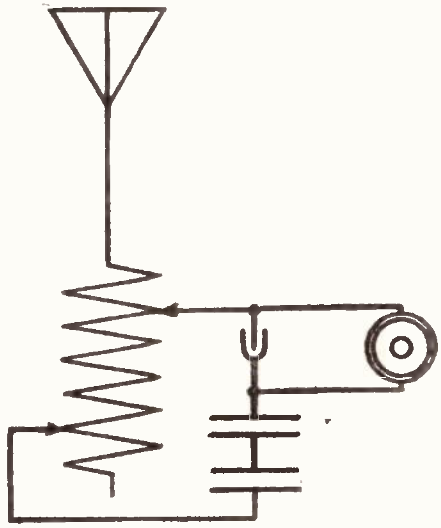


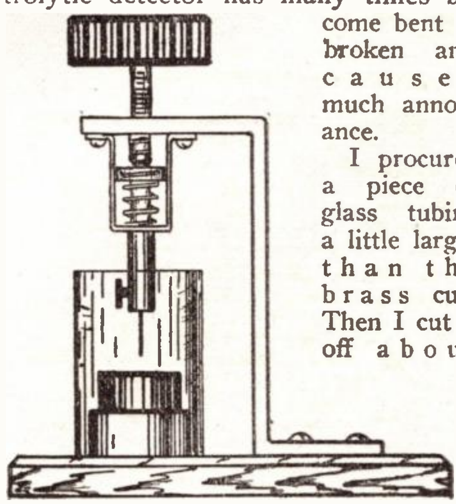
FIG. 3 M.E.

Contributed by
ALEX. T. McCONE.

WOLLASTON WIRE PROTECTOR.

The Wollaston Wire in any electrolytic detector has many times become bent or broken and caused much annoyance.

I procured a piece of glass tubing a little larger than the brass cup. Then I cut it off about



M.E.

three-quarters inch above the cup. This allows plenty of room to draw off the acid.

Now I have no more trouble with broken wire.

Contributed by
McCALLUM WILLIAMS.

Wireless Clubs

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

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

Alpha Wireless Association—Box 57, Valparaiso, Ind.

Amateur Experimental Association — Spokane, Wash.

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

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

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

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

Arkansas Wireless Association—Little Rock, Ark.

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

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

Boise Wireless Association—513 North 6th Street, Boise, Idaho.

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

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

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

B. W. T. A. Wireless Department—111 Morris Avenue, Buffalo, N. Y.

Canadian Central Wireless Club—P. O. Box 1115, Winnipeg, Manitoba, Canada.

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

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

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

Danvers Wireless Association — Franklin Street, Danvers, Mass.

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

Dorchester Wireless Association—22 Harvard Street, Dorchester, Mass.

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

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

Electric St. Louis Wireless Club—2008 Allen Avenue, St. Louis, Mo.

Experimental Club of Cincinnati — 1714 Jackson Street, Cincinnati, Ohio.

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

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

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

Gramercy Wireless Club — 311 East 23d Street, New York, N. Y.

Greater Boston Wireless Association—41 Lawrence Street, Wakefield, Mass.

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

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

Hannibal Amateur Wireless Club — 1306 Hill Street, Hannibal, Mo.

Haverhill Wireless Association—Haverhill, Mass.

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

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

Independence Wireless Association — 214 South 6th Street, Independence, Kas.

Inter-Mountain Wireless Association — 219 5th Street, Salt Lake City, Utah.

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

Knights of Wireless—1271 East 35th Street, Flatbush, Brooklyn, N. Y.

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

Long Beach Radio Research Club — Long Beach, Cal.

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

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

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

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

North Jersey Wireless Association—Hawthorne, N. J.

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

Oklahoma State Wireless Association—Box 1448, Muskogee, Okla.

Oregon State Wireless Association—Lents, Oregon.

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

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

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

Progressive Wireless Club—Seattle, Wash.

Progressive Wireless Club — Poplar Bluff, Missouri.

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

Rochester Wireless Association—Rochester, N. Y.

Rockland County Wireless Association—24 De Pew Avenue, Nyack, N. Y.

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

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

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

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

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

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

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

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

Tri-State Wireless Association — Memphis, Tenn.

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

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

Waynesburg College Wireless Club—Waynesburg College, Pa.

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

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

Western Division High School Wireless Association—Milwaukee, Wis.

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

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

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

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

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

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

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

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

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

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

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

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

Wireless Club of Baltimore — 728 North Monroe Street, Baltimore, Md.

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

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

Young Edison Society—Rogers, Ark.

LIST OF AMATEURS.

The Harvard Wireless Club wishes to announce that for the revision of its list of amateur stations within twenty miles of Boston the club has combined with the wireless societies of the Massachusetts Institute of Technology, of Tufts, and of New England. This new list will be published under the name of the New England Society, and it is expected that with this combined effort a much enlarged and more accurate list will be obtained.

All calls sent in during the summer should be addressed to H. B. Richmond, 12 George street, Medford, Mass.

In the fall they should be sent to Committee on Calls, Harvard Wireless Club, Harvard University, Cambridge, Mass.

In sending in calls it is desired to obtain full name and address of the owner of the station, call, power, and to know if a new call would be accepted in case of a duplicate one.

UNITED AMATEUR RELAY CLUB.

President, George Yerbury, Passaic, N. J.; Vice-president, Albert Dammers, Rutherford, N. J.; Secretary and Treasurer, Earle Bathsgate, 102 High street, Passaic, N. J. Members wanted all over United States. For information write secretary and treasurer. Amateurs, join.

THE ARKANSAS WIRELESS ASSOCIATION.

The Arkansas Wireless Association has been organized in Little Rock and the following officers elected: G. A. Rauch, president; Lawton Hutchinson, vice-president; Edward Vaughan, secretary and treasurer, 2622 State street; W. F. Meyer, chief engineer; Bernard Knight, assistant engineer.

NOTICE.

The Superior Wireless Instrument Co., 407 R. I. St., Buffalo, N. Y., are getting out a directory of all the amateur wireless stations within 100 miles of Buffalo, and would be pleased to have all the amateurs within that distance send them their names and addresses, together with the call letters and power they are using.

The object of this directory is to bring the amateurs into closer touch with each other and that they may know with whom they are talking.

SUPERIOR WIRELESS INSTRUMENT CO.

BALKY NUMBER

The Wireless Screech

OUR MOTTO . . —— . . . . ? —— .

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Mohammed Ulysses Socrates Fips, Editor.

Subscription price in U. S. and Kalexico, 150 purple trading stamps.
New York City and Montenegro, 185 cigar coupons.

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Checks from out of town cranks cannot be excepted unless the unusual ax-change is added.

Unmarried Copy, 15 Vents.

Forms close as a matter of form with a sheatgown and plenty of buttons on the back.
The Editor has made arrangement with the ghostal authorities to confiscate the mail of those criminals who deliberately pester poor, unsuspecting Editors with their murderous M.S.S. The Editor would advise such criminals to sell their M.S.S., as well as their brains, as fertilizer to Alaskan farms.
No manuscripts accepted unless it has been returned by us.

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The Wireless Screech may be had at all goose stands in the U. S. and Mars, also at Bentvamos, 137 Avenue du Cuspidor, Paris.

VOL. 2%. OGUST. No. ¼.

Iditorial

THE Editor wishes to announce that he has just issued the following proklamation to the Brotherhood of American Wireless Screechers, which is of the most far reaching konsekwenses:

We have to-day a S. P. C. A. to take care of stray and mistreated animals. We have the S. A., who takes care of stray and mistreated bipeds at large. We have the S. P. C. C. to take care of stray and mistreated children. But who takes care of the millions and billions stray and mistreated wireless waves roaming through the boundless ether? Yes, who? Is this the civilized age we hear so much about? It is to laugh. Just think for one minute of all the homeless, poor orphan waves cast out into the cold ether every night. LESS THAN ONE PER CENT. of the waves sent out from an aerial reach a friendly receiving station, to find a comfortable bed in an up-to-date detector or 'phones. The other 99% outcasts, yes, shamefully treated outcasts, are forced to wander forever through endless space, exposed to the hardships of infinite travel. How long are we going to allow such unwarranted, shameful, barbarish conditions? How long, I ask you?

The Editor

Is it not about time to found the
S. P. C. W. W.?
(Society for Prevention of Cruelty to Wireless Waves)?

I ask every Wireless Screecher in America to send in at once his or her name for charter member of the new Society, enclosing ten pink trading stamps to defray the expenses for the Society's new headquarters. Now get busy and show the spirit of 1912.

M. U. S. FIPS.

The Praktikel Electrician

By Proffessor Z. Hokuspokus of the University of Coney Island.
A popular curse in electri*ville* on the conduction of electional apparatus and expeariments to be Kondukted with them.

Translation by Mohammed Ulysses Socrates Fips, E. E. E.

FIRST BOOK.

ELECTRICITY.

CHAPTER II.
FIRST PARAGRAPH.

IN the last chapter we have learned what electricity really is, and how it is used in some instances. Inasmuch as this is a praktikel course in electricity, it will now be necessary for the student to study the most common, as well as uncommon electrical terms, in order to become more thoroly acquainted with the mysteries of the mysterious fluid. These terms should be studied by heart if the student really has any aspirations to a praktikel electricityship.

Electrical Definitions.

Ampere. This as may be guessed by our more intelligent readers is a french word with an english start. Pere means father. We all know what A. M. means. Hence the definition of the ampere is "Morning father."

Bar Magnet. This is a magnet used in saloons, mainly to *attract* customers to place their feet on the bar rail.

Battery. Technical term usually used by magistrates such as "assault and battery." When blood flows it is termed a *wet battery.* When no blood flows it is termed a *dry battery.*

Commutator. A man who commutes between his country home and the city.

E. M. F. This is a trade mark of a prominent automobile.

Feeder. This may be either a spoon, fork or knife. Some people also use their fingers.

Bus Bar. Abbreviation for a busy bar.

A. C. This is used similarly to B. C. = Before Christ, hence A. C. = After Christ.

Leyden Jar. The first word is german, meaning suffering. Thus if you pick up a well charged Leyden jar, you will get a "suffering jar," and don't you forget it.

Switchboard. Instead of using this word, the better one, *dressing table* should be substituted, unless the lady insists upon placing her switch on a board.

Contact. The best known form of contact is a Kiss, because it is a *perfect contact* having high conductivity, especially if sufficient pressure is used.

Watt-hour. Question usually asked by foreigners, before they have learned to ask "What time?"

Pole test paper. Papers used by "Doc" Cook to attest the discovery of the North Pole.

Buzzer. New Jersey mosquito.

Chapter 3.

The Study of Electricity.

The promising young electrician begins the study of electricity very early. He begins as a rule with a burnt out lamp bulb, at the age of three. It feels nice and smooth and gives off a queer tone when shook up and held against the ear. This tone is created by the vacuum rubbing against the inside of the glass wall of the bulb. After the young electrician has rolled the pretty bulb on the carpet back and forward for a while, he tries to play marbles with it. This, however, meets with strenuous objections on the part of the lamp bulb. The latter protests vigorously with a loud bang, whereby the vacuum and some glass become spilled, while the enterprising young electrician raises a war whoop and retreats with more or less speed from the battlefield.

The young electrician has learnt his first lesson—*A theory is correct, till it is exploded.*

We next find our rising young electrician deeply interested in the insides of the telephone. He has often spoken through it and knows perfectly well that his papa is concealed in the box, else how could the thing talk so nicely. A thoro investigation of the interesting subject is decided upon. Our young electrician is now over five years old, and has already learnt how to use tools such as the ice pick, the hammer, as well as the pliers, not to forget brother's nickel plated letter opener. A systematic course of procedure is decided upon. This conclusively proves that the young aspirant of the mysterious fluid some day will be a future Edison. The box is, therefore, attacked first. It must be said, to the credit of the builders, that they know how to build telephone boxes. Gibraltar could not be better fortified. That telephone box successfully withstands the combined onslaught of the letter opener, pliers and the screwdriver. It meets its Waterloo, however, during the successful engagement of the chisel and hammer. At last the telephone box has opened its secretive bosom and laid its inside bare to an inquisitive world.

Our young electrician is very much flabbergasted at the uncanny revelation, for there is no papa inside, not even an imitation of the individual. There are, however, two paper-covered round cylinder-like affairs, which our future Edison, it must be said to his credit, recognizes immediately as dry cells. With an exclamation of disgust, he closes the box again, and altho it does not close as well as before, it is charged with open terms for thirty days or longer.

The battlefield, after deliberate consideration, is then shifted northward, into higher regions. Another box encountered, about a foot distant from the one just explored. This box, however, looks vastly more promising than the first one. There is a crank on the right side. In front is the arm carrying the funnel into which one talks, while on the left on a nicely plated fork hangs a black polished handpiece, having some distant resemblance to Uncle Ben's dumb-bells, except for the green cord which chains the handpiece to the box to prevent people from carrying it off.

In the ensuing engagement the cover of the box soon gives way to our gallant general's chisel. It swings open, turning easily on its hinges. From the general's breast, an "Oh!" full of pleasure and contentment disengaged itself with more or less suddenness.

For a minute or two the excitingly weird contents are admired in rapt wonder. That papa has also here failed to make his appearance is taken as a matter of fact by our future Edison. One becomes emancipated quickly in this electrical age, accepting fact over fancy.

Standing on a chair, the young electrician begins at once to exploit the inner anatomy of the telephone box. The mouthpiece—the one into which one talks—is selected first. Strange to say, the funnel unscrews readily enough, but the round, nickel-plated affair resists all attempts to lay its insides bare. The combination of a first-class safe looks comparatively easy to that talking box thing. With supreme efforts and mechanical ingenuity, the round box finally weakens and yields. With a groan it opens its virgin heart, and our young eavesdropper is astounded to find a quantity of gray silvery grains trickling down into his hand. This looks ominous, and our hero thinks it best to immediately close the nickel box up, in which he succeeds well after a while.

Next he descends deep into the bowels of the telephone box with his left hand, with a view to thoroughly exploit uncharted regions. While he is deeply engaged in this engineering problem, it occurs to him to turn the crank at the side of the box with his unoccupied right hand, the idea being that something new might be discovered of everlasting benefit to humanity.

In this our praktikel electrician is not disappointed. Indeed no.

After he has given a few quick turns to the crank handle, his left hand suddenly emerges from the inside of the box with lightning speed, while simultaneously the body of our future Edison closes with a jerk like a jack knife, turns a somersault from the chair and is propelled with unlawful speed against the opposite wall. Every nerve throughout the entire states, possessions and territories of our young electrician's anatomy tingle and vibrate for quite some time afterwards, and are drowned into unconsciousness only by the unceasing howling of our shamefully tricked general. He finally picks himself up from his undignified position, and, after he has rubbed his still tingling limbs and other extremities, he swears vengeance to all telephone boxes.

Thus our young electrician has had his first electric shock, the first one, alas, to be followed by even more wicked ones in his career, which lies before him still enveloped in the fog of ignorance and the mist of inexperience.

Incidentally, he has learnt his second great lesson: *"Don't fool with a crank; he might be loaded.*

(To be continued.)

The Grattle

If stupid questions you must ask,
Please ship them to us in a cask.
Or if you do not like this mode,
Mail them to us by Morse code.
Of if you should require less,
Send them to us by wireless;
But if you wish to make a hit,
Then simply send 'em to us—nit!

ANTENNA SWITCH.

(1166) Demosthenes A. M. Pere, Seattle, Mo., crows:

Q[1]. If I attach my sister's switch to my aerial, have I then an aerial switch?

A[1]. Correct, Demos. But if you take two poles and attach your sister's switch between them, you'll have a double pole switch.

Q[2]. Why is it that an incandescent bulb don't explode when lighted. I should think the expanding vacuum would be powerful enough to burst the glass.

A[2]. For the same specific reason that your dome don't crack when, due to your fool questions the little vacuum you have locked up there, expands!

Resistance

By Moore Stuart

The exact meanings of the terms resistance, Voltage and Amperage are often rather vague in the minds of experimenters. Although this subject has been thoroughly thrashed out in current periodicals, as well as Modern Electrics, from time to time, we are of the opinion that the following illustration will not be wholly out of place, even at this time.

Let us consider an every day example and one that is easily understood. Take for comparison a welding machine of rather large proportions and a small induction coil, around the one-quarter size, together with a small dry cell. How many are there, if after seeing the welding machine in operation, melting and finally welding huge bars of steel held in its large copper contact clamps, like same was so much tallow, would rather grasp the clamps, or jaws of this machine, through which are flowing thousands of amperes, in preference to grasping the secondary terminals of the induction coil while it is in operation in conjunction with the dry cell. We will hazard that nine out of every ten would, on first thought, rather take a chance with the induction coil secondaries, rather than the welding machine. Yet the writer has seen a person place his tongue across the gap between the jaws on the welding machine, while the current was on, receiving no more of a shock than if the leads from a common battery of dry cells were placed upon the tongue. Nearly every experimenter, has at some time or other had the pleasure of 'getting hooked up' with the induction coil secondary while it was doing business and consequently know by experience just what a 'jolt' they get in consequence.

The explanation of this case is simple. It will be remembered that it takes voltage to force current through a circuit, and that the current forced through a given circuit is dependent upon the resistance of that circuit and the voltage which is doing the forcing. As we all know, the resistance of the body is relatively high, that is, in comparison with the common metals used for conducting electricity, namely copper and iron wire. The voltage used in the welding machine is very low, because the resistance of the bars to be welded is very low. Consequently a heavy current, or number of amperes, is easily forced through the circuit and converted into heat at the required point. It takes amperage to produce a sensation and as the voltage used in the welding machine is too low to force even a very small fraction of an ampere through the tongue, no sensation is produced. On the other hand, the voltage delivered by the secondary of the induction coil is exceedingly high, being stepped up many thousand times the voltage of the batteries. This exceedingly high voltage readily forces a current through the resistance of the body, large enough to be very disagreeable, to say the least.

