Special Wireless Number

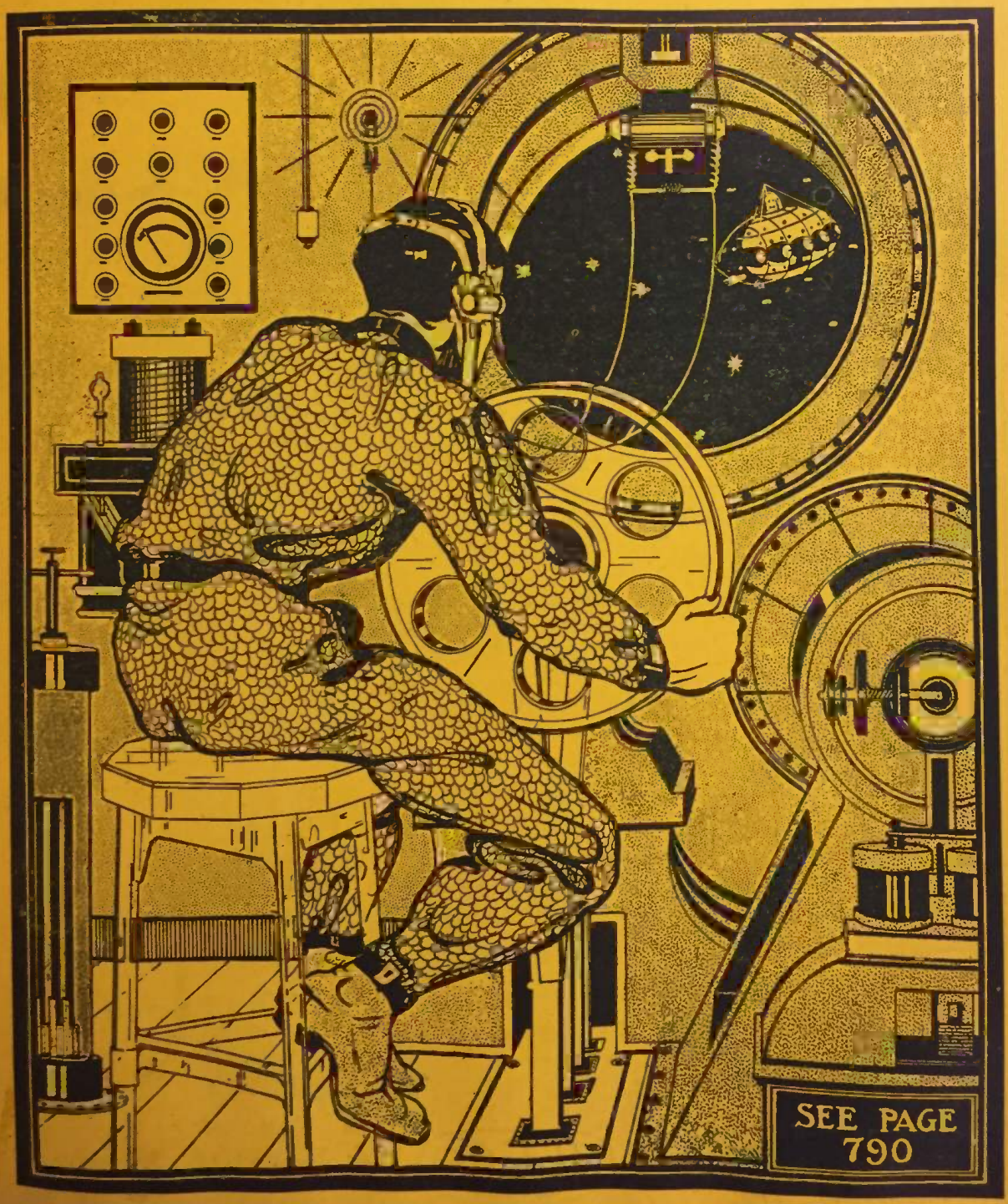
PRICE 10 CENTS

FEBRUARY, 1912

VOL. IV.

No. 11

MODERN ELECTRICS



SEE PAGE 790

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Modern Electrics

VOL. IV. FEBRUARY, 1912 NO. 11

The Practical Electrician

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

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

CHAPTER III.

61. MEASUREMENT OF CURRENTS. CURENTS AND METHODS OF MEASURING SAME.

CURRENT intensity is the volume of electricity passing through a conductor during one second; it can only be measured in an indirect way, it being impossible to measure the volume of electricity passing through a conductor, in a manner as one measures the volume of water, or gas flowing through pipes.

To measure the intensity of a current in amperes, one has to take, as a basis, the chemical, magnetic, or mechanical effects, which the current produces in or around a conductor through which it passes.

1.—One weighs the quantities of a chemical substance which the current decomposes during a certain time.

2.—One determines the intensity of a magnetic field produced by the current, by measuring its effect on a movable magnetic needle or on a piece of soft iron.

3.—One measures the intensity of the force which a fixed current exerts upon a movable current.

62. CURRENT INTENSITY AND CHEMICAL EFFECTS.

Law of Faraday, 1833.—*If a current flows through a substance which can be decomposed, the weight of the decomposed particles is proportional to the volume of electricity which passed through it in a given time, and therefore, must also be proportional to the current intensity.*

If m and m_1 are the weights of quantities of the same electrolyte, which will be reduced by currents of intensities I and I_1 during the same length of time, we have:

$$I : I_1 = m : m_1.$$

Keeping this law in mind we can, as a general rule, measure the current intensity by means of a voltameter if we assume as a unit, the current intensity I, which decomposes a certain amount of a substance, for instance water, in a given time, say, one minute. The best known chemical standards for measuring electricity are the following:

1.—1 cubic centimeter hydrogen and oxygen in a minute, that is, that current intensity stands for a unit which, in one minute, produces 1 cubic centimeter oxygen and hydrogen.

2.—1 milligram hydrogen produced in one minute.

3.—1 milligram water decomposed in one minute.

4.—1 milligram copper deposited in one minute.

5.—1 milligram silver deposited in one minute.

63. VOLTAMETER. ELECTROLYSIS. WATER VOLTAMETER 1835.

Figure 76.—A good voltameter may be made by anyone if a wide glass as shown in the illustration is used. All the other materials necessary to make the instrument are:

Two test tubes, of the same size. Two small pieces of platinum wire.

Fig. 76

Near the bottom of the glass one bores two very narrow openings which should be opposite each other. This may be done quickly by hand. A three-cornered needle file, having a very pointed end and which must be exceedingly sharp, is heated to a bright red heat and quenched immediately in iced water; the point becomes so hard that it could not be used to bore any metal. By means of this point, scratch a cross at the point where the hole is to be made. Lubricate the point well with camphor dissolved in benzine or turpentine. Move the point back and forward with a boring movement, and the point of the file will pierce the glass quickly.

When the hole is almost entirely through the glass, press with very little force and bore very slowly. Hold a small piece of wood against the inside of the glass which prevents large pieces from breaking out.

After the two holes have been drilled seal in the two platinum wires as shown in illustration, by means of wax, or better, Portland cement. After the cement has set, paint it with shellac or paraffine to keep the water from running out.

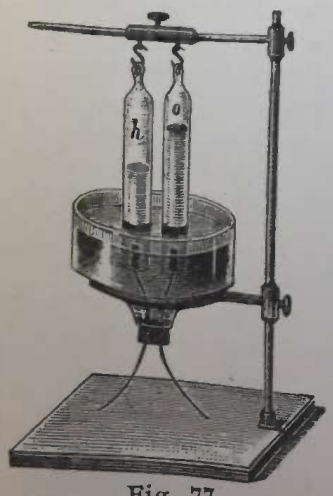


Fig. 77

Figure 77 shows another way of making a voltameter, and this does not necessitate any boring of glass, as the illustration shows.

A large glass funnel, supported by a ring attached to a stand as shown in illustration, is used. This funnel has an opening at the bottom in which fits a soft rubber cork through which the platinum wires pass. The tubes are suspended by means of little hooks, as clearly shown in cut. Both of these two voltameters are used in the same manner. Either of them is filled with a solution of one part chemically pure sulphuric acid and 7.5 parts water.

The test tubes are filled with the same solution. They must be filled quite full. When full, place the thumb over the mouth of the tube and only withdraw the thumb after the mouth of the tube has been submerged beneath the surface of the electrolyte in the main glass vessel. If this is not done the electrolyte will run out of the test tube.

The positive electrode attracts the oxygen, the negative electrode, the hydrogen. The oxygen may be known by its power to support combustion. If a lighted match that is just on the verge of going out, is introduced into the test tube containing oxygen, it will burst into flame at once. The hydrogen may be known by its weak, blue flame which, however, is very hot.

To decompose water, at least three to four volts are necessary. This calls for three Daniell batteries or two Bunsen batteries or else two storage cells. The stronger the current, the quicker the decomposition of the water (Electrolysis) goes on. The term voltameter has been brought out because one can measure the intensity of the current after the rule:

The number of cubic centimeters of hydrogen and oxygen produced in one second, at a temperature of 20 degrees Celsius (Centigrade) and a barometric pressure of 725 millimeters, multiplied by five gives the current intensity in amperes.

One could, by means of another method, also weigh the gases thus produced; and while this may be done, the method is quite complicated, but we give here-with the figures:

37 milligrams hydrogen, and 0.366036 grams, water, are the equivalents of 1 ampere hour. One kilogram of water at ordinary atmospheric pressure and at ordinary temperature, gives 2 cubic meters oxygen and hydrogen.

A pretty experiment may be made as follows:

If one takes for electrodes, iron or nickel strips, attached as shown in Figure 77, and if one fills the glass funnel with soapy water containing a little caustic soda, to make the solution conductive, soap bubbles will be formed at the surface, containing a mixture of oxygen and hydrogen which is explosive. These bubbles may be ignited by means of a match and explode immediately, without however, doing any damage.

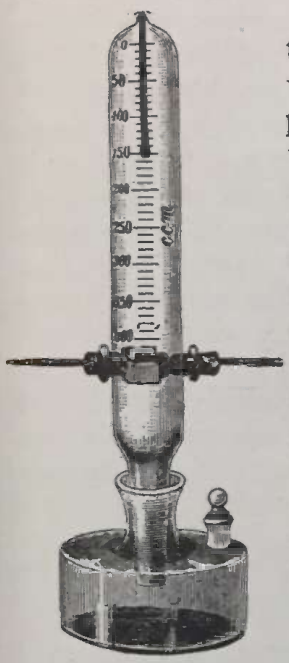


Fig. 78

Figure 78 shows the Kohlrausch voltameter. Two platinum electrodes as shown, are close together and these electrodes have an active surface of 15 square centimeters. With this instrument as shown currents up to 40 amperes can be measured. The small glass stopper on the right side is taken off while the apparatus is in use. When the current intensity is very small only the hydrogen need be measured, inasmuch as the oxygen, on account of the production of Ozone, is absorbed by the water to a great extent.

The electric current decomposes the sulphuric acid in a watery solution after the equation

$$H_2SO_4 = H_2 + SO_4$$

The free hydrogen (H) appears at the Cathode and SO_4 at the anode. SO_4 however cannot exist by itself but becomes $SO_3 + O$. But SO_3 combines immediately with the water and becomes sulphuric acid:

$$SO_3 + H_2O = H_2SO_4.$$

At the anode, consequently only oxygen will be formed. Therefore, as a matter of fact, it is really not the water which is decomposed but the sulphuric acid, and with the products of the decomposition of the sulphuric acid, in the presence of the water, it will be seen that new acid is always formed automatically. For this reason free oxygen appears at the anode and free hydrogen at the cathode.

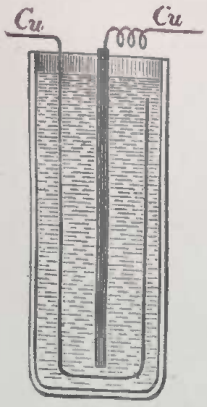


Fig. 79

Copper Voltameter. Figure 79 shows this. If we replace the acidulated water in the water voltameter, by a solution of copper sulphate (Blue stone) $Cu\ SO_4$, the metal Cu travels to the negative electrode and the acid radical SO_4, goes to the positive electrode and slowly dissolves the copper plate into $Cu\ SO_4$; thus the solution does not lose anything. The result at the end gives the work done by the electric current in terms of the amount of copper that is transported from the anode to the cathode, upon which it is deposited.

The separate particles, the ions, on account of their chemical relationship and affinity, try to associate themselves again with each other and from this an E.M.F. is produced which opposes the outside current. *The magnitude of this electro motive force of polarization is dependent upon the nature of the body that is decomposed.* In order that electrolysis be possible, it is evident that the E.M.F. of the outside electrical source must be greater than this counter E.M.F.

A single Daniell battery cannot decompose water. As stated above, at least three such batteries or two Bunsen batteries are necessary. The metal which is deposited molecule by molecule, at the cathode takes the form and impression of the latter, and if, after a while, the deposit is peeled off, it will be found that it is a true impression of the negative electrode. This phenomenon has brought about the invention of the galvanoplastic, invented in 1839 by Jakobi and Spencer.

The quantities which a current of one ampere deposits in one second are termed electrolitic or electrochemical equivalents.

If now one wishes to measure a constant current one simply places in series with it a copper voltameter whose electrodes are platinum or copper strips. In order to increase the conductivity of the electrolyte composed of a solution of concentrated sulphate of copper and water, one adds to it about 5 per cent. of sulphuric acid. After the current has

passed through the voltameter for a certain time, a copper deposit appears on the negative plate; this is well washed and cleaned and carefully dried. The deposited copper is then weighed and is termed Q. This weight is expressed in milligrams, and this figure is divided by the number of seconds, t, and by 0.3284:

$$I = \frac{Q}{0.3284 \times t} \text{ Amp.}$$

Figure 80 shows the Lippmann galvanoscope which is a very sensitive indicator to show the presence of electricity. This instrument is made as follows:

Procure a glass vessel with as thin walls as possible. The shape should be preferably as shown. If this cannot be had, a vessel with straight walls will do.

Next get a piece of glass barometer tubing with fairly thin walls, not thicker than 1/32". The bore should be about 1/16". Supply houses usually carry such tubes. Bend the tubing in an alcohol flame to a right angle. Draw the shorter piece out to a fine point by means of an alcohol or other hot flame. Break off the point so as to leave an extremely fine opening in the tube. This aperature should be so fine that it cannot be distinguished with the naked eye.

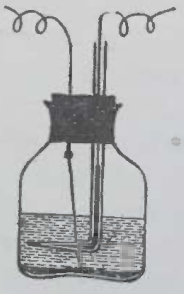


Fig. 90

Now put into the vessel enough mercury to cover the bottom of same. On top of this pour electrolyte prepared by adding 1 part of sulphuric acid (oil of vitriol) to 10 parts of water. (Oil of vitriol *must* always be poured into the water, never vice versa, as an explosion might occur.)

Now fill the finished tubing with mercury about half-way up. Bring the upper part of tube through a cork, into which it should fit tightly.

A silver or platinum wire goes through the cork down to the bottom of the vessel to make contact with the mercury. A similar wire is then introduced in the open part of the tubing to make connection with the mercury.

If the two outleading wires are now connected to an old, nearly worn-out dry cell, the thin capillary thread of mercury in the fine point changes its position. The thread will move a greater distance the stronger the current is. Too high a voltage squirts the mercury out through the fine aperature. Too much mercury in the tube has the same effect.

If carefully built this excellent instrument will record a pressure of 1/300 volt. It works on both direct and alternating currents.

It is as sensitive as a good many instruments costing $10 and higher and will last for a long while.

(To be Continued.)

"THE OREGON STATE WIRELESS ASSOCIATION."

This club was recently organized in Portland, Ore., and the following officers elected: Charles Austin, president; Joyce Kelly, recording secretary; Edward Murray, sergeant-at-arms; Clarence Bischoff, Lents, Ore., treasurer and corresponding secretary.

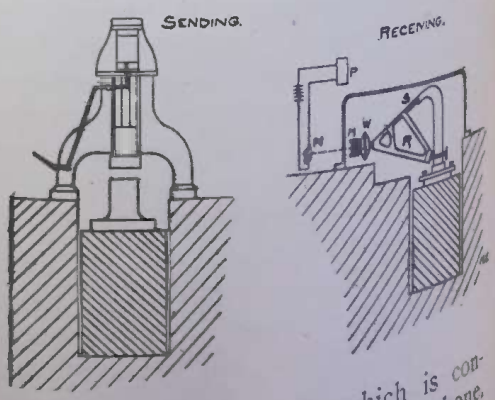
The object of the club is the prevention of interference; also to help each other in any way possible.

I would like very much to hear from the Corresponding Secretary of any other Wireless Club in order that we might exchange ideas for the betterment of each of our respective clubs.

CLARENCE BISCHOFF,
Corresponding Secretary.

NOVEL WIRELESS SET.

Here is a wireless set for transmitting signals through the earth. As will be seen from the diagram the sending set consists of a steam hammer; while the receiving set is a seismograph, the tremors of which swing a pivoted mirror, M, to throw a beam of light upon



the selenium cell, N, which is connected with the battery and telephone, P, by means of which, the signals are read. R, is a swinging pendulum, S, a flat spring controlling the motions of R, and W, a weight on the end of R.

The Quenched Spark

By C. A. LeQuesne, Jr.

MOST operators have, no doubt, noticed that stations using the ordinary spark gap, can be heard in two places on their tuners, in other words, these stations each seem to have two different wave lengths at the same time. In reality there are two waves present, even when the aerial and condenser circuits are tuned to exactly the same wave length, and neither wave is that to which the two circuits are tuned. This double wave results from an interchange of energy between the condenser and aerial circuits. Following the initial discharge of the condenser, the primary (condenser) circuit starts oscillating, the oscillations increasing to a maximum value, at which point the secondary (aerial) circuit begins to oscillate and gradually increases to a maximum. Meanwhile the primary

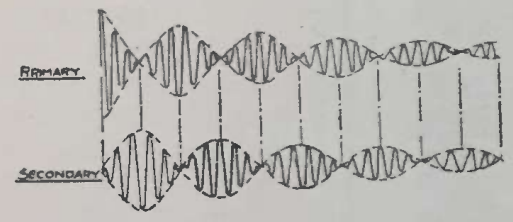


Fig. 1. Ordinary Spark.

oscillations are decreasing in value and become zero at the time the secondary oscillations reach their maximum. The primary then begins oscillating again, as before, but the energy necessary is not supplied by the power transformer but is taken from the aerial circuit, which causes the secondary oscillations to die down to zero at the time the primary oscillations reach their second maximum, which, however, is lower than the first. This is illustrated in Fig. 1.

This interchange of energy continues until the oscillations of both circuits decrease to a point where the current in the primary circuit is no longer able to jump the spark gap. Then the oscillations in the secondary circuit slowly die out but are too feeble to radiate much energy from the aerial. The result of this is that the aerial circuit, instead of radiating a strong train of waves for each discharge of the condenser, radiates a number of short wave trains whose aggregate value is much below that of a single long, slightly damped wave train that would result if the oscillations in the primary circuit be stopped just as soon as the secondary oscillations reach their maximum value. See Fig. 2.

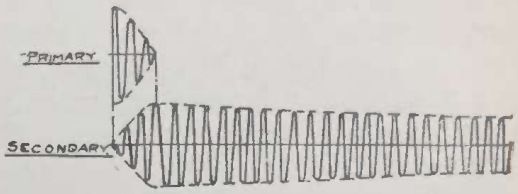


Fig. 2. Quenched Spark.

In order to radiate the most energy from the aerial, it is essential that the primary remain active only long enough to build up the secondary oscillations to a maximum. If, at this point, the spark gap can be made to lose its conductivity, the energy in the secondary will not be lost in again setting the primary oscillating again, but will be radiated from the aerial.

There are several forms of spark gap which possess this desirable property of promptly damping out the primary oscillations. The most widely known is probably the rotary gap introduced by Marconi, then there are the *quenched gaps* of von Lepel, Penkert, the Telefunken Company, and others, which operate on the principles first made known by Professor Max Wien in 1906, and the mercury vapor discharger of Cooper-Hewitt.

The rotary gap is so well known

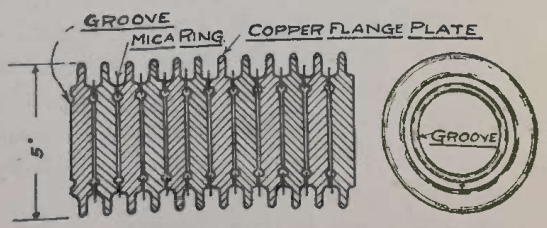


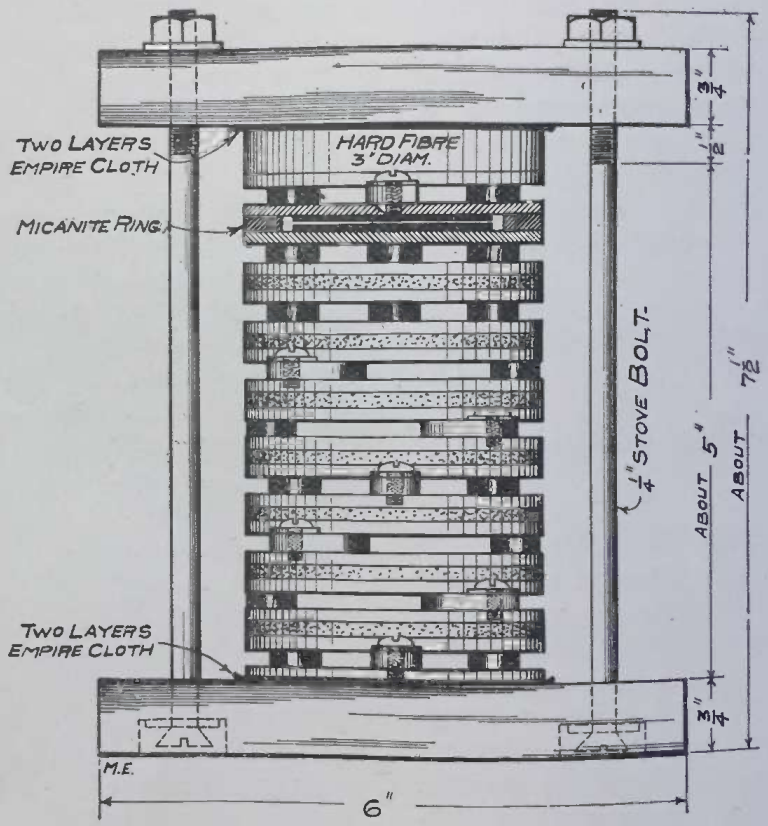
Fig. 3

that no further mention will here be made of it.

The Cooper-Hewitt mercury vapor discharger is similar to the tube in a mercury-arc rectifier, and, while very

efficient as a quenched spark gap, must be maintained within rather narrow temperature limits while in operation. It cannot be constructed without the use of appliances usually found only in an up-to-date incandescent lamp factory, and, as it is expensive, it is beyond the means of most experimenters.

The von Lepel gap consists of two massive copper discs, either solid or water cooled, separated by a sheet of paper about 0.01 inch thick. A small hole is punched in the center of the paper, in which space the spark starts. As the gap continues in operation, the paper is gradually burned away in an atmosphere devoid of oxygen, the products of combustion together with the cooling of the gap serving to quench the spark at the proper time. A groove cut around the faces of the discs near the edge prevents the sparks from burning their way out to the edges. This gap will work on either direct or alternating current of 300 to 500 volts and consumes from one to two amperes. The inventor claims to have transmitted signals to a distance of 300 miles with less than one-half k.w. The only disadvantage in using this gap is that after several hours' use, it must be taken apart and the paper renewed.



-FIG. 4-

The Peukert gap consists of two parallel copper discs and is made in two forms: one, in which both discs revolve, in opposite directions, in a bath of oil; in the other form only one disc revolves and oil is introduced into the space between the discs through a duct in the center of the stationary disc. This disc is movable, axially, to adjust the length of the gap which is about 1/250 inch. The rotation of the other disc, which revolves at about 800 R.P.M., throws the oil out centrifugally, thereby keeping a fresh supply of oil in the gap. The Peukert gap operates on direct current at 600 to 700 volts, but good results may be had on 400 to 500 volts. The current should not be above 4 amperes. The oscillations occur in a practically continuous train and are suitable for wireless telephony. If a musical tone is desired one of the discs should be slotted.

The Telefunken gap is, perhaps, the best known of all the quenched gaps and consists of a number of short, air cooled gaps in series, and is illustrated in Fig. 3. It consists of a number of double faced, flanged copper discs separated by mica rings 0.01 inch thick. The number of gaps used at any time depends upon the voltage used, the usual allowance being 1,200 volts per gap.

Another form of this gap, designed by Mr. Eugene Peterson, of Ithaca, N. Y., employs a number of single faced discs assembled in pairs, the discs of each pair separated by mica rings as in the Telefunken type, but with an air space between the successive pairs. This is effected through the use of metal spacer blocks. Separating the successive pairs in this manner, results in greatly increased cooling surface without the use of large cooling flanges, and increases the efficiency of the gap.

It is claimed that with the von Lepel gap 60 per cent of the energy supplied to the gap will be radiated while the Telefunken people claim 75 per cent

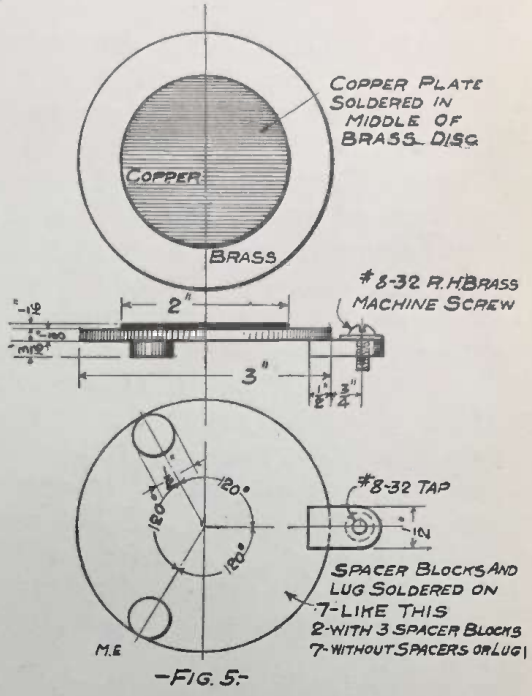
for their gap. Efficiency figures for the other gaps are not available.

It has often been stated that the various types of quenched spark gaps produce high pitched musical notes. *They do so only when supplied with power from a high tension D.C., circuit, or from an A.C., transformer.* When used in connection with induction coils or open core transformers supplied with direct current, the pitch of the spark will be the same as the tone emitted by the interrupter. When used on low frequency alternating current usually several sparks per alternation occur, and the tone is mushy. It should also be borne in mind that the capacity of the sending condenser should be decreased in the same proportion as the number of discharges per second is increased. These points are usually overlooked by most experimenters who wonder why their rotary or quenched spark gaps fail to produce the high, clear, musical spark they expected to obtain.

Figures 4, 5, 6, and 7, illustrate a form of quenched spark gap, suggested by Mr. H. Gernsback, that may be readily constructed by anyone handy with ordinary tools. For the frame, there will be needed: A hard wood base and top of any shape that suits the builder, a block of hard fibre 3 inches in diameter and ½ inch thick, four discs of empire cloth 3½ inch diameter, and two ¼ inch stove bolts 8 inches long with two washers each.

For the gap itself there will be required. 18 round brass discs 3 inches diameter and ⅛ inch thick, 16 round copper or silver discs 2 inches diameter and 1/16 inch thick, 8 micanite rings 3 inches outside diameter, 0.135 inch thick, and ⅜ inch wide, 20 round brass spacer blocks ½ inch diameter and 3/16 inch thick, 7 brass lugs ½ inch wide 3/16 inch thick and 1¼ inches long. The discs may be cut from sheet metal and the lugs and spacer blocks may be made from rod stock. In addition there will be needed seven ½ inch brass or copper washers with hole to pass No. 8-32 machine screws, also seven No. 8-32 brass round head machine screws ⅜ inch long.

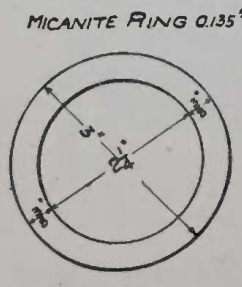
The only part of the work which is at all difficult is the construction of the discs; but this may be done without much trouble by the following method: Thoroughly tin one side of each of the smaller discs and the corresponding face of each of 16 of the



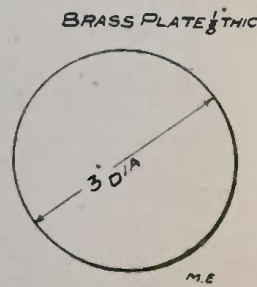
-FIG. 5-

brass discs. Lay each small disc on the middle of one of the brass discs, (with the tinned sides facing each other), heat until the solder melts, then press firmly together and allow to cool while still under pressure. Seven of these composite discs are now finished as far as soldering is concerned, and may be laid aside.

Two of the remaining discs should have three of the round spacer blocks soldered on the back, spaced equally



-FIG 6-



-FIG 7-

around the edge; and the other seven should have two spacer blocks and a connecting lug soldered on as shown in Fig. 5. To do this soldering without loosening the copper or silver discs, place the brass disc (with the copper or silver face down) on a block of wood protected by a sheet of asbestos, then clamp it there by means

(Continued on Page 795.)

A New Electric Fake

THE illustration below shows a new electric fake by which a concern in Pennsylvania exploits unsuspecting prospectors.

A prospector from Texas sent us the apparatus with the request to install a new battery in same. We promptly notified him that we did not know what the machine was for, and he told us that the apparatus is the "Electric Simplex Meter for locating various kinds of minerals, lost treasures, etc." Inasmuch as this was a new one on us we wrote to the concern for printed matter, and our letter of course was ignored. We finally got the printed matter from the prospector himself, and we must admit that it is one of the most curious pieces of literature that reached our office in a long while. We re-produce in Fig. 1, illustration of how the apparatus is supposed to work.

The apparatus is nothing but an ordinary nickel-plated buzzer mounted on a nickel-plated tube, which contains a common tubular flash light battery. The adjusting screw 2 is mounted on a bracket which is supported at the bottom by a spring. It is evident that if any pressure is exerted on the spring, at the bottom, contact will be made

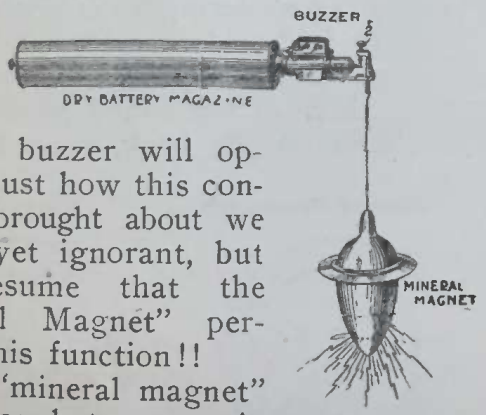


Fig. 1

and the buzzer will operate. Just how this contact is brought about we are as yet ignorant, but we presume that the "Mineral Magnet" performs this function!!

This "mineral magnet" is supposed to start in jerking the string as soon as it comes near a lost treasure, presumably out of sheer excitement. It will also act in the same manner for other minerals. Our photograph shows the apparatus without the famous "mineral magnet" attached. Below we give a few bits from the circular which are worth their weight in gold.

"The reason our instruments are the best and most sensitive, is that the mineral magnets are composed of the latest discovered and deepest earth penetrating magnetic composition known to electricians and mineralogy science. We guarantee our instruments to be the best and most perfect instruments ever invented for prospectors seeking mines and hidden treasures. All our mineral magnets are made on a scientific basis, they are hollow, filled, charged and sealed with each affinity, (? !!) Electro Magnet mineral which produces the proper attraction for locating any of the above named minerals.

Fig. 2

"To make location without instruments the prospector takes hold of the electric light battery magazine with both hands as described in illustration, holding it directly in front of him and as level as possible, following in the direction in which the mineral magnet leads, and as soon as the deposit is reached the magnet will have a downward attraction, which will cause the electric buzzer to make a continuous noise, incidentally showing the exact location.

"We guarantee our instruments to attract about 2,000 yards, and to the depth of from five to eight feet according to the condition of the soil and the richness of the deposit."

The concern furthermore states that the price of the "Electric Simplex Meter" is $50.00 cash, but in the same breath, it goes on and says that it will let any prospector have the meter for $15.00 with the understanding that he will pay $50.00 every time he makes a successful paying location!!

That anyone person in his right senses should buy this contrivance is more than we can understand. It does not seem to enter these poor prospectors heads that if the thing really were any good the man who makes it would go prospecting himself.

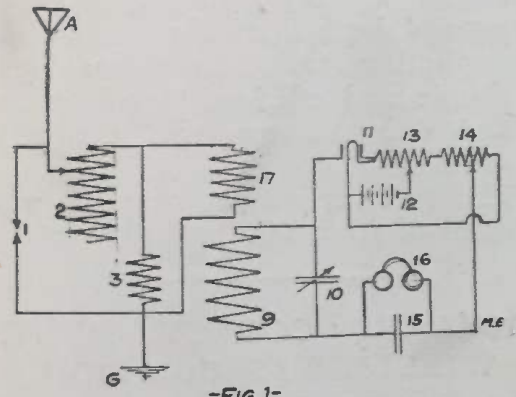
However, as long as the people want to be fooled and are willing to pay for it, we presume we have no right to complain.

The Marconi Valve Receiver

THIS month we present a photograph and wiring diagram of the new Marconi Valve Receiver, the new tuner employing the Fleming Valve instead of the magnetic detector. Most of the important Marconi land stations and many of the trans-Atlantic steamers are now fitted with this tuner as regular equipment, with the multiple tuner, described last month, and the magnetic detector for a second set.

Inside the case are placed two inductive tuners of the rotating ball type, a protective choke coil, a loading coil, variable by steps, a close coupled jigger for use when standing by, and two fixed condensers.

On top of the case are mounted two

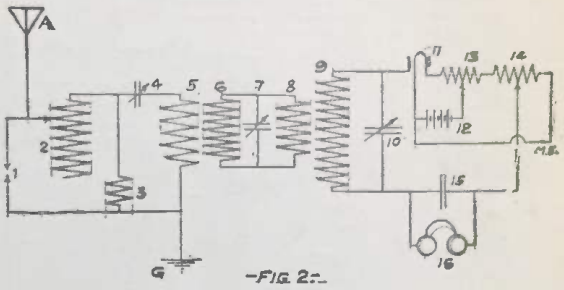


-FIG. 1.-

Fleming valves with a SPDT switch to connect either one in circuit, two rotary and one sliding tube variable tuning condensers, a micrometer spark gap and a DPDT switch to connect the tuner for accurate tuning or for standing by, by which is meant that signals of widely varying wave length can be heard simultaneously. On the left end are a potentiometer for varying the voltage in the telephone circuit and a rheostat for varying the heating current in the filaments of the Fleming valves. The handle on the front cuts in the loading coil, step by step, and the handle on the right hand end varies the coupling of the inductive tuners by rotating the secondaries with respect to the primaries.

The rotary condensers are the same as used on the multiple tuner. The sliding tube condenser, which is used to tune the detector circuit has a very small capacity, has ebonite instead of air as the dielectric, and, being operated by a screw with milled head is capable of very fine adjustment.

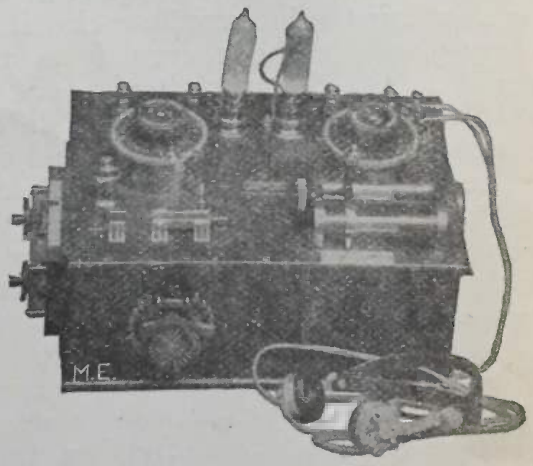
In this tuner, unlike the multiple



-FIG. 2.-

tuner, the coils of the loose couplers are not variable, and all the tuning is done by means of the variable loading coil, the variable condensers, and by varying the coupling between the primaries and secondaries.

Fig. 1 is a simplified diagram of the "stand by" connections, Fig. 2, that of the "tuned" connections, while Fig. 3, is the complete wiring diagram. In Figs. 1 and 2, 1 is the spark gap, 2, the loading coil, 3, the protective choke coil, 4, the aerial tuning condenser, 5



General View of Receiver.

and 6 primary and secondary of first loose coupler, 7, intermediate tuning condenser, 8 and 9, primary and secondary of the second loose coupler, 10, valve tuning condenser, 11, Fleming valve, 12, valve and receiver battery, 13, lamp rheostat, 14, potentiometer, 15, a fixed condenser (0.002 mfd), 16, telephones, 17, "stand by" primary which, used in connection with the secondary, 9, gives a very close, non-adjustable

coupling of the aerial and detector circuits.

It will be noticed that, as in the multiple tuner, an intermediate circuit is introduced between the aerial and detector circuits. The advantage of having this arrangement will be apparent when it is considered that even with all

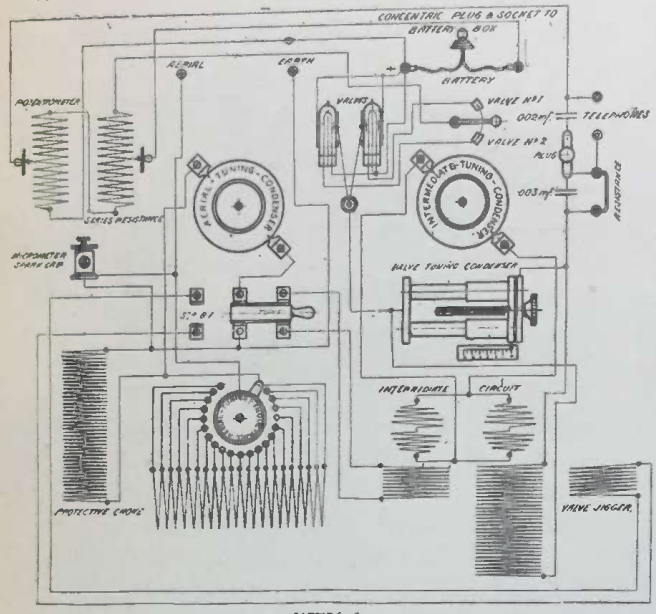


Fig. 3

the advantages the variables give, there is no one circuit in the whole receiver which has its damping capable of being reduced as much as required. By introducing the intermediate circuit to carry through the energy from the aerial to the detector circuits, one is able to produce the necessary difference of impedance to waves in and out of tune, impossible in the aerial and detector circuits alone, where the damping is already necessarily great, and this gives the receiver greater power to differentiate between signals of slightly differing wave length. In other words, the introduction of the intermediate circuit gives the receiver greater selectivity and freedom from interference.

If high resistance telephones are used they are connected to the binding posts marked "Telephones" in Fig. 3. Sometimes, however, a step down telephone transformer is used in connection with a pair of 75 ohm telephones. In this case the plug near the telephone binding posts is removed which opens the circuit between the two fixed condensers. The fine winding of the transformer is connected to the telephone binding posts and the coarse winding is connected to the telephones. Information concerning the telephone transformer is not available at this writing, but Fleming is responsible for the statement that a ten inch spark induction coil is used. It is claimed that with the transformer and low resistance telephones, better results are obtained than with the best high resistance phones obtainable.

When the receiver is not fitted with a potentiometer, one of a set of high resistances furnished is connected to the binding posts marked "resistance" (Fig. 3), in place of the short circuiting bar shown.

The aerial and earth terminals are not connected directly to aerial and earth, but are usually connected across a very short gap in the ground lead from the transmitting oscillation transformer, making a simple and efficient "break in" set and doing away with the aerial switch.

This receiver may be tuned to wave lengths of from 600 to 1,600 meters.

ROCKLAND COUNTY, (N. Y.), WIRELESS ASSOCIATION.

The following officers were elected at a recent meeting of the R. C. W. A.: President, W. F. Crosby; vice-president, Tracey Sherman; secretary, Marquis Bryant; corresponding secretary, E. B. Van Houten.

Meetings are held the first Friday in every month, and anyone interested in wireless is welcome to attend.

Address all communications to, E. B. Van Houten, 24 De Pew avenue, Nyack, N. Y.

ATTENTION AMATEURS.

All amateurs between the ages of 14 and 16 residing on Washington Heights, and who would like to organize a Wireless Club please write to,

MARTIN J. DWYER, JR.,
3800 Broadway, near 158th St.,
New York City.

ELECTRIC DRIVE FOR THE EARTH.

While it has never been demonstrated that interstellar space offers any resistance to the motion of ponderable bodies and it is consequently doubtful whether any motive power is necessary to keep celestial bodies in motion, nevertheless theories have occasionally been advanced to account for the motion or rotation of such bodies. At least there must have been some force in play at the time when such motions were first started up.

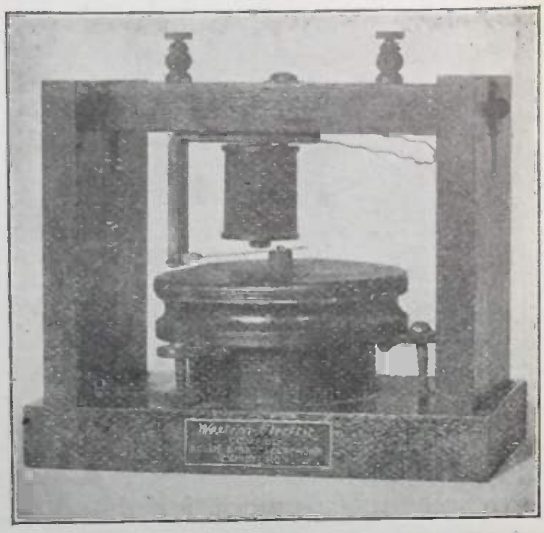
The accompanying illustration of a

Globe Imitates Earth.

model prepared by Peter W. Sothman illustrates one theory which might account for the rotation of the earth. The model consists of a globe made up of two metals in which thermo-electric currents are caused to circulate when one side of the globe is heated. The heating effect is produced by the presence of a lamp whose radiation takes the place of sunlight. A magnetic field is necessary to produce motion on this hypothesis and it is supplied in the model by a U-shaped magnet. The magnetic field thus produced is approximately horizontal while the motion takes place around the vertical axis. The permanent magnet and the thermo-electric currents provide the two necessary requisities of an electric motor. The model makes about four revolutions per minute.—*Western Electrician.*

BELL'S FIRST TELEPHONE.

The accompanying illustrations, which we are able to reproduce through the



Bell's First Telephone.

courtesy of the Western Electric Company, show Professor Alexander Graham Bell's telephone in its early form.

Nowadays we would have nothing to do with such cumbersome receivers as these, but the ones we use in our every day business life operate on exactly the same principle embodied in those shown here. A comparison between our modern compact and efficient instruments with these bulky pieces of apparatus gives but a slight

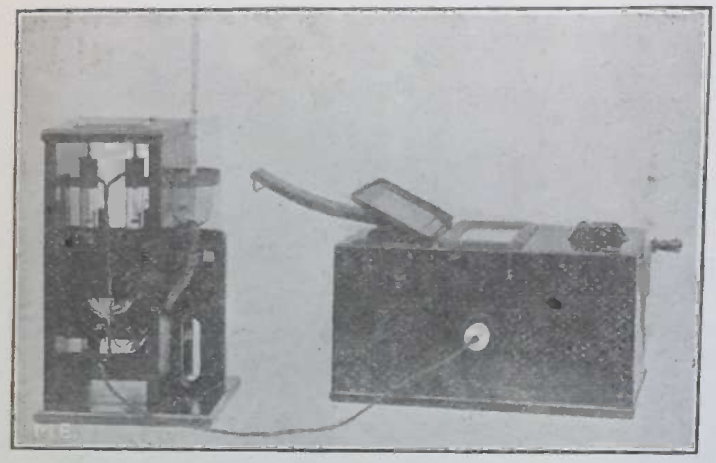
How the First Telephone Was Used.

idea of the vast improvements that have been made in the telephone art in the few years since Prof. Bell first made known his discovery.

Paris Letter

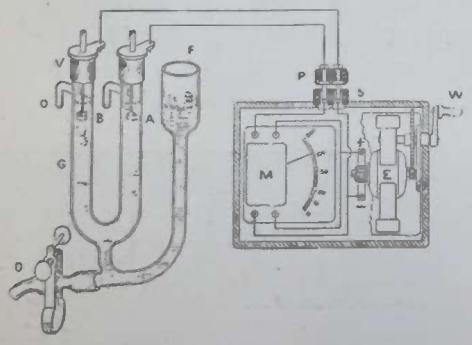
ELECTRICAL WATER TESTER.

Here is a simple electrical water tester made by Evershed & Vignols of London, which substitutes a simple electrical measurement for the elaborate chemical analysis usually gone through to determine the purity of a sample of water.



General View of Water Tester.

The apparatus to the left is filled with the water to be tested, a crank on the box at the right is turned, and the reading of the electric meter in the same box is noted. Reference to a table of conductivities, furnished with the instrument, at once determines its purity. The connections of the instrument are also shown in the diagram.



AN IMPROVEMENT IN SPARK GAPS.

M. Paul Jégou, a Frenchman, has announced a discovery that should be of interest to all who operate wireless stations. He has discovered that if one of the electrodes of the spark gap be surrounded by a turn of wire that is close to but does not touch same, the maximum length of the spark gap may be nearly doubled and that arcs will not form in the gap, a trouble to which most ordinary gaps are subject. When the gap is composed of spheres, or cylinders placed end to end, the wire is in the form of a circle while when the cylinders are side by side it should have a rectangular form. The wire while it does not actually touch the electrode it surrounds, must be electrically connected to it, and the plane of the ring must be at right angles to the length of the gap.

THE DUCTER.

The illustration shows, in use, a new instrument, known as the Ducter, which measures electrical resistance by the well known voltmeter and ammeter method. It is made by Evershed & Vignols, London.

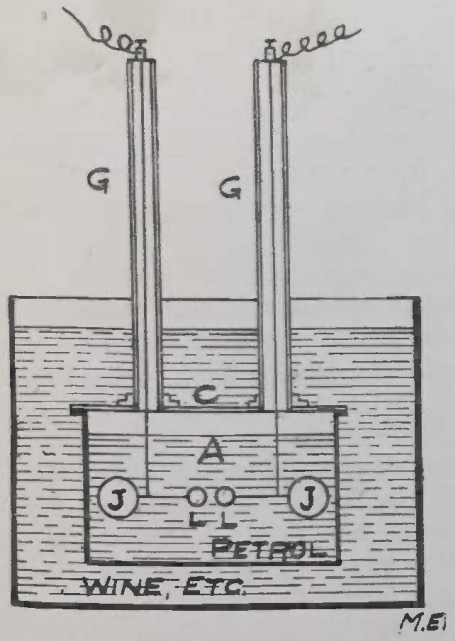
Ducter in Operation.

Each of the handles contains a voltmeter and an ammeter contact spike. The Ducter combines in one instrument the functions of the ammeter, the potential galvanometer and the slide rule. It gives a direct reading of the value of the resistance under test, without any more calculation than is involved in multiplying by tens. There is no preparation to be made beyond connecting the Ducter to the cell which provides the testing current, and pressing the contact spikes which complete the circuit against the terminals of the resistance which is to be tested. The movement is nearly aperiodic, and the index

comes to rest in about three seconds from the moment when the contact spikes are applied to the test resistance. Hence the reading can be noted within four or five seconds, and a complete test will not usually occupy more than one minute from start to finish.

AGEING WINE BY ELECTRICITY.

The accompanying diagram shows an apparatus for ageing wine, spirits, etc., by means of high frequency oscillations. A, is an ebonite tank full of petrol (gasoline), immersed in the wine to be treated. It has a tight cover of glass into which are sealed the ebonite tubes (G) open at the top. In the tank are a pair of spark balls (L)

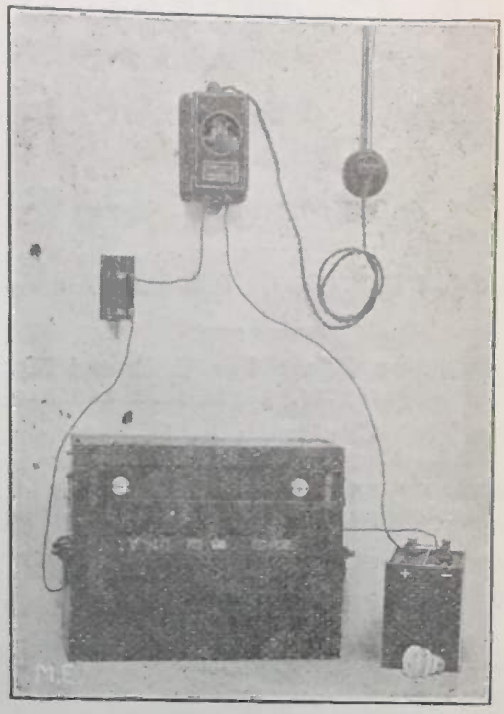


and a pair of larger aluminum balls (J) which serve as oscillators. The apparatus is connected to a spark coil by means of the wires extending up through the tubes. The tubes also serve to allow any gases that form in the tank (A) to escape to the atmosphere.

VIBRATORY RECTIFIER FOR ALTERNATING CURRENT.

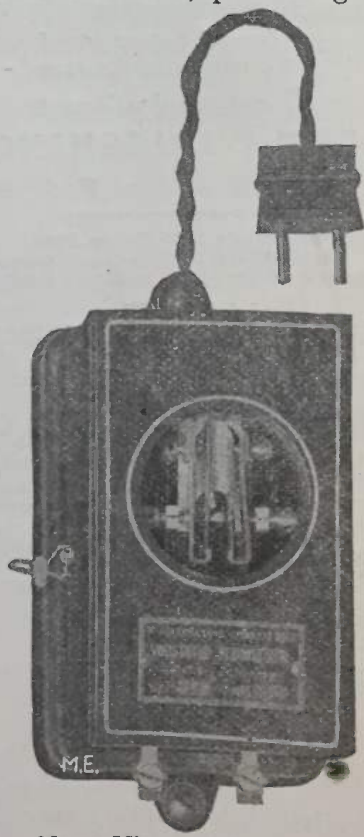
The accompanying illustrations show two views of a new rectifier, of the vibratory type, brought out by the Adnil Electric Company, Ltd., of London. In the first picture the rectifier is shown simultaneously charging an eight volt and a four volt accumulator from a 220 volt alternating current supply. The other one is a better view of the rectifier alone.