If it were possible to increase the voltage delivered by the secondary, and at the same time keep the primary voltage and amperage constant, the sensation received by passing the secondary current through the body, would continue to get more and more disagreeable, until a certain point was reached. Then it would again recede and in time reach a stage which would produce no definite sensation, although the current would still be flowing. The reason for this is also very simple, if we will stop and consider. We all know that the number of volts flowing in a given circuit, times the number of amperes flowing in that circuit give us the wattage of that circuit. We also know that the current in watts delivered by the secondary of an induction coil or transformer equals the wattage delivered to the primary of that coil, less certain losses, impossible to overcome, namely, losses due to transformation, magnetic leakage, hysteresis, etc. Now if we increase the voltage delivered by the secondary of an induction coil, we must also decrease the amperage delivered in the same ratio, in order that the number of watts delivered may equal the number of watts flowing in the primary.

(Continued on page 552.)

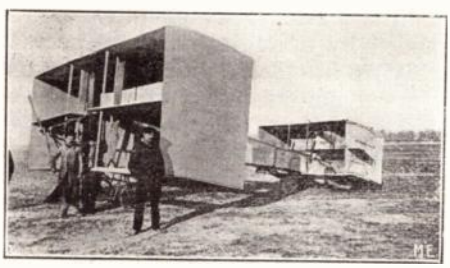
Aeroplane Fatalities and Their Causes

By Austin C. Lescarboura.

Member of the Aeronautical Society.

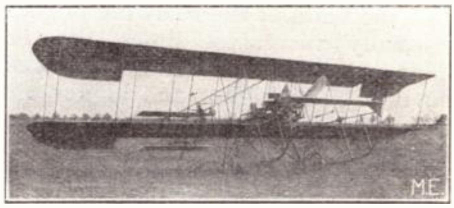
BEGINNING with the unfortunate death of young Lieut. Thomas E. Selfridge at Fort Myers on September 17, 1908, the rapidly increasing list of deaths in the progress of aviation has been the cause for extensive study regarding the reasons, and the possible prevention of accidents. While the absolute elimination of accidents will never be attained, and aerial navigation will always present a more dangerous form of travel than over-water and over-land locomotion, yet there seems to be no reason why it should not become reasonably safe in the future.

Aviation catastrophes, which will probably number over 200 victims by the end of 1912, are due to three prime causes: Natural elements, such as winds, air-holes, gusts, etc.; carelessness or errors on the part of the aviator; and last of all, structural deficiencies in the machines, and motor trouble. It would be difficult to estimate from the incomplete data available exactly



An Early Type, of Weak Construction.

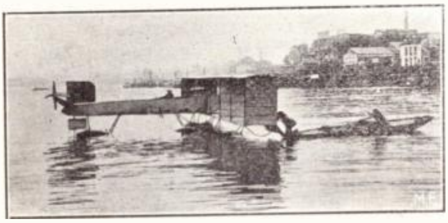
which of these causes has claimed the most victims, but it may be assumed that in the earlier period of heavier-than-air flying, the poor construction of the flying machines caused the most deaths; while later, and at the present



Typical Biplane of high structural quality.

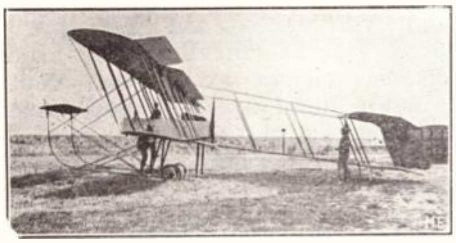
time, the fatalities are principally due to adverse winds and carelessness on the part of the pilot. However, engine trouble still causes a large percentage of accidents, though aeroplane construction has gained a high standard of efficiency.

The natural elements causing aeroplane fatalities are, unfortunately, beyond man's control, but means can be taken to overcome their effects to quite an extent. With the latest types of aeroplanes, which represent extensive study and experimentation on the part of the constructors, the gusts and air eddies have lost much of their former terrors, and an experienced aviator with a high quality engine and efficient machine can, at the present time, fly in the face of winds varying from 25 to 40 miles per hour, without undue danger. Side winds are still troublesome, for with one side of the aeroplane lifted to a dangerous angle, the aviator must either right the machine immediately, by means of the ailerons or warping of the wings, or a side slip and crash to the ground will result. In flying in high winds, it is always the practice to fly againt the wind; but several aviators, either through force of necessity or carelessness have met death by flying with the wind at the rear of the aeroplane. Among these victims was the well-known American aviator, John B. Moisant, who met death while flying near New Orleans on December 31, 1910. In such flights



Voisin-Canard Hydroplane.
A safe type of machine.

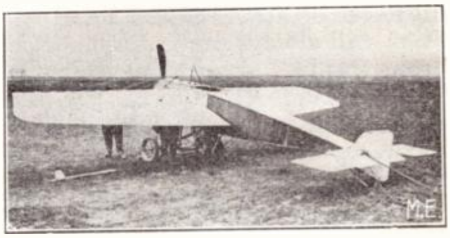
with the wind at the rear, the pressure gradually increases under the rear plane, especially in monoplanes, causing it to raise higher and higher until the aeroplane is pointed diagonally towards the ground, and an instant later it crashes to the earth, due to the loss of sustaining power of the main planes. Air holes are a menace to aerial travel and are not detectable until the sudden drop of the machine occurs. In flying over rough ground, aviators report that drops of 10 and even 100 feet are sometimes encountered, in what is termed, "a Swiss cheese atmosphere." The drop is sudden, but the machine usually regains its sustaining power at its termination. However, should the aeroplane be flying within a limited height above the ground, and such a drop is experienced, a crash to the ground will result. For this reason aviators prefer to fly at con-



Maurice Farman Biplane.
A machine which has gained a reputation for safety.

siderable heights to avoid this danger.

Carelessness or errors on the part of the aviators cause probably the greatest percentage of deaths at the present time. With the commercializing of aeroplane flights in the form of exhibitions, aviators are often forced to attempt spectacular performances to meet the whims of the spectators, who are ignorant of aerial dangers. Such circus flying is causing the loss of many of the lesser-known aviators engaged in filling "fair" engagements. In making volplanes while flying from higher to lower levels, the aviator is often apt to glide at an exaggerated angle, which causes the downward momentum to increase to tremendous proportions. On nearing the ground, the pilot attempts to operate the controls, but learns that the rudders refuse to respond, or are even shattered or broken off from their fastenings, due to the enormous pressure on the planes, thereby allowing the aeroplane to continue on its disastrous dive. Such glides have caused the death of many aviators, the latest victims being Miss Harriet Quimby and her passenger at the recent Boston aviation meet. A crash between two aeroplanes dur-



Morane-Saulnier Monoplane
of rigid design.

ing a heavy fog recently caused the deaths of two French military aviators, and with the increasing use of aircrafts this danger will become more prominent, and will have to be met with suitable precautions. Collisions with trees and houses have caused fatalities in fogs, which must also be avoided by suitable means. Spectacular flying has been widely discouraged by constructors, but it still claims occasional victims.

With the experience gained by constructors of aeroplanes the machines built to-day are strong and well designed. In many cases, builders are using steel tubing in place of wood, which forms a strong framework for either monoplane or biplane. Double sets of control wires, and the substituting of aluminum parts for brass or steel ones, have materially reduced the death toll. The landing chassis, which in earlier types caused deaths by over-turning machines, has been given special study, with the result that several of the leading builders of flying craft pride themselves on the landing gear employed in their products.

In the beginning of heavier-than-air conquest, greater speeds were obtained by using more powerful motors, and fatalities occurred due to the incapability of the aeroplane to withstand the added strain caused by an over-powerful motor. At present, however, the obtaining of high speeds is secured by the proper design of the machine, and the use of a standard medium-powered engine, thus preventing any possible accidents through the strains of a motor out of proportion with the aeroplane construction. The most unfortunate fatalities due to structural failures are the following, all of which occurred prior to 1911: George Chavez (Bleriot), Leon Delagrange (Bleriot), Ralph Johnstone (Wright), and Lieut. Thomas E. Selfridge (Wright). The breaking of control wires have caused the deaths of some of these, as well as many other victims, as have also the jamming of rudders and elevators.

The reliable aviation motor has thus far found its nearest realization in the rotary Gnome engine, which is the type most widely used by successful aviators in all countries. There are several engines which are claimed to be as efficient as the Gnome type, but these have yet to prove their claims and gain the prestige which the rotary engine has secured since its introduction at the Rheims meet in the latter part of 1909.

The stopping of engines has caused many disasters, since with a "dead" engine the aviator is at the mercy of the winds and must accept any landing place which happens to be located at the termination of the machine's glide.

From the best obtainable data it appears that during the year 1908 but one fatality occurred, but in 1909 this number was increased to four. During the active year of 1910, approximately twenty-four victims were claimed by flying machines, bringing the total for the three years up to twenty-eight. By the end of 1911 this figure had increased to almost a hundred, and thus far in 1912 the indications seem to point to the figure exceeding a total of two hundred deaths for the five years. While the figure may seem staggering to the layman, still, with a knowledge of aviation and its perils taken into account, it is remarkable that the death toll is so low, with the number of flights made each day, all over the world. As the art of aviation progresses, the number of disasters will undoubtedly decrease to a low percentage. Monoplanes have perhaps claimed more victims than the biplane type, due to the fact that it is a more difficult machine to handle. However, structural difficulties in the monoplane are easier to overcome than with the more cumbersome biplane. Practically every standard type has had its proportion of victims, so that the fatalities have not been limited to any particular type or class of machine.

It is to be hoped that with the many valuable lives which have been sacrificed to this—the latest mode of locomotion—aviation will rapidly become as safe as land and water travel, without the claiming of further martyrs, such as have gone before.

REMAGNETIZATION

(*Continued from page* 458.)

Then draw the magnet backward until the ends are half way across the pole pieces of the electro-magnet, rock the magnet up onto the pole pieces and swing it right over until the bend portion is on the opposite side.

This will bring the opposite edges of the magnet in contact with the pole pieces of the electro-magnet. The magnet then should be rubbed back and forth once or twice with the magnet in this position so that this portion can be thoroughly saturated, and then rocked back and over into the original position.

By this time the magnet should be thoroughly remagnetized, so all that remains to be done is to leave it rest in this position for a few minutes, put a keeper across the opposite edges, while on the magnet, then pull the magnet, or rather, slide it off and away from the poles of the electro-magnet. The keeper should be in place until the magnet is in contact with the pole piece which constitutes the base of the magneto from which it was taken.—*Ignition and Accessories.*

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.

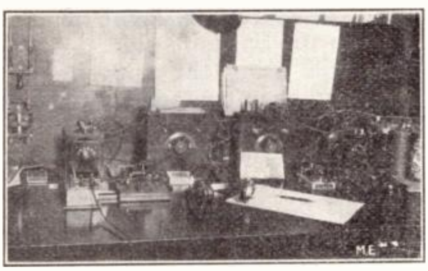
This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE, THREE DOLLARS.

Enclosed find picture of my wireless receiving set.

The instruments are, from left to right, magnetic aerial break, Murdock loose coupler, Manhattan fixed condenser, silicon detecter, Manhattan relay, variometer, "E. I. Co." variable condenser, variometer, Murdock loose coupler and "E. I. Co." 2,000 ohm phones.

My sending set (which is not shown in picture) is all of my own make and consists of 1 kw. transformer, condenser, rotary spark gap, Murdock magnetic key operated with Manhattan telegraph key, and oscillation transformer.


EMIGH STATION

I have received as far down as Southern California and up as far as Sitka, Alaska, and 2,000 miles out at sea.

My sending set has a radius of about 75 miles.

I have received many useful hints from your magazine, *Modern Electrics*.

CHAS. M. EMIGH,
Washington.

HONORABLE MENTION.

Herewith are a photograph of my wireless outfit and one of my aerial.

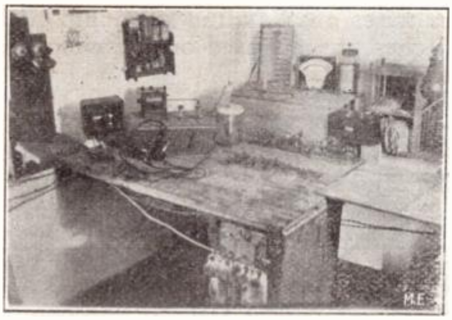
For sending I use a 2 kw. transformer, 1 inch spark coil, helix, oscillation transformer (the oscillation transformer being made after the picture was taken and was made from diagram in the June issue of *Modern Electrics*), spark gap, Leyden jar, hot wire, ammeter, Gernsback electrolytic interrupter, glass plate condenser.

The transformer and coil are both worked on the helix, spark gap and condenser, with the same key, without discharging both transformer and coil at the same time. I also have necessary switches for this arrangement. For a diagram of this hook-up, see page 39 of the April issue of *Modern Electrics*.

For receiving I use loose coupler and close coupled tuning coils (the close coupler tuning coil being added after picture was taken), carborundum, silicon, ferron, galena and electrolytic detectors (the carborundum, silicon and galena detectors being added after picture was taken and are of my own design and make), two fixed and one variable condensers, protentiometer, a pair of 3,000 ohm phones, buzzer for testing detectors. The necessary switches can be seen on front of receiving cabinet.

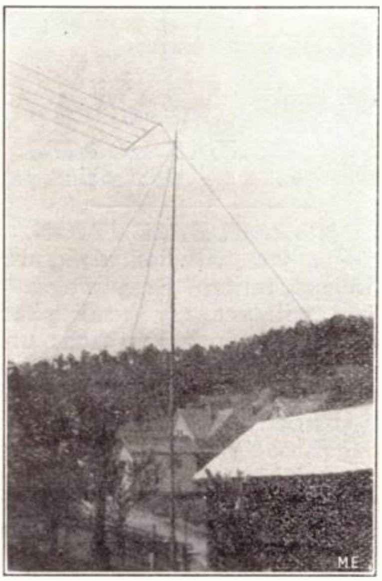
Both of these cabinets are of my own design and make, and are made of the best grade of cedar.

In front of the sending cabinet can be seen two relays, one sounder, three keys and one sounder at left of receiving cabinet. I am at the end of a



WATKINS STATION

telegraph and telephone line which runs to 6 of my boy friends' homes. None of them has a wireless set but we keep things hot along the telegraph line.



WATKINS AERIAL

My aerial is made up of 5 aluminum wires spaced 18 inches apart, one end being supported by a 39 foot pine pole on a 20 foot house, the other being supported by the 55 foot pole shown in the picture.

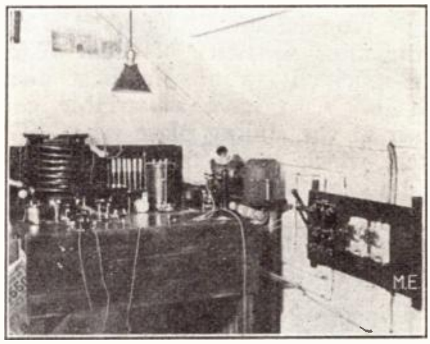
I am a constant reader of the *Modern Electrics* and consider it a very valuable magazine.

C. E. WATKINS,
Kentucky.

HONORABLE MENTION.

Herewith is a flash light of my wireless equipment.

The sending set consists of a one inch Muskegon coil operated by a Thordarson step down transformer, fixed spark gap and a rotary gap driven by a 1-16 h.p. motor, a helix wound with eight turns No. 4 brass wire and a small Murdock helix used as a loading helix, 6 Leyden jar condensers, wireless key with heavy contacts. The



WORK STATION

whole sending set is operated by the necessary switches and inductances.

The receiving set consists of a Murdock double slide tuning coil and a large loose coupler operated by two D. P. D. T. switches, one fixed and two variable condensers (one Murdock and one of my own design), one Murdock silicon detector, one of my own design which may be used either as a silicon or a galena detector, Murdock 2,000 ohm receivers.

My aerial is composed of five wires 2 feet apart, 110 feet long, 70 feet high at one end and 50 feet at the other.

The aerial switch is a T. P. D. T. knife switch. Since this photograph was taken I have enlarged the switchboard and mounted all the switches upon it. With this outfit I have obtained most excellent results.

I am a monthly reader of *Modern Electrics* and think it is the best wireless magazine published.

ASHTON G. WORK,
Pennsylvania.

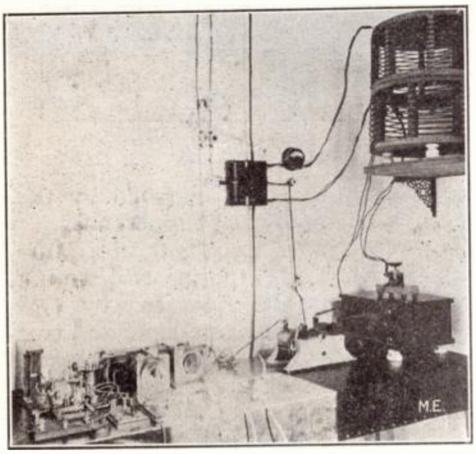
HONORABLE MENTION.

Enclosed please find photograph of my wireless set.

The sending set consists of ¼ kw. closed core transformer, condenser of

36 plates 9 x 10, spark-gap, which is on top of condenser box, and inductive helix, which I constructed myself (the primary consists of 10 turns of No. 6 copper wire, the secondary of 14 turns of No. 8 copper wire), and a hot wire meter which can be seen on the wall.

My receiving set includes the following instruments: Blitzen receiving transformer, an old style loose coupler, a double slide bare wire tuner (which I use as a loading coil), a pair of 2,800 ohm Brandes phones, galena, pyron and perikon detecters. I find galena to be the most sensitive of them all. I have received stations farthest away with it. Also have a variable condenser of the sliding plate type. The switch, which is on table, is to short my detecters while sending.



REINHARDT STATION

My aerial is 55 feet high, of the umbrella type, with six wires in it. I have received over 2,000 miles with same.

I have found lots of helpful hints in *Modern Electrics.*

WM. REINHARDT,
Nebraska.

HONORABLE MENTION.

Find enclosed a picture of my wireless outfit.