The rectifier consists, essentially, of a transformer with vibrating contacts. A stray field in the transformer operates



General View of Apparatus.

the armature and contact system of the rectifier at the zero points of the alternating current wave, producing a recti-



Near View of Rectifier.

fied current. Since the contacts are broken at the zero points of the wave the machine operates sparklessly.

MODERN ELECTRICS

A Magazine devoted entirely to the Electrical Arts.

H. GERNSBACK, Editor

O. J. RIDENOUR, Business Manager

Subscription Price: For U. S. and Mexico $1.00 per year, payable in advance.

New York City and Canada, $1.25.
Foreign Countries, $1.50 in Gold.
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Forms close the 20th of the month preceding date of publication. Advertising rates on application.

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MODERN PUBLISHING CO.
233 Fulton Street, New York, N. Y.

Chicago Office: 1106 Trude Bldg.
Paris Office: 12 Boulevard Arago
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Entered as second class matter March 31, 1908, at the New York Post Office, under the Act of Congress of March 3, 1879.

Vol. IV. FEBRUARY No. 11

EDITORIAL.

ELSEWHERE we print a copy of the new Alexander Wireless Bill.

Before we go any further we might as well tell all those interested in wireless that it is not necessary to feel any anxiety over this or any other wireless bill. We have noted in the past that every time we have printed any of the various wireless bills there was almost a panic among the amateurs and other wireless interests.

Readers of this magazine well know the policy that *Modern Electrics* has always pursued, and as far as the interests of the wireless amateurs is concerned, it is not necessary to point out that the proprietors of this magazine have always stood up for the wireless amateurs.

This holds true of the Alexander bill, and as soon as the bill was made public, *Modern Electrics* at once took steps to safeguard these interests. A great number of protesting letters were written at once to Washington and the results accomplished so far are distinctly encouraging, in so far as the amateurs and other wireless interests are concerned. As far as the Alexander bill itself is concerned, it is no worse than previous ones; in fact if it should be passed, which we doubt, it would not hurt the wireless amateurs in the least, inasmuch as this bill covers only interstate business. Wireless amateurs living in the same state could communicate with each other the same as before.

The Government realizes fully the importance of the American amateurs to-day, and if any bill should be passed, it will be one that *regulates* wireless, but in no way suppresses it.

This, *Modern Electrics* has always advocated. In fact *Modern Electrics* is heartily in accord with any bill that should regulate wireless in such a way that the amateurs do not interfere with commercial or Government business, which is only right and fair.

As stated elsewhere in this issue, Government officials have already been busy in New York of late, to find out what equipment the various amateurs use, what their wave lengths are, what power they use, etc.

This is distinctly encouraging, because it shows that the Government is getting accurate information before trying to pass any bill.

There should be a bill passed restraining the amateur from using too much power, say, anything above 1 K.W.

The wave length of the amateur wireless station should also be regulated in order that only wave lengths from a few metres up to 200 could be used. Wave lengths of from 200 to 1,000 metres, the amateurs should not be allowed to use, but they could use any wave length above 1,000. If this is done, all interference with Government, as well as commercial station, will be done away with and

the wireless situation will then be the same as to-day. The amateurs will have the same liberty and perhaps greater liberty than to-day, and complaints against them from Government or Commercial stations will cease automatically.

Modern Electrics has prepared a very comprehensive article which will be published in the next issue showing just what equipment the amateur can use to keep from interfering with Government and Commercial stations, and there is no doubt that this article will, in a great measure, prevent a lot of future mischief.

It is significant that none of the other periodicals, who always shout that they have the interests of the amateur at heart, appeared to know anything about the Alexander bill, nor did any of them take any steps to serve their readers.

Modern Electrics has been the first in the wireless field and will continue to serve the wireless amateur and the independent wireless interests in the future, as in the past.

Alexander Wireless Bill

In the House of Representatives.

December 11, 1911.

Mr. Alexander introduced the following bill; which was referred to the Committee on the Merchant Marine and Fisheries and ordered to be printed:

A BILL

(H. R. 15357)

To regulate radio communication.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a person, company, or corporation within the jurisdiction of the United States shall not use or operate any apparatus for radio communication as a means of commercial intercourse among the several States, or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the receipt or transmission of radio messages or signals the effect of which extends beyond the exclusive jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory, except under and in accordance with a license in that behalf granted by the Secretary of Commerce and Labor upon application therefor; but nothing in this Act shall be construed to apply to the transmission and exchange of radio messages or signals between points situated in the same State, provided the effect thereof shall not extend beyond the jurisdiction of the said State or interfere with the reception of messages or signals from beyond said jurisdiction; and a license shall not be required for the transmission or exchange of messages or signals by or on behalf of the Government of the United States. Any person, company, or corporation that shall use or operate any apparatus for radio communication in violation of this section, or knowingly aid or abet another person, company, or corporation in so doing, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding five hundred dollars, and the apparatus or device so unlawfully used and operated may be adjudged forfeited to the United States.

Sec. 2. That every such license shall be in such form as the Secretary of Commerce and Labor shall determine and shall contain the restrictions pursuant to this Act on and subject to which the license is granted; shall specify the ownership and location of the station in which said apparatus shall be used and other particulars for its identification; and shall not be construed to authorize the use of any apparatus for radio communication in any other station than the one specified. Every such license shall be subject to such regulations as may be established from time to time by authority of this Act or subsequent Acts and treaties of the United States. Every such license shall provide that the President of the United States, in time of war or public peril, may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus, or may authorize the use and control of any such station or apparatus by any department of the Government upon just compensation to the owner.

Sec. 3. That every such apparatus shall at all times, while in use and operation aforesaid, be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce and Labor. Every person so licensed who, in the operation of any such wireless apparatus, shall fail to observe and obey regulations made pursuant

to this Act or subsequent Acts or treaties of the United States, or any one of them, shall, in addition to the punishments and penalties herein prescribed, suffer the suspension of his said license, and the same shall not be renewed for a period of one year from and after the date of his conviction of any such failure. It shall be unlawful to employ any unlicensed person or for any unlicensed person to serve in charge of the use and operation of such apparatus, and any person violating this provision shall be guilty of a misdemeanor and on conviction thereof shall be punished by a fine of not more than one hundred dollars or imprisonment for not more than two months, or both, in the discretion of the court, for each and every such offense.

Sec. 4. That for the purpose of preventing or minimizing interference with messages or signals relating to vessels in distress or of naval and military stations by private or commercial stations, the President of the United States shall establish from time to time regulations, by designation of wave lengths or otherwise, to govern said private or commercial stations, which may be granted license by the Secretary of commerce and Labor in accordance therewith, and such regulations shall have the force and effect of law and be enforced by the Secretary of Commerce and Labor through collectors of customs and other officers of the Government as other regulations herein provided for.

Sec. 5. That every license granted under the provisions of this Act for the operation or use of apparatus for radio communication shall prescribe that the operator thereof shall not knowingly interfere, as in this Act provided, with messages relating to vessels in distress or with any naval or military station. Such interference shall be deemed a misdemeanor, and upon conviction thereof the owner or operator, or both, shall be punishable by a fine of not to exceed five hundred dollars or imprisonment for not to exceed one year, or both.

Sec. 6. That the Secretary of Commerce and Labor shall have power to make regulations prescribing the form and manner in which applications for licenses under this Act shall be made and respecting the granting of such license; and regulations, by wave lengths or otherwise, suitable to secure the due execution of the provisions of this Act, and from time to time to add to, modify, amend, or revoke such regulations, as in his judgment may seem expedient; and such regulations, when so adopted, shall have the force and effect of law.

Sec. 7. That licenses may be granted under this Act for the use and operation of apparatus for radio communication at fixed stations upon the mainland, islands, or the navigable waters of the United States, to be known as licenses of the first class and upon vessels of the United States engaged in interstate or foreign commerce, to be known as licenses of the second class.

Sec. 8. That the expression "radio communication" as used in this Act means any system of electrical communication by telegraphy or telephony without the aid of any wire connecting the points from and at which the messages, signals, or other communications are sent or received.

Sec. 9. That messages and signals relating to ships in distress shall have priority over all other messages and must be answered with similar priority, and, subject to such priority, messages by, to, or on behalf of the Army or Navy of the United States shall have priority over other messages. Any person failing to comply with the requirements of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punishable by a fine of not more than five hundred dollars and by the revocation of his license.

Sec. 10. That a person, company, or corporation within the jurisdiction of the United States shall not knowingly utter or transmit, or cause to be uttered or transmitted, any false or fraudulent distress signal or call, or false or fraudulent signal, call, or message of any kind. The penalty for so uttering or transmitting a false or fraudulent distress signal or call shall be a fine of not more than two thousand five hundred dollars, or imprisonment for not more than five years, or both, in the discretion of the court, for each and every such offense, and the penalty for so uttering or transmitting, or causing to be uttered or transmitted, any other false or fraudulent signal, call, or message shall be a fine of not more than one thousand dollars, or imprisonment for not more than two years, or both, in the discretion of the court, for each and every such offense.

Sec. 11. That a person, company, or corporation shall not use or operate any apparatus for radio communication on a foreign ship in territorial waters of the United States otherwise than in accordance with the regulations made for that purpose by the Secretary of Commerce and Labor, and for any breach of any such regulations the offender shall be liable to a penalty of not to exceed fifty dollars for each offense and to the forfeiture of any apparatus for radio communication used or operated on such ship. Save as aforesaid, nothing in this Act shall apply to apparatus for radio communication on any foreign ship.

Sec. 12. That the trial of any offense under this Act shall be in the district in which it was committed, or if the offense was committed upon the high seas or elsewhere out of the jurisdiction of any particular State or district, shall be in the district where the offender is found or into which he is first brought.

Sec. 13. That this Act shall take effect and be in force on and after the first day of January, nineteen hundred and thirteen: *Provided, however*, That the fourth, fifth, ninth, tenth, and twelfth sections of this Act shall take effect and be in force on and after four months after its passage.

Ralph 124C 41 +

(Continued.)

By H. Gernsback

DURING the next few days nothing of importance occurred. Ralph worked almost uninterruptedly in his laboratory in the conning tower. In the course of a week, since he had left the Earth, he had only dozed off for about two hours, no sleep being possible on board a space flyer.

He constructed several new pieces of apparatus, which he thought might come in handy during a possible encounter with Llysanorh'. He knew very well that Llysanorh' would not be as easily subdued or caught as Fernand. Quite the contrary. This tall Martian was an inventor himself and knew a few things about handling novel death-carrying apparatus. It would be useless trying the Radioperforer on him, as he probably would carry a Silonium armor, proof against all Radium emanations.

Ralph knew that Llysanorh' was a mighty foe, a ferocious one at that, and one who would fight till death rather than give up. Accordingly Ralph took his measures and made all the preparations necessary for the coming encounter.

His genius as usual had risen to the occasion and he had invented several things that he thought would give a few surprises even to Llysanorh'.

One of the first things he had done was to lead wires from the steering apparatus up to the conning tower. On the floor of the tower he arranged contacts in such a manner that he could press them together with his feet. The control was similar to the foot pedals of an organ. He then practised for some days and gradually became expert in steering the flyer solely by means of his feet. Thus his hands were quite free to manipulate all the apparatus which he would need in order to attack his enemy, or to defend himself. With his feet he would steer the machine in order to dodge projectiles, in case there were to be any.

As the days rolled by, however, Ralph became more and more alarmed. He now took observations almost hourly, his eyes glued to the indicator. With sinking heart he saw that he was not gaining on his enemy. The latter had his machine well in control and was covering almost 90,000 miles an hour now. At this rate Ralph would never catch up with Llysanorh'. It was maddening. The days became a long, drawn-out agony. Ralph had done everything in his power to accelerate the speed of his flyer and it was useless to strain the machinery further, without inviting almost certain death. Within eight days Llysanorh' would land on Mars—his course plainly showed that he headed for this planet. At best Ralph would be ten hours behind—time enough for his enemy to accomplish his purpose. And he, Ralph 124C 41+ the greatest inventor the world had ever produced, was powerless to prevent his enemy from marrying his sweetheart right under his nose, as it were.

Ralph sat down and stared at the stars, his eyes wide open and devoid of lustre. He had been beaten and robbed as if he were a child. There he sat with clenched fists and drawn face, ready to cry of sheer madness and disappointment.

Suddenly he gave one bound, which brought him promptly into collision with the ceiling. He let forth one hysterical shriek and began to laugh till the tears rolled down his cheeks. For five minutes he continued to laugh; he acted more like a lunatic than a cold, matter-of-fact scientist.

Surely he had reason to be merry. His genius had risen to the occasion in the eleventh hour. His wonderful brain had overcome all impossibilities. Mind again would triumph over space and time. The battle was not lost, it had not even begun!

His plan was so simple that it made him laugh even hours afterwards. This was what his fertile brain had ferreted out:

He knew he could not overhaul Llysanorh'. He could not intercept him either. A wireless decoy message was futile. Llysanorh' would never be caught that way, that much was certain. There was nothing left but to prevent Llysanorh' from reaching Mars.

How could it be accomplished? By sending a message to the Martian authorities? A futile thought. Even if the distance could be bridged, which was doubtful, Llysanorh' would, of course, intercept the message with his recorder. He would promptly call his friend and invite him to board a space flyer and to rush to him at top speed. The marriage cere-

(Note.—This Novel started in the April Number. Back issues containing all installments will be furnished at 10c each.)

mony would then be performed out in space and Ralph would get the Hah, Hah!

No, Llysanorh' must not know that he is pursued and still he must be prevented from landing too early.

Ralph would move the heavens in the truest sense of the word. He would get a comet which threatened to collide with Mars. Llysanorh', a staunch patriot, would surely try to bring the comet from its course, to avoid its colliding with Mars. He could do so without danger to himself, simply by steering his flyer close to the head of the comet—within a few hundred kilometers. The gravitational action of his machine on the comet would deflect the course of the latter quite a little—even a few degrees would be sufficient to change the path of the comet.

But how about the comet? At first thought Ralph's plan seems ridiculous, but nevertheless it is simplicity itself. Ralph did not need to "catch" a comet—no, he would manufacture one for himself and one so unique as never rushed through the universe before.

He knew that comets had been reproduced artificially on a small scale, centuries ago*; however, no one had ever tried to make a real comet on a large scale. He also knew full well that the largest comets have a very small mass, and that the tail is composed mainly of gas and dust, which is so thin that the stars may be readily observed through the tail of nearly every comet.†.

So it came about that Ralph was the first human being to create a heavenly body, of his own free will, surely a grandiose undertaking. As comets are composed mainly of hydrogen gas and dust, the manufacturing of Ralph's artificial comet was extraordinarily simple.

By means of scraps of zinc and iron filings, over which sulphuric acid was poured, Ralph produced a large quantity of hydrogen. This he filled in tanks and when he had enough he connected the tanks with the large metal stop cock in the wall of the space flyer. As soon as the stop cock was opened the hydrogen rushed out in the open with a roar.

Immediately Ralph connected his high frequency apparatus with the outside aerials of the space flyer and lo—a wonderful phenomenon took place.

The hydrogen particles which heretofore had been invisible, began to glow with a wonderful light, enveloping the entire flyer. For thousands of miles behind the machine stretched a true comet tail, the flyer forming its head or nucleus. The tail, in true comet fashion, was turned away from the sun, and although Ralph could not see the end of the tail, he knew it could be seen for hundreds of thousands of miles, as if it had been a natural comet.

Ralph, however, was not yet fully satisfied, so he set about to improve the comet. He manufactured several other gases in large quantities, which he ejected into the outer space, and which greatly enhanced the brilliancy and size of the comet's head as well as of the tail.

However the head, he imagined, was not "solid" enough as yet, so he improved upon it immediately.

It is well known that comets are not only composed of gases, but contain a large amount of dust. These dust particles in a comet act very much like the dust particles upon which a sun ray falls. Everyone is familiar with the comet-like appearance of a sun ray passing through dust, and if we eliminate the atmosphere and place the same dust in the outer space, a small comet will be the result. The small particles will be highly electrified by the sun and begin to glow. Each particle repels the other and thus even a handful of light dust will form a respectable comet in the outer space.

*In 1876 Reitlinger & Urbanitzky before the Vienna Academy of Sciences published a report on their experiments on artificial comets. A tube containing hydrocarbon has been pumped out till the pressure has fallen to 0.1 millimeter. If connected to an induction coil, a blue sphere will be formed at the positive electrode after a short time, which "hangs" suspended freely. Connected to the sphere is a tail, fig. 1. One is struck immediately with the close resemblance between this artificial comet and that of Henry's Comet of 1873, fig. 2. If a conductor (a brass ball) as seen in fig. 1 is brought near the tube, the tail flees from the conductor as far as the tube allows. This again proves that the artificial as well as the real comets are subject to the same natural laws. As is known, the tails of all comets are repulsed strongly by the sun, which latter is nothing but a conductor.

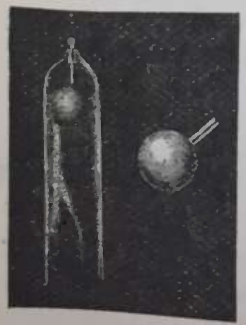


Fig. 1.

Fig. 2.

†According to Bredikhine, the long straight tails, as seen in the comet of 1861, are composed of hydrogen; the long curved tails, like the principal tail of Donati's Comet, consist largely of hydrocarbon vapors; while the somnolent, rare, short tails of violent curvature are made up of mixed iron, sodium and other metallic vapors. This classification has received support from spectroscopic evidence. In 1882, Fitzgerald first propounded the theory that the tail was due to the pressure of light upon the gaseous matter composing it. In 1900 Arrhenius revived the theory, but modified it to the extent of supposing the tail to consist, not of gaseous matter, but of fine particles produced by condensation from the emanations of the comet.—New International Encyclopædia.

For this reason Ralph made a large quantity of dust by grinding paper and wood and other materials on a fine sandpaper wheel.

After he had made a few pails full, he blew the dust out into the outer space, and if his comet had been a magnificent sight before, it was really wonderful to look upon it now from a great distance.

The heaviest particles did not stray far away from the flyer, on account of gravitational action, but quite enveloped it. The machine was now a true planet, while the fine dust particles had become little satellites, revolving around their central body, the flyer.

The lighter dust particles found their way into the tail, as the powerful pressure of the sun's light overcame the attraction which the flyer brought upon them.

Ralph tried turning off the high frequency current and was surprised that the comet was not extinguished and that its brilliancy was not in the least influenced. The gas and dust particles had no way to dissipate their initial electrical charge, being in an absolute vacuum; and to Ralph's astonishment his artificial comet had become a real one in the truest sense of the word.

Inasmuch as the dust was quite dense immediately around the flyer, his outlook was not as clear as it had been before. He could just barely see the stars, which seemed enveloped in a misty haze. This, however, pleased him greatly, as he knew that his comet must look very natural from a great distance.

In this he had not been mistaken. As he afterwards ascertained, his comet had been "discovered" simultaneously on the Earth, on Venus, and on Mars the very day he had made it. It had been charted and named, and on account of its great brilliancy and its wonderful long tail, it had been termed at that time "The Great Comet of 2660"!!

That Llysanorh' would see the comet Ralph never doubted for a second. He headed the comet exactly toward the point where it would collide with Mars at the end of six days. He also knew that the Martians would be on the lookout, and inasmuch as Ralph's careful search did not reveal another space flyer anywhere near him, he knew that the Martian officials would surely locate Llysanorh'.

In this he was not mistaken. His chronometer pointed to 5 P. M. when he first recorded weak signals coming from Mars. Several messages were exchanged thereupon between the Martians and Llysanorh'. Llysanorh' gave his number and position in the heavens and he in turn received instructions to approach as near to the "comet's" head as feasible in order to change its course. He was also instructed to bombard the comet's nucleus with time-set explosives, if he could not deviate the comet from its course. Llysanorh' answered that he would follow instructions as his equipment well allowed him to do so.

During the next few days Ralph was wild with joy to note that the distance between him and Llysanorh' diminished with great rapidity. His trick had worked beautifully—Llysanorh' not only had discontinued his course toward Mars, but he actually rushed at top speed towards Ralph, whom he took for a comet.

Ralph chuckled all day long, it was a picnic for him and he enjoyed the situation hugely. Was not his sweetheart, his Alice, on board, drawing nearer and nearer to him every minute! No wonder he felt elated and happy.

At last the day came when Llysanorh' came into range. Ralph had not changed the direction of his machine and Llysanorh' soundly believed that he had to do with a genuine comet. Llysanorh' approached the "comet" up to about 150 kilometers and then receded. He then took observations, but somehow or other the "comet," instead of being deflected, commenced to pursue Llysanorh'. This was an unheard-of occurrence and Llysanorh', beginning to think that the "comet" was to collide with him, began to fire explosive torpedoes against the nucleus of the "comet." As the distance between him and the latter was only about 100 kilometers now, he watched the torpedo in its flight. His aim had been accurate. Through his telescope he could see the torpedo rushing towards the "comet's" head . . . . . but what was that? . . . . . the "comet" actually dodged, "ducked," more accurately, and the torpedo shot far above the nucleus! This certainly was preposterous—why did the comet behave thus? A cold shiver ran over Llysanorh'.

He fired again, an excellent shot for accuracy. The torpedo would surely strike now, —no,—horrors!—the "comet" this time "sidestepped," as it were, and the torpedo sped on through space, missing its target by a wide margin.

If there ever was a bewildered Martian it surely was Llysanorh'. The cold sweat broke out all over him. This certainly was an unheard of thing, an uncanny phenomenon. It surely was not gravitational action that made the "comet" act in this strange manner; however, there was no time to be lost in idle speculations,—he must continue to fire. He fired one torpedo after another, but the comet dodged them all.

This became too much for Llysanorh' and he gave up firing torpedoes. He next tried to destroy the infernal "comet" by electricity.

Soon his aerials were white hot with the energy he threw upon them. He then turned his flyer into such a position as to direct the outflowing energy towards the "comet's" head. All the results he obtained from this, however, were in the increased luminosity of the "comet." The latter still continued merrily to pursue Llysanorh'! In fact, it had stolen up suddenly towards Llysanorh', who had not speeded up his machine to the utmost, with the result that the distance between the two bodies had been reduced to about 50 kilometres. Llysanorh' noticed with horror that the head of the "comet" now seemed to fill up almost one-quarter of the "sky." He first had imagined that the "comet's" head was solid, but to his amazement he only saw a small black speck in the center of the nucleus, which he could not understand. It was against all theories and facts known of comets.

No sooner than Ralph and his "comet" had come within fifty kilometres of Llysanorh,' he felt that the time had come to open the battle in earnest. So far he had acted on the defensive only; now the real war would begin.

He had, of course, one great advantage over his enemy. The latter was totally unprepared, as he still thought that he had to deal with a comet. This facilitated matters greatly for Ralph.

He carefully insulated himself by sitting on a tall glass tripod. He then attached to his ears the telephone receivers that were connected with the induction balance,* which he had attached to one of the glass port-holes.

He then started to turn the glass wheel of the ultra-generator, which latter was connected with the outside aerials.

A terrible screaming sound was emitted by the generator and the whole flyer shook. Ralph continued to turn the wheel quickly. The generator emitted sounds shriller and shriller, higher and higher, and suddenly the frequency had become so high that no sound could be heard any longer. The vibrations had reached 35,000 and above this the ear is incapable of hearing further sounds, although the sound is still there, inaudible to the human ear.

Ralph turned the wheel a few more notches and everything became pitch-dark over an area of over sixty kilometres in diameter.

As in his Switzerland exploit, two months before, Ralph's aerial on the space flyer due to the powerful action of his ultra-generator, attracted the ether so fast that it could not be replenished quickly enough. It acted much like an immense vacuum pump on the atmosphere.

The consequence was that there was an utter darkness over a large area. As his as well as Llysanorh's flyer was in the affected region, both machines were, of course, in the dark, and invisible to each other.

Ralph, however, steered his machine on its former course and speeded it up to its utmost.

Llysanorh', as soon as this never heard of darkness had set in, had brought his machine to a dead stop. He was almost frantic with terror and stood like one paralyzed, unable to think or to act.

Within a few minutes Ralph's induction balance caused his telephones to emit higher and higher notes, and from this he could tell, despite the pitch-black darkness, just how near he was to the other flyer.

When he was certain that he had approached Llysanorh's machine, he suddenly shut off his ultra-generator. Quick as lightning he had grasped his radioperforer, and although the light which had returned so suddenly blinded him for a few seconds, he had seen Llysanorh's terrified face, just a few meters distant, his forehead pressed tight against the glass plate of the porthole. Ralph took quick aim and pressed the button.

There was a silent flash and Llysanorh' seemed to topple over. Simultaneously the glass of the porthole turned green.

Like a flash Ralph jumped up and peered anxiously from one porthole to the other, expecting to catch sight of his long lost sweetheart.

There was nobody to be seen.

He rushed to the wireless and signaled frantically for several minutes. Breathlessly he clasped the receivers to his ears.

There was no answer, no sound. Nothing.

With sinking heart, terror all over him, he now rushed to the connecting tube like a madman. In his excitement it took him twenty minutes or longer to make the connection between the two machines and to make the tube air-tight. Before he crawled into the connecting tube he ran for his radioperforer as a precaution for safety.

Finally he got into Llysanorh's machine. The sight that presented itself to him, twenty feet away, made him utter an agonized cry. He threw the radioperforer far away from him and rushed to Llysanorh'.

Llysanorh' was lying across Alice, his sharp dagger sunk into the upper part of her arm. He was stone dead. Ralph picked the rigid body up and threw it aside like a stick.

There lay Alice in a terrible pool of her own blood, her eyes closed—dead. . . . Her body was warm as yet, but her heart must have

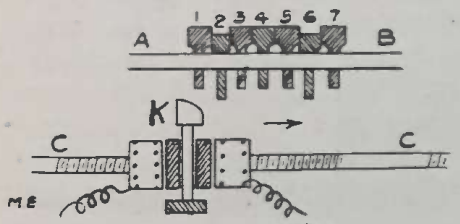
(Continued on Page 796.)

* The induction balance is an instrument which, connected with a telephone, causes the latter to emit a singing sound, when a piece of metal is brought near the balance. It is incredibly sensitive and has been used to locate buried treasures, etc. Invented in 1880 by Professor Hughes.

Wireless Transmission of Secret Messages

A Norwegian inventor, Mr. Horland, is working with an apparatus for sending secret messages by wireless, and in case of war or in usual military operations, as well as in other cases, this may prove to be valuable. We will describe the main points of the device, omitting many of the details. The object is to send the letters of the alphabet and to have them printed in usual or in secret type at the other end. The method for the usual type will be considered first.

-FIG. 1-



-FIG. 2-

Each letter is supposed to be made up of a certain number of equal spaces each of which has the width of a dot (Fig. 1). Thus the letter F, having two dots and one dash, is made up of the parts numbered from 1 to 7. Each of these parts is represented by one movable type in Fig. 2, so as to set up the letters by raising the type. The type have projections below, and are placed in a frame. Below the frame a magnet device K runs along upon a revolving screw shaft and it has a striker which can push up the type when the magnet receives current from the other end of the line. The transmitter and receiver both run on synchronous motors, so that should the sending operator wish to set up the letter F, he depresses a key at the proper moments while the magnet is passing from A to B, so that projections 1, 3, 4, 5, 7 are struck while 2 and 6 are passed by. For the next letter, the device K is brought back and then makes a new course, and so on.

In Fig. 3 will be seen the manner in which the type acts as contact pieces so as to complete a circuit and cause the corresponding letter to be printed by a wheel upon a paper strip. On a frame C are placed sets of contacts in different lines, each line representing one letter, with the shortest letters at the top. After the frame A B has the letter (F, for instance) set up on it, it is pushed slowly to pass by the pins on the cross bar. When the pins come to a certain row of contacts they will bridge over all the gaps and cause the circuit to be completed for this row which represents the letter F, and a current then passes across so as to work the printing wheel, thus striking the letter F on the paper tape.

This is seen in Fig. 4, but instead of using a frame, the contacts are carried around a cylinder, while the type frame i h., is fixed below. On the shaft is a printing wheel N with the letters of the alphabet and under it runs a paper strip. An electromagnet E g presses the paper against the wheel at any moment so as to print a letter. The magnet is put in the circuit of the wheel contacts by brushes at a and b. When the type frame completes the circuit of the contacts representing the letter F, this same letter upon the printing wheel is just over the magnet at this time, and when the current passes in the magnet the letter F is printed on the paper. In the next period, the type in i h and the device K are restored to zero so as to commence setting up a fresh letter. The cylinder makes another rotation, and the next letter is printed on the strip, and so on.

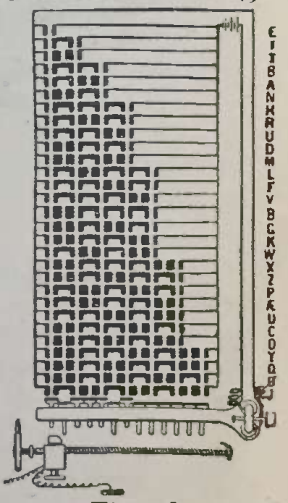


Fig. 3

The method of sending is shown in Fig. 5. On a fixed disc C is carried a set of contacts, with an arm moving around them and driven by an electric motor. The arm passes around from 1 to 7 at the same time that the type-

setting electro-magnet device at the receiving end is running under the type from left to right, since the motors at each end are operated in synchronism with each other. On the disc C, should the contacts 1, 3, 4, 5, 7 carry current, electrical impulses will pass over the line at the proper moments to raise the corresponding type as we have above seen. In practice, the operator has a keyboard so that pressing one button, F, automatically puts current into the proper contacts, as seen at A, B, C, D, etc. At the same time, any one of the buttons completes the circuit in the relay g, h so that the current passes on the line. These impulses can be sent by wireless, as seen below, and they are received in the wireless apparatus of Fig. 4.

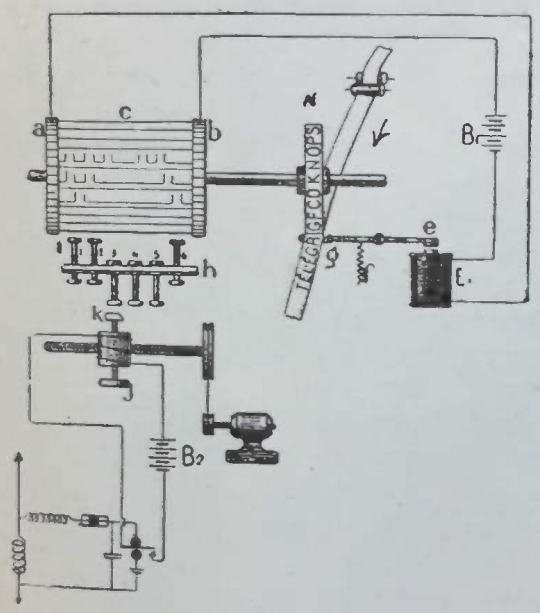


Fig. 4. Printing Apparatus.

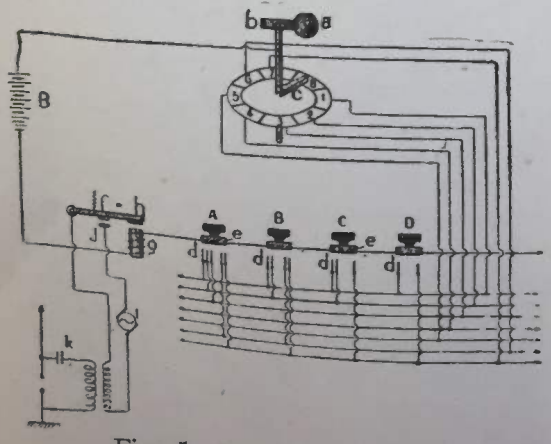
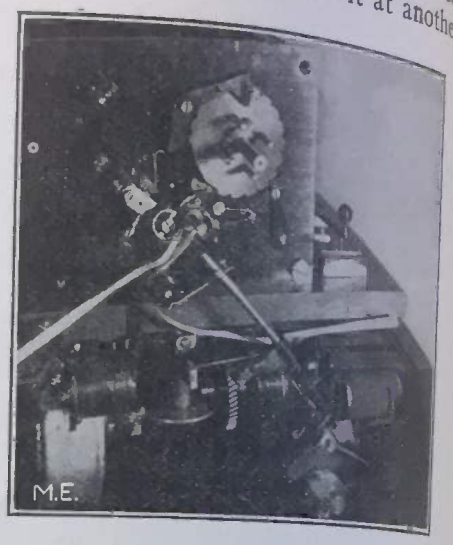


Fig. 5. Sending Apparatus.

To send secret messages, which are printed in cipher letters, all that is needed is to shift the printing wheel around the shaft, and set it at another point, so that instead of printing F we print J, for instance, and so on. The message can then be read only by the operator. We give an example of a message sent first, in usual words, (in Norwegian) and again in cipher characters. Mr. Horland has succeeded very well in sending such messages by wireless over short distances, but the question of distance does not enter in here, as such messages can be sent to any distance which a wireless post can cover, so that very long distances can be reached.



Printing Apparatus, Horland System.

4. ÜY22.+EU4U U430YN =3U2D 3EN .9Æ45=4YN .4U AY .U 52Y69.3 !Y2U2U39.4. 69+U2.9 2U SUÆ47U+4. .RY47U4 U4+48Y2554Y 54. . 52Y69.3UU2U39.4Y.4 3 72.2.03 .4.	DEN TRAADLØSES SEIER. PISA 14 NOVEMBER. DET ER LYKKES MARCONI FRA STATIONEN COLTANO AT UTVEKSLE DIREKTE TELEGRAMMER MED MARCONISTATIONERNE KANADA OG I DEN
3U2+34. U7S 79+9. 3 4YRUY42N	ITALIENSKE KOLONI ERYTREA.

Facsimile of Secret Wireless Message.

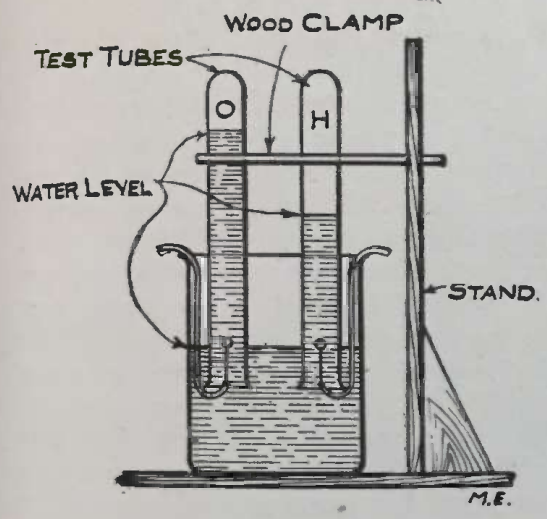
GOVERNMENT LOOKS INTO AMATEUR STATIONS.

Recently Government officials have visited quite a number of amateur wireless stations in the vicinity of New York City for the purpose of finding out the wave lengths most in use among amateurs. As a result of their investigations it is said that a regulation will shortly be made by the Government restricting amateur and private stations to wave lengths below 400 metres or above 1,200 metres. In other words, they will not be allowed to use wave lengths between and including these values.

Simple Experiments in Chemistry—Water

By Philip Edelman.

WATER is a compound of Hydrogen and Oxygen in which there are two parts of Hydrogen to one of Oxygen. This is represented by the formula H_2O. It is estimated that water covers about three-fourths of the earth's surface. In addition to the liquid form, water exists in a vapor and a solid (ice) form. Water is contained



-FIG. 1-

in all animal and plant matter, in the soil, and porous rocks. Foods are largely water and the human body itself is almost seventy per cent. water.

Electrolysis of Water.—Water can be easily decomposed into its two components by the use of electricity. This is illustrated in Fig. 1. The apparatus consists of a container, two test tubes, and two electrodes. A little sulphuric acid is added to the water to make it conduct better. The test tubes should be filled with water and inverted over the electrodes as shown. A battery, or other source of electricity is then connected to the electrodes and bubbles of gas will at once form. The bubbles will rise and displace the water in the test tubes. One tube will be filled with gas just twice as fast as the other. The tube with the greater volume of gas contains Hydrogen and the other contains Oxygen. The tubes can be taken off and tested for the two gases. The polarity of a source of electricity can also be determined in this way.

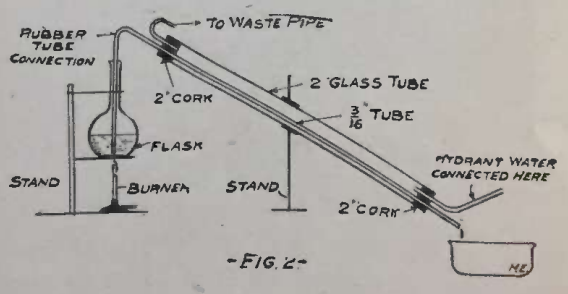
Water for use in battery solutions and the like should be as pure as possible. This is particularly so with storage batteries. Water is seldom found pure, so that it is necessary to distill it for the purpose mentioned. This consists of boiling the water to form steam, which is pure water and then condensing the steam. See Fig. 2.

Since water is such an important compound, it is a large problem to get it in a pure form. Various mechanical, electrical, and chemical devices and processes have been devised for the purification of water, none of which is as efficient as distillation; but on account of its expense, distillation is seldom used except for drinking water and other purposes requiring small quantities at a time.

Perhaps the most interesting property of water is its power to dissolve various substances. The degree of solubility varies greatly with the substance used. Take a test tube half full of water and small quantities of the following substances, and try each for its solubility:

Alcohol.
Glycerine.
Kerosene.
Common salt.
Also any others which are at hand.

Of those named, all, except the kerosene, will be found to be soluble in water. Generally, a solid will be more soluble in hot, than in cold water. There are exceptions, however. Some lime compounds, (Calcium Hydroxide,



-FIG. 2-

or Bicarbonate of Lime) are less soluble in hot water than in cold. Ordinary salt will be found to dissolve only slightly better in hot than in cold water. Copper Sulphate and Potassium

Nitrate, on the other hand, are much more soluble in hot water. Thus, boiling water will dissolve nearly eight times as much Potassium Nitrate as will water at an ordinary temperature.

There is a limit to the quantity of a substance that can be dissolved in a given quantity of water. Although there may be some of the material left which has not dissolved, when this point is reached it will remain undissolved. This point is called the point of saturation and depends upon the temperature, as well as the purity of the material and the water.

When a solution is saturated it contains the greatest amount of the substance which is possible under the given conditions. Thus, if a solution of salt or Potassium Nitrate is prepared in a test tube with boiling water and then cooled, the solution which at first was clear, is changed and crystals of the material form. Since the material is more soluble at the higher temperature, the solution is saturated with less material at the lower temperature and the excess becomes undissolved.

When some substances are dissolved in water a great change in temperature takes place. Thus, when a little sulphuric acid is added to a test tube half filled with water the water becomes warm. *Never pour sulphuric acid in a tube first and then water over the acid.* If this is carried too far enough heat will be generated to crack the tube. Caustic soda acts in much the same way when added to water. *Care should be taken, when using acid or caustic soda not to get them on hands or clothing.* Other materials cause a fall in the temperature upon dissolving. Potassium Nitrate is the best example of this.

In chemical operations it is often desirable to separate the dissolved substance from the solution by precipitation. If a little solution of camphor in alcohol is put in a test tube and water is added, the camphor is precipitated because it is insoluble in water. The camphor in this case is the precipitate and after a little time it will fall to the bottom of the tube.

Make a clear salt solution by dissolving a little salt in water. In like manner make a clear solution of silver nitrate, using distilled water. Now if the salt solution is added to the silver nitrate solution the clear solution is at once changed and a white precipitate forms. The silver chloride which is formed is insoluble. The sodium nitrate which is also formed, remains dissolved because all sodium compounds are soluble.

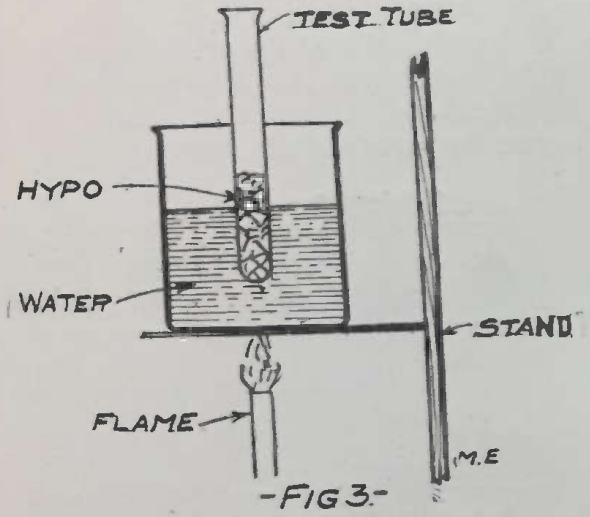
Fill a test tube half full of sodium sulphate or sodium thiosulphate crystals and heat in a hot water bath. (See Fig. 3.) When the crystals have all dissolved in their own water of crystallization the solution will be clear. The solution can be left to cool and no crystals should form. The solution is supersaturated. Now, if a tiny crystal of the material is added to the clear solution, crystals will form about it and the whole will crystallize. At the same time the solution which was cool before, will now give up considerable heat as the crystals form. This last is the heat of crystallization, and this method is used in preparing heat storing hot water bags. The bags are filled with the crystals instead of water and boiled in the ordinary manner. Thus prepared they may be put away for an emergency and the stored heat recovered by causing the crystals to form.

In the foregoing experiment "Water of crystallization," was mentioned. Many crystals contain this water as a part of the compound. Crystal Sodium Carbonate is made up of nearly two-thirds water. When exposed to the air, it soon loses it's crystal water and changes to the anhydrous or dry form. Sodium sulphate acts in the same way when exposed to the air. This peculiar property is known as Efflorescence.

Some crystals will only lose their water of crystallization when heated. If a few crystals of copper sulphate are put into a test tube and then heated, they lose the water of crystallization and change to a dull gray powder. They can be changed back into the crystal form by adding water. Cobalt Chloride when heated in this way turns blue. The solution in water may be used as an invisible ink. It should be diluted until it is a pale pink and used with an ordinary pen. To make the writing appear, the paper containing the invisible writing is heated in a flame (taking care not to burn the paper). The writing appears

in blue when the water is driven off by the heat. To change it back again to the invisible form it is only necessary to blow upon it, the moisture in the breath changing it back again.

Still other substances that are soluble in water, but are dry when kept in air tight containers, have the power to absorb water when exposed to the air. They absorb the moisture which is in the air and become moist, some absorbing enough water to completely dissolve. This property is called Deliquescence. Calcium chloride is the best example of this. Caustic Soda and Caustic Potash also have this property. This deliquescence is very important and is used in many ways. Chemists rely upon it to remove water vapor from gas. Calcium Chloride is cheap and has been used to sprinkle streets. It absorbs water from the air and keeps the dust settled. It can also be used to advantage in making high grade ground electrodes for wireless stations and the like, as was pointed out by the writer some time ago.*



-FIG 3.-

Solutions have important electrical properties. While water is itself a poor conductor of electricity, the addition of almost any crystal, acid, or soluble substance makes it a fairly good conductor. Sugar is an exception, because it is not decomposed. This property of solutions is utilized in some forms of water rheostats and in electrolytic interrupters. It may be remarked that acids are not the only materials which can be used for this purpose. Caustic Soda, Sal-Ammoniac, common salt and many other substances will be found to serve as well or better.

In the beginning, it was stated that water is contained in vegetable and plant matter. If a small sample of some vegetable matter is at hand this can readily be proved. Put the sample in a test tube and heat until all the water is driven off in the form of steam. (Sugar may be used for this purpose.) Gases as well as water will be driven off from most samples and the residue will finally be carbon. Such water is called integral water, that is, the water is incorporated in the compound.

Some crystals like salt do not contain water of crystallization, but have some water held in between the crystals. If a few crystals of rock salt are heated in a test tube this will become apparent.

*See Modern Electrics for August, 1911.

THE QUENCHED SPARK.

(Continued from Page 777.)

of three round head screws the heads of which catch over the edge of the disc. The spacer blocks and lugs may then be soldered on without any fear of loosening the copper or silver facing on the other side. Remove all surplus solder from both sides of the discs, grind the copper or silver surfaces true and flat on a sheet of emery cloth glued on a flat board and the discs are finished.

Figure 4 shows how the gap is to be assembled, the gap at the top being shown in section.

This gap is heavy enough to handle anything up to ½ k.w. without the use of a cooling fan and if a fan is used it will handle 1 k.w.

The number of individual gaps used may be varied from three to eight and should be governed by the size of the transformer and the distance to be covered. Binding posts are provided for the purpose of varying the number of gaps used.

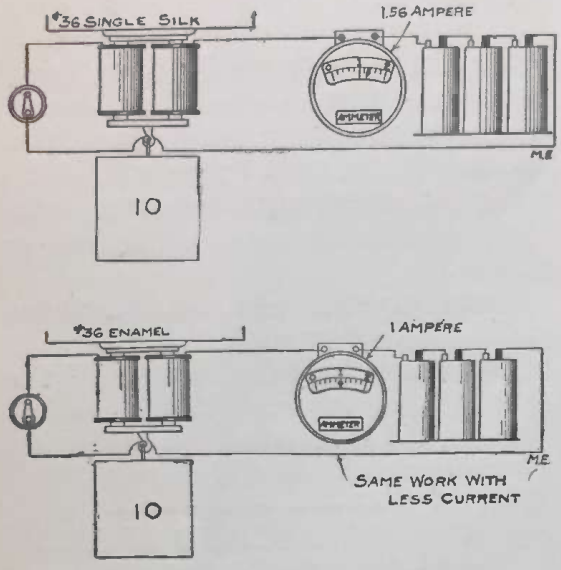
Micanite, from which the insulating rings are made, may be purchased from almost any electrical supply house.

More women would want to do as they liked if they only knew what they liked.

Many a man goes wrong because he isn't satisfied to stay where he is.

Advantages Gained Through the Use of Enameled Wire.

The accompanying cuts illustrate some of the advantages to be gained

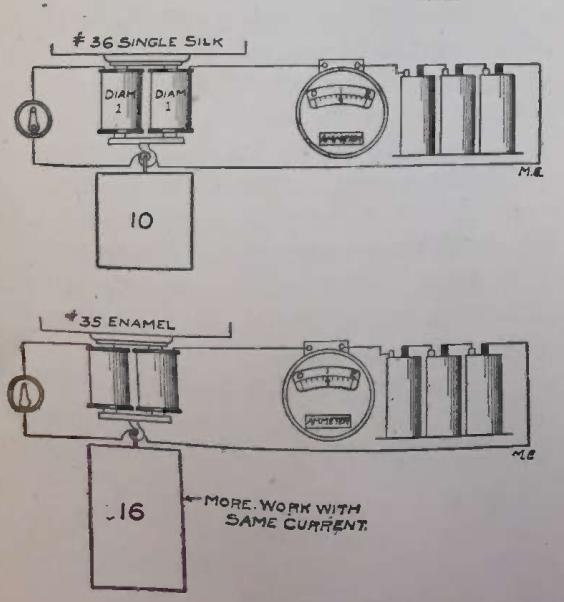


Case 1.

through the use of enameled wire for winding magnets.

Case I. Here we have the same sized wire, winding space, and work to be done. On account of the greater amount of enameled wire that can be wound in the same space, the resistance is increased and the ampere turns and work done, remain the same with less current.

Case II. Here the winding space, resistance, and current are the same in each case. By using one size larger



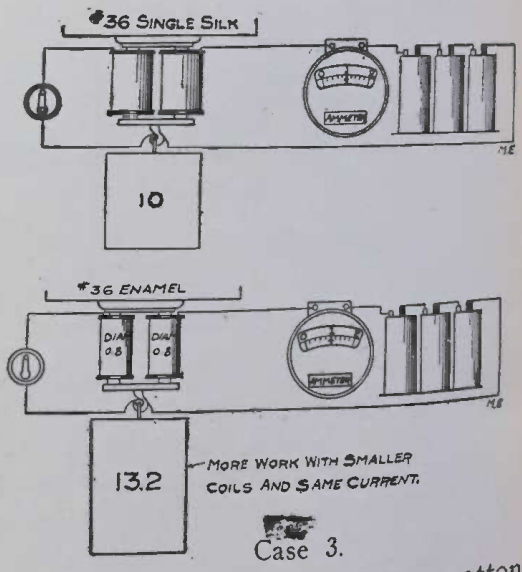
Case 2.

wire on the enameled wire wound coil, 60 per cent. more work is obtained with the same current.

Case III. Here the size of wire, current, and resistance are the same in each case. The length of the wire on each magnet is the same, but as the enameled wire occupies much less space the ampere turns and the work obtained is increased by 32 per cent., with the same current, despite the fact that the enameled wire wound coil is 20 per cent. smaller than the silk insulated coil.

The wire on the silk insulated coil is single-silk covered. The voltage is the same in each case.

In addition to the advantages shown, the insulation of the enameled wire wound coil is much better, and the coil can be worked at temperatures that



Case 3.

would quickly destroy silk or cotton insulation.

RALPH 124C 41 +

(Continued from Page 790.)

stopped beating for quite some time. Llysanorh' had probably aimed at her heart, but had cut into the arm, directly into the large artery. As he fell across her she probably had fainted and the blood had quickly flowed out, and with it her young life had ebbed slowly away. . . . .

Ralph covered her face with kisses while tears rolled down his cheeks. He then picked her up gently and transported her into his machine, where he tenderly placed her upon his bed.

(To be concluded.)

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.

Notice.

There seems to be a misunderstanding on the part of some of our contributors as to the kind of articles wanted for our magazine. We are always glad to receive original articles on any of the subjects covered in our publication. *We do not, however, want articles which have been copied from other magazines, or published books.*

Recently two such articles have been submitted to us, the source of one of which was discovered after the manuscript had been edited and the type for same set up for publication. Needless to say, we did not publish it. The other article was published in our magazine and we received a rather indignant letter from one of our readers in which he says in part, "It seems to me a pity that you should publish as original, things that have been published before in other books."