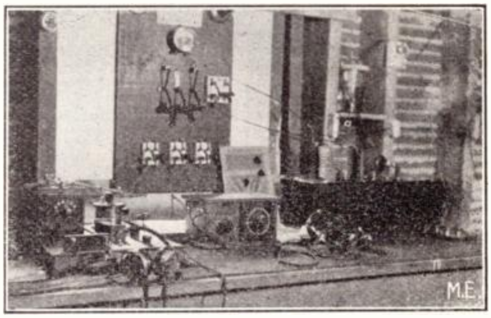
For receiving I have two sets, both loose coupled. One is the Blitzen receiving set, which consists of a variometer, a ferron detector, two condensers and phones. The other is a set mounted by myself, which consists of a Murdock loose-coupler, a Dawson-Winger detector, two condensers and phones.

For sending I have a ¼ kw. set made by Clapp-Eastham, and a rotary gap (not seen in the picture).

I have an aerial sixty feet high, with twelve foot spreaders, consisting of four wires one hundred feet long. All switches are mounted on switchboard, seen in front.

With these instruments I have copied GO (Chicago), NAX (Colon), OHX (New York *Herald*), and many other land stations.

I am a subscriber to *Modern Electrics* and think it the best wireless magazine printed.



HODGES STATION

DUNCAN HODGES,
Massachusetts.

HONORABLE MENTION.

Enclosed you will find a picture of my wireless station. Beginning at the left, you will see my head phones, which are of 1000 ohms each; under these you will notice my receiving set, which is mounted, and consists of one Alden company's three slide tuning coil, one Brooklyn Wireless Company tubular variable condenser, a Manhattan company's fixed condenser, and a revolving detector of my own make. The latter cannot be seen as it is behind the tuning coil. Also a double pole double throw switch, on the front, for short circuiting my set. In the centre will be seen the E. I. Co.'s sending and receiving switch, and next to that is my switch for breaking my aerial and ground circuit. On top of the helix is my spark gap.

My helix, size 15x12, is home made, of No. 6 aluminum wire, which came from the Electro Importing Co. Below my helix is my sending condenser, of 27 glass plates coated with tinfoil, size 9x12. Under the table is my transformer, which I made. It is of the open core type—core is 30 inches long, primary five pounds of No. 14 D. C. C. copper wire. The secondary is made of five block secondaries from the E. I. Co. I get a nice spark and often talk

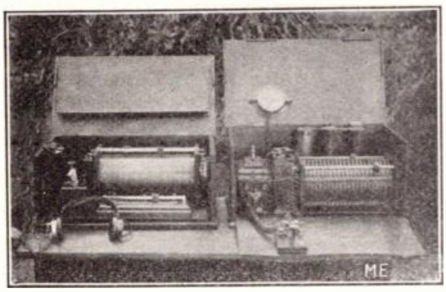
HENVIS STATION

to Fortress Monroe, which is three miles away. My antenna is 150 feet long, of six aluminum wires, and about 50 feet at the highest. I have heard stations along the coast, from Key West to Cape Cod. I am a member of the W. A. O. A. My call letter is NS.

FRANK W. HENVIS, Virginia.

HONORABLE MENTION.

Herewith you will find photograph of my wireless set. It is a portable one, and, when closed up, takes up very little room. All the instruments (excepting the sending helix and sending condensers) I imported from the E. I. Co., of New York. The receiving set comprises the following: Large tuning coil double slide, two fixed condensers, electrolytic, and lead peroxide detectors, potentiometer and 2,000 ohm receivers. The sending set: One inch



SKINNER PORTABLE

spark coil, worked from storage batteries, double slide helix and 3 condensers. I am obtaining very good results with this outfit.

I am a constant reader of *Modern Electrics* and consider it a splendid magazine.

T. SKINNER,
New Zealand.

HONORABLE MENTION.

Enclosed is a picture of my wireless set. It consists of one loose coupler, two fixed condensers, two variable condensers, one pair of 2,000 ohms Crescent receivers. My aerial is 35 feet high, 180 feet long, of copper wire. I am eleven years old, and have very good results in reaching vessels off the Atlantic coast and stations on the coast as far north as Nova Scotia and Cape Hatteras to the south.

My detectors are ferron, silicon and molybdenite. I am a member of the

KERR STATION

Wireless Association of America. My call is M. B. K.

MORRIS B. KERR,
Massachusetts.

SPECIAL POWER PLANT FOR SHIP WIRELESS.

The new steamer "Megantic," of the White Star Line, will be provided with a special generating outfit for the wireless equipment. The electric generator is driven by a gas engine, and will furnish current to light the ship and operate the wireless when accident has rendered the regular power equipment useless. The special equipment has been installed on the upper deck.

Modern Wireless Instruments

By R. E. Stark.

Having studied the Telefunken tuning devices and having listened to their ship stations operating in the South Pacific Ocean, I made up my mind to try a few ideas that came to me. I may say that I would rather listen for an hour to a Telefunken Station with its high pitched musical note than for one-tenth that time to a low frequency one like the "Marconi Note." It is this that led me to see if I could not produce a higher pitched note than 50 cycle alone would give.

It is necessary first to consider the circuits and apparatus in the modern wireless field and then to design our several pieces of apparatus to best suit our conditions. To start with, let us consider what the Telefunken Generator produces and then follow all the circuits in the order of their connections with generator.

The generator consists of an induction alternator, Dion type. It is not unlike the old "Mordey Victoria" alternators in principle, though, of course, not the same in design.

This generator is usually driven by a compound wound motor running off *D. C.* and is coupled directly to the motor, hence running at same speed as motor. The poles of the generator are, of course, of such a number that, when motor is running at normal speed, the frequency is approximately 500 cycles a second, i. e., 1,000 poles pass a given point in the armature each second.

The alternating current proceeds from the generator to the switchboard, where it passes through Ammeter in series and hot wire Voltmeter in shunt; then to the blocking relay, which prevents sending while the receiving instruments are connected with "aerial." The leads then pass in turn through primary turns of *"Air Core Transformer"*; through an adjustable choke coil with iron in it, then to the usual Morse key, completing the circuit.

This key has to break a normal potential of 250 volt, and, as the duration of each oscillation is only 1-1000 second, the arcs produced are of very small duration. The modern key has large copper faces the size of a one-cent piece and a break of not more than 1-16 inch.

This completes the comparatively low potential medium frequency side. We must next deal with the high potential side of the "Air Core Transformer." The high potential side consists of a second winding of finer wire which produces E.M.F. of 5,000 Volts which charges the condensers. Two tall jars or four short ones connected in parallel form the condenser (combined capacity about 2,400 cms. C.G.S. units or about 0.02 mfd.) These are in turn connected in series with the transformer secondary and the flat spiral inductance of silver plated strip.

The aerial is sometimes connected so that only the "flat" inductance is in aerial circuit and sometimes the condenser is also in circuit; these connections depend upon conditions in a station.

We have yet three essential pieces of apparatus to count in, viz., the spark gap, shunting transformer; the variometer in the aerial circuit, and also the hot wire ammeter in earth circuit.

There is, of course, a switch disconnecting receiving instruments, and at the same time connecting all sending circuits.

We naturally say, "What is it that produces the high pitched note?" At first thought we say the speed at which the poles of the generator pass the coils of wire in the stationary armature is the sole factor, but when we consider other things also, we shall see that that is not all.

The adjustable choke coil gives one the means of making the "note" pleasant or otherwise, and is the most important factor in their Telefunken station. If there were no choke coil, first of all a short circuit on the generator would be produced; secondly, if generator were shorted through the absence of the choke coil, there would not be the high voltage produced in the secondary of the Air Core Transformer. Hence I have chosen this as one instrument to be re-designed for the amateur.

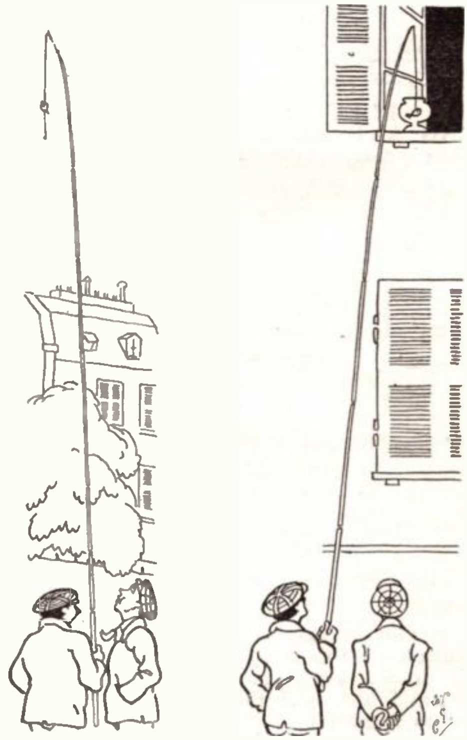
(*Continued on page 552.*)

Flying Sparks

THE VETERAN'S DREAM

AND HOW IT CAME TRUE.—*Fliegende Blätter.*

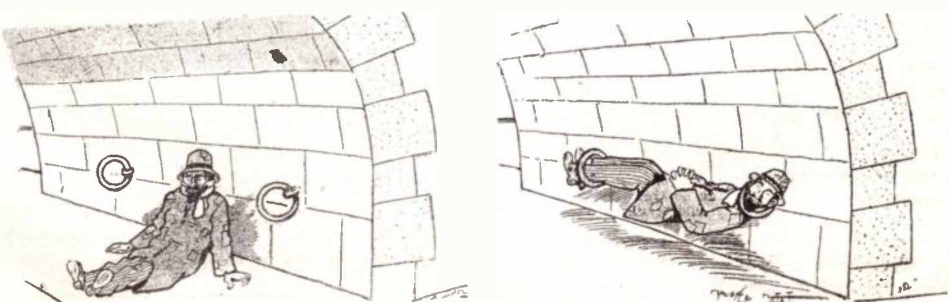
THE CLEVER FISHERMAN



"ARE YOU OUT OF YOUR MIND, TO USE SUCH A LONG ROD WITH SUCH A SHORT LINE?"

"OH, I DON'T KNOW! IT ALL DEPENDS!"

THE INGENIOUS HOBO



THE HOBO—"THIS STONE FLOOR IS TERRIBLY UNCOMFORTABLE. I THINK I'LL—

—USE MY HAMMOCK!"

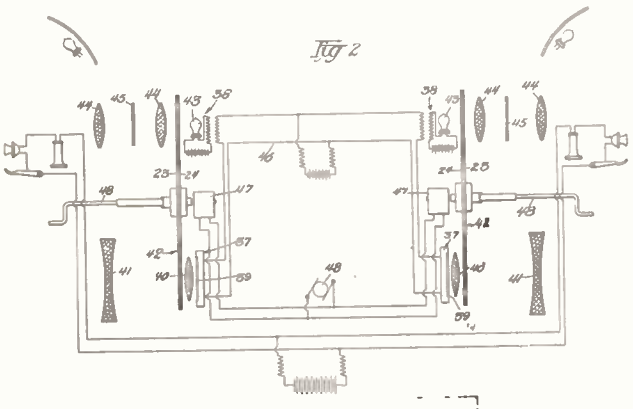
—*Pêle Mêle.*

PATENT NO. 1,030,240 HAS BEEN GRANTED TO GUSTAV E. HOGLUND, OF CHICAGO, ILL., FOR MECHANISM FOR ELECTRICALLY TRANSMITTING AND REPRODUCING IMAGES.

The present invention relates to a telephot, and brings us a step nearer to the solution of this very interesting problem. We do not know personally whether Mr. Hoglund has used this device in practice, and as a matter of fact we entertain some doubts as to the working of the apparatus. Nevertheless it is an interesting piece of work and will certainly start other inventors to thinking about the problem. We are sorry that we cannot produce the entire patent in full, as it is quite a big affair, having no less than five sheets of drawings. We urge everyone interested in the device to procure a copy of the patent, which is quite interesting and shows some very good features. In brief, the invention covers the following:

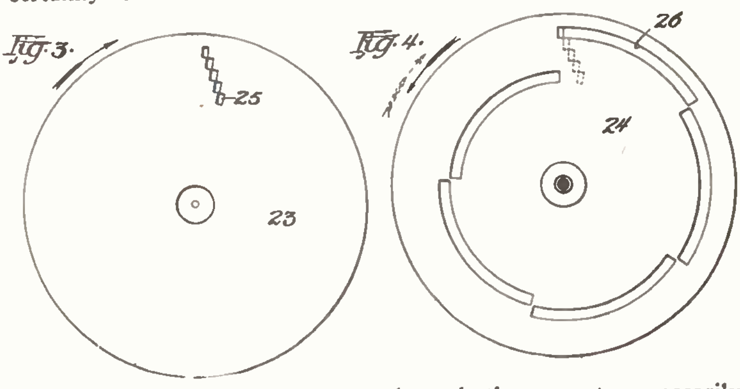
Mr. Hoglund employs a rotary shutter shown in Fig. 3 in one position, while Fig. 4 is a rear view of the same device. He rotates this disc, 23, Fig. 2, in front of the selenium cell, 37. It will be seen that the projected picture passes through the reducing lens, 41, then through the opening in the disc, 42, falls on the lens, 40, and from there it is concentrated upon the selenium cell, 37. Inasmuch as the shutter only goes over certain parts of the image each fraction of a second, it should be evident that the selenium cells will be influenced in just such a manner. These impulses are transmitted over the line, 46, again through the transformer, 38, and through some form of speaking arc, 43. These fluctuations in the resistance of the selenium cell, 37, will be translated into luminous impulses in 43. These impulses must pass through the perforated shutter, 42, on the left-hand side of Fig. 2, and from there pass through the lens, 44, and the ground glass plate, 45, upon which the image is supposed to appear. From there it is observed through the lens, 44. The apparatus, as shown in Fig. 2, is made for intercommunication over an ordinary telephone line so that conversation may be carried on at the same time as the two communicating persons view each other over the line.

Fig 2



The two shutters, 42, are revolved by hand in such a manner that each person can see the other to the best possible extent when the shutters are rotated at the right speed, and they must necessarily, therefore, rotate in synchronism.

Fig. 3. Fig. 4.



PATENT NO. 1,030,872 HAS BEEN GRANTED TO CHARLES N. CHURCH,

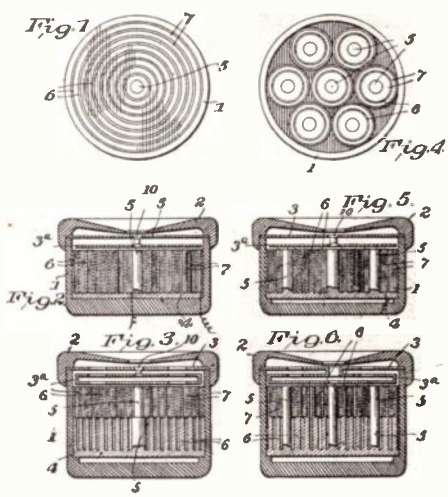
OF CAMDEN, NEW JERSEY, FOR A TELEPHONE-RECEIVER.

This invention relates to some distinct improvements in telephone receivers and should be of especial interest to the wireless student, as we think that Mr. Church has created a receiver which will do wonders in the wireless field.

The main idea of Mr. Church's invention is that he uses a compound diaphragm, such as shown in Fig. 2. This diaphragm is necessary on account of the electromagnetic action of this receiver.

We quote herewith an extract from the patent:

"The magnetic structure of my receiver comprises a plate, 4, of magnetic material having projecting therefrom the central bar or rod, 5, and the concentric rings, 6. The rod and rings may be integral with the plate, 4, or may be suitably secured thereto or held in close contact therewith. The rod and concentric rings constitute the core structure of the magnetic system, connected by means of a yoke piece constituted by the plate, 4. The annular spaces between the rings or core structure form winding spaces which are completely filled with the insulated wire forming the magnet windings, 7. The alternate windings or coils are wound and connected so that the electric current flows in opposite directions in adjacent coils and the coils are preferably all connected in series. By means of this circuit arrangement the current flowing at any instant will cause adjacent concentric rings, 6, to be of opposite polarity, the north and south magnetic poles alternating in the different rings. It will be apparent from this that each ring will have induced therein magnetic fluxes by both the inner and outer magnet coils adjacent to it, and that the flux in-



duced by both inner and outer coils will be in the same direction, and combine to produce the same polarity. By making the coils relatively thin and separated by thin magnetic walls constituted by the rings, I am enabled to keep the electric and the magnetic elements of the system in close proximity, which enormously increases the efficiency and produces a maximum of flux lines for the number of ampere turns of the magnet.

It will be obvious from the above description that each ring forms the return magnetic circuit for the adjacent rings because they are of opposite polarities. The magnetic flux passing from one ring enters a portion of the diaphragm which lies just above these rings, viz.: the auxiliary diaphragm, 3^a. Each magnetic circuit, therefore, is completed through the diaphragm, and is a nearly closed magnetic circuit producing the most efficient magnetic system.

In order that I may use the great strength or pull of this magnetic system, I have devised a compound diaphragm in which there is secured to the main diaphragm, 3, an auxiliary diaphragm, 3^a, rigidly secured thereto at the center, preferably by means of a tubular rivet which allows the free passage of the air from the inside to the outside of the diaphragm. The pull upon the auxiliary diaphragm, 3^a, will be substantially uniform over its entire area, and the pull which is distributed over its entire face will be transmitted by means of the central rivet to the center of the outer or main sound-producing diaphragm, 3, and thus transmit a maximum amplitude of vibration to said outer diaphragm. By supporting the power-transmitting diaphragm, 3^a, only at the center, leaving its entire circumference free from contact with the casing, I am enabled to secure a direct pull over the entire area and out to the very circumference of the diaphragm, 3^a, and to transmit the combined pull due to the attraction of the several concentric magnetic circuits constituting my combined magnetic system."

In Fig. 4 another method is shown of accomplishing the same purpose, and our readers will do well to get a copy of this patent as it makes interesting reading on a novel subject.

PATENT NO. 1,032,404 FOR AN ELECTRICAL ACCUMULATOR HAS BEEN GRANTED TO FREDERICK WYER HARDY AND EMIL HENRY HUNGERBUGLER, OF SALTBURN, ENGLAND.

This invention relates to a new storage battery, and is carried out quite ingeniously. The inventors have gone to a lot of trouble to produce something really new. and we think they have accomplished their purpose. The inventors use a very narrow plate, Fig. 5, and instead of using a lug at the top of the plate, they connect the lug, 5, at the bottom, and carry it up through an insulated tube, 6. They explain, with reference to this very unusual procedure, that the electrolytic action in a storage battery is largely confined to the upper part of the cell, with the result that the active material at the lower portion almost invariably is inoperative. The inventors do not use a regular grid, but use a plate as shown in Fig. 5, which is only a skeleton frame, while the blank portion is filled with the active matter.