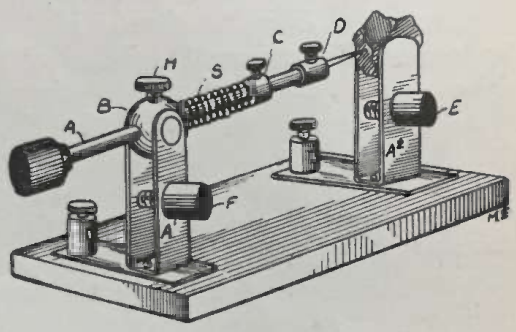
We do all we can to avoid using articles which have been taken from other books or magazines, but as we cannot be familiar with the entire contents of all the books and magazines published, an article is occasionally overlooked and published by us in good faith. Whenever any of our readers discover such articles, we should be glad to have them let us know of it.

FIRST PRIZE TWO DOLLARS.

UNIVERSAL DETECTOR.

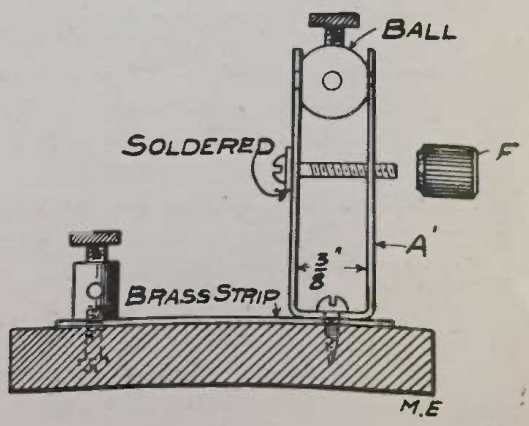
The parts of the detector are mounted on a hard wood base 2½x3½x½ inches. The edges may be beveled to give a better appearance.

Next make two U-shaped standards (A^1 and A^2) of spring brass, using material ½ inch wide and 1-16 inch thick. They should stand about two inches high, thus requiring 4½ inches of material for each standard. One of these clamps the mineral while the other supports a ½ inch brass ball (B), which is held in place by practically the same method used on the back of wireless receivers, and allows the rod A to be moved in various directions.



-FIG. 1.-

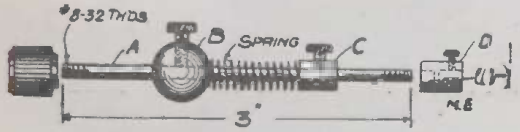
By studying the drawings one will easily be able to understand how the detector works. Suppose you want to use a mineral that requires a rather heavy pressure on its surface. Place the mineral in standard A^2 using the knob E to clamp it tight. Thumb-



-FIG 2-

screw H must be loosened so that rod A is able to slide back and forth through ball B. The pressure of the point on the mineral is regulated by the collar C, by changing the tension of the spring S.

All that is necessary now is to place the point on a sensitive spot of the mineral. Silicon, carborundum, and pyron are generally used with the set screw H loose, using the spring S to push the point against the mineral. Galena is an excellent mineral to use.



-FIG. 3.-

The detector may be used as a perikon type, by clamping the zincite in A² and for the other mineral solder a piece of bornite in a cup having a shank on it, and clamping the shank in the tip D.

The writer has made two of these detectors and mounted them on his receiving cabinet, using a double point switch to change from one to the other. By connecting two detectors this way they may be easily adjusted to the highest degree of sensitiveness, which they possess.

Contributed by

R. COWDEN.

SECOND PRIZE ONE DOLLAR.

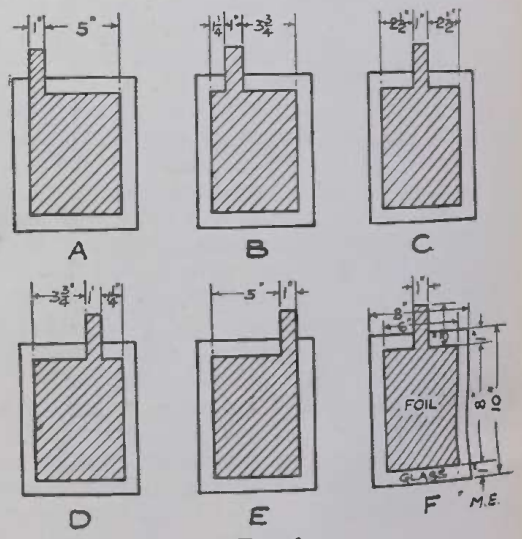
AN OIL CONDENSER.

An authority states that more sending sets prove inefficient through losses brought about by a poor condenser than from any other one thing, losses in some stations amounting to as much as 33 1-3 per cent. of the total energy. Why not save this lost energy by building the condenser right in the first place?

From any large photographer procure 40—8x10 inch used plates. He will give you all that you can carry away. These plates are particularly suited for this purpose as they are absolutely free from flaws of any kind. Clean the plates in hot water and dry them thoroughly. These plates may seem small but they allow the use of six-inch tinfoil, which is much easier to procure than wider sizes.

Between two and three pounds of tinfoil will be needed as the lugs and plates are to be cut in one piece. Cut the pieces 6x8 inches with a lug 1 inch wide and 3 inches long on one end. Alternate these lug ends so that on adjacent plates the lugs come out at opposite ends of the pile of plates. The first lug should be placed as at A. (Fig. 1); the next two as at B (Fig. 1); the next three as at C (Fig. 1); the next four as at D (Fig. 1); the next ten as at E (Fig. 1), and the remaining twenty as at F (Fig. 1).

The glass plates should now be thinly coated with vaseline; the plates of tinfoil placed on the glass so as to clear the edges by one inch all around, and the foil rolled tight to the plate. The vaseline makes an excellent adhesive for this purpose, and as it does



-FIG. 1.-

not harden all of the air can be gotten out from under the tinfoil. When the foil is all rolled tight coat the whole plate with from one-sixteenth of an inch to one-eighth of an inch of vaseline. Treat the remainder of the plates in a similar manner. Now pile up the plates so that at one end 20 lugs are at the center, while at the other end there are five bunches of 1, 2, 3, 4, and 10 lugs each respectively. These bunches of lugs must come from consecutive plates and be on the same part of the plate. The pile should look as in Fig. 2. Compress the pile and tape it together.

Build a box of oak (⅝ inch stock) 10x14x5 inches (outside measure). Miter or rabbet the corners, glue the bottom on, and fasten the top on with nickeled round headed brass screws. The box may be filled and varnished or just shellacked as preferred. It should be well shellacked inside, however. On one end of this box a hard-rubber or fiber plate ¼x4x9 inches should be fastened. On this plate mount five 15 ampere S.P.S.T. knife switches and two large binding posts.

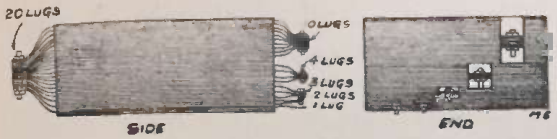


FIG. 2.

One end of every switch should be connected to one of the binding posts by a copper bus-bar. The five other ends are connected to the five bunches of lugs 1, 2, 3, 4, 10, in order. The lugs at the other end of the plates are all connected together and to the other binding post.

This about completes the construction. By this arrangement any number of plates from one to twenty can be cut in by closing the proper switches. For instance, if 17 plates were desired, the switches connected to the bunches of 3, 4, and 10 plates would be closed, and so on. The thick vaseline cuts out the brush discharge almost entirely and furthers the general insulation. This condenser was designed for use on any coil or transformer up to and including ½ kw., but any larger size can be built accordingly.

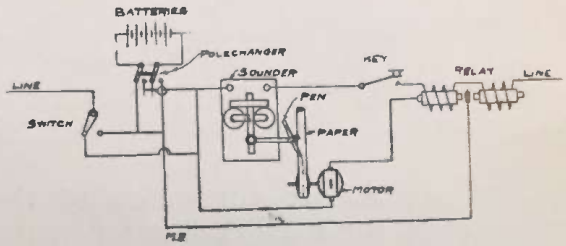
Contributed by

L. W. TELLER.

AN AUTOMATIC TELEGRAPH RECORDER.

A simple telegraph recorder can be made from a telegraph sounder by attaching a pen to the arm by means of a strip of brass. Under the pen is a roll of paper moved by a small motor. The relay used in series with the sounder is made up of two differently wound magnets and a magnetized armature.

With the current flowing in a certain direction the armature will move in that direction, closing the circuit and starting the motor. The armature will remain there by force of gravity until an opposite current moves it, thus opening the circuit. The relay can be made with little trouble from a couple of old magnets and a long piece of magnetized steel. Mount as shown in the sketch, pivoting the armature at the bottom.



At the first tick the relay closes, starting up the motor which turns the roll of paper. The sounder presses the pen down on the paper making a dash. The pen then proceeds to take down the message until finished, when the operator at the other end of the line changes the direction of the current he is sending. The relay is then opened and the motor stops.

In the sketch the proper connections are shown. The switch at the left is to cut out the batteries when not needed. Paper in rolls may be bought at a supply house. With a little experimentation the reader will find out how fast to run the motor which turns the roll of paper.

Contributed by

HAZEN PRATT.

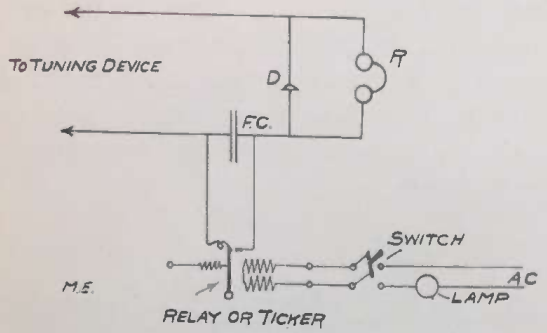
AN IMPROVED POULSEN TICKER.

For all operators who are able to hear any of the various Poulsen stations in the United States, an efficient "Ticker" will prove of considerable pleasure and interest. The "Ticker" to be described is very simple of installation and operation.

A low resistance telegraph relay comprises this "Ticker." This may be purchased new at any supply house from three to four dollars, and second hand, for very much less.

The magnets of the relay are connected to any alternating current

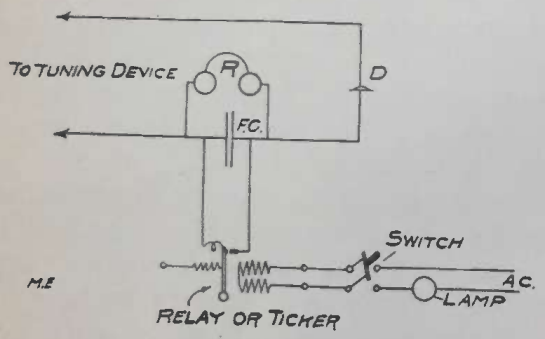
source of electricity in series with a 16 c.p. lamp and suitable means for making and breaking the circuit. The other two binding posts on the relay, which are connected to the platinum



-Fig. 1-

contact points, are connected to the two sides of the fixed condenser in the receiving circuit. Two different hook-ups are shown below.

Whenever the familiar frying of the Poulsen arc is heard, the "Ticker"



-Fig. 2-

should be switched onto the A.C. mains, and the signals may be read as easily as with the spark system of wireless telegraphy.

This "Ticker" will prove much more efficient than those which are directly connected to the rectifying element in a detector. The moment that the "Ticker" is disconnected from the A. C. current, the set is receptive for spark system signals.

Contributed by

ELLERY W. STONE,
California.

ANOTHER WAY TO LIGHT GAS.

I have read with interest the account of the well known gas lighting experiment as described by Samuel Cohen. It will be understood that the wire should be insulated when it is twisted around the gas burner. But in fact, the wire is not necessary at all. Under the conditions mentioned by Mr. Cohen, the spark from the bare fingers applied to the tip of the gas burner, from above, will ignite the gas without injury to the fingers. I have performed the experiment dozens of times in cold dry weather.

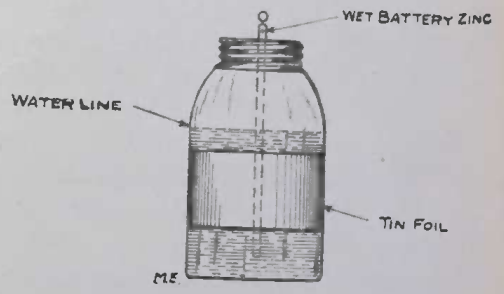
Contributed by

WM. MAVER, JR.

FIXED CONDENSER.

Herewith find a sketch of a fixed condenser, which I think will be very efficient in wireless work.

It will require a one quart fruit jar and a strip of tinfoil 3 inches wide



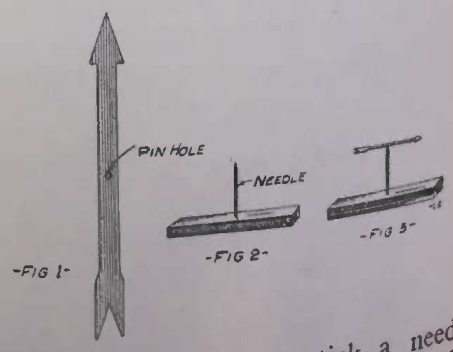
and long enough to go around the jar, and a wet battery zinc. Remove the glass from under the can cover and bore a hole in the top of the cover, next fill with water up to dotted line on sketch, add a teaspoonful of salt to the water. The sketch will explain the rest.

Contributed by

JOHN HOGAN,

A SIMPLE ELECTROSCOPE.

Make a small arrow about 2½ or 3 inches long of light stiff paper, Fig.



1. Into a pine board stick a needle with the point up, Fig. 2. Mount the arrow on the needle by making a small

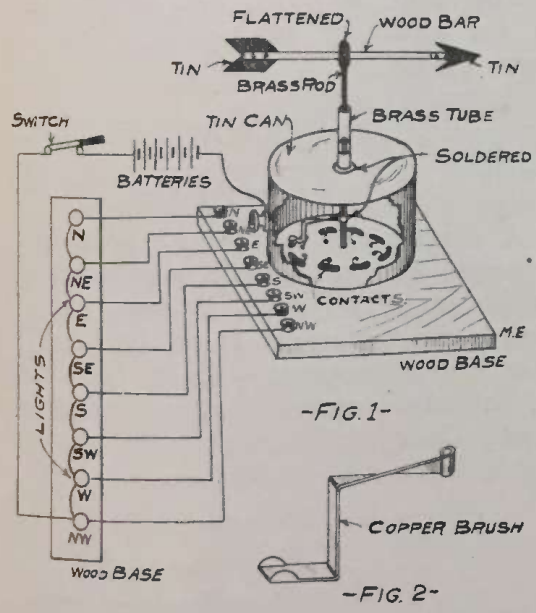
hole with a pin point, Fig. 3. If a piece of writing or other soft paper is rubbed briskly with a pencil, the paper when held close to the arrow will cause same to turn and will follow the paper. This is a simple and easy experiment, and the apparatus costs practically nothing.

Contributed by

STATES FINLEY.

WEATHER VANE.

The drawing attached is a design of an indicating weather vane, to determine approximately the direction of wind at any time. The apparatus can be assembled at an inconsiderable expense. The wire, 6 batteries, switch and 8 small one candle electric lights, constitute the material to be purchased. The housing for the contacts is a common can. It will be noted that as



-FIG. 1-

-FIG. 2-

the vane revolves according to the direction of the wind, the brush comes in contact with the brass pieces and completes the circuit through one of the lamps. The lamps are marked with letters corresponding to the points of the compass. The brush, Fig. 2, is made of sheet copper.

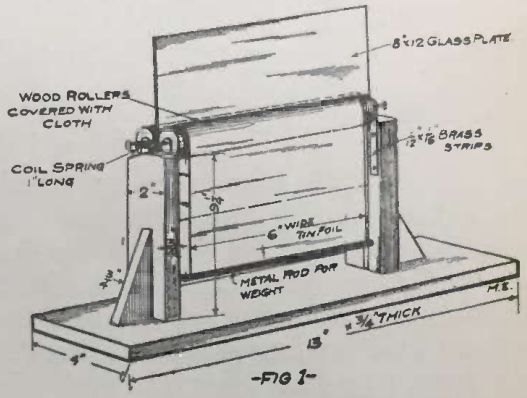
Contributed by

EDWARD CRAIG.

VARIABLE CONDENSER.

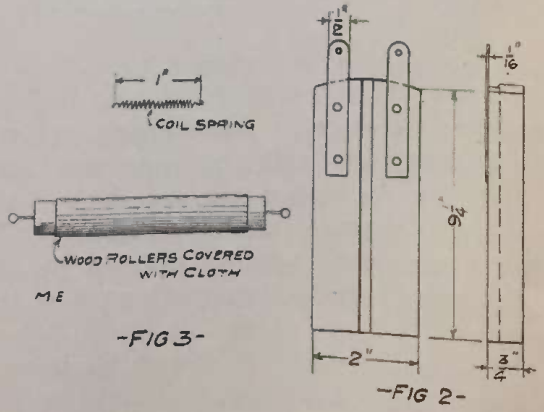
In the September issue of this magazine appeared a Novel Variable Condenser contributed by R. S. True, one of which I made and found to be alright, except for the cloth covered wood rolls. I found it almost impossible to get them to run true. When the glass plate was moved up or down rolls would move away from plate just enough to prevent the tinfoil from making a good contact with plate.

So I made a device as shown in enclosed sketch which is composed of four brass strips two on each end of plate ½x1-16x5 inches long, the strips having 3-16 inch holes bored ½ inch from each end, and two small coil



-FIG 1-

springs, one for each end of the condenser. These are slipped over the screws together with the brass strips before the screws are put into the wood rolls. I have found this to give fine results and it works very smoothly when glass plate is moved up or down. As the brass springs hold rolls firmly against plate nearly perfect con-



-FIG 3-

-FIG 2-

tact between the tinfoil and the glass is secured. The enclosed sketches will fully describe everything.

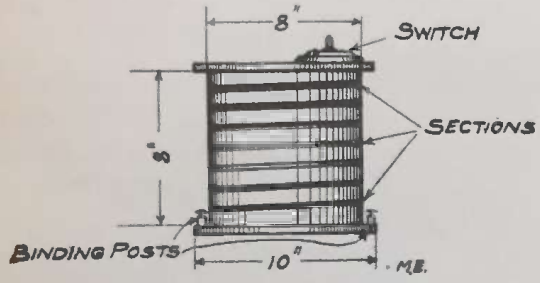
Contributed by

CLARENCE E. CHAMBERLIN.

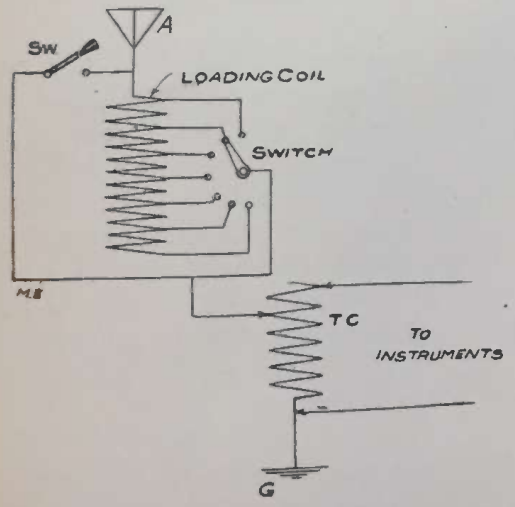
A SIMPLE LOADING COIL.

A simple and efficient loading coil for receiving long waves may be made as follows:

Make a hollow tube of cardboard eight inches in diameter and eight inches in height. Boil the tube in paraffine until the bubbles cease to come from the cardboard. Procure several hundred feet of No. 24, B. & S. gauge enameled wire.



One half inch from the top of the tube start winding the wire and continue winding until a section one-half inch wide has been completed. Break off the wire allowing about one foot for lead and fasten. Measure one-half inch from completed section and wind



another section. Continue making these sections until the tube has been filled but a space of one-half inch should separate each section. The lead from each section should be led to a switch and connected as per diagram.

This coil makes a very neat instrument when constructed with care and is capable of getting those high-powered stations with ease.

The coil will be greatly improved if end pieces are added and the switch mounted on one end.

Contributed by

ALLEN DAHLQUIST.

GROUND CONNECTIONS.

Most amateurs pay least attention to their ground connection. The average experimenter does not consider that the ground is the essential part of a wireless station. A bad ground connection will cause trouble, and the operator will go searching around the instruments to ascertain the trouble without giving the ground connection a thought.

The easiest ground is a water pipe, which will be found very efficient and not much trouble, the wire may be connected by means of a ground clamp. It is best not to solder a water pipe as nine times out of ten it will break, the heat melting the lead. A gas pipe may be used to fairly good advantage but not to a very good effect. If neither are convenient a piece of sheet copper of a conical shape, filled with charcoal, with a wire soldered to it buried in a damp place, will be found to be as good as a water pipe.

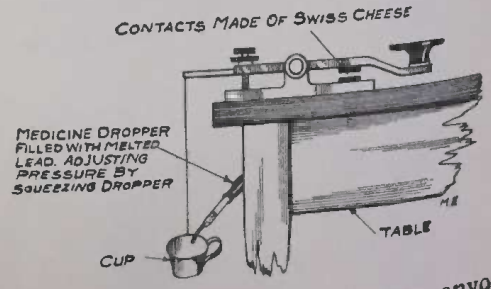
This hint may help the experimenter in his receiving and sending range to some extent.

Contributed by

EDGAR STEWART FRARY.

WIRELESS KEY.

A contributor sent in a design for a wireless key in which the contacts are to be made of *swiss cheese*, and instead of a spring to raise the lever he specifies a counter-weight consisting of a cup partly filled with *molten lead*. Hot stuff, this! He says you don't have to work it,—just hold it



down. We would like to see anyone hold down a combination of *swiss cheese and molten lead*. What?

TELEPHONE RELAYS.

Those now in service are called Ampliphones. If they prove to be constant and reliable they will be used generally (a) to enable ordinary messages to be read without the use of a head telephone, (b) as a call, (c) to

increase the absolute difference between signals of different strengths, thus enabling the message desired to be read through interference or static, (d) to step-up signals so weak that they could not otherwise be read and thus increase the range of communication, (e) as a resonance device responding within limits to a single spark frequency, thus cutting out interference, (f) for separating signals of different wave train frequencies so that several messages of different frequencies can be received at the same time on the same aerial, (g) to automatically record incoming signals.

Coherer detectors change their resistance sufficiently to work a relay which actuates a call, tapper and recording apparatus. The induced currents rectified by crystal and valve detectors are too weak to produce visible material movement, and the same is true of the direct currents produced by the momentary depolarization of the electrolytic detectors.

It has been found, however, that these currents will produce sufficient movement of the diaphragm of a receiving telephone to alter its pressure on a microphonic contact, this alteration being enough to change the conductivity, and thus increase or decrease the current in a circuit containing the contact, a battery and another telephone. This change in current moves the diaphragm of the second telephone and its movements can either be read directly as sound or made to change the current in another circuit by change of pressure on another microphonic contact. One or more of these microphonic relays produces sufficient action in a loud speaking telephone to be heard in the operating room.

When used as a resonance relay the relay diaphragms are mounted so as to have a pronounced mechanical period of vibration and act as wave filters or weeding out circuits, responding most efficiently only to wave trains of a frequency the same as their own. The sound produced by the last one in circuit (the loud speaking telephone) may be intensified by attaching to it an air pipe whose note is the same as that of the diaphragm in vibration.

The use of recording apparatus was necessarily abandoned when coherers were no longer used. It is possible that microphonic relays referred to in the preceding article will again permit the use of recording and calling apparatus. Both tend directly to economy in the operation of wireless stations by reducing the number of operators to a minimum.

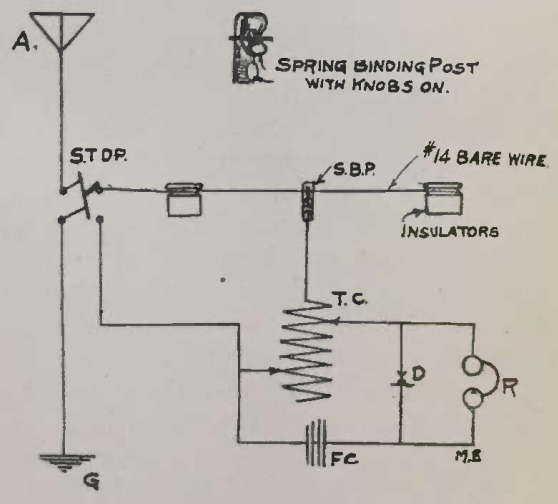
Contributed by

STANLEY E. HYDE.

A "MICROMETER" TUNING ARRANGEMENT.

Oftentimes a single turn of wire on a tuning coil will not suffice for close tuning. Herewith is shown a device with which the closest tuning may be accomplished.

Stretch a piece of No. 14 bare copper wire between two porcelain insulators as shown in sketch, then take an "Electro" spring binding post and place two hard rubber knobs as shown in Fig. 1.



Solder a piece of flexible lamp cord to end of post and thread on a two-inch length of soft rubber tubing, and slip well up on joint; fastening it in place with a little glue.

The binding post may now be placed on the wire. To tune, adjust your coil or transformer as well as possible, then grasp the knobs between thumb and forefinger and slide along the wire until the best position is reached. It is absolutely necessary to have the post well insulated or you will ground the signals through your body..

Contributed by

F. E SICKLES.

IRON CORES FOR WIRELESS OSCILLATION TRANSFORMERS.