In an ordinary battery this would not do, as there would not be enough support for the active material, as it would tend to fall out. The inventors overcome this by using a separator composed of porous material which not only occupies all the space between the plates and absorbs the electrolyte, but it is in intimate contact with the plate, and active material, preventing the material from becoming dislodged. The inventors find that some forms of filter paper can be used to very good advantage for separators, but that also kaolin powder, or china clay,

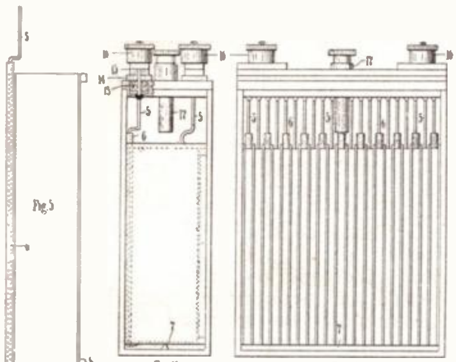


Fig 5 Fig 10 Fig 11

when combined by heat and without the use of a glaze or flux, forms a solid mass, which at the same time is very porous.

Such slabs are packed in between the plates and these slabs take up enough electrolyte for the action of the cell. Consequently a battery made in this manner is always dry. The battery is assembled as shown in Figs. 10 and 11. A novel means of preventing corrosion at the terminals is included, the inventors use the method shown in Fig. 10, where the lug, 5, goes through the cover of the battery, a recess is drilled in the latter, and this recess is filled with some flexible rubber compound, 13, which effectively prevents electrolytic action from reaching the binding post, 16.

PATENT NO. 1,032,830 HAS BEEN GRANTED TO WILHELM JOHANN, OF ARNHEIM, NETHERLANDS, FOR A TWO-FLUID GALVANIC CELL.

This invention relates to two-fluid galvanic cells having a carbon diaphragm serving also as an electrode, and it has for its object to render the diffusion between the two liquid electrolytes automatically proportionate to the varying requirement of the cell; that is, to the varying consumption of electric current, and to stop the diffusion as far as possible while the cell is at rest. This object is effected according to this invention by utilizing the warm gases and vapors generated by the electro-chemical action to produce pressure acting upon the liquid electrolyte. This utilization of the gases and vapors may be effected alone or in conjunction with capillary material lying against the sides of the diaphragm or situated within the insertions.

In both figures, a is the outer vessel of the cell, b the carbon diaphragm (serving also as an electrode), c a metal electrode of zinc, iron, aluminum or other suitable metal, and d is a lid with a stopper, e.

As shown in Fig. 1, f is a tubular or other hollow insertion, preferably of glass, vulcanite, celluloid, earthenware, but which may also be of carbon or the like; it is arranged on the underside of the lid and dips to a greater or less depth into the electrolyte. The warm gases which are generated on the discharge of current, mostly along the sides of the carbon electrode b, rise between the insertion f and the carbon electrode b, and force here the liquid downward so that it rises within the insertion f to, say, the level indicated by the line h; this action taking place more or less quickly according to the consumption of current and the resulting greater or less generation of gas and heat.

Now, since this pressure causes the inner level of the liquid to be higher than the level of the outer liquid surrounding the metal electrode, the pressure due to this greater head of liquid will cause the diffusion of the liquid contained within the carbon electrode to be more or less accelerated and proportionate to the varying requirements. As soon as the consumption of current ceases in whole or in part the generation of gas and heat will also cease in whole or in part, and thereby cause the raised column of liquid in the insertion f to sink again. Further, owing to the cooling of the gases and the condensation of the vapors, a certain vacuum will be produced between the carbon and the insertion f, which will enable the liquid (or portions thereof) that surrounds the metal

Fig. 1.

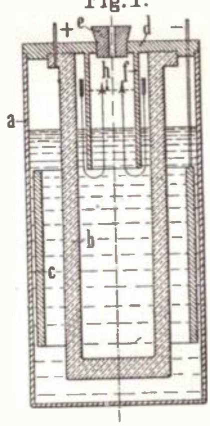
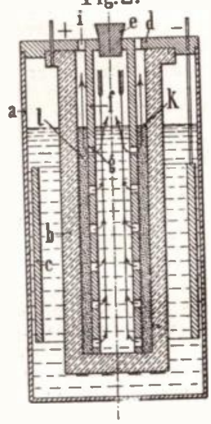


Fig. 2.



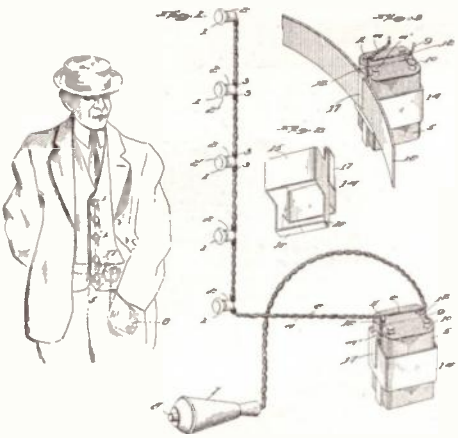
electrode and now stands at a higher level to pass back to a greater or less depth into the carbon and thus prevent the liquid contained in the carbon from diffusing or passing out from the latter while the cell is at rest.

If the aforesaid pressure action should produce a too great pressure in the carbon electrode, this pressure will be relieved by the escape of gases through the stopper, e. In such a case, however, the gases must first pass through the liquid, by which they are partly absorbed."

This appears to be an ingenious idea, but we do not know how well it works out in practice. Perhaps Mr. Hesseln, who has worked with this device, should probably know. It should seem to us, however, that after the battery has been in use for some time the gas action should be very little.

PATENT NO. 1,030,516 HAS BEEN GRANTED TO EVERETTE S. LAGARGE AND PETER A. ANGENEND, JR., OF HOUSTON, TEX., FOR ILLUMINATED VEST OR COAT BUTTONS.

We had thought that the electrical lamp had stopped being patented, but in this we are



glad to say we are mistaken. The present invention shows this to be the case. The inventors, as will be seen, have obtained a patent on using ordinary electric light bulbs as vest or coat buttons, using the device presumably to find the buttons in the dark, which of course is a great help to humanity. However, the device may also be used to light the way home, or, when a burglar attacks you, simply flash your vest buttons in front of him, and he will be so overcome with surprise that he will certainly beat a rapid retreat. The device is also very handy to find the keyhole in the dark, and it also serves the purpose to stop an automobile from running over you, and this is effectively done by placing yourself in the middle of the road, and, flashing the lights on your vest will certainly stop the most ferocious automobile, or, for that matter, a train might be flagged also. Of course, the inventors do not claim all this, but we simply tell it to a long suffering public.

We are equally astonished that the inventors have forgotten to patent electrically lighted shoe buttons, cuff buttons, collar buttons, glove buttons, and also the more important buttons for the back of a lady's dress.

Many husbands have troubled their brains and have often lost their patince in an effort to find the 500 odd buttons on a fashionable dress, and it would seem to us that the inventors have missed a good bet by not patenting such a device. We hope they will do it soon.

CHARLES F. BURGESS, OF MADISON, WIS., HAS BEEN GRANTED PATENT NO. 1,031,038 FOR AN ELECTROMOTIVE DEVICE.

This invention relates to a new kind of vibrator and our illustrations explain the device better than words. It will be seen that the coil, 6, when operated by alternating current, magnetizes the core, 1, which necessarily closes the air space, 5, and a vibrating action is the result; this hammering action may be transmitted to a table plate, 14, through the rod, 15. In this instance the hammering action may be used as a means for shaking or vibrating the table top to assist the molder in performing certain molding operations.

Fig. 1.

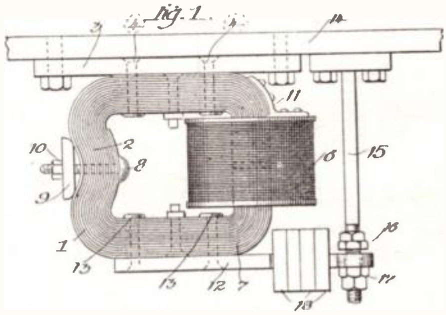
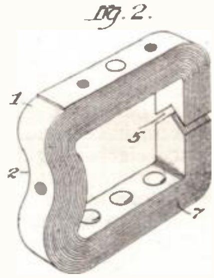


Fig. 2.



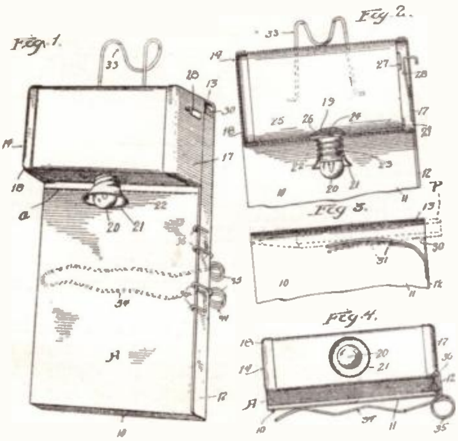
The inventor also utilizes the method for massaging purposes, using the same principle. The device is carried out quite effectively, and will probably find its way into the market.

PATENT NO. 1,030,825 HAS BEEN GRANTED TO OTTO KNOERZER AND JOSEPH W. WEIS, OF HAMMOND, IND., FOR A COMBINED MEMORANDUM-PAD SUPPORT AND LIGHTING DEVICE.

This invention relates to an electrically lighted memorandum pad, and is quite an ingenious idea. In the language of the inventor:

It frequently happens that thoughts or ideas are developed at times when it would be very advantageous to register or record them; that is, to make a memorandum thereof for future reference. Many brainy men do a great deal of thinking after retiring for the day, and the convenience of having a self-illuminating device upon which the thinker may make a memorandum of his thoughts or ideas is self-evident.

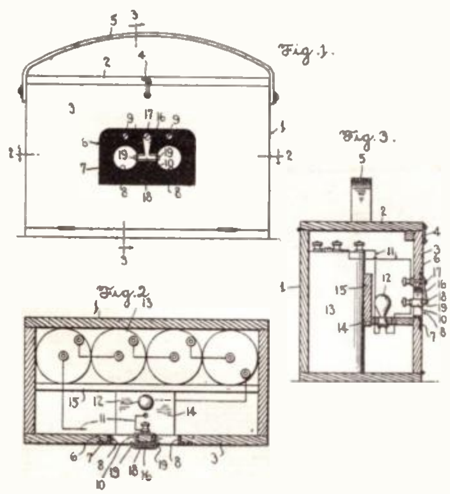
It appears to us that the idea may also be applied with more or less success to reporters, who often have to take their notes in a dark place, and such a device would undoubtedly help a great deal. We hardly need give any further description of the device, which is self-evident to our readers.



We might say that an ordinary flashlight battery is used while, 28, is a push button to close the circuit.

PATENT NO. 1,033,017 HAS BEEN GRANTED WILLIAM HUMPHREY, OF AUBURN, NEB., FOR AN EGG-TESTING DEVICE.

This is a novel idea, and purports to be an automatic egg tester. It is well known that when an egg is viewed with the light



falling on it from the back it can be easily ascertained whether the egg is good or bad. In some devices candles and lamps have been used, but lately some electrical devices have sprung into existence, and the present patent is a good application on the subject.

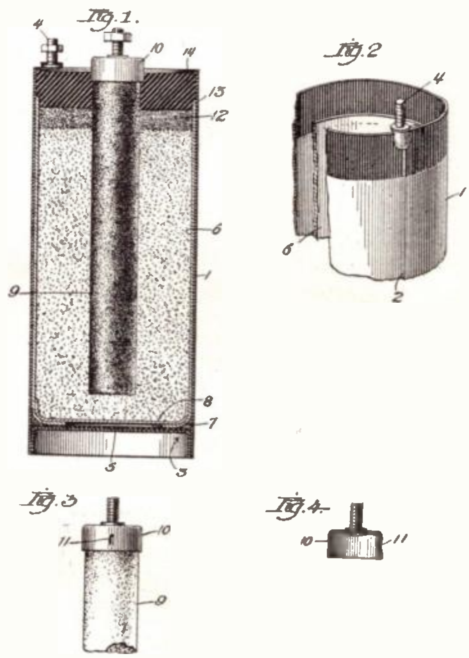
In Fig. 1 will be seen two openings in the black insulating piece, 6. There is an automatic switch, 16, arranged in such a manner that when an egg is placed in the opening the switch, 16, on account of the weight of the egg closes the circuit, thereby lighting the lamp, 12. This lamp is actuated by the battery, 13. It is evident that the egg may be placed in either of the openings.

Whether this device will be introduced into practice we do not know. It would be a good idea to make the hens lay the eggs directly on the device, thus saving an extra manipulation, and the hen could then also convince herself whether or not the egg was strictly fresh.

CHARLES F. BURGESS AND CARL HAMBUECHEN, OF MADISON, WIS., HAVE BEEN GRANTED PATENT NO. 1,032,529 FOR A BATTERY.

The present invention shows some improvements in dry batteries, which are mainly as follows:

The inventors have found that the binding post, 4, is best located at a soldered seam, 2, for some reason only known to them. In order to prevent local action, they dip the zinc can, 1, in hot asphaltum paint, and this is

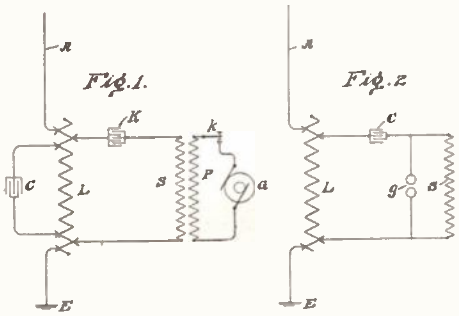


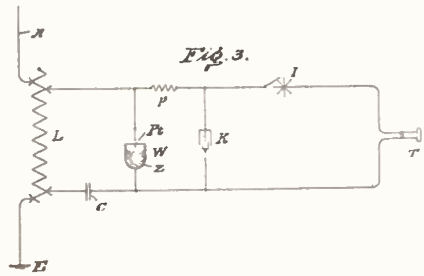
shown in Fig. 2. In most of the batteries the porous material at 6, which holds the solution or electrolyte, is turned in at the top. The inventors of the present battery do not do this, using, instead, the method shown in Fig. 2, which does not necessitate turning over the upper edge of the carton, 6. Another point in this invention is the cap, 10, which has a notch, 11, to make better contact with the carbon.

CORNELIUS D. EHRET, OF PHILADELPHIA, PA., HAS BEEN GRANTED PATENT NO. 1,031,698, FOR A SIGNALLING SYSTEM.

This is a new wireless signalling system and we give herewith an extract from the patent:

"In Fig. 1, G represents a source of fluctuating or alternating current, preferably of high frequency, as, for example, a thousand cycles per second, more or less. Included in





the circuit of said generator is the operator's key *k* and the primary P of a transformer, whose secondary is S. This transformer may be of either the air-core type or of the magnetic core type. Included in the circuit of the secondary S is the condenser K and an adjustable portion of the inductance L. C is a second condenser, preferably of smaller capacity than the condenser K, and it is included in a closed circuit with a variable portion of the inductance L. A variable portion of the inductance L is also serially connected between the aerial conductor A and the earth connection E. By means of the transformer PS the circuit, including the condenser K, is charged periodically at a frequency corresponding with the frequency of the generator G. Each time the condenser K is charged, however, it discharges through S and L, the discharge being oscillatory and of a frequency determined by the capacity and inductance of that circuit, and, in a measure, by the resistance of the circuit; the resistance, however, should be maintained as low as possible. The condenser C is then charged also, at preferably high potential, from the circuit including the condenser K and periodically at a rate equal to the natural frequency of the circuit containing the condenser K. The condenser C, in turn, discharges through a closed circuit through the inductance L and the natural rate of vibration of that circuit is relatively high as, for example, from one hundred thousand to several millions per second. It is the energy of these high frequency oscillations that is then radiated from the aerial A, the aerial circuit being preferably brought into tune or resonance by suitably adjusting the amount of inductance L. In consequence, there is radiated from the aerial A trains of Hertzian or electro-magnetic waves of high frequency, such trains succeeding each other at high rate, presumably at a rate corresponding with the natural frequency of the circuit containing the condenser K."

PATENT NO. 1,032,360 HAS BEEN GRANTED TO FREDERICK H. GOSS, OF CORAOPOLIS, PA., FOR A TELEPHONE-RECEIVER HOLDER.

This is a novel invention for telephone receivers and purports to do away with the necessity of holding a receiver in your hand which very often is not alone tiresome, but at times when "holding the wire" becomes one of the greatest nuisances known. Mr. Goss, who probably has found this himself, invented this device, which is quite clever, and we see no good reason why it should remain unnoticed, which is usually the case.

Mr. Goss uses two receivers in order that hearing can be affected with both ears instead of one. We have always noticed that American telephones use only one receiver. Most people who use a telephone frequently know that the left ear is very sensitive to

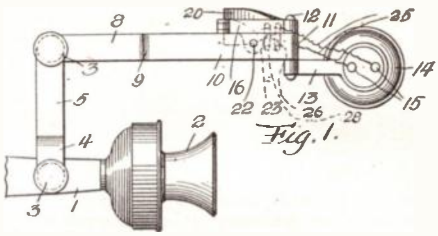


Fig. 1.

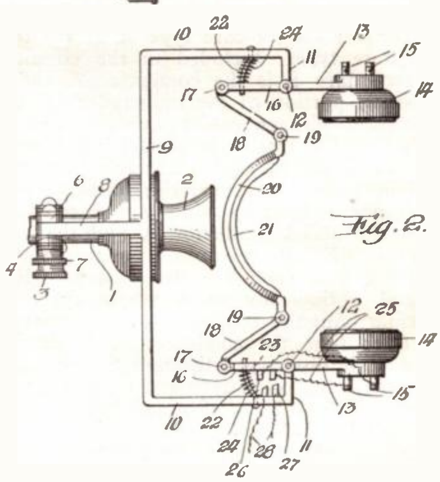


Fig. 2.

faint sounds while the right ear is not at all so, inasmuch as the telephone is seldom used with the right ear. It is very strange that such a custom should prevail so long in this country, and there is no country in Europe to-day where a telephone apparatus has not

(*Continued on page* 556.)