On November 13th, 1911, at a meeting of the American Institute of Electrical Engineers, Mr. E. F. Alexanderson, of the General Electric Company presented a paper entitled Magnetic Properties of Iron at 200,000 cycles.

Inasmuch as this frequency corresponds to a wave length of 1,500 metres, and comes well within the range of frequencies employed today in wireless telegraphy, it appears that perhaps the efficiency of wireless transmitting sets may be improved by the addition of properly designed iron cores in the oscillation transformers.

We reprint below, a portion of Dr. Steinmetz's discussion of the paper in which he expresses the belief that such improvement should follow the judicious use of iron in these transformers. He says, in part:

"This may have an industrial value bearing in wireless apparatus. As you know, in wireless systems we transform the energy produced by the oscillating discharge from the voltage of the generator circuit to the much higher voltage impressed upon the antenna, by a transformer or auto-transformer, which is an air core apparatus. In these cases we deal not with alternating voltages, but with oscillating voltages; trains of waves which gradually, and usually quite rapidly, decrease in amplitude and then die out. The important problem, then, is to get the rate of dying out, the attenuation of the waves, as low as possible, to get as well sustained waves as possible, that is, to reduce the losses in transformation.

"Iron has not been used in these transformers, not always because people did not believe iron would follow the frequency, but because the general impression is that the losses in the iron, even when as thin as commercially feasible, would be so formidable as to greatly increase the attenuation, increase the rapidity of dying out of the wireless wave."

* * * * *

* * "this investigation seems to show that by using an iron core of proper proportion at wireless telegraph frequencies, we can materially improve the efficiency of the transformer or auto transformer, and so reduce the attenuation of the oscillating wave, and that is the problem of the power in wireless telegraphy.

"Naturally, this design may be more or less, possibly materially modified, by the problem of the voltage that we have to generate, and the necessity of insulating for the voltage, which must be taken into consideration; but in general it seems from the conclusions of this paper that there should be a material advantage in wireless telegraphy in using iron core transformers, or auto transformers, instead of the air core apparatus used at the present time."

Anyone interested can probably obtain a copy of the paper by applying to the Secretary of the American Institute of Electrical Engineers, 33 West 39th Street, New York City. The complete discussion appears in the January issue of the A. I. E. E. Proceedings, from which the above quoted portion is taken.

Book Review.

ELECTRICITY AND ITS EVERYDAY USES.

By John F. Woodhull, Ph.D.

Published by Doubleday, Page & Co., Garden City, N. Y. Contains 357 pages, 200 illustrations, aside from the colored frontispiece and title page. Bound in heavy linen, embossed with the design. It is not sold separately, but included as a unit of an entire Library set.

This volume, is one of a series known as "The Children's Library of Work and Play." It is written in a popular fiction form, bringing in the technical points on electricity in a non-technical and interesting manner. The story method of explaining technical subjects proves far more efficient in general, and in this work in particular.

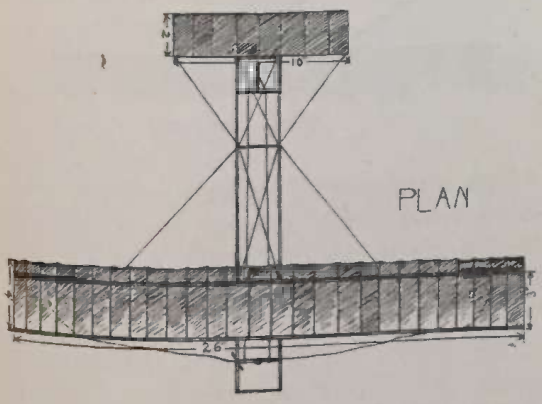
Every phase of electricity is touched upon, from the power plant to the incandescent lamp. Simple explanations are given on the construction of simple electrical apparatus, and in fact the reader is taken to the different power plants and other electrical establishments, and explained each apparatus in turn. At home he is shown how simply the principles may be illustrated with simple household articles.

Construction of a Practical Glider

By Philip T. McCutchen.

IT is a very difficult matter, when one first makes up one's mind to build a gliding plane, to decide, apart from any question of dimensions, what type of machine is most suitable to his requirements. I know of two men who made a 40 foot glider in a small workshop in the city, and not having any other convenient space, erected it, when complete, in the street at 3 o'clock in the morning, preparatory to hauling it to the flying ground.

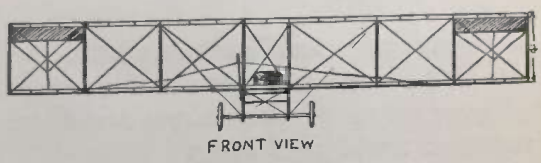
The case of the purchaser of the



complete machine is of course a simpler matter; his troubles resolve themselves into a choice of type at his price, storage and ground. To the constructor there are to be faced, in addition, difficulties varying with personal conveniences to hand-workshop accommodation, the expense to which he perhaps rightly wishes to make a limit, the ground, and the means of transport from workshop to hangar.

In either case, however, the first question is of type, as upon this most of the other considerations depend. The machine described in the following lines is superior to the ordinary type of glider for the reason that it is fully controlled and is fitted with a landing gear.

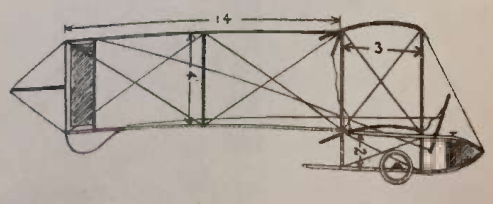
A room or building about 18 to 20



feet square will be required as a workshop. In this room all the parts may be finished for assembling, of course, if a larger space is available all the work of assembling and construction may be done in one place.

In building any type of flying machine the woodwork used should be straight grained and absolutely free from knots.

Now to build the machine. First prepare 8 long spruce beams ¾x1¼ inches and 13 feet long. These are for the main wing bars. Sixteen spruce struts or uprights should be made of ¾x1⅜ inch stuff 4 feet long. Fifty-four spruce ribs are made of ⅝x½ inch strips. They are separately steamed to shape over a large pot covered with a disc of tin in which a trough is bent to allow the whole length of

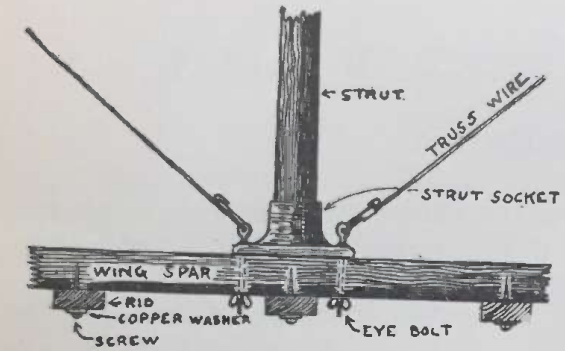


SIDE VIEW

the rib to pass through the steam. The wood soon becomes pliable after which

it is bent to a templet and secured in place by some long bolts. When thoroughly dry they are given 2 coats of very hot, thin glue, which makes them keep their shape. After the glue is dry the ribs should be given 2 coats of shellac to render them weather proof.

The skids and skid braces are made of 1½x1 inch spruce. The four rear



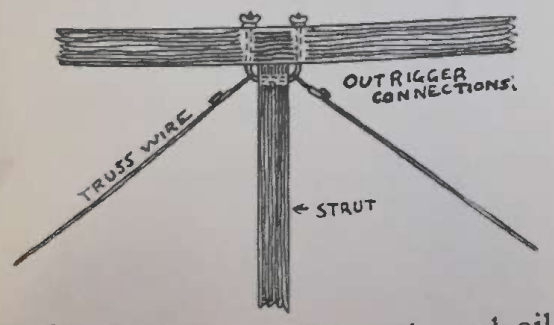
DETAIL OF MAIN FRAME.

outriggers are 1x1 inch and 14 feet long. The four uprights between the outriggers are of the same sized material and are 4 feet long.

The rudder and ailerons are made of ½x¾ inch spruce.

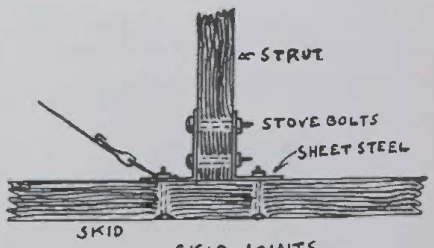
The framing of the main planes should be made first. The curved ribs are screwed to the wing bars at intervals of one foot, using small ½ inch screws fitted with copper washers. When this operation is completed the rear ends of the ribs should be wired. This is illustrated in the drawing.

The frame is now ready for the covering. Almost any light cloth is suitable, although cambric or muslin are preferable. The cloth should be at least 38 inches wide, weighing about 2 ounces to the square yard. It is tacked to the front wing spar and is glued to the ribs with waterproof glue,



(ordinary glue containing linseed oil). The edges where the fabric is turned over the rear wire being cut into a few gores. An overlap of about 2 inches should be allowed. The cloth should run with the warp across the plane, so that the width will just be sufficient to stretch over three ribs with, at the ends, an allowance for turning over on to the sides of the ribs. Glue and brads should be used on the ribs where one piece of cloth overlaps another. The fabric is of course, applied to the under side of the plane. The normal angle of incidence of the sustaining surfaces will be about 1 in 8, or a little over 7 degrees. Allowance is made in the center of the planes whereby a section of the cloth is laced to the frame in order that the two sections of the planes may be readily taken apart.

Aluminum strut sockets of sufficient size to accommodate the struts are then fastened to the wing spars with eye bolts ⅛ inch in diameter. The struts are fitted in the sockets and the biplane is ready for wiring. No. 16 piano wire is used for trussing. The wire joints are made as shown in the drawings.



SKID JOINTS.

The skids, skid braces and seat rests are joined with small pieces of sheet steel and ⅛ inch diameter stove bolts. This is also clearly illustrated.

The rear plane, rudder and ailerons being made of the same materials require very little description. The ribs and cross-pieces are joined with strips of tin nailed to the wood. All these surfaces are double covered with cloth.

Two 20 inch wire wheels and a light wood axle serve as a starting device. This arrangement is fitted with rubber spring shock absorbers.

All the movable controlling surfaces are attached to the rigid frame by leather straps, which form flexible joints.

The wooden control lever is fitted with a universal joint at the lower end. This allows free movement in four directions. Moving the lever from side to side operates the ailerons and push-

ing it forward and drawing it back operates the elevating plane at the rear. The rudder is operated by a foot lever pivoted to the seat rests.

When the machine is complete and ready for test flights take it to the top of a gradual hill in a large open space and set the glider so that it faces the wind, which should be blowing at least 10 miles an hour. Then get into the seat and give the word to your helper to give a good shove. The glider will start forward and with increasing speed will begin to lift. When you feel that you are off the ground give your attention to bringing the machine up to an even keel. The balancing movements should be careful and sure, do not become rattled and move the lever too far in any direction as it is liable to cause a "spill." To make a landing push the lever forward sharply and hold the position until the machine is close to the ground then quickly straighten the machine out.

Beginners should only make short flights at first, the length increasing with the experience gained. If this method of learning is followed you will become thoroughly proficient in a short time.

A MOTOR FOR MODEL AEROPLANES.

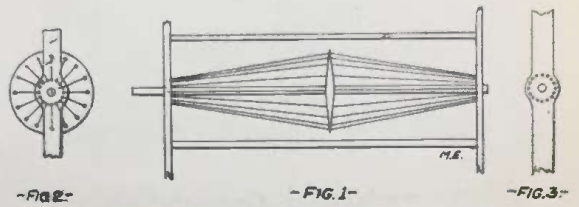
The motor represented in the drawing works on very much the same principle as the ordinary rubber strand motor, except that it has an additional part which gives it a high and steady velocity until it is fully unwound.

From a piece of light wood ¼ of an inch thick cut a disk 3 inches in diameter.

Taper from the center outward until the disk is 1-16 of an inch thick at the edge.

One eighth of an inch from the edge drill a circle of small holes ½ an inch apart. These holes should be large enough to admit the size of rubber strand to be used. Drill a ⅛ inch hole at the center of the disk for the shaft. Obtain, for a shaft, an aluminum or steel rod ⅛ inch in diameter and 25 inches long. Twelve inches from one end drill a small hole and force a piece of iron wire 1⅜ inches long through it leaving ⅝ of an inch projecting on either side. One-fourth of an inch from the rod on either side bend the wire at right angles and parallel with rod. Drill two small holes through the disk ¼ of an inch on opposite sides of the center, fit the disk to the shaft, forcing the small wire through the corresponding holes in the disk, and bend down on other side.

Construct a support for the shaft as in Fig. 1 of the diagram and around each bearing drill holes corresponding to those in the disk, as in Fig. 3.



-FIG.2- -FIG.1- -FIG.3-

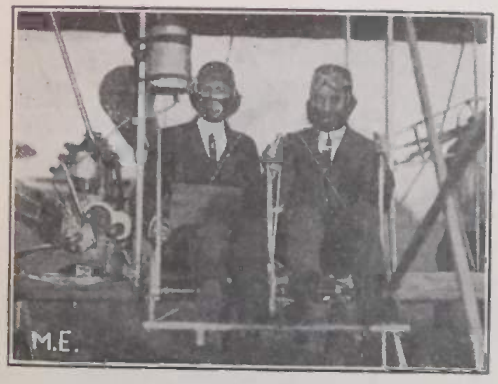
When the shaft is installed in the bearings pass the rubber strands (without stretching) through the holes in the disk and the corresponding holes around the bearings. Hold the strands in place by knotting them on the outside of each bearing. When the propeller is fastened to the end of the shaft, the motor can be wound up by twisting it.

THE AERO-PHONE.

The accompanying illustration shows a new device, known as the AERO-PHONE, which is designed to enable aviator and passenger, or a racing autoist and his mechanician to converse freely. Without such a device, conversation, under these circumstances, would be all but impossible, on account of the roar of the motor and the wind rushing past one's ears. The device is thoroughly protected by patents.

The AERO-PHONE consists of two special watch case receivers, mounted in the ear flaps of the regular aviator's helmet. These flaps fasten under the chin and hold the receivers snugly and comfortably against the ears. Connected with these receivers is a very light weight transmitter of special construction. The transmitter is held in place over the mouth by a band of soft, pliable kid. A long flexible, light cord with a plug at its end serves to connect the helmet, with its

receiver and transmitter, to the rest of the apparatus, which is contained in a small, neatly finished case made of hardwood and finished in a weather-proof material. Inside and at each end of the case there is a jack made



Aeroplane in Operation.

to fit the plug on the end of the helmet cord. Connected with these jacks are a few small batteries and the apparatus for magnifying the speech. When in use the box is fastened to the plane and when the operator and aviator are ready to communicate, they slip their plugs into the jacks. The circuit is automatically made and the apparatus is ready for communication. There is nothing complicated about this and any one may use the apparatus. It is very rugged and practically impossible to get out of order. It allows the free use of both hands by the aviator and passenger, a very important and valuable feature for military use or for the instruction of pupils.

On one end of the box there are two binding posts for wireless work, these binding posts are to be connected to the receiving side of the aeroplane wireless telephone or telegraph set. There is also a clever arrangement whereby the aviator and passenger can carry on either singly or together clear communication with the earth or another aeroplane without removing their hands from the controls.

VOTING BLANK

In order to know exactly what our readers desire for the coming year we have prepared below an Australian voting ballot.

Our old motto "TO PRINT ONLY WHAT OUR READERS WANT" still holds good, but YOU must give us your opinion, without it we cannot make the magazine the way you would like it best.

The editors will appreciate it greatly if you will fill out the blank below by placing a cross opposite the article or item you like best, or do not like. Paste the blank on the back of a postal and mail it to the editor.

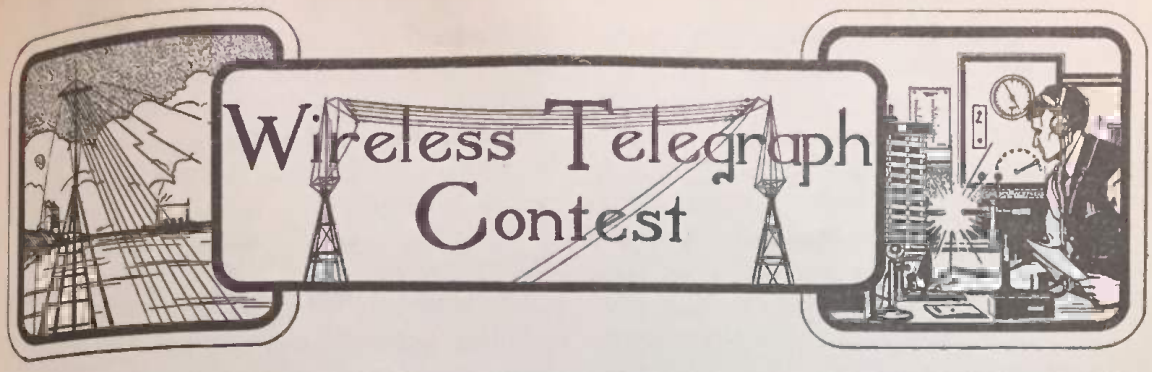
IT ONLY COSTS YOU ONE CENT TO DO SO AND YOU WILL GET A BETTER MAGAZINE AS THE RESULT. Do it NOW before you turn this page and forget it. Success resolves itself in doing things to-day, TOMORROW IS NOT PATENTED AS YET.

	Make Cross Here X		Make Cross Here X
I like Modern Electrics the way it is	....	I would like another serial story by Mr. Gernsback	....
I do not like Modern Electrics the way it is	....	I like short stories	....
I like "The Practical Electrician"	....	I do not like short stories	....
I do not like "The Practical Electrician"	....	I like the Experimental Department	....
I would like longer installments of "The Practical Electrician"	....	I do not like the Experimental Department	....
I like scientific articles	....	I like the Aeronautical Department	....
I do not like scientific articles	....	I do not like the Aeronautical Department	....
I like popular articles	....	I like the "Wireless Telegraph Contest"	....
I do not like popular articles	....	I do not like the "Wireless Telegraph Contest"	....
I like articles "How to make Things."	....	I like the Department "With the Inventor"	....
I do not like articles "How to make Things"	....	I do not like the Department "With the Inventor"	....
I would like more articles on Wireless	....	I like the "Paris Letter"	....
I would like less articles on Wireless	....	I do not like the "Paris Letter"	....
I like Mr. Gernsback's serial story	....	I like the "Oracle"	....
I do not like Mr. Gernsback's serial story	....	I do not like the "Oracle"	....

Other Suggestions .....

Name .....

Address .....



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.

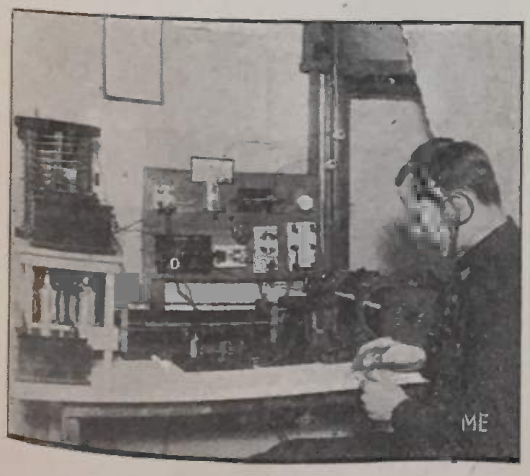
It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

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.

Here is a flashlight of my wireless telegraph outfit.

The receiving set consists of, double-slide tuner, large loose-coupler, variometer, fixed and variable condensers, loading coil, silicon, perikon and carborundum detectors, and Brandes 2,000 ohm head set.



Harry Station.

For sending I use two coils, one, 1 inch and one, ½ inch; aluminum wire helix, zinc spark gap, Leyden jar condensers, anchor gap, ammeter in series with aerial, and telegraph key with large contacts.

By the use of 2 D.P.D.T. switches, I can use either the double-slide tuner or loose-coupler.

All necessary switches are shown on the switchboard. I use heavy glass tubing for bringing in the leading in wires.

I use a 6 volt 60 amp-hour storage battery for operating the coils.

My aerial is composed of six strands of copper wire 45 feet long, 48 feet above the ground.

I have obtained excellent results from this outfit and am in constant communication with a friend living a few miles away.

Modern Electrics has given me many helpful hints and I consider it the best magazine for the amateur.

CHARLES HARRY,
Michigan.

HONORABLE MENTION.

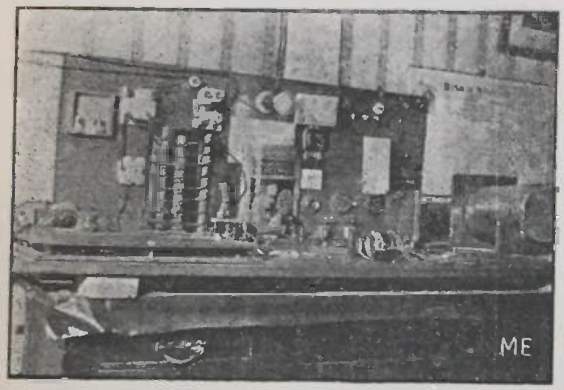
Here is a photo of my wireless telegraph station which has taken me about two years to complete.

For sending I use a small closed core transformer which was made from instructions in September, 1910, issue of *Modern Electrics*. It is run direct from the 110 V. A. C. current and gives a good spark, also, a helix wound with No. 7 wire, glass plate condenser, seen in front of the transformer on the left, spark gap, and a key which has a condenser bridged across the terminals to prevent sparking.

The receiving set consists of a single slide tuner in front of which is a large variable condenser, fixed condenser, electrolytic, peroxide of lead and silicon detectors, and 1,000 ohm phones, behind which is a potentiometer.

On the switchboard there is a switch for cutting in the various detectors, one for the battery, and one for cutting in the potentiometer. There is also a test buzzer which is shown to the right of *Modern Electrics,* and below this is a push button. On the sending side is the switch for controlling 110 volts, fuse block, hot wire meter which, however, is not yet complete, switch for same, and the aerial switch.

The aerial is composed of four copper wires 65 feet long and elevated at the highest end forty-five feet.

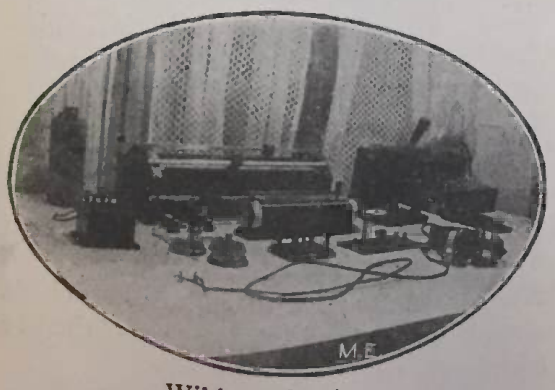


Mott Station.

HAROLD MOTT,
Manitoba.

A CORRECTION.

Last month we printed a description of Mr. Willard S. Wilder's wireless station, but the photo was of someone else's station. Mr. Wilder called our attention to the mistake and enclosed this photograph which we cheerfully print in correction of the error. We receive a lot of descriptions and pictures each month, many of the pictures being enclosed, loosely, with the letters describing them, and having no names on the backs to identify them. For this reason we sometimes get them mixed. Perhaps this is the reason for the mistake in the present instance. If our contestants would put their names on the backs of their pictures there would be no chance for mistakes of this kind to happen.

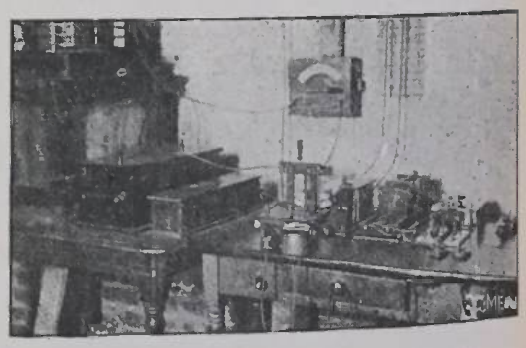


Wilder Station.

HONORABLE MENTION.

The accompanying photograph was taken of our wireless station which we have set up within the last five months. The outfit is complete in every detail and, with the exception of condenser and head set, none of the apparatus is factory built. We have had fine success with this outfit, being able to receive from New York and Chicago to New Orleans, and have sent 125 miles overland. The aerial used is of the four wire loop type. It is spread on 12 foot spreaders and is 300 feet long. The height at one end is 75 feet, and the other end is 60 feet high.

The receiving set consists of loose coupler, Murdock variable condenser, rotary variable, fixed condenser, ferron and silicon detectors, and a 2,000 ohm head set.



Templeton and Kamphausen Station.

The transmitting set is run from the city A.C. supply and includes the following apparatus: 1 kw. transformer, glass plate condenser of eight plates, 18 x 22 inches, helix, spark gap (inclosed in helix), hot wire ammeter, key and impedance. Since this picture was taken we have made a rotary spark gap and it certainly does the work. All the transmitting wiring is done with No. 10 stranded wire. We would be glad to hear from any stations at any time between 7 and 10 p. m. Station call—Z.A.

TEMPLETON & KAMPHAUSEN,
Ohio.