Advice on Patents

ELECTRIC RAT TRAP.

(54.) R. W. P., Milwaukee, Wis., sends in a sketch for an electric rat trap and wishes to get our advice on same.

A. We have given our opinion fully on rat traps before, so it is unnecessary to repeat same here. Our correspondent's device suffers the same shortcomings as all the others discussed during the last four months in these columns, also in the columns "With the Inventor."

We would advise our correspondent to read over the discussions that have already appeared and much time and trouble will be saved.

ELECTRIC SWITCH.

(55.) J. Edgar Linn, East Patchogue, L. I., sends in drawings of a switch for wireless work, to change from sending to receiving, and would like to have our opinion on the device.

A. The sketches which our correspondent sends in are not clear enough, nor is there any description from which we can see how the switch is supposed to work. In the absence of further information we cannot give an opinion.

A NEW DEVICE.

(56.) Frank Converse, Painesville, Ohio, has invented a device which will prevent blowing of fuses on motors running printing presses.

A. The device appeals to us as a good one, and we think a patent might be obtained on same. It would be a good idea to get in touch with some patent attorney with a view of making a search through the Patent Office, in order to ascertain if a patent may be secured on the device.

ANOTHER RAT TRAP.

(57.) F. L. Southgate, Halifax, N. S. We refer our correspondent to inquiry No. 54, discussed above, inasmuch as this device has all the defects of the first one.

INDUCTION COIL.

(58.) Carl Farrell, Puyallup, Wash., sends in a diagram on a winding of an induction coil. He interposes the primary between two sections of a secondary, and wants to know if he could get a patent on the device.

A. This scheme has been tried a number of times, but not much success has ever been had, inasmuch as the primary does not have enough surface to act on the core and it has been found that such a primary tends to cut down the efficiency of the coil.

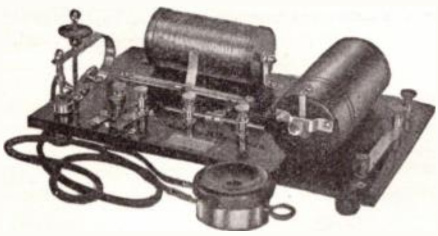
THREE WIRELESS OPERATORS ON THE "IMPERATOR."

Three wireless operators will be carried on the new steamer "Imperator" of the Hamburg-American line which was launched at Hamburg, Germany, May 23. This steamer is the largest ever constructed.

SENDING AND RECEIVING WIRELESS OUTFITS

COMPLETE — PORTABLE

IDEAL SETS FOR HOME, PICNICS, CAMPING OR BOATING



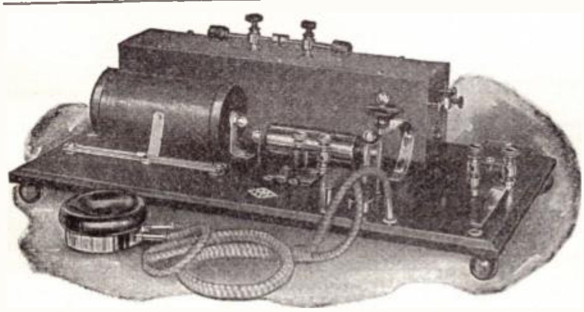
Mounted on solid oak base, size 7 x 12

No. 796—$5 Value $3.90

Sends ½ to 1 Mile—Receives up to 500 Miles

This new, up-to-date, guaranteed, portable set, consisting of one ¼-inch spark coil, equal to the average ⅜-inch coil, and high tension vibrator, 1 combination universal detector; one 75-ohm nickeled case, exceptionally sensitive telephone receiver and cord; 1 large high efficient flat plate secondary condenser; 1 sending key; 1 condenser switch; 1 spark gap with lathe turned ⅜-inch zinc spark ends; 1 tuner 4½ x 2 inches, latest type, wound with bare copper wire; 1 special primary condenser; 1-inch wollaston wire; 1 doub e throw double pole aerial switch; 120 feet aluminum aerial wire; 2 insulators, complete directions, diagrams and code. The raw material alone would cost you this amount were you to build the set yourself. *Operates on two batteries* ....Price.................... **$3.90**

No. 798—Same as above, with ½-inch coil. Sending radius 1 to 2 miles. Price.................... **$5.00**



Mounted on solid oak base, size 8 x 14 inches

No. 800 : $8.50

$15.00 Value

Sends 8 to 10 Miles. Receives 600 to 800 Miles

New—Up-to-Date—Guaranteed

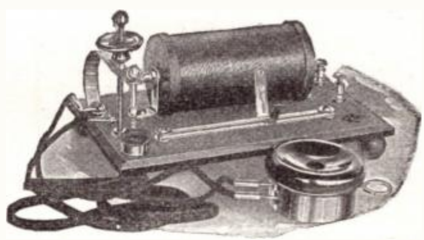
This set consists of a guaranteed 1-inch spark coil, the best type ever placed on the market for wireless; 1 sending key; special flat plate secondary condenser, extra large size; primary condenser; combination universal detector; very fine 1000 ohm, silk copper wire wound receiver and flexible receiver cord; the newest type bare copper wire wound tuner, exceptionally large capacity; spark gap with lathe turned 3.8-in. zinc ends; 1 condenser switch; 120 feet aluminumaerial wire; double pole; double throw switch; 2 insulators; 1-inch Wollaston wire; proper capacity sending helix; diagrams. 8 to 10 miles sending. 600 to 800 miles receiving. Regular $15.00 Value. *Operates on 6 batteries.* Price complete... ......**$8.50**

WIRELESS SPARK COILS

We give a greater value in spark coils than any other firm in America. Our coils are larger than other coils of the same quoted spark length as we put more working material inside of them. Our vibrator platinum points are PLATINUM AND WON'T STICK by welding together as alloy points are bound to do. We guarantee the spark lengths given below and you can have your money back if they don't come up to the values promised. These coils are put up in hard wood cases finished in an elastic varnish and then rubbed down to a dead finish making the handsomest coil on the market.

No. 200	¼ in. coil	**$2.00**
No. 201a	⅜ " "	**3.00**
No. 201b	½ " "	**3.30**
No. 201c	¾ " "	**3.65**
No. 202	1 " "	**3.93**
No. 203	1½ " "	**5.50**
No. 204	2 " "	**7.75**
No. 205	3 " "	**15.50**
No. 206	4 " "	**25.00**
No. 207	6 " "	**50.00**
No. 208	8 " "	**75.00**

For the Beginner



No. 797 — Mounted on Solid Oak Base — $2.50 VALUE — Receives up to 500 Miles — $1.75

This consists of a combination universal detector; 75 ohm nickeled case; exceptionally sensitive receiver and telephone cord; tuner 4½ x 2-inch latest type, wound with bare copper wire; 1-inch Wollaston wire; 2 insulators; 65 feet aluminum aerial wire. **Price**.......................... **$1.75**

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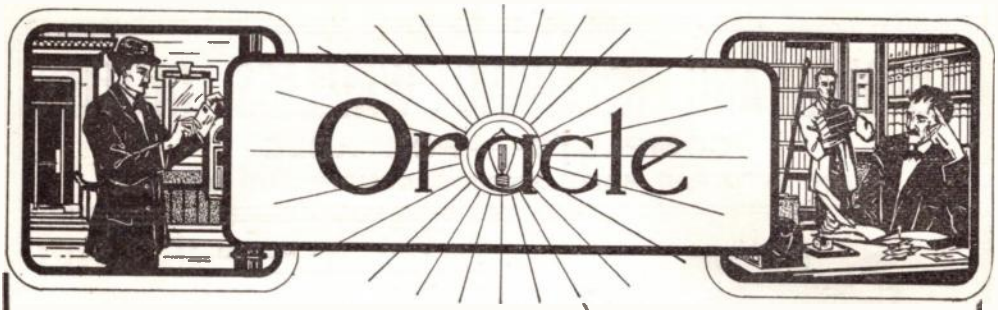


Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

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 for each question. 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 remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

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

WE CANNOT ANSWER QUESTIONS REGARDING SENDING AND RECEIVING RANGES.

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

REWINDING FAN MOTOR.

(2082.) Oliver W. Cook, Massachusetts, writes:

Q. 1.—How much would I have to alter a motor that is designed for 52 volt and 125 cycle so that it will run on the 110 volt cycle circuit? Will I have to rewind both fields and armature?

A. 1.—If the motor is of the commutator type, it will be necessary to rewind both the field and the armature. If, on the other hand, it is an induction motor with a squirrel cage rotor, it will only be necessary to rewind the field.

Q. 2.—How large a condenser must I have through which I can pull current enough to operate a ½ kw. coil? The condenser is to go in series with the key and the 110 circuit to prevent the load from flickering the house lights, and is to take the place of a one-to-one transformer, for which I would have to pay.

A. 2.—This would require a condenser of 400 to 500 microfarads capacity, and could be used only in connection with alternating current. You might better buy the transformer, because the condenser would be very much more expensive to build and would be very bulky. It would not stop the flickering of the lights, anyhow.

WAVE LENGTH AND HELIX.

(2083.) P. J. Theisen, Colorado, asks:

Q. 1.—I have seen several different ways in your magazine of finding the wave length of a station, and they seem to contradict each other, so I want to know if this is the right way to find it: take the length of the aerial, multiply this by the number of the wires, and divide by 39 (after reducing same to inches), which will give you the wave length?

A. 1.—Your method is not correct. See article on Limited Wave Lengths in the March and June issues and answer to No. 2074 in the July issue.

Q. 2.—When finding the wave length of a loose coupler or a tuning coil do you take the length of wire on same and proceed the same as for aerial?

A. 2.—As already stated several times in this column, a loose coupler or any other kind of tuning coil has no wave length of its own, and it is useless to attempt to figure it.

Q. 3.—I enclose herewith a small piece of brass tubing, and would like to know it this is a satisfactory material to use on a two k.w. helix? I have not tried it out, but think that as the current only travels on the outside of the conductor that this material would be all right as it gives two surfaces, the one on the outside and the one on the inside of the tube.

A. 3.—Tubing such as you have enclosed will be suitable for your helix, but it is rather large. Tubing ¼ inch outside diameter would be big enough. The current is densest near the outside surface. The inside surface has no effect on the carrying capacity.

ONE INCH COIL ON BELL RINGING TRANSFORMER.

(2084.) Thomas Scott, Texas, would like to know:

Q. 1.—Would a Thordarson $3.75 bell ringing transformer be all right to work an E. I. Co. one inch coil for wireless?

A. 1.—No. The output of this transformer is something less than 20 watts, which is not enough to operate a coil satisfactorily.

Q. 2.—Are 10 glass plates too many for

the secondary condenser of my coil?

A. 2.—This depends upon the size of the plates. Six plates having tinfoil 6 inches by 8 inches would be plenty for this coil.

Q. 3.—Can the lightning ground be used also to ground the instruments, and if so, how?

A. 3.—Yes, the lightning ground may be used for the instrument ground, and it is only necessary to connect the ground terminal to the lightning ground wire.

LEYDEN JAR CONDENSER.

(2085.) Frank Moy Ling, Oregon, writes:

Q. 1.—I have a radial oscillation transformer. The secondary consists of 25 feet of No. 8 B. & S. copper wire wound on a frame 10 inches in diameter. There are ten turns spaced 1 inch apart. The primary consists of 18 feet copper tubing, ¼ inch in diameter wound on a frame 14 inches in diameter. There are four turns spaced 1 inch apart. My aerial is composed of six strands of No. 14 B. & S. aluminum wire spaced 1½ feet apart 63 feet long and 48 feet high. Please give wave length of oscillation transformer; of aerial?

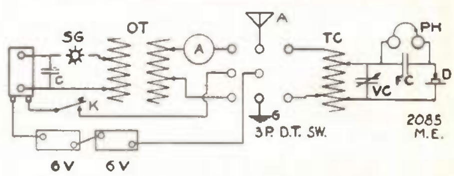
A. 1.—See answer to No. 2083. The wave length of your aerial is about 170 meters.

Q. 2.—How many one-quart fruit jars are necessary for the condenser, described in the April, 1911, issue by E. J. Lamb, for the "Electro" ½ k.w. transformer coil with vibrator, to be used with the above apparatus for a 3½ inch spark coil?

A. 2.—Three or four will be required for the transformer coil and four connected, two in series and two in multiple for the 3½ inch spark coil.

Q. 3.—Please give diagram for connecting the following set through Electro antenna switch. Receiving: Three slide tuner, silicon detector, variable and fixed condenser, 2800 ohms receiver. Sending: Oscillation transformer, two clips on secondary, two clips on primary ½ k.w. transformer coil with vibrator, glass jars condenser, key, rotary spark gap, hot wire meter and storage batteries.

A. 3.—Diagram herewith.



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2 K.W. TRANSFORMER FOR 220 VOLT D. C.

(2086.) Mario R. Pujol, Buenos Aires, writes:

Q.—Will you please tell me in the Oracle the length, weight and diameter of the core, the size of wire and number of sections and weight of each in the secondary of a 2 k.w. transformer for 220 volts direct current?

A.—Transformers cannot be operated directly on direct current. An open core transformer may be used in connection with an electrolytic or mercury turbine interrupter on direct current, but it then becomes simply an induction coil. The fol-

lowing transformer should take about 2 k.w. when operated on 220 volts in this manner: Core, 14 inches by 1½ inches, primary winding, two layers No. 12 DCCC wire; secondary, 12 lb. No. 32 SSCC wire wound in thirty pies, ¼ inch thick. The primary and secondary winding should be separated by a hard rubber tube having walls ⅜ inch thick. The interruptions of the primary current should be at the rate of about 250 per second.

CHANGING A. C. TO D. C.

(2087.) Arthur Van Pelt, Illinois, inquires:

Q. 1.—If A. C. 110 volt is changed to D. C. is the D. C. of the same number of volts or not? I have read that D. C. is about 10 or 11 times as strong as A. C. Is this true?

A. 1.—When the 110 volts A. C. is converted to D. C. through a rectifier the voltage of the latter is about 70. There is no truth in the statement that D. C. is about 10 or 11 times as strong as A. C. Equal amounts of A. C. and D. C. will do the same amount of work provided the A. C. does not lag behind or lead the voltage in the circuit.

Q. 2.—I have an electric car line rigged up and would like to start, stop and reverse it from my desk. I have heard of these reversers but do not know how to make one. Kindly tell me how one of them is made.

A. 2.—We presume this refers to a toy electric railroad. If the motor used on the car is of the permanent magnet field type it is only necessary to reverse the current supply of the motor in order to reverse it. This may be done by means of a simple reversing switch placed anywhere in the circuit. If, on the other hand, the motor field is of the electro-magnet type some such device as is described on page 106 of the May, 1911, issue should be used.

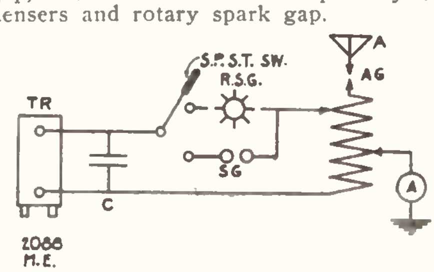
Q. 3.—Why do some electric things need more amperes than volts and others vice versa? Please explain this difference and why it is?

A. 3.—As a rule, apparatus wound with fine wire requires a small amount of current at high voltage, while apparatus wound with coarser wire requires a large amount at a lower voltage.

¼-INCH SPARK COIL.

(2088.) John W. Magee, Pennsylvania, asks:

Q. 1.—Kindly give me the diagram how to connect the following: ¼-k.w. transformer, helix, spark gap, condenser, anchor gap, hot wire ammeter and primary condensers and rotary spark gap.



A. 1.—Diagram herewith. Primary condensers are not needed and have been omitted.

Q. 2.—Do you know what a license will cost for an amateur wireless station when the law passes?

A. 2.—As far as we know, the license will cost nothing. See editorial page, July issue.

Q. 3.—I would like to make a ¼-inch spark for a test and one thing holds me from making it, that is the winding of the primary. Could you give me some information in winding one?

A. 3.—Insulate the core with two layers of tape. Over this wind two layers No. 22 B. & S. DCCC, tying the end turns with thread to keep them from slipping, after which soak the whole thing in melted paraffine until all the air has been driven out.

TYPE OF AERIAL.

(2089.) L. Anderson, New York, inquires:

Q. 1.—Is a helix 22 inches in diameter, 14 inches high, composed of 12 turns No. 4 copper wire, too large for a 1½-k.w. transformer?

A. 1.—No.

Q. 2.—Of the types shown on sketch herewith, which aerial do you consider best, "A," "B," "C" or "D"?

A. 2.—The L-shaped aerial shown in type "A" gives the best results. It would be better if you connect the lead in at the low end instead of the high end.

Q. 3.—Will the Gernsback electrolytic interrupter operate on 30 volts furnished from dry cells, and would you please publish a diagram showing the way it is to be connected to the coil?

A. 3.—No. You must have at least 45 volts. With this amount connect the positive pole of the battery to the positive binding post of the interrupter, then connect the negative binding post of the interrupter to the one of the primary binding posts of the coil, then connect the remaining primary binding post of the coil, through the key, to the negative side of the battery. If your coil has a mechanical vibrator on it screw it down tight so it cannot vibrate.

RECEIVERS WITH DIFFERENT RESISTANCES USED TOGETHER.

(2090.) William J. Baker, Ohio, writes:

Q. 1.—I have an aerial 35 feet long, composed of aluminum wires, and wish to lengthen the aerial. Will it work if I splice more of the same kind of wire on the present wires?

A. 1.—Yes. Aerial should operate satisfactorily if the splices are well made and protected from the weather. The best means of protecting the splices is to wrap them with tinfoil and then tape them up, using *rubber* tape.

Q. 2.—What is the wave length of the following aerial: 35 feet long, 30 feet high, composed of 4 wires spaced 1½ feet apart; the lead into instruments is 85 feet long?