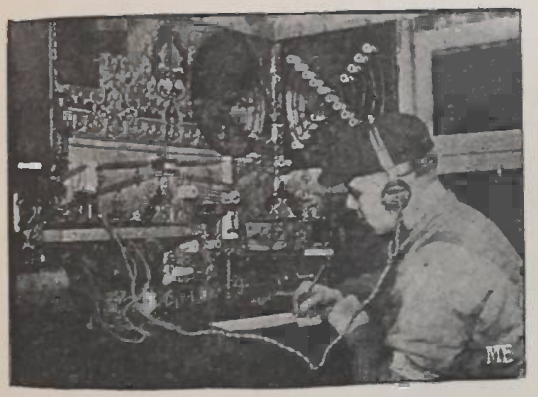
HONORABLE MENTION.

Herewith is a flashlight photo of my wireless telegraph station.

My sending outfit consists of two one inch coils, one E. I. coil, sending condenser, two keys, spark gap, and helix.

My receiving outfit consists of a tuning transformer, of which only half appears in the photo, two variable condensers, one single slide tuning coil, five detectors: silicon, galena, and electrolytic, one double throw receiving and sending switch, and one pair of 2,000 ohm E. I. phones.

I built all the instruments from the articles in the *Modern Electrics*, excepting the phones, keys, switch, and induction coil.



Kieffer Station.

My aerial consists of four strands of No. 16 copper wire, one and one-half feet apart, and one hundred feet long. The poles are seventy feet high.

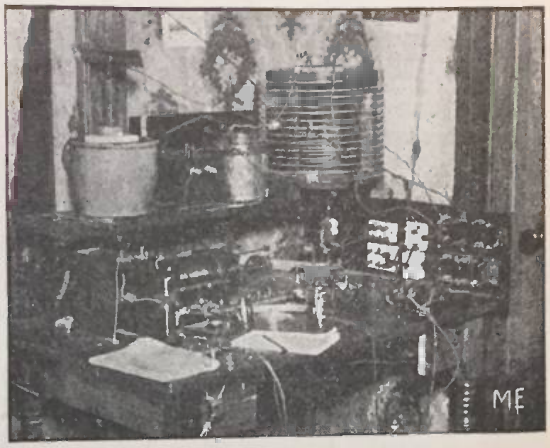
With this outfit I have obtained excellent results.

ALBERT H. KIEFFER,
New York.

HONORABLE MENTION.

This is a picture of my wireless apparatus. The receiving set is as follows: Loose coupler with two sliders on the primary and one inside slider on secondary, one fixed condenser and one variable condenser, three detectors: E. I. Co. electrolytic, Murdock silicon and a galena. I have two sets of 2,000 ohm phones: Murdock and C. Brandes, and a buzzer test for detectors.

My sending set includes: E. I. Co. ½ k.w. transformer coil, electrolytic interrupter, one large Leyden jar and helix. The helix frame is of black walnut and it is wound with No. 8 aluminum wire. My key is a telegraph key and my spark gap is adjustable. My aerial consists of seven copper wires.



Garey Station.

With this set I have made proven tests of receiving over 2,000 miles. I hear the following almost every night: "M.CC. (Cape Cod), "NAX" (Colon, Panama), "NAR" (Key West) "HA" (Cape Hatteras), "NY" (New York). I also hear all over the Great Lakes. I get very good results with this set.

LLOYD GAREY,
Michigan.

HONORABLE MENTION.

Here is a picture of my wireless outfit which consists of: a ½ kw. transformer, an electrolytic interrupter, and the electro sending helix. My aerial is 75 feet long, 60 feet high and consists of 8 strands of No. 12 bare copper wire. My receiving set consists of silicon and electrolytic detectors, a fixed and a variable condenser, a double slide tuner and potentiometer.

Granden Station.

HOWARD GRANDEN,
Nebraska.

HONORABLE MENTION.

This is a photo of my wireless station, nearly all of which was built by myself. I have an 80 foot pole with a 4 strand, copper wire antenna 200 feet long. My receiving set consists of the following: Perikon, pyron, galena, and silicon detectors, which are controlled by a 5 point switch, 3,000 ohm Western Electric phones, potentiometer, variable condenser, fixed condenser, and inductance, with double slide tuner. The detectors are mounted upon E. I. Co.'s bases which are very useful for this purpose. The apparatus is all made of quartered oak and mounted upon a quartered oak board with the necessary switches and binding posts.

Ashley Station.

The sending set is made of the following: 1 inch spark coil, Mesco spark gap, Bunnel key, and 80 amp-hour National Storage battery. I am a constant reader of *Modern Electrics* and find it very helpful. My call is M.B.

JOHN ASHLEY,
Massachusetts.

MODEL AEROPLANE CONTESTS.

Flying contests for model aeroplanes are held every Sunday afternoon, weather permitting, at Van Cortlandt Park, under the auspices of the New York Model Aeroplane Club. Full particulars may be obtained from Mr. Edward Durant, c/o The Aeronautical Society, 250 West 54th Street, N. Y. City.

EDISON ON STATUS OF INVENTORS.

In a "New Year" interview printed in the New York Evening Journal, Mr. Thomas A. Edison said, in part:

"The worst thing about 1912 is the number of hoggish men it will have to tolerate—men, I mean, who are so greedy that they'll starve an inventor so hard he can't work. There is no end—absolutely no end—to the things 1912 could produce to make life easier and better and happier. But the inventors can't produce. They're starved down. The men that handle their inventions starve them. That's why the greedy men are the year's worst blight.

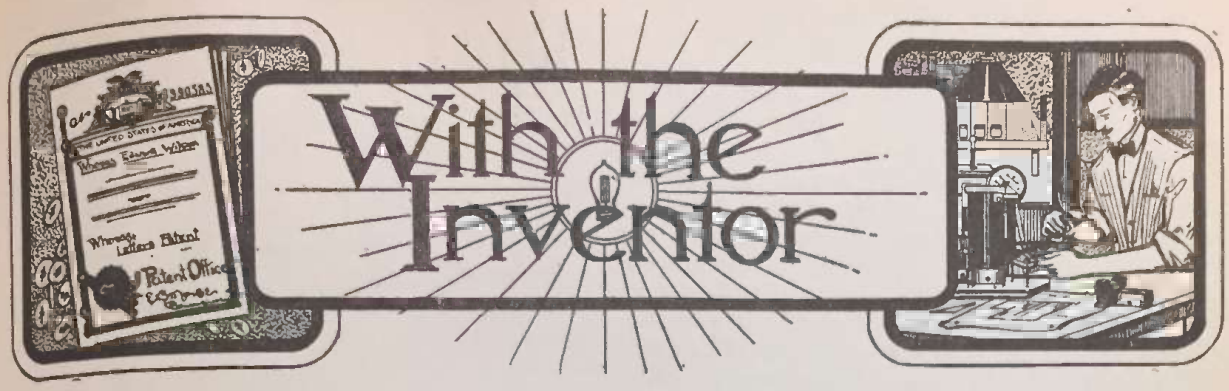
"What should we do this year? Jack up the man who produces—the man who works. That is, support the man and make his job easier. The men whose opinions of 1911 I thought best of were the men who can produce. Jack up that kind of man. That's the year's best message.

WIRELESS TRANSMISSION WITHOUT MASTS.

According to reports from Rome, Italy, Mr. William Marconi has discovered that wireless messages can be sent over desert land without the usual masts. Sand, being a non-conductor, acts as insulation for the wires which are laid on the ground in the direction in which the message is to be sent. Stations without masts can easily be established and maintained without becoming conspicuous to the enemy in time of war.—*Elec. World.*

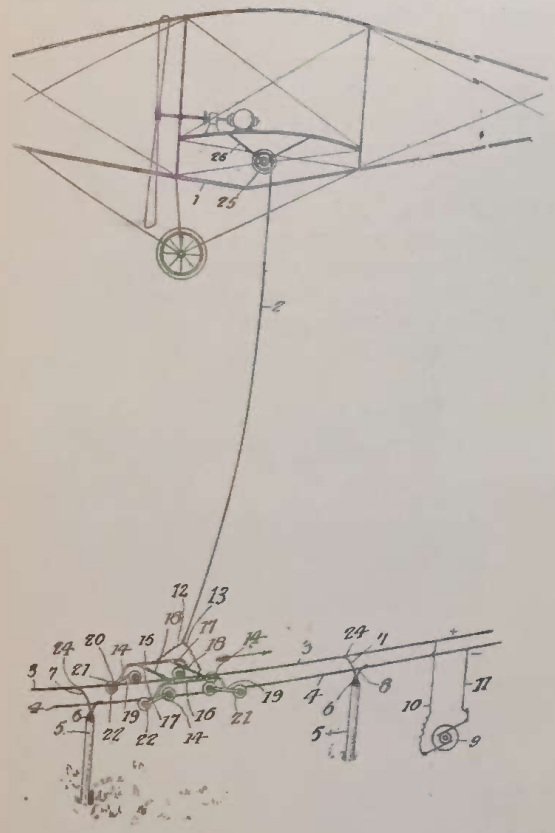
AN ELECTRICAL FAKE.

A man has recently been making the rounds of Southern Indiana reaping a good harvest by selling an attachment to electric-light circuits which, he has represented, will give a saving of 25 per cent. on light bills when installed between the meter and the lights. He collects $15 in advance. His so-called machine is an ordinary 4-in.-deep outlet or junction box with two wires passing straight through, the box being filled with ordinary cement.—*Elec. World.*



PATENT NO. 1,015,196 FOR TRANSMISSION OF ELECTRIC POWER HAS BEEN GRANTED TO THEODORE T. KRYSHTOFOVICH, OF ST. LOUIS,

This invention relates to transmission of electric power to airships. The inventor



uses a double set of trolleys as shown, which are made to run from the electrical highway formed of the cables 3 and 4, to which power is furnished by generator 9. The power is thus transmitted to the cable 2 and acts on the electric motor of the airship.

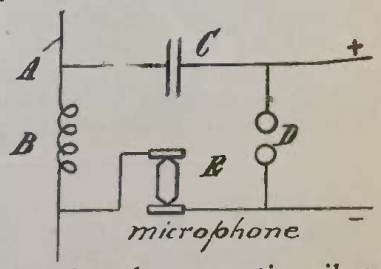
We do not know whether the inventor has tried this arrangement, but we feel almost sure that when he does something will happen. Besides, we do not see what advantages the device has over an ordinary airship, unless Mr. Kryshtofovich thinks he can reduce the weight of his machine by doing away with the gasoline engine and equipments. This, however, does not make much difference as an aeroplane can just as well carry a few hundred pounds more or less without much trouble. There is certainly not any more safety in this aeroplane than in any other and it surely is worse off than any other if the cable should become broken or if the power at 9 fails.

GEORGE SEIBT, OF BERLIN, GERMANY, HAS BEEN GRANTED PATENT NO. 1,012,456 FOR RADIO-TELEPHONY.

This well known authority on wireless secured the following patent on wireless telephony.

While Mr. Seibt's invention at the first glance, does not present anything novel, the theoretical points which he covers are well taken and although the patent is to-day more or less obsolete, inasmuch as it has been in the patent office since 1907, nevertheless, our readers interested in wireless telegraphy should secure a copy of this patent as quite some food for thought will be found in it.

Part of the specification reads as follows:



According to the present invention the variable resistance is brought into such relation to the fixed resistances that the variation of pressure produced by the acoustic vibrations causes a maximum variation of radiated electrical energy. In the case in which the oscillations are produced in the antenna itself or transferred to it by loose coupling from a closed oscillation-circuit, and assuming the microphone to be inserted directly into the oscillation circuit, theory shows that the resistance of the microphone ought to be numerically equal to the other resistances of the antenna, or in other words, that the damping produced by the microphone resistance ought to be the same as the damping produced by the resistance in the antenna itself.

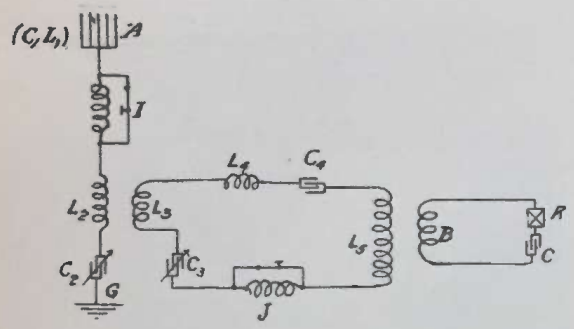
The gist of this invention is to have the Ohmic resistance of the microphone the same as the resistance of the other parts of the system.

PATENT NO. 1,014,002 FOR APPARATUS FOR WIRELESS SIGNALING HAS BEEN GRANTED TO JOHN L. HOGAN, OF BRANT ROCK, MASS.

This invention deals with simplifying the

handling of apparatus of a wireless station, and we quote herewith part of Mr. Hogan's specification:

"Heretofore the associated electrical circuits employed in wireless telegraphy have been independently tuned by varying the tuning elements such as capacity and inductance, in each circuit separately, whereby to give the several associated circuits the same natural electrical period. The necessity of moving several indicating devices and making several adjustments has introduced errors and also has required considerable skill in the user of the instruments. By my invention I avoid this difficulty, and incidentally make it possible to more delicately adjust the apparatus, as well as reduce the liability of error"

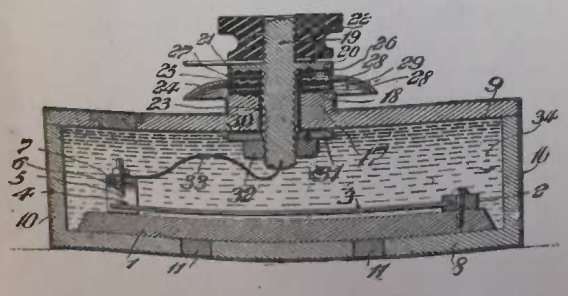


In practice Mr. Hogan constructs the tuning box L2 and L3 and C 2 with leads attached to connect the antenna and ground in circuit with L2 and he uses but a single variable pointer or indicator, that is, the slide of the coil represented by L2. Thus any kind of tuning element may be varied as long as it is common to both circuits.

This patent which is quite interesting should be secured by the wireless students as it covers several unique points.

PATENT NO. 1,013,854, FOR A THERMOSTAT, HAS BEEN GRANTED TO MR. GUNTHER PHILIP WILD, OF PHILADELPHIA, PA.

This invention relates to a thermostat, and the only new feature of this patent is that Mr. Wild uses oil or other hydrocarbon fluid, 34, which, conducting the heat well, assists in acting upon the composite metal thermostat bar 3. If enough heat is

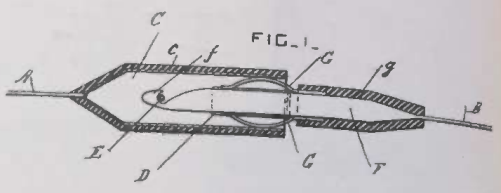


produced, the bar 3 contacts with the screw 6. The oil serves the function to prevent arcing between the contacts, and if an arc should be formed, it is quickly extinguished.

The device is well gotten up and the construction is well carried through.

PATENT NO. 1,013,990 FOR ELECTRIC SWITCH HAS BEEN GRANTED TO JAMES EARL DU VAL, OF BOWIE, TEXAS.

This shows a novel switch presenting some good points.



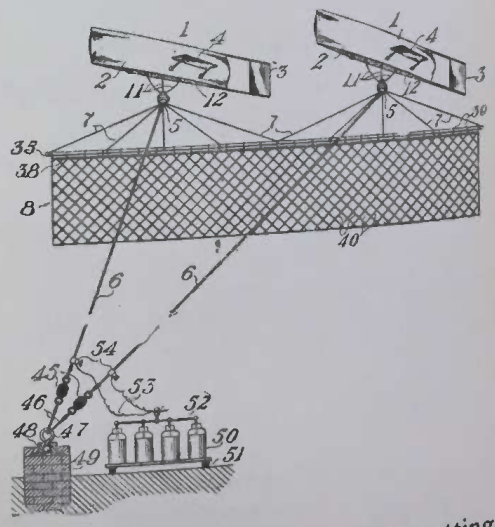
It is in the form of a plug switch which after the part F is pushed in the part C, engages with the pin E. The connection cannot be opened by pulling on the part F, but it is necessary to push it in a little further by giving it a downward movement which disengages F from E.

As this article is neatly gotten up, it certainly should find a good market.

PATENT NO. 1,014,719 FOR APPARATUS FOR COLLECTING ELECTRICAL ENERGY HAS BEEN GRANTED TO WALTER I. PENNOCK, OF PHILADELPHIA, PA.

Wonders never cease!

Mr. Pennock's invention as will be seen, deals with collecting atmospheric electricity which electricity is to be stored in the Leyden jars 50.



Mr. Pennock employs a metal netting 8, which is held suspended by balloons 1 attached to a swivel arrangement 5. In order that the electricity does not rush to the ground whereby a terrible loss would surely be the result, the inventor uses the insulators 45, which check the flow of electricity and force it to trickle down into the jars 50.

There is, of course, no doubt that this thing will work. Now, however, comes the one big question, and that is, what is Mr. Pennock going to do with the static electricity after he captures it? We have no idea what he intends to do with it, and he certainly does not hope to form a new trust by extracting all the electricity from the

air and selling it to the unsuspecting consumer.

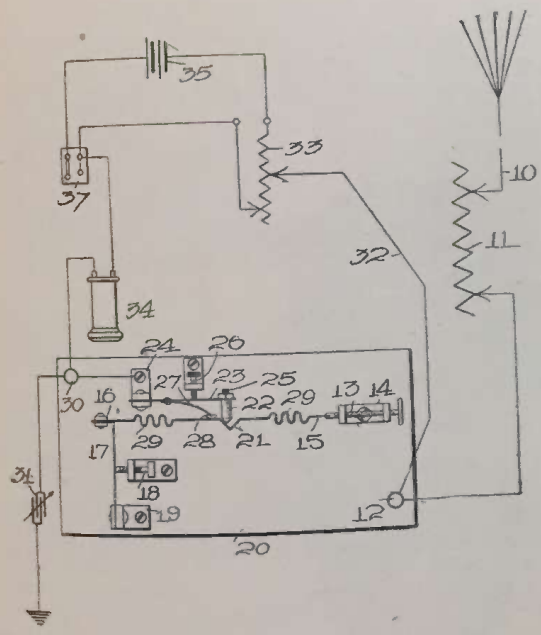
Perhaps this invention is a little premature and there may be some use for it for our future generations.

FREDERICK G. SARGENT, OF WESTFORD, MASS., HAS BEEN GRANTED PATENT NO. 1,013,223 FOR A DETECTOR.

Here is something very new in a wireless detector. Mr. Sargent uses a resilient conductor 15 of iron or steel, and preferably in the form of a flat wire. It is made of this material so as to have a capability of keeping a slight amount of residual magnetism.

Careful adjustment can be made by means of screws 13, 18 and 26. No exterior magnetic field is used.

Mr Sargent claims that when electromagnetic waves strike the wire 15 this is



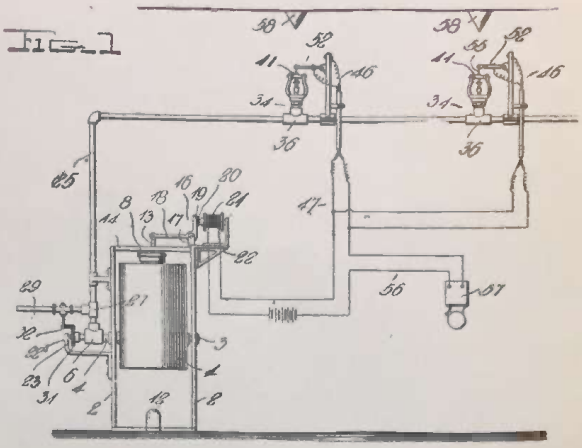
made to vibrate longitudinally, thus contacting with the part 22 which has a conical point and engages with the off-set portion 21 of the conductor 15.

The detecting contact member 22 may be made of carbon, carborundum, zincite, steel, iron, silicon, or other material. While in the illustration is shown a battery and potentiometer, Mr. Sargent claims that his device is so sensitive that it does not require a battery at all.

PATENT NO. 1,012,913, FOR AUTOMATIC ELECTRICAL FIRE EXTINGUISHERS, HAS BEEN GRANTED TO STEPHEN B. PRIEST, OF WASHINGTON D. C.

This invention deals with automatic electrical fire extinguishers and presents some novel ideas.

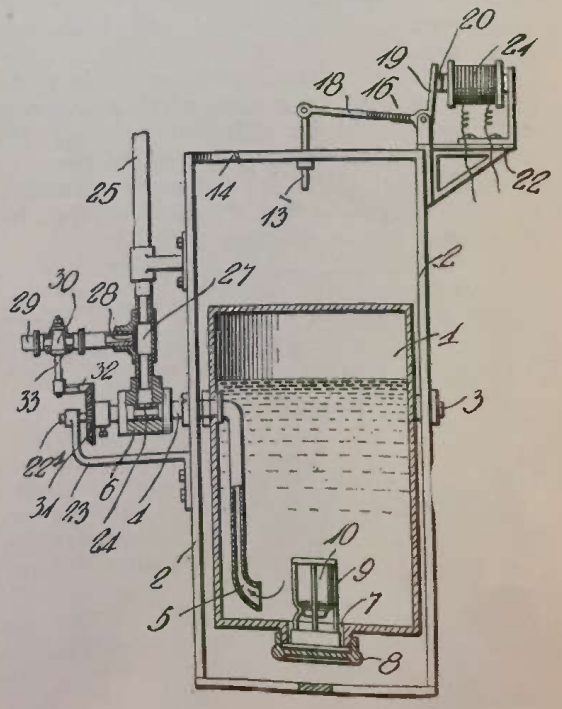
If fire should break out near the valves 36, the fusible bar 41, will be made to melt and the bar 52 is made to fall down, acting on the line 47. The valve 34 is thus opened and is ready for action. At the same instant, however, the electromagnet 21, is operated which pulls the lever 18 up. This disengages the tank 1, which is pivoted at 3, and the tank is turned up-side-down immediately. The chemicals in the tank act



instantaneously and discharge through the tube 25, as shown in Fig. 2.

The chemicals under pressure are forced out through the tube 25, and rush out through the valve 36 extinguishing the fire that has started around that valve or near by. At the same moment, however, while the tank had revolved, it opened another valve 30, of the common water supply, which now also rushes through tube 25 after the pressure of the water has opened the valve 28. Thus if the chemicals of the fire extinguisher were not able to quite extinguish the fire, the water from the water-mains will follow up the work.

This invention is quite ingenious and several novel points have been covered. It has only one fault and that is, it seems to us a little complicated and has too many parts that seem to us liable of getting out



of order. However, we have no doubt that the inventor will overcome these defects without much trouble.

PATENT NO. 1,013,465, HAS BEEN GRANTED EDWARD VAN WAGENEN, OF NEW YORK, N. Y., FOR A BATTERY-CHARGE INDICATOR.

This invention deals with an indicator for storage batteries, and has some very novel points.

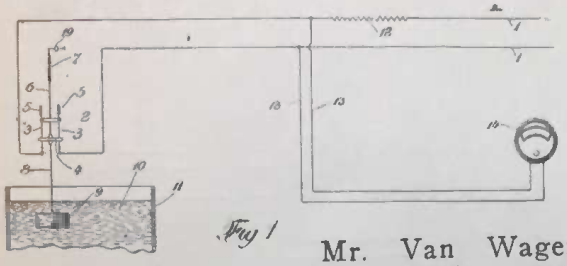


Fig 1

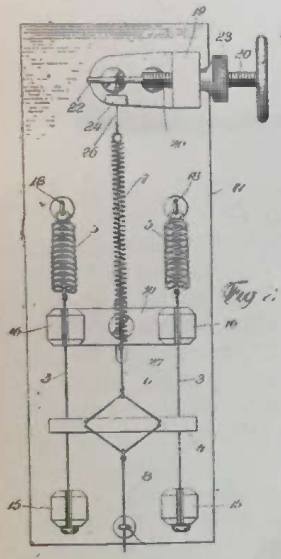


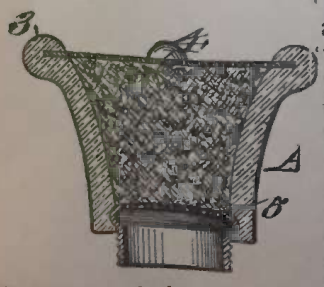
Fig 2

Mr. Van Wagenen uses a hydrometer 9, which floats in the solution of the storage battery electrolyte 10. As the battery is charged the hydrometer 9 rises, and moves up the rod 8, which is held by a spring 7. The rod 8 also moves a metal connection piece 4, which slides on the resistance wires 3, 3. Thus any variation of the slider 4 will naturally make a difference in potential and this difference will be recorded in the recording voltmeter 14. Inasmuch as this voltmeter traces a complete record for each hour of the day, one can easily ascertain just how smoothly the charge of the storage battery proceeded.

Mr. Van Wagenen uses his indicator mostly to show the condition of a battery at a distance. This point his invention covers largely.

Looking over this invention it has occurred to us that by means of this arrangement one should be able to cut off the charging current automatically at the end of the charge. We do not know whether Mr. Van Wagenen has thought of this but it occurred to us as very feasible.

MR. IRVING S. ROSENBLATT, OF SAN FRANCISCO, CAL., HAS BEEN GRANTED PATENT NO. 1,012,919, FOR AN ANTISEPTIC TELEPHONE-MOUTHPIECE.