A. 2.—About 175 meters.

Q. 3.—Will a 1000 ohm receiver and a 75 ohm receiver work together on the same head band for wireless?

A. 3.—Yes. These receivers will work together, but the results will not be good. The signals will be heard fairly strong in the 1000 ohm receiver, while those from the 75 ohm receiver will be barely audible. This, of course, is assuming that both receivers are in good condition.

SENDING AND RECEIVING WAVE LENGTHS.

(2091.) C. E. Kroener, New Jersey, wants to know:

Q. 1.—If you have secured a license from the Secretary of Commerce and Labor does that give you the right to send and receive out of your own State, or just to receive out of your own State?

A. 1.—There is no restriction on the amount of receiving you may do, and none on the amount of sending, so long as you do not cause wilful interference with any other station.

Q. 2.—If your transmitting set must not be over 200 meters, can you have a larger wave length for receiving, if you have a license?

A. 2.—Yes. There is no restriction on the receiving wave length.

Q. 3.—Can you give me the right number of wires for my aerial, which is 100 feet long, to make the 200 meter wave? If the height has anything to do with the 200 meters, my aerial is 35 feet high at one end and 22 feet high at the other.

A. 3.—Four wires 90 feet long. This gives a natural wave length of about 150 meters, leaving 50 meters to be made up in the secondary of the oscillation transformer. The exact number of turns depends upon the amount of capacity in the aerial and cannot be figured in advance, but must be determined by experiment. Arrange the closed (condenser) circuit as per the table on page 276 in the June issue, and then tune the aerial circuit to resonance with the condenser circuit by means of a wave meter or a hot wire ammeter.

ROTARY SPARK GAP ON SPARK COIL.

(2092.) James Hayes, Texas, asks:

Q. 1.—Will a rotary spark gap on a 1½-inch coil produce a singing spark?

A. 1.—No. The reason that the spark gap fails to produce a musical note is that the duration of the spark discharge from an induction coil, operated in the ordinary manner, is so short that the rotary gap is unable to break it up; also the irregularity in the spark is due to the fact that even though you do have a large number of plugs in the revolving wheel, if the stationary plugs and revolving plugs are not in line at the instant the rise in voltage in the secondary of the coil takes place, no spark will occur. This is due to the fact that the rise in voltage in the secondary is almost instantaneous and it dies out again with equal rapidity. Although the revolving plugs pass the stationary ones with great rapidity, the action of the voltage in the coil is still quicker, and, as just stated, if the plugs are not in line at this instant no spark will occur.

Q. 2.—Please give size and amount of tinfoil sheets to reduce sparking at vibrators on a 1½-inch coil?

A. 2.—This condenser should contain 1100 square inches of tinfoil, separated by paraffined paper 0.001 inch thick. The sheets may be made any size that will fit into the coil box.

Q. 3.—How many turns of No. 8 copper wire 1 inch apart, 12 inches diameter, helix, to bring up wave length to 200 meters when having 175 meters natural wave length?

A. 3.—Probably one or two. See answer to No. 2091.

SIZE OF WIRE FOR CONNECTING UP.

(2093.) R. Woodward, New Jersey, asks:

Q. 1.—What is the best wire to use for wiring a ½-k.w. sending set?

A. 1.—No. 10 stranded rubber covered copper wire.

Q. 2.—What is the best wire for lead-in from antenna to lightning switch? From switch to instruments?

A. 2.—The aerial lead-in should be of the same material as the aerial wires and should be equal in conductivity to all of them in parallel. From the switch to the instruments use No. 10 or No. 12 stranded rubber covered copper

Q. 3.—How large a dynamo is needed to operate a ½-k.w. transformer coil with vibrator and condenser?

A. 3.—Any dynamo which will furnish 10 amperes at from 10 to 12 volts will be suitable.

THREE SLIDE TUNER.

(2094.) C. Don Martin, Oklahoma, writes:

Q. 1.—I intend making a three-slide tuner with brass spring sliders. In which direction should the ground slider run, and in which direction should the other two sliders run that are connected to the detector circuit?

A. 1.—The placing of the sliders makes no difference so long as they slide the full length of the coil.

Q. 2.—How do you make the buzzer test?

A. 2.—See answer to No. 2071 in the July issue.

Q. 3.—What is the purpose of a condenser?

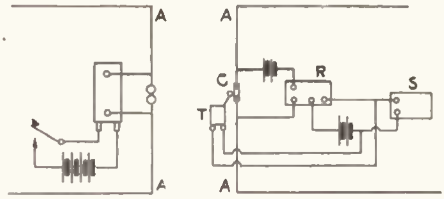
A. 3.—In a telephone circuit, a condenser is usually employed to prevent the passage of direct current while allowing A. C. to pass over the circuit. In wireless work they are used to facilitate tuning circuits to a given period of oscillation or a given wave length.

COHERER SET.

(2095.) Howard Sorey, Oklahoma, inquires:

Q. 1.—Can a telegraph sounder or an electric bell be operated by wireless over a distance not to exceed 100 feet with all ground connections eliminated? If so, please give diagram.

A. 1.—Yes. It can be done. Diagram herewith. The spark coil used should give a ½-inch spark. C is the coherer, T the tapper, R the relay, and S the sounder or



2095 M. E.

bell. The wires marked A should be all of the same length, from 20 to 50 feet long. Those on the receiving end being placed parallel to those on the sending.

Q. 2.—Does a galena detector require a battery?

A. 2.—No. This detector works better without battery.

SPARKLESS SYSTEM.

(2096.) R. M. Lake, Minnesota, asks:

Q. 1.—Would you please explain the operation of the new wireless light?

A. 1.—We do not know what you mean by this, and in the absence of details cannot advise you.

Q. 2.—The principle of the sparkless transmitter (Standard Wireless Equipment type) operates on either 110 volts A. C. or D. C. with lamp in series, or on 6 dry batteries, and sends 5 to 6 miles?

A. 2.—We have not seen one of these sets, but believe it is simply an ordinary set using a quenched spark gap in place of the ordinary spark.

Q. 3.—Can you explain this? A California amateur electrician could draw enough power from 110 volts A. C. wires a half block away to light three 16 candle power 110 volt lamps with only a ground connection and a wire running to a small box on the roof. What did the box contain? A friend of mine told me about this and said that the young electrician fetched the box to his office and worked it there. My friend saw the apparatus, but knowing nothing of electricity, could not give me the slightest idea or hint as to what did it or of the apparatus in the box. Neither the house nor the office were wired for electric lights.

A. 3.—Without knowing what was in the box, we cannot tell how the lamps were lighted.

USING A MOTOR FOR A DYNAMO.

(2097.) Henry V. Nesbit, Indiana, asks:

Q. 1.—Can a 1/10-h.p. Emerson 220-volt 0.6 ampere motor be turned into a dynamo? If so, how? It is shunt wound.

A. 1.—Yes. All that is necessary is to belt it up to an engine or some other source of power.

Q. 2.—What would be its output in volts and amperes? At what speed should it be run, and what h.p. would it require to run it?

A. 2.—The output would be about 0.5 or 0.6 of an ampere at about 120 volts, if it is driven at the same speed at which it was run as a motor. It would require about 1/6 h.p. to drive it.

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LIGHTNING GROUND.

(2098.) Edward E. Lewis, Connecticut, would like to know:

Q. 1.—Would a single pole double throw 200 ampere switch be all right to ground the aerial for lightning? If not, what kind would you advise me to get?

A. 1.—Yes. This will do very well. It is heavier than the underwriters require, but that is a good fault.

Q. 2.—I intend to place it outside the house. Should I put a hood over it to keep the rain off?

A. 2.—It is not necessary to place a hood over the switch, but it would be better to do so.

Q. 3.—What code do the government stations use?

A. 3.—The government stations use the Continental code for official business, but use the Morse code when working with ships which use Morse code only.

REWINDING A. C. MOTOR.

(2099.) Frank Kratky, Jr., Oklahoma, writes:

Q.—I want to know how to wind and connect the armature coils on a 1/4-h.p. Blatz motor which runs on A. C. The number of segments in the commutator is 24 and the slots in the armature are 24. I know the amount of No. 28 wire it is wound with, but I cannot get the connections right. The field has six field coils which are connected by an iron plate which makes two poles of three coils each. The field winding was connected in parallel or multiple with the armature. I enclose sketch of motor on a separate sheet.

A.—The armature of this motor is wound in the same way that a D. C. armature having the same number of slots and commutator segments would be wound. That is, each slot contains one-half of each of two coils. The winding may be started at any slot. The wires should be carried from the commutator end, through the slot, across the back of the armature, and back through the same slot that the coil occupied originally. The wire should then be carried round and round through these two slots until the correct number of turns for one coil have been wound on. The slots should then be half full. The next coil should then be started in the next slot either to the right or left of the first coil, leaving a loop in the wire between the end of the first coil and the beginning of the second for connection to the commutator segments. The second coil should be wound on as was the first, and the operation continued until twelve coils have been wound on, when the slots will be half full, and you will have taps for the commutator segments leading out opposite one-half the slots. Keep on winding in the same manner, only placing the coils in the upper portion of the slots and winding them right over the coils already in them until you have wound on twelve more coils. The winding will then be complete and the finishing end of the wire should be joined to the beginning of the first coil and you will have com-

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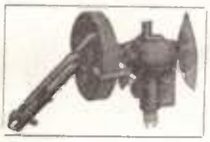
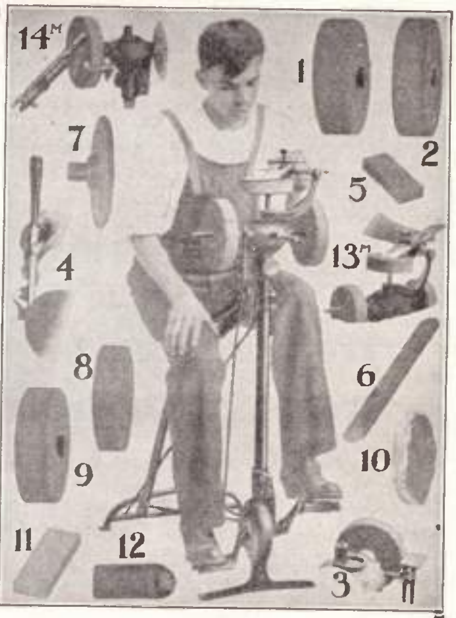


with the tool rests and special attachments your apprentice can do it as well as a master mechanic.



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30 DAYS' FREE TRIAL

Write to-day for our 30 days' Free Time offer on our big 14 Tool Shop Sharpening Outfit and big free illustrated book showing the many uses of the Luther Hummer Outfit and how it pays for itself—also McClure's Magazine story of the discovery of artificial diamond abrasives.

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mutator taps leading out opposite each of the twenty-four slots. These twenty-four leads should be brought straight out to the commutator segments and soldered to them.

HOOK-UP.

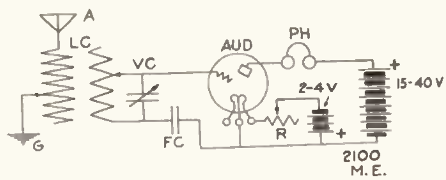
(2100.) Herbert N. Pinkman, Washington, asks:

Q. 1.—What k.w. would a transformer be with the following dimensions: Core 1¾ inches by 12 inches by 11 inches (outside measurements), 5 lbs. No. 12 DCC for the primary (wound on one leg and secondary winding on other leg), 15 lbs. of No. 28 SSC for secondary winding in 14 sections ¼-inch thick?

A. 1.—This transformer would be about ½ k.w.

Q. 2.—Please give a diagram of a set that receives from one to two thousand miles with aerial not over 50 feet high, and tell what apparatus, if any, that are described in the *Modern Electrics* as far back as March, 1910?

A. 2.—Diagram herewith. The loose coupler and fixed condenser are described in our book "How to Make Wireless Instruments," while a variable condenser is described in the May issue.

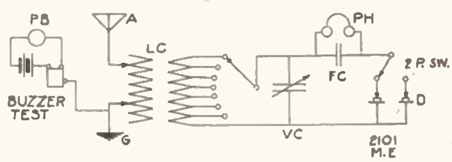


AERIAL WAVE LENGTHS.

(2101.) Hammond M. Perkins, Massachusetts, writes:

Q. 1.—Please give me the best hook-up for the following instruments: Loose coupler, with two sliders on the primary and six point switch on the secondary, two fixed and one variable condensers, two detectors, silicon, and galena, and 2000 ohm phones. Also, a buzzer test and necessary switches?

A. 1.—Diagram herewith.



Q. 2.—What is the wave length of each of the following aerials, and which would work the best with the instruments mentioned in No. 1? Can you suggest a better four-strand aerial of the same length and height?

A. 2.—Both the aerials shown in your sketch have the same wave length, which is about 180 meters. Either of these aerials should give good results, and the only change we would suggest would be to bring down a lead from each aerial wire to the station, bunching them just before they enter the station.

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Q. 3.—A short while ago I saw on a receiving transformer, made by the Long Distance Wireless Instrument Co., two sliders on one rod on the primary. What is the advantage of this, if any, and would it be any better to do this than to have two separate sliders and rods on the primary of a loose coupler?

A. 3.—So far as we know, there is no advantage in putting two slides on one rod. We should think it would be better to have the sliders on separate rods.

HIGH RESISTANCE RECEIVERS. TESLA TRANSFORMER.

(2102.) Floyd F. Whiting, Minnesota, wants to know:

Q. 1.—What instruments would I need to transmit and receive from here to Duluth, Minn., a distance of about 80 or 90 miles, and what size aerial would I need?

A. 1.—You will need a 1-kw. A. C. transformer with suitable condenser, oscillation transformer, and rotary or quenched spark gap. Your sending aerial should be four wires, 50 feet high, 80 feet long. For receiving you had better put up a separate aerial, 150 feet to 200 feet long, and as high as possible. For a receiving set a good combination consists of a three slide tuner, fixed condenser, variable condenser, silicon detector or perikon detector and a high-grade telephone head set. The small aerial for sending is specified for the reason that we suppose you intend operating a private station and will be restricted to the use of a 200 meter wave. Of course, if you set up a commercial station your wave length will not be so restricted.

Q. 2.—Where can I obtain a pair of 5000 ohm receivers?

A. 2.—You can probably obtain a pair of 5000 ohm receivers from either W. J. Murdock, 40 Carter Street, Chelsea, Mass., or the Holtzer-Cabot Electric Co., Brookline, Mass. It is possible that C. Brandes, 111 Broadway, New York, will make you a pair. In all probability these receivers will have to be wound especially for you. There is no advantage in using receivers of more than 2000 ohms for the pair.

Q. 3.—Where can I get data for building a Tesla transformer, such as was described in the photograph of Howard Lucas's wireless outfit?

A. 2.—Our book "Construction of Induction Coils and Transformers" gives detailed instruction for several different kinds of Tesla transformer. The price is 25c., postpaid.

MOULDING HARD RUBBER.

(2103.) E. A. Kuser, Pennsylvania, inquires:

Q. 1.—Would like a formula for making a composition to be used in place of hard rubber on wireless instruments, and also the method of heating and moulding it into different shapes?

A. 1.—The only substitute we know of for hard rubber would be a composition made up of ground mica and shellac.

Q. 2.—Is there any method of melting

old hard rubber and moulding it for use on instruments?

A. 2.—So far as we know, there is no method of remelting old hard rubber and moulding it over again. Hard rubber may be softened at a temperature of about 212 degrees Fahrenheit and then forced into moulds under heavy pressure.

Q. 3.—Is there any law prohibiting one from collecting a fee for the transmission and receipt of messages from a town fifteen miles distance? If so, what must be done in order to have several stations listed as commercial, the aerial of one to be 350 feet long and 100 feet above the top of a mountain, with an output of about 4 kw.?

A. 3.—So far as we know, there is no law prohibiting you from collecting a fee for transmitting a wireless message, but if you wish your station listed and licensed as commercial station you will have to show to the satisfaction of the Department of Commerce and Labor that you are actually operating your stations strictly as such, and not as amateur stations, occasionally collecting a fee for transmitting a message in order to operate on a higher wave length and with a larger amount of power than are allowed private stations.

BATTERY VOLTAGE.

(2104.) Allen A. Ginn, Tennessee, wants to know:

Q. 1.—Can a solution of bichromate of potash and sulphuric acid be used in a sal-ammoniac battery? What voltage will it give? What voltage will a sal-ammoniac give any way?

A. 1.—Yes. This solution may be used and the voltage of the cell will be a fraction over 2. The salammoniac cell gives in the neighborhood of 1½ volts.

Q. 2.—What is a good electrician supposed to know? What branches of electricity are needed most? About what pay do they get per month?

A. 2.—A good electrician is supposed to thoroughly understand the fundamental principles of electricity as applied to wiring and the installation of lighting and power apparatus. Good electricians get anywhere from $2.00 to $4.50 per day.

Q. 3.—Where may second hand chemical apparatus be bought?

A. 3.—You may try G. & H. Berge, 95 John Street, New York City.

SAL-AMMONIAC BATTERIES.

(2105.) Lionce Bonnecaze, Louisiana, writes:

Q. 1.—Would you please tell me if I could use sal-ammoniac batteries with two ¼-inch coils?

A. 1.—Sal-ammoniac batteries may be used to run spark coils, but as the current output of these cells is rather limited and they polarize quickly, the service received from them would probably be unsatisfactory.

Q. 2.—Please explain how to make these batteries, giving quantity of sal-ammoniac to be used?

A. 2.—A sal-ammoniac battery consists

of a rod of zinc and a rod or plate of carbon immersed in a solution made up in the proportion of 6 ozs. sal-ammoniac to about 1½ pints of water.

WIRELESS TELEGRAPHY.

(2106.) Shirlig Mutchmor, Canada, asks:

Q. 1.—Please state how, or how I can not, work the drawing on sheet 2? I do not wish to buy a 220-440-volt D. C. dynamo, so can I use a spark coil or rectifiers as the current in the city is alternating?

A. 1.—The apparatus described may be used for wireless telegraphy on 500-volt A. C. current, but it could not be used for wireless telephony, for the reason that the set would send out a continual hum that would drown out the effect of any voice current. This is true of all A. C. transmitting sets whether they employ a rectifier or not.

Q. 2.—What size spark coil should No. 2, on page 2, be?

A. 2.—The apparatus mentioned is a transformer, not a spark coil, and must have a secondary winding heavy enough to carry the arc current.

Q. 3.—Is a Geissler tube necessary to tell the oscillations?

A. 3.—No.

COHERER SET.—COMPUTING RANGES.

(2107.) Melvin Moffet, Canada, writes:

Q. 1.—Please give me a diagram of coherer relay (1000 ohms) bell and 75 ohm sounder?

A. 1.—See answer to No. 2095. Connect the bell parallel with the sounder or use the bell for the tapper.

Q. 2.—Can two relays be used in coherer system? If so, how?

A. 2.—Yes; connect them in series.

Q. 3.—Please give me the simplest form how to figure the sending and receiving radius?

A. 3.—The simplest rule for finding the transmitting distance over salt water is to multiply the effective height of the aerial in feet by the number of amperes of current in the aerial. The product of these two numbers is roughly the distance in miles over which the set will transmit over salt water. For more definite information see article on determining ranges mathematically in the March issue.

SPARK COIL.

(2108.) Alexander Plausics, New York, asks:

Q. 1.—Should this coil work all right: Core ⅝-inch by 8-inch, primary two layers No. 16 B. & S. gauge, secondary 2 No. 4 type Electro secondaries; condenser, Electro No. 55 special condenser, home made vibrator?

A. 1.—This coil seems to be all right.

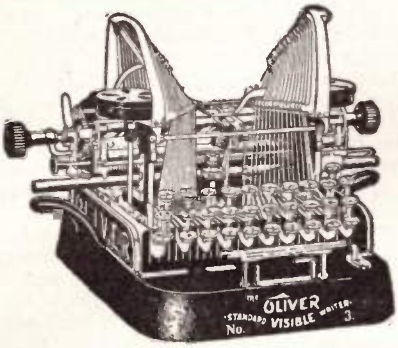
Q. 2.—About what spark should the above give?

A. 2.—About ½-inch.

Q. 3.—Please give spark coil data suitable with three No. 4 electro secondaries?

A. 3.—The same primary mentioned in

$5.00 Per Month



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The Famous Model No. 3 Oliver—The machine with the type bars that strike downward—that makes the "write-in-sight" principle mechanically practical. It is so simple children learn to operate it in ten minutes—so fast the experts choose it—so strong a shrewd business man insists upon it—The World's Standard.

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If You Own a Typewriter Now—

trade it in to us as first payment—we will be liberal with you.

Send your name and address on coupon and we will tell you more about this unusual offer—more about this splendid typewriter—it won't cost you anything and you will be under no obligation—we won't send a salesman.

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You may send without placing me under any obligation, further information of your typewriter offer.

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My old machine is a..............................No. ....

question No. 1 is long enough and may be used with the three No. 4 secondaries.

SENDING CONDENSER.

(2109.) Robert F. Adams, Texas, inquires:

Q. 1.—How many plates, size 12 x 16, with tinfoil, 8 x 10, should be used for a sending condenser for a spark coil to give a 2-inch spark?

A. 1.—Seven.

Q. 2.—Will a rotary spark gap increase the sending efficiency of a spark coil run by batteries? Will same give a high pitch note in the receivers?

A. 2.—Yes. No. See answer to No 2092.

Q. 3.—When a 2-inch coil, condenser and helix are connected up for sending, what should be the greatest length of spark that can be obtained at spark gap before the aerial and ground are connected?

A. 3.—About 3/16-inch.

VARIOMETER.

(2110.) J. Edgar Finn, New York, asks:

Q. 1.—What are the materials needed for making a variometer, and how is it made? (Receiving variometer.)

A. 1.—See page 20 in the July, 1910, issue Modern Electrics.

Q. 2.—I have a receiving transformer and want to put in a loading coil for longer wave length. Will it increase my receiving distance or decrease it? My aerial is 112 feet long, 30 feet one end and 25 feet other, loop aerial aluminum wire?

A. 2.—The addition of a loading coil will decrease your receiving distance, but will enable you to tune to longer wave lengths.

Q. 3.—Would an audion improve my set? If so, please show connections.

A. 3.—Yes. See No. 2100.

ELEMENTARY ELECTRICITY.

(2111.) J. C. Speed, Louisiana, writes:

Q. 1.—Please name some good book on electricity. I have only such knowledge as I have obtained through *Modern Electrics.*

A. 1.—"Practical Applied Electricity," by Moreton. We can furnish this book for $2.00, postpaid.

Q. 2.—Please explain the difference between volt, ampere, watt and ohm? Which is most essential in lighting and which in power?

A. 2.—The volt is the unit of electrical pressure; the ampere, the unit of current flow; the ohm is the unit of electrical resistance, and the watt is the unit of electrical power. These units are so related to each other that none can be said to be more essential than the others.

Q. 3.—Please give the names of instruments necessary for a receiving set to work several hundred miles, and can I make all of them at home; at about what cost? What tools would be needed?

A. 3.—A good receiving set comprises a three-slide tuner, a variable condenser, a fixed condenser, silicon or perikon detector, and a good pair of high grade telephones. The phones may be purchased at from $5 to $13 a pair, complete with head band and

cord. It is better to buy them than to attempt to make them. The rest of the apparatus can be constructed by you at a cost of something less than $5 for material. The work can be done with ordinary wood working tools, a few drills, files and hacksaw and screw-driver.

AERIAL INSULATOR. — SPREADER.

(2112.) I. Cecil Hebb, Canada, writes:

Q. 1.—Do you think an aerial insulator made like the enclosed drawing would be all right? It is made out of a colored bottle. Do you think the color would conduct electricity too much? If so, would a white bottle be all right?

A. 1.—This insulator should give satisfactory service, and it makes no difference whether the bottle is clear glass or colored.

Q. 2.—Do you think a spreader like the enclosed drawing would be all right? I am thinking of putting up four wires 100 feet long. Is this big enough to receive 1,000 miles with the right instruments?

A. 2.—Your spreader is all right, except that it would have to be permanently attached to the mast, which would be objectionable.

DUPLEX AERIAL.

(2113.) Rolland Maxson, Wisconsin, writes:

Q. 1.—I want to make wireless connections between Milton and Cudahy, Wis., a distance of about 56 miles. I am thinking of using an E. I. Co. ½-kw. transformer coil with interrupter on a 110-volt D. C. supply, A. C. not available.

A. 1.—Use ½-kw. open core transformer with an electrolytic or a mercury turbine interrupter.

Q. 2.—Please give height, dimensions and diagram of connections of a duplex aerial mentioned in the editorial column of *Modern Electrics* for May, 1910, to send this distance, the sending aerial not exceeding 200 meters wave length and receiving capacity large enough to receive long distances with suitable instruments and a good ground connection?

A. 2.—Your sending aerial should consist of four wires 80 feet long, 50 feet high, and your receiving aerial four or six wires 150 feet to 200 feet long and as high as possible.

Q. 3.—Will the 50-watt step-down transformer described in the January, 1911, issue of M. E. Work satisfactorily when the primary current is supplied by D. C., changed to A. C., by a mechanical converter such as the one described in "Simple Experiments in A. C." in the May, 1912, issue, the converter to be driven by an electric motor? If not, why?

A. 3.—It will work, but not so well as on A. C., on account of the peculiar wave form of the current supplied by the mechanical converter.

INSTRUMENT TRANSFORMER.

(2114.) Charles Gardner, California, says:

Q. 1.—I have a General Electric Co.'s

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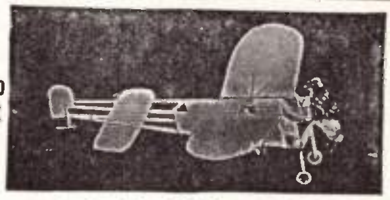
No 2



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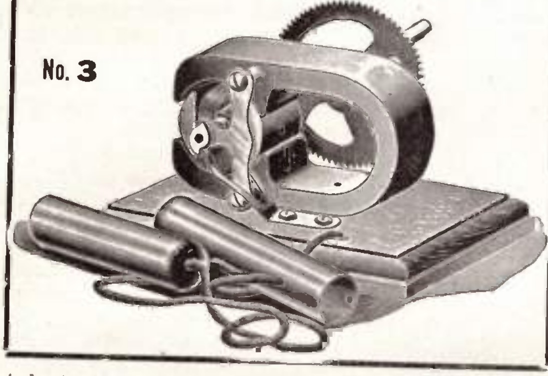

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Every boy wants one for instruction and experiment. It is a veritable fun factory and in a group, side-splitting laughter is created by the many amusements and tricks the machine is capable of producing.

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Note—For N. Y.C. or Canada add 35c; Foreign, 60c potential transformer, the name-plate of which reads as follows: Type H, form P. A.; watts 10 cycles 60/125; volts, 1100-110. What is this used for?

A. 1.—This transformer is used with a 110-volt switchboard voltmeter to measure voltages up to 1100 on an A. C. circuit.

Q. 2.—Is this transformer anything similar to the one required by the fire underwriters to be used on the 110-volt mains?

A. 2.—It is similar, but its capacity is very small. The transformer required by the underwriters would have to be equal in capacity to the transformer used in the sending set.

Q. 3.—Does a step-down transformer change the cycles?

A. 3.—No. It simply changes the voltage.

RECEIVING TROUBLES.

(2115.) Charles H. Dudley, New Hampshire, writes:

Q. 1.—My brother has an aerial of three No. 14 aluminum wires, 100 feet long, and spaced about three or four feet apart. The connections of the aerial are not soldered; the wires were merely scraped and wound tightly together and the joints taped. The high end of the aerial is supported about 30 feet from the ground by a steel windmill tower. The tower, of course, is grounded. The lower end is supported by a pole on the summer-house about 20 feet high. A tap from each of the aerial wires is brought down, and all the taps bunched together before being connected to the instruments, which in turn are loose-coupler, primary 8 inches long, 5 inches diameter, wound with 22 B. & S. enameled wire, secondary 4 inches in diameter 32 B. & S. enameled wire; silicon detector, fixed condenser, 2800 ohm phones. The ground wire is small, about No. 16 B. & S. The ground itself is made of about 12 square feet of hen-wire and 10 feet of 1-inch iron pipe buried from two to three feet deep. The aerial is well insulated from all its supports. In your opinion, would it be possible to hear Wellsfleet with this outfit; and if not (which, as a matter of fact, is the case), wherein are the troubles?

A. 1.—With the aerial and instruments mentioned you should be able to hear the station at Wellsfleet, Mass., if you are referring to the high power station MCC, which is only about 150 miles away from you. The trouble is probably with your ground. If you cannot ground your aerial on the pipes, of a town water supply system, you had better secure several sheets of heavy copper or zinc which have an area of about 10 square feet each, and bury them in permanently damp earth from 10 to 20 feet apart. Connect them together and to your instruments with a wire equivalent to No. 4 B. & S. gauge copper.

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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. (Add 6 cents for postage).
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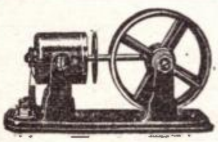

Wireless Engine. The Slickest little engine ever placed on the market. You cannot see a piece of wire. Has two fly-wheels and beautiful balancer. Cast iron base; works on one dry cell. The engine sells for 45 cents. (Add 14c. for postage)
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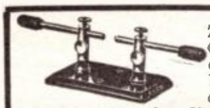
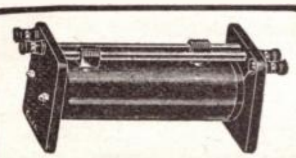


Zinc Spark Gap mounted on hard rubber base. Electrodes fitted with rubber handles. Pure zinc rods. Used in all of the best stations. Spark gap sells for 60 cents. (Add 7 cents for postage.)
Given free for 2 subscriptions.



"Electro" Junior Tuning Coil. Slickest tuning coil on the market. Has solid hard rubber ends, bare copper winding, hard rubber sliders. Size, 8 x 3¾ x 3¾ in. Weight, 1½ lbs. The most beautiful and most practical coil made. "Electro" Tuner sells for $2.00. Sent by express only.
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Pony Telephone Receiver. This is the receiver you have long wanted. The best one on the market. Hard rubber case. Single pole, powerful magnet. Hook can be screwed off. Standard resistance of 75 ohms. Receiver sells for 40 cents. (Add 7 cents postage.)
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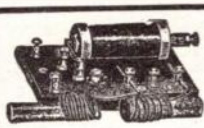
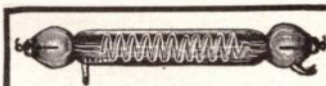
'Electro' Rheostat Rotary adjustment. Air cooled. Very useful to vary the speed of motors and small lamps. Wound with non-rusting wire.
Given free for 1 subscription.

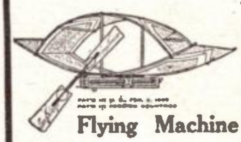


"Electro" Medical Coil. Al quality. No end of fun with one of these coils, besides its therapeutic properties. Complete with cords and handles. Medical Coil sells for 70 cents. (Add 12 cents for postage.)
Given free for 3 subscriptions.

"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.)
Given free for 10 subscriptions.

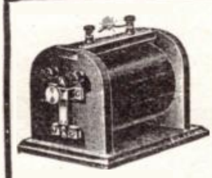


Six Inch Geissler Tube With Liquid. A fine tube; works on any spark coil. Gives the most beautiful, astounding colors. Tube sells for 50 cents. (By mail extra ten cents)
Given free for 1 subscription.



Areo-Flying Machine. A practical miniature aeroplane; byplane type Guaranteed to fly 100 feet. A well constructed machine. Aluminum propeller; rubber motor. Sells for 75 cents. (Add 12 cents for postage.)
Given free for 3 subscriptions.

"Electro" Lytic Bare Point Detector. Holds the world's record for long distance receiving. Mounted on hard rubber base. Finest adjustment. Increase your receiving range 30 to 40 per cent. "Electro" Lytic Detector sells for $1.25 (Add 12 cents for postage.)
Given free for 3 subscriptions.



One Inch Bull Dog Spark Coil. This is the coil that has sent a message 90 miles with a suitable aerial. None better made. None better looking. Has French vibrator and fibre casing. Sells for $1.50. Can go by express only.
Given free for 12 subscriptions.

Please understand that we have an invariable rule that premiums cannot be given unless you ask for them, when sending in the subscriptions.

We are sure you can get any of the above premiums by showing this magazine to your friends, doing a little talking. Then is your chance, get the subscription before the other fellow gets it. Strike while the iron is hot. Act Now. Don't delay, the offer is new now and lots of people will get busy at once.

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THEY HAVE THEM OVER ON THE OTHER SIDE, TOO.

We have always been under the impression that the Unted States was the land of easy marks, where anybody with a quack contrivance to sell would reap a rich harvest.

The following clipping from our British contemporary, *Electricity* would seem to indicate that there is a large field for the quack over on the other side of the pond as well as here.

Quack! Quack!

So long as there exists a gullible public, I take it that the purveyors of so-called electric belts, magnetic corsets, galvanic rings, and numerous other cure-all devices, in which the fascination of electricity is called in to assist a "faith" cure fraud, will continue to make a very presentable living. One would have thought the Harness Electropathic Belt exposure, some few years back, would have served to educate the lay mind up to an appreciation of the real character of these alleged healing appliances, but presumably time and subtly-worded advertisements have revived the trade, for I have recently noticed several specious advertisements of this nature in weekly periodicals which do not exercise a very strict censorship over their advertising clientele. One of them depicts a very muscular and well-developed individual, apparently exuding superfluous electricity at every joint, where the conductors (*sic*) of his electric belt encircle the limbs.

Another equally attractive advertisement, intended to appeal to the fair sex, sets out with excess of verbiage to acclaim the marvels of a so-called Magneto Corset. This marks a departure from the usual methods of the fraternity, inasmuch as magnetism is boldly claimed as the healing force. "My magneto corset," says this pseudo-specialist—"is charged from end to end, right through, with magnetism—that wondrous health-giving power that is the mainstay of life itself. From the hour when you clasp them around your body, a ceaseless flow of magnetism pervades you from head to heel, and just as long as you wear them, so long will you benefit by Nature's greatest healing force — magnetism." Then follow the usual unsolicited testimonials from dupes, couched in well-known terms—"Since wearing your corsets I have lost all trace of ear-ache, whilst my hay fever has entirely left me," etc., etc. Bluff, every word of it; yet the British public roll up with their cheques and postal orders by every post, and I guess that specialist is netting a four-figure income by selling an article whose real healing qualities are about on a par with those of a sheet of brown paper.

THE OLD SCHOOL.

The old " 'fore de wah" darky had asked a young attorney to write him a letter on his typewriter.

"And is that all you want to say, Rastus?" queried the man of law at the close of the epistle.

"Yes, sah, 'ceptin' you might say, 'Please 'scuse pooh spellin' an' a bad pen.' "—July Woman's Home Companion.

HOW LONG CAN HE STAND IT?

This is Mrs. Forbes-Robertson Hale's latest suffrage story:

"A negro woman was arguing and arguing with her husband, and when she had finished he said, 'Dinah, yo' talk don' affect me no mo' than a flea-bite.'

" 'Well, niggah,' she answered, 'I'se gawna keep yo' scratchin.' " — July Woman's Home Companion.

WHAT EXCUSE.

Jones: "Do you carry life insurance?"

Brown: "Yes; I have $10,000."

Jones: "Made payable to your wife?"

Brown: "Yes."

Jones: "Well, what kind of an excuse do you put up to your wife for living?"—U. S. Review.

HELLO!

Irritable Man (at other end of telephone line)—Hello, hello! What's the matter with you? Are you forty-seven?

Angry Spinster (at this end)—No; I'm not. Who said I was? I'm only thirty-three.

Irritable Man—Oh, ring off!

WIRELESS OPERATORS WANTED!

TO JOIN

WIRELESS DIVISION NO. 37

OF THE

Commercial Telegraphers' Union of America

The C. T. U. A. was organized in 1902. Its jurisdiction includes all branches of telegraphy except the railroad. It is affiliated with the American Federation of Labor and the Trades and Labor Congress of Canada. It is the strongest union of commercial telegraphers ever organized. Each member receives monthly, without cost

THE COMMERCIAL TELEGRAPHERS' JOURNAL

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April		4.00	October		4.00
May		3.34	November		3.34
June		2.67	December		2.67

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RANDALL SAFETY RAZOR and 12 blades,	$1.00
MODERN ELECTRICS, two years . . .	3.00
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Our "GET ACQUAINTED" Offer, both for	2.00
SAVING	$2.00

This RANDALL SAFETY RAZOR which retails regularly at $1.00, consists of:—

The Randall Razor Frame which is made of brass, heavily nickel-plated.

Twelve Blades given **FREE** with each set, represent the highest perfection in manufacturing, being made of the highest tempered steel, skillfully ground and honed to the keenest edge.

The Case is almost identical to those supplied with the standard safety razors sold at higher prices. It is of chase leather, with a special fastening device to lock it, and is lined with a rich plush.

This Combination has created what is to-day recognized as the simplest, most useful and practical safety razor yet devised irrespective of price, and is given with the **IRON CLAD GUARANTEE** that if it does not give satisfaction in every respect your **money will be refunded without a word.**

This Razor Given Absolutely FREE with Two Years' Subscription to

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Enclosed find $2.16 (cash, stamps or M. O.), for which send me prepaid one Standard Randall Safety Razor on terms described in this advevtisement and Modern Electrics for two years to the address below.

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Note---For N. Y. City or Canada add 35c.; Foreign, 60c.

MODERN WIRELESS INSTRUMENTS.

(*Continued from page* 504.)

Nextly, the usual practice is to use a number of gaps in series, usually eight in number, and to have these so that they are readily dismounted for cleaning. We shall consider the design of these a little later.

As regards the inductance spiral, I think this can be left to the amateur to use the material at hand, as he probably has a helix that will do. (Heavy wire wound on a board having ten turns spaced say, half inch apart, is convenient.) Any type of condenser suitable to size coil is to be used.

Then we shall consider the apparatus whereby the radiator circuit is brought into accord with the closed circuit of the secondary of coil and of condensers.

It is to be supposed here that the amateur has an induction coil which he is going to utilize, or a transformer with an iron core, for we have not the high frequency of 500 V to start with; and that we wish to produce at a distant station a loud and high pitched note with only a small consumption of energy.

If the operator is using batteries or accumulators we know it is usual to place a small resistance in the primary circuit to cut down the arc at the contact breaker, also to economize on the power. I have found that a choke coil made as the following one, is most serviceable, allowing us to dispense with resistances and also making the signals higher pitched and more distinct. The same thing applies when working with A. C. say, 50 or 60 cycles.

The Adjustable Choke Coil.

A bundle of iron wires, 7 inches long and 2½ inches diameter, or a number of plates of transformer iron cut so as to make a bundle of same size will serve as the core. Remember to have the wire or the sheets run from end to end in the core.

Thoroughly insulate this core with several layers of Press Pan and shellac varnish, or cardboard and shellac varnish. Seven layers, about 38 turns each of No. 12 D.C.C., either square section or round wire are carefully and evenly wound on the core, taps being taken out at end of first layer, third layer, and at end of coil. Hence there are four wires from the coil. Mount the coil on a well seasoned piece of board with four terminals in a row about 1¾ inches apart, and in order in which they come from coil. It might be well to paint the whole with some good insulating compound, being careful to have a good finish. Now mark the number of turns between each pair of terminals. They will be approximately A 38 B 78 C 152 D. By this method of winding we see any combination can be had. By utilizing A and D, we have 7x38 turns, A and C we have 3x38 turns, B and D 6x38 turns, etc. By this method a very neat adjustment can be made for any coil of medium size.

My personal experience has been to bring the voltage of supply down to just a little greater than normal pressure to be supplied to the coil. This is best done where A.C. is used with a step down transformer such as described in a previous issue. By this means we see no power is wasted in heat in resistance wires or in lamps used as resistances.

Resistance

(*Continued from page* 496.)

In other words, we cannot take out more current from a transformer than we put into that transformer, although the current taken out may differ widely from that delivered to the primary. Therefore we could, in this case, step up the voltage in the secondary to such a point that the amperage of the current would be practically NIL. It would be impossible, however, to reach a point where there would be absolutely no amperage present, exactly in the same manner as it would be absolutely impossible to reach infinity in mathematics. We can, however, raise the voltage to such a point as to so decrease the amperage as to have no appreciable effect on the human sense of touch.

It is amperes that produce a sensation, amperes that kill and amperes that cure. In other words, Amperes do the work, after Voltage has forced them through the Resistance of the circuit, to the place where that work is to be done.

It is readily conceded that it takes approximately 250 Milli-amperes to produce death in the average human being, and it takes from 1200 to 2200 Volts to overcome the resistance of the


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PRACTICAL LESSONS IN ELECTRICITY
THE ELECTRIC TELEGRAPH
ELECTRIC RAILWAYS

body. Cases are known where a very much lower voltage has caused fatal results. In these cases conditions were favorable in every way, such as a person being in a tub of water, or thoroughly drenched by acidulated water, which lowered the normal resistance very materially.

METALIZING

(*Continued from page* 471.)

trate in one gallon of water, precipitate with potassium cyanide, using about 2 ounces, taking care not to use an excess. Filter the precipitate out, wash and redissolve in a fresh cyanide solution using double the amount necessary to precipitate the silver.

For a gold bath that works by single immersion, without heat, may be made by dissolving 150 grains of gold in aqua-regia, boil down to a paste, dissolve in 40 ounces of pure water, add 1 lb. of baking soda, and boil 2 hours, when the solution will be ready for use.

The above green color and the gold solution must be used in a glass dish.

THE VIBROPLEX.

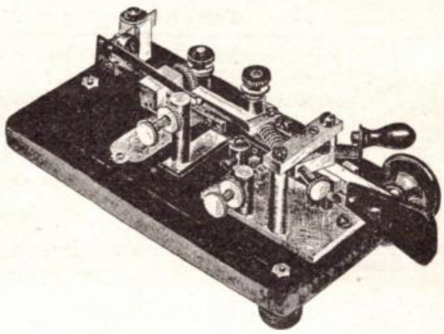
This little machine is used by many telegraph operators to take the place of the familiar Morse key. It is especially useful on fast press wires where the operator has to hustle all the time to keep cleared up. With a little practice almost any one can send perfect Morse with very little effort. Take the letter P or the figure 6 for instance. The first requires five up and five down movements of the ordinary key while the second requires six. With the Vibroplex only one movement is required for either. The key handle is simply pushed to the right, and when the requisite number of dots have been made automatically the handle is released. The machine will automatically make any number of dots, from one up to fifteen or twenty, dependent on how long the handle is held over. To make a dash the handle is pressed to the left and held there the proper length of time to make a long or short dash. Through recent improvements in construction, it is now impossible to jam the dots and dashes together ,and for this reason the

machine will work any wire that can be worked by hand with the old key.

It is also capable of successful operation with wireless sets. It will work directly any set that may be operated by an ordinary Morse key, and, in connection with a relay having sufficiently heavy contacts, will handle almost any set.

To show the popularity of the machine amongst telegraph operators it is said that at one time when the manufacturer temporarily discontinued making them, operators were offering each other from five to fifteen dollars premium in order to get one.

This machine has saved the job of many a good operator who developed



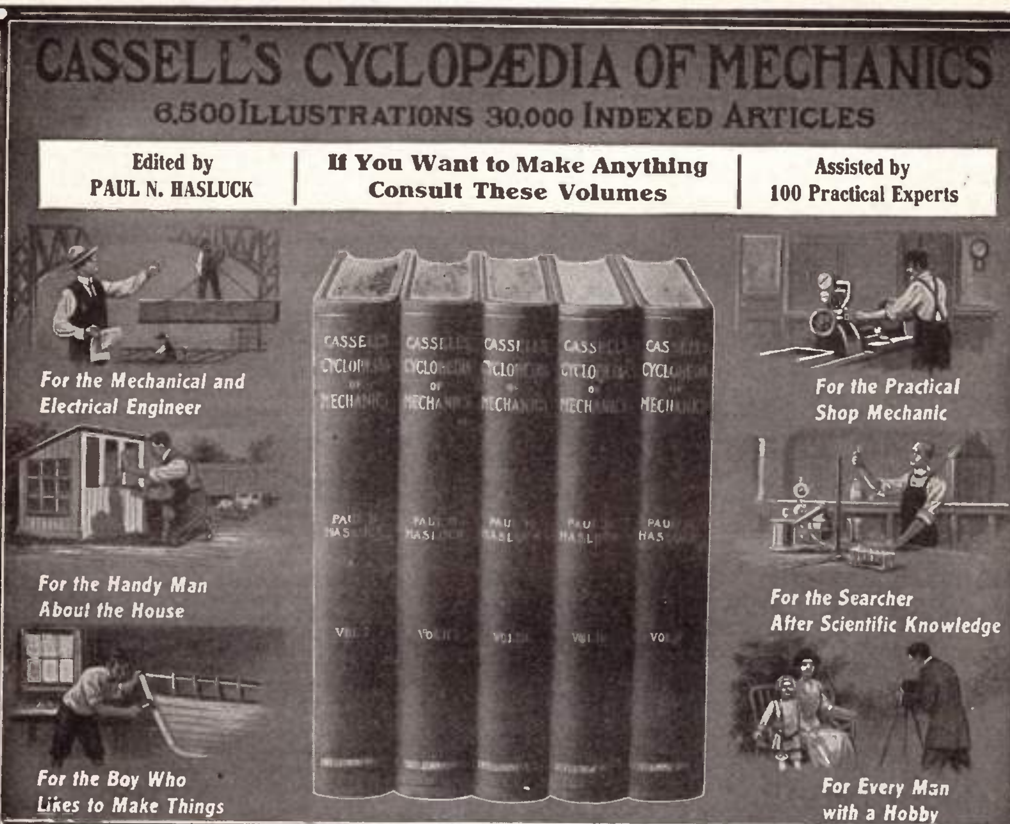
a "glass arm" or "lost his grip," and who, having lost his ability to send correctly with the ordinary key, would have been obliged to seek some other form of employment or starve.

PATENT NO. 1,0382,360.

(*Continued from page* 516.)

two receivers. We should think our telephone companies should wake up to this fact, as they could do no greater favor to the public at large.

From the present invention it will be seen that the communication ordinarily is open, as the contacts, 27 and 28, are open. As soon as the forehead presses against the cushion, 21, supported by the circular piece, 20, the contact is pressed and the receivers are connected in circuit, and the conversation may begin. When the conversation is over, the pressure of the head releases the contacts, and at the same time the two receivers swing upward, disengaging the ear. This idea is a very good one and is highly recommended.



EVERY Mechanic, Engineer, Scientist, Farmer, Handyman and Man with a Hobby should own a set of these books. The work is not only of priceless value to Mechanics, Electricians and Scientists, but contains thousands of articles written for the Handyman about the house, farm and shop; for anyone who likes to make things, from a match-holder to a suite of furniture—from a wheelbarrow to a carriage or motor body. The boy who is learning how to use his brains and hands will find these volumes a never ending inspiration. Read the description below; then let us send you the set for examination before you purchase.

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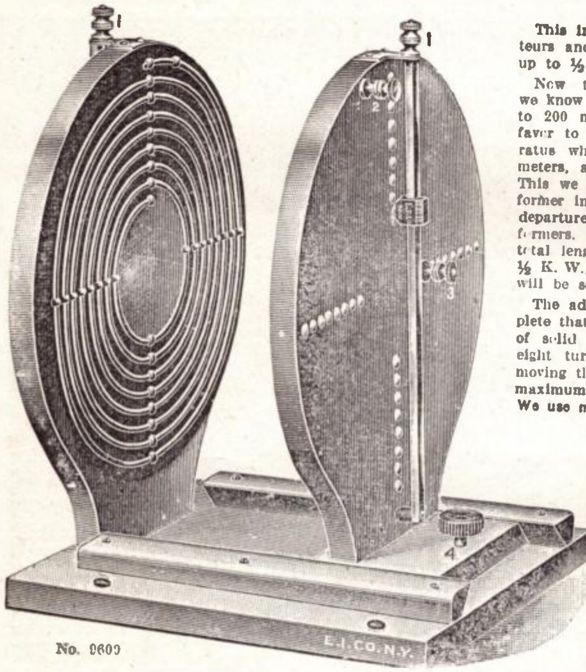
The "Electro" Commercial Oscillation Transformer



No. 9600

This instrument fills a long felt want among amateurs and has been designed to be used with power up to ½ K. W.

Now that the Wireless situation is clear and we know that the amateur may use a wave length up to 200 meters, we thought we could do no greater favor to the American amateur than build an apparatus which would confine the wave length to 200 meters, and at the same time obtain high efficiency. This we have accomplished in our Oscillation Transformer introduced herewith, and it presents a radical departure from other similar Oscillation Transformers. In connection with a four wire aerial, total length of fifty feet with any transformer up to ½ K. W., a wave length of not more than 200 meters will be sent out.

The adjustment of this apparatus is the most complete that could be thought of. There are two spirals of solid No. 6 Aluminum Wire, each spiral having eight turns. The two spirals can be separated by moving the spiral on the right back and forward, the maximum separation being 10 inches.

We use no helix clips of any kind, but the adjustment is made by means of a slider mounted directly on the back of each spiral. By means of these sliders, adjustments which vary the inductance to a half turn, are readily accomplished. This feature cannot but recommend itself and has never been attempted before in any other similar instrument. By means of the handle 4, the movable spiral can be adjusted back and forth, which assures practically any adjustment that may be wanted.

This apparatus is especially recommended for close tuning and is **invaluable for Wireless Telephony work**, where it positively stands unequalled.

The construction and general execution of the apparatus is of the highest order and stands distinctly by itself.

The wood is cherry throughout, mahogany finish, hand rubbed polish, ⅝ inch thick.

The Oscillation Transformer is shipped flat and takes up but little space when shipping.

The full size of the instrument is 16" x 14" x 12"; weight 8¾ lbs. All metal parts are brass nickel plated, except the Aluminum Wire.

There are six generous nickel binding posts. The Aluminum wire spirals are fastened by a unique process, never attempted before. The whole instrument will make a valuable addition to any wireless station.

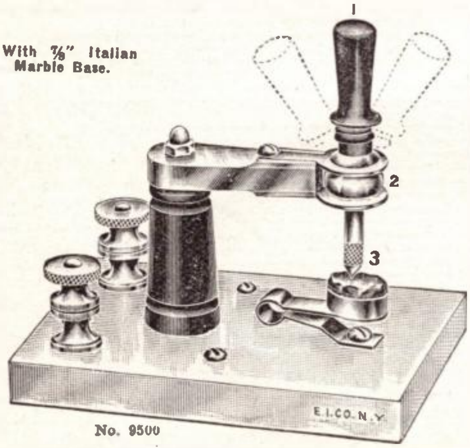
We positively guarantee the working efficiency and wave length of this instrument, and will cheerfully refund the purchase price if not entirely satisfactory and equal to our description.

No. 9600 ELECTRO COMMERCIAL OSCILLATION TRANSFORMER as described $10.00

CAN ONLY GO BY EXPRESS OR FREIGHT.

THE ELECTRO COMMERCIAL DETECTOR STAND

With ⅞" Italian Marble Base.



No. 9500

This instrument lately perfected by us stands in a class all by itself. It is the highest grade Detector Stand ever introduced in the United States. It will appeal to all who wish a high grade instrument at a reasonable price.

Specification: Heavy marble base ⅞" thick, size 4½ x 3". Hard Rubber Pillar, on which is supported a nickel plated casting, which holds the ball-swivel 2. As will be noted, the handle, 1, may be moved sideways in any direction on account of the swivel-ball arrangement; a feature not found in any other detector. This is quite an important feature, as it is often necessary with certain substances to "feel" over the surface in order to find the most sensitive spot.

The handle, 1, **can also be pulled up vertically**, as it is held back by a spring inside of the ball. Any amount of tension of the spring may be had by adjusting knurl, 3. This gives to the contact point on the detector substance any required tension. Therefore this detector is capable of the greatest variations, not alone in its free movement, but it **can be adjusted from the lightest contact to the heaviest.**

Only the best materials are used in the construction of this detector, all metal parts being finely nickel plated and highly polished.

There are two heavy nickel binding posts and there is a **FELT COVERING ON THE BOTTOM OF THE MARBLE BASE.**

Size over all 4½" x 3" x 5". Weight 1 lb.

No. 9500 ELECTRO COMMERCIAL DETECTOR STAND as described, price $3.75

BY MAIL EXTRA 25 CENTS.

THE GREATEST WIRELESS

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HOW TO MAKE WIRELESS INSTRUMENTS, by Twenty Wireless Experts, 96 Pages, 75 Illustrations, Third Edition.

This book is chock full of information and shows how to make different instruments and wireless appliances and information not usually found in other books. You will be surprised how carefully this book is gotten up and how easy it is to make your own instruments. **Price by mail, 25c.**

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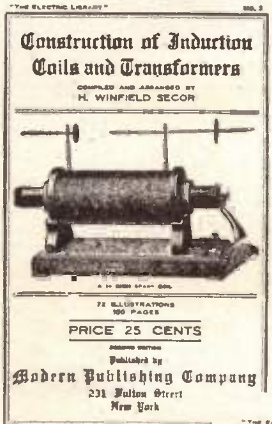
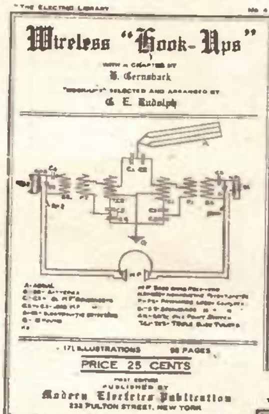


CONSTRUCTION OF INDUCTION COILS AND TRANSFORMERS, by H. Winfield Secor, 96 pages, 72 illustrations, second edition. If you want to build your own induction coil or transformer we unhesitantly say that this book will give you more information on the subject than any other one irrespective of price. Important tables for spark coils from 1 inch to 20 inch and for transformers from ½ K. W. to 3K. W., both closed core and open core are given. A multitude of information is found in this book which cannot be found in others.

Price by mail, 25 Cents



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