This shows another antiseptic telephone mouthpiece, and is one of those inventions that should better not be made. The proof of it is that no inventor has ever made any money out of an antiseptic telephone mouthpiece. It seems to us that the ordinary glass mouthpiece as used now, is about the ideal thing inasmuch as it shows the dirt and dust very prominently and can be washed off with but little trouble.

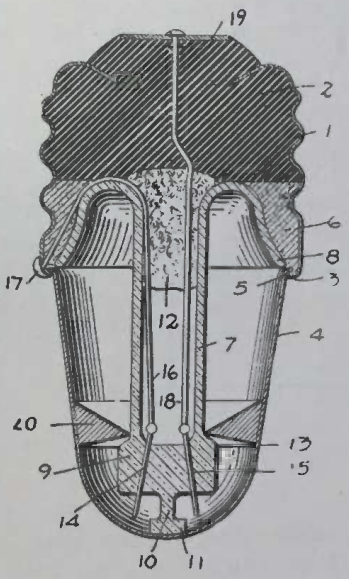
The antiseptic idea has long been given up as nobody was ever able to prove that anyone ever was infected from a telephone mouthpiece.

Mr. Rosenblatt in his specification says that the absorbent material which he uses in his mouthpiece, may be saturated from time to time with suitable antiseptic, and he advises the use of cotton as an absorbent.

Has Mr. Rosenblatt ever tried to use his telephone mouthpiece with cotton, saturated with antiseptic on a long distance line? We think he will find that the other party will hardly be able to understand him.

Cotton happens to be one of the best sound insulators and for this reason it should not be used. Any other loosely packed material in a telephone mouthpiece acts in the same manner.

MR. WM. GEORGE ASMUS, OF CLEVELAND, OHIO, HAS BEEN GRANTED PATENT NO. 1,015,119 FOR THERMOSTATIC CIRCUIT CLOSER.



This invention is another thermostatic arrangement and while it does not present anything absolutely new, its form is well gotten up and it will surely find its way into the market as it is useful, neat and compact.

The apparatus can be screwed into an ordinary Edison socket, making it very handy to use, at the same time taking up very little room.

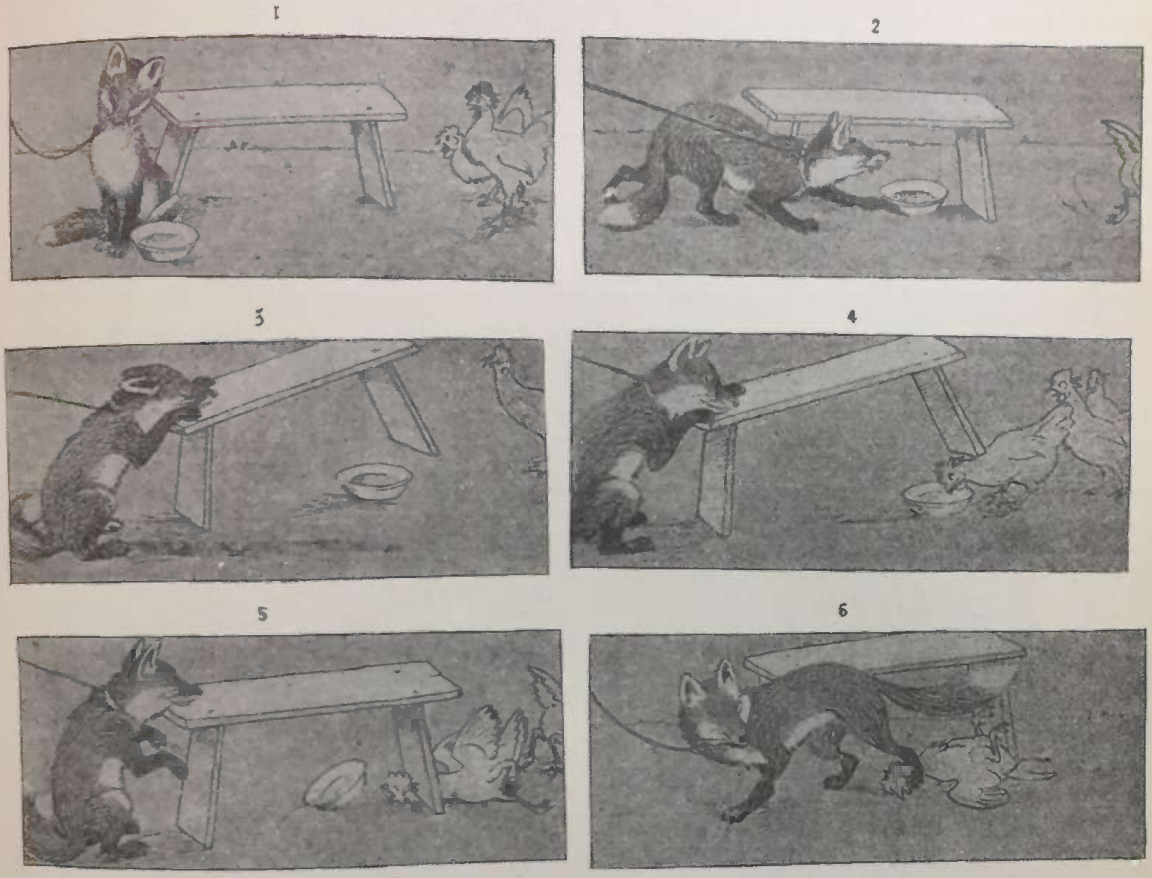
Mr. Asmus thinks that he can even use the sockets of broken lamp brackets for the construction of his thermostat.

The conical ring 20 is made of fusible material preferably soft solder, while 4 is the metal enclosure. The wires 14 and 15 normally do not make contact. As soon as sufficient heat is directed against the apparatus, the ring 20 will melt and the solder will fall down, thereby short circuiting the wires 14 and 15 which operate the necessary devices.

Considerable interest has been centered on the report of Mr. John Ericson, city engineer of Chicago, relative to the electrolysis of underground cables and pipes. Gas and water pipes were found to be affected most. On one particular 36 inch water main, the pits due to electrolysis were ¼ inch or more deep. In one case it was found that 30 amp. was flowing in a 24 inch water-main, and in other, 143 amp. in a 36 inch water-main.

Flying Sparks

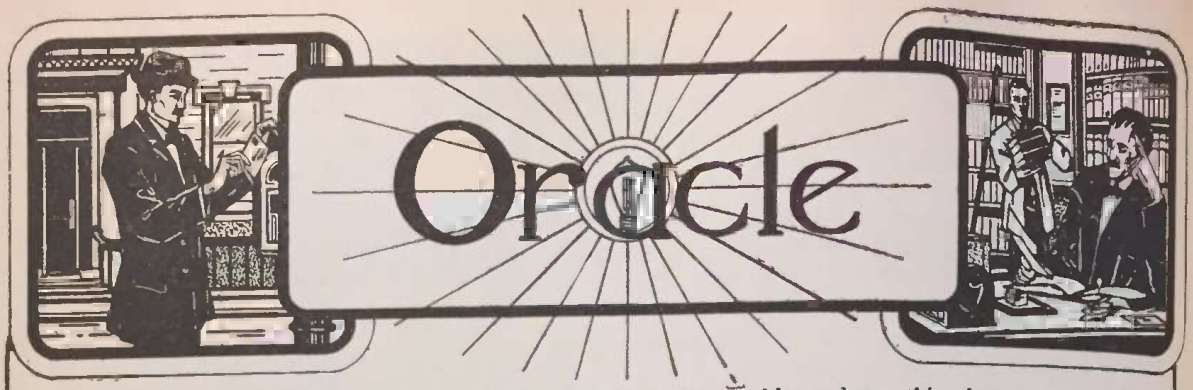
THE SLY FOX.



A foxy story without words. —*Meggendorfer Blaetter.*

AUTOMOBILING IN AFRICA

And how to catch autos. —*Fliegende Blaetter*



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

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

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

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

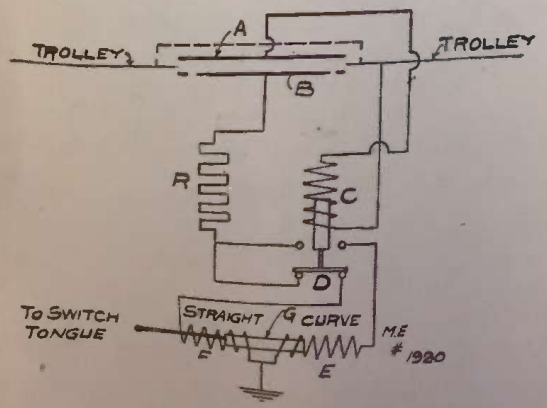
NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT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

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

ELECTRIC SWITCH.

(1920.) Walter Belstad, Washington, asks how an electric switch works.

A. Wiring diagram of one form of electric track switch is given below. A and B are two metal strips insulated from the trolley, but installed so that the trolley wheel will touch both of them. When a car approaches the switch and the motorman wishes to go straight ahead he allows the car to coast while passing under the contact pieces A and B. When the wheel connects A and B, current passes from the trolley through solenoid C to contact A, through wheel to B, thence through resistance R, the lower contacts on which disc D rests, disc D, and solenoid F, to ground. This moves the plunger G to the left and sets the switch for the straight track. Should the motorman wish to take the curve he leaves the power on while passing under A and B. In this case the current drawn from A through the solenoid C is sufficient



to raise its plunger and the disc D into connection with the upper contacts. Current from B then flows through the resistance R disc D and upper contacts, and solenoid E to ground, moving plunger G to right and setting switch for the curve.

There is another form, in which, if the motorman finds the switch correctly set for him he coasts under A and B, no matter which way he wishes to go; and leaves power on if the switch is set wrong. The mechanism of this type is similar to that described above.

ELECTRICAL BLASTING.

(1921.) Arthur Logan, Colo., asks:

Q. 1.—Kindly give a description of the operation of electric blasting.

A. 1.—Two methods are in use at present, one being the hot wire blasting, and the other, the electric spark blasting. The former consists of a very fine piece of iron wire or other high resistance metal wire, connected across two copper wires. This is mounted in a metal cap containing the fulminating mercury preparation, which is far more explosive than dynamite and is the material used in percussion caps of cartridges. The current is supplied by an "exploder" which consists of a box containing a magneto which is driven by a plunger. The handle is given a rapid downward push, which makes contact and allows the current from the magneto to pass over the two wires to the hot wire fuse in the blasting hole. The red-hot wire causes the fulminate of mercury to explode with terrific violence which in turn explodes the surrounding dynamite charge by concussion. The other method consists of a small spark gap enclosed in a similar manner as the previous system. This gap is supplied from a small spark coil with the current. It is not as practical as the former method which is being used universally at present.

Q. 2.—Is it practical to refine gold by means of the electric current?

A. 2.—We presume that you mean by electro-chemical means. In the U. S. Assay office in New York there is an interesting exhibit on the refining of gold by means of electro-plating. The gold obtained is as pure as can be obtained by any known process. However, the expense of this method makes it prohibitive to use except where cheap water power which may be converted into electricity is at hand. The usual method of treating the slag with heat is still the best method and most economical known, for commercial work.

INSULATORS IN GUY WIRES.

(1922.) Clyde Hudson, Oregon, writes:

Q. 1.—Please explain why and how aerial guy wires should be insulated; and if they should be as well insulated for receiving only, as for sending.

A. 1.—Uninsulated guy wires absorb energy from the Hertzian waves, and detract from the amount received by your aerial. Breaking the guys up into short lengths by means of insulators prevents this to a great extent. Guys should be insulated whether aerial is for receiving or sending.

Q. 2.—How much farther can one receive by using two 1000 ohm receivers than with two pony 75 ohm single pole receivers?

A. 2.—You should be able to cover several times as great a distance with the better phones; but as explained before in this column the range depends on many other things besides the resistance of the receivers.

Q. 3.—How much farther can one receive with an aerial 70 feet high at both ends and 80 feet long, than with one 70 feet at one end and 50 feet at the other?

A. 3.—The first named aerial should work a little better than the other; but not much.

COMPARATIVE RESISTANCE OF COPPER AND HUMAN BODY.

(1923.) George Oswald, New York, writes:

There was a certain lady telephoning one evening and while she was doing this, I took a telephone receiver and placed one of the wires leading from the receiver to one of the posts of the lightning arrester and took the other wire and held it between my thumb and forefinger and then touched the other post of the arrester with one of my fingers of the same hand and I could hear almost as good as if I took the regular wire and touched the arrester with it. How much of a better conductor of electricity is copper than the human body?

A. The explanation of this is that the resistance between two fingers of the same hand is only a few hundred ohms and made little difference in the loudness of the words heard in the receiver. The resistance between a finger on one hand and the corresponding finger on the other hand is about 5000 ohms, while the resistance of a similar

length of No. 40 B. & S. copper wire is only 5 or 6 ohms.

SENDING CONDENSER.

(1924.) Lester E. Lighton, Pennsylvania, asks:

Q. 1.—How many square inches of tinfoil are needed in Leyden jars for a ¼ K.W. transformer? Does this foil have to be on a certain number of jars?

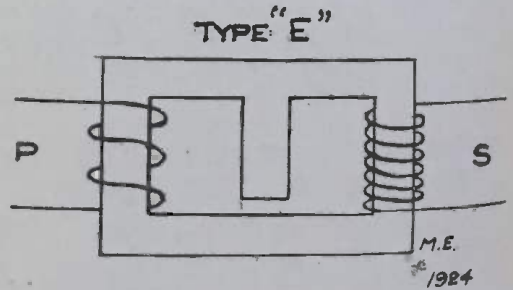
A. 1.—This will depend on the thickness of the jars, the secondary voltage of the transformer, the length of the spark gap, and the number of sparks per second. For 60 cycle operation, about 1440 square inches of glass should be covered on both sides. This is for two jars in series. As these jars will be rather large the condenser may be divided into sets of smaller jars connected in series multiple. (Two groups in series.)

Q. 2.—How may I tell if my head phones are wound to 1000 ohms? The number of ohms is not stamped on them.

A. 2.—The only sure method is to measure the resistance with a wheatstone bridge. A rough test may be made by connecting them in series with a set of phones known to be of 1000 ohms resistance. If the sound in each set is equally loud the two sets will have about the same resistance.

Q. 3.—What is the difference between the type E transformer and other transformers advertised for $40 and $50 per K.W.? Can you give me a diagram of their construction?

A. 3.—The difference lies chiefly in the iron core. In the type E transformer the core is of the shape shown below. The others are plain closed core transformers or else have odd shaped cores designed to give the characteristics of the type E.



WAVE LENGTH FORMULA.

(1925.) Harold Sachs asks:

Q. 1.—How far can I receive with a single slide tuner, etc.?

A. 1.—Nix, Harold, we have given up guessing things like that. See notice in the August issue.

Q. 2.—What is the wave length of same station in meters?

A. 2.—We don't know. We cannot calculate it from the data given.

Q. 3.—What is the formula for finding same?

A. 3.—The wave length in meters, of any circuit containing inductance and capacity, in series, is $3 \times 10^8 \times 4 (LC)^{0.5}$ wherein L is the total inductance in henrys and C is the total capacity in farads.

OZONE.

(1926.) Raymond Stevens, Indiana, asks:

Q. 1.—What size fuses should be used with a 6 volt 60 ampere-hour storage battery?

A. 1.—Use 10 ampere fuses.

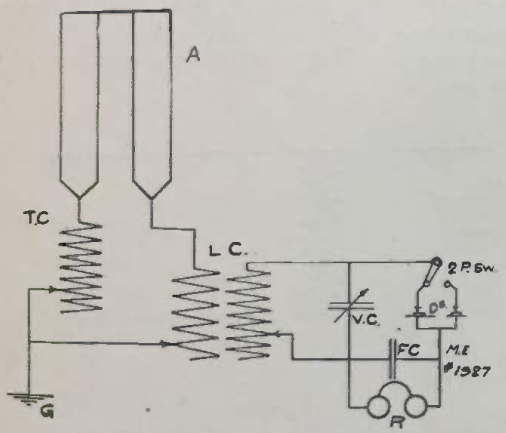
Q. 2.—How does "Ozone" generate from a spark?

A. 2.—Ordinarily, oxygen molecules are made up of 2 atoms each. Under the influence of a spark or a high potential brush discharge, the molecules break up and the atoms re-combine into molecules of 3 atoms each, these latter molecules being Ozone. Just why this happens, we don't know. There are very few who do know, we think.

RECEIVING HOOK-UP.

(1927.) C. Chester Stephen asks for a hook-up for the following: Loose coupler, tuning coil, fixed condenser, Murdock rotary variable, pair of 2000 ohm phones, 2 detectors, silicon and carborundum, and a 2 point switch.

This is the diagram:



GLASS DETECTOR CUP.

(1928.) Robert F. Adams, Texas, asks:

Q. Where can I obtain a glass cup with a platinum wire fused in same, to be used for holding the electrolyte for an electrolytic detector, as I find a graphite-carbon cup very troublesome on account of the acid solution "sweating" through same.

A. We do not know where you may obtain it. Any good glass blower could make it for you or you might try cutting the lower part off a small pill vial and dipping a platinum wire into the solution in the cup so formed.

TRANSFORMER DATA.

(1929.) Lloyd Garey, Michigan, writes:

Q. 1.—Please give data for a ½ K.W. transformer, number of pies, etc.

A. 1.—Core: rectangle 7 inches by 14 inches O.D., cross section 1.4 inches square. Insulation on core: ¼ inch empire cloth. Primary winding: 480 turns No. 13 B. & S. D.C.C. in 4 layers (about 6 pounds). Secondary winding: 25 pies ¼ inch thick 2092 turns each No. 34 B. & S. D.C.C. (about 8 pounds).

Q. 2.—Can the Marconi station "M.C.C." vary the direction in sending?

A. 2.—Not in so far as we know.

Q. 3.—What is the solution used in an electrolytic detector?

A. 3.—Chemically pure nitric or sulphuric acid one part, distilled water 4 parts.

RHEOSTAT MATERIAL.

(1930.) Jay J. Jackowski, Kansas, asks:

Q. 1.—What is used for resistance in a regular switchboard rheostat. I took one apart and it looks like carbon. Where can I get material for making a rheostat (no liquids).

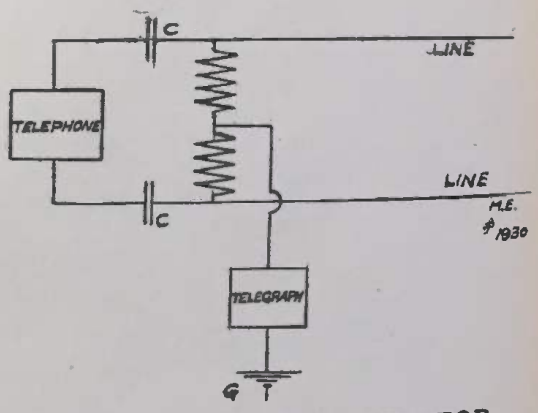
A. 1.—Usually some form of resistance wire or tape is used. German silver makes a good rheostat and can be bought at almost any electrical supply house.

Q. 2.—Please tell me in what issue there was a rectifier and directions how to make one. I want a rectifier to change 110 volts A.C. to D.C. It must carry about 5 amperes.

A. 2.—In the January, 1911, issue you will find such a rectifier described on page 582.

Q. 3.—I wish to telephone and telegraph over a wire at the same time. Is there a way that I could do both and not have ne interfere with the other?

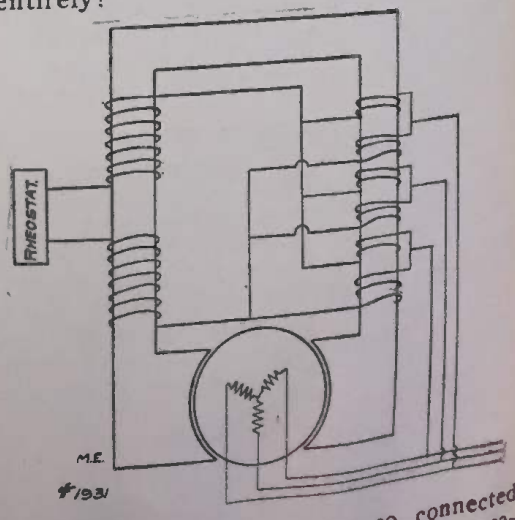
A. 3.—Yes, it can be done. Try this scheme. The sizes of the condensers and inductance coils will have to be found by experiment. Diagram shows one end of the line only.



THREE PHASE GENERATOR.

(1931.) A. R. Coleman, Virginia, writes:

Q. 1.—If a three phase dynamo had its field wound as shown would it pick up when the resistance of the rheostat was cut out entirely?



A. 1.—No. A generator so connected would not excite its own fields, for the reason that the algebraic sum of the voltages in the three phases of a three phase circuit

is always zero. Hence there would no current to excite the fields.

Q. 2.—I am located on the west side of a high hill. Close to my house are two pine trees about 50 feet apart their base above my desk, will carry an aerial about 40 feet high. I want a loose coupled receiving apparatus strong enough to pick up wireless stations at Washington and ships in Chesapeake Bay. I am a Morse code operator on ——— Ry. What code must I learn and about what will receiving set cost?

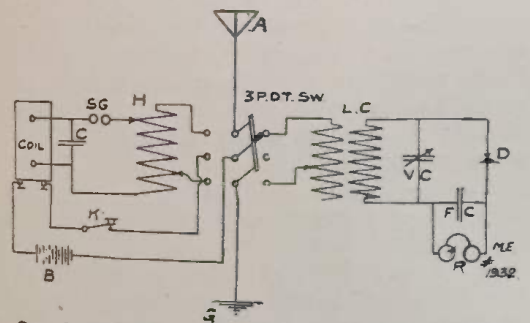
A. 2.—Your Morse will suffice for most stations and ships in your vicinity. The government stations usually use Continental, which is very similar to Morse. A good receiving set should cost about $25.

HOOK-UP AND TUNER DATA.

(1932.) Richard Brooke, Missouri, writes:

Q. 1.—Please give hook-up for the following wireless instruments: Single slide loose coupler, silicon detector, junior fixed condenser, head phones, antenna switch, 1 inch spark coil, condensers for primary and secondary, helix, spark gap and key?

A. 1.—Here is your hook-up.



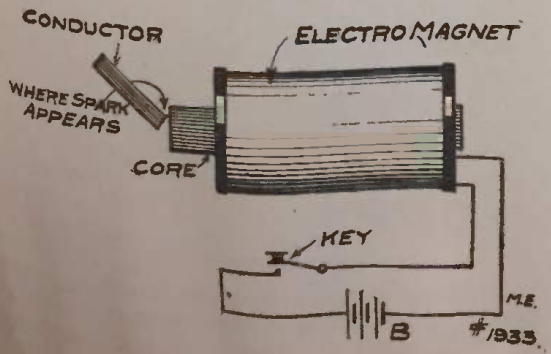
Q. 2.—Please give dimensions and size of wire for a small tuning coil.

A. 2.—Core 3 inches diameter, 6 inches long. Winding 1 layer No. 22 or No. 24 enameled wire.

MAGNETIC FREAK.

(1933.) Otto Atchison, California, says: Some time ago, while experimenting with electro-magnets I noticed, upon opening the circuit through a certain electro-magnet and a set of dry cells, that a spark could be seen to jump from the core of the magnet to any metallic conductor, which was brought close to the core. I think that the reason for this is that I had just the right combination of resistance and inductance in my circuit. The current which accompanied the spark was sufficient to affect a sensitive telephone receiver.

Maybe you are right Otto, this is too much for us.



PECULIAR PHENOMENON.

(1934.) W. J. Vincent, New York, writes:

One cold frosty morning this winter I noticed a peculiar phenomenon for which I cannot account nor have I been able to find anything on the matter. It was about 7.30 A. M., and the sun was just rising. Two telephone wires stretched across the street near my residence were vibrating quite rapidly, but, seeing no linemen at work on the line I thought it must be a peculiar optical illusion. On closer inspection, however, I found that they were actually vibrating with an up and down motion. I observed this strange action for several minutes, the wires continuing to oscillate with undiminished vigor. Perhaps some of your readers have observed a similar phenomenon and can offer an explanation.

Has anyone else noticed anything like this? We never have, nor can we explain it.

CHOICE OF AERIALS.

(1935.) Edward Eichstaedt, Connecticut, writes:

Q. 1.—My wireless receiving station is situated in a hollow. The aerial is 30 feet high, which is just about enough to bring it on a level with the hills on either side. Would I get better results if my station were up on the hill?

A. 1.—Yes.

Q. 2.—In my case is a slanting or horizontal aerial better.

A. 2.—If both are the same height use the horizontal, but if you can put up a higher slanting aerial than you can one of the horizontal type, the slanting one is preferable.

Q. 3.—Does the length of the lead in make any difference.

A. 3.—Yes. The length of the lead in affects the wave length of the aerial.

SINGING TELEPHONE.

(1936.) Jesse Rich, Illinois, asks:

Q. 1.—Do automobile concerns use a coil or transformer in the circuit when a dynamo is used to furnish light and power for spark, or do they use the voltage direct from the dynamo for light and spark?

A. 1.—Some use a coil and the jump spark; while others use a make and break spark without any coil.

Q. 2.—What makes a singing noise in a phone when the receiver is put in front of the transmitter?

A. 2.—When the receiver and transmitter are in this position, any sound that disturbs the diaphragm of the transmitter is communicated, electrically, to the receiver diaphragm, and the sound produced by the latter again jars the transmitter diaphragm. Each acts as a repeater to the other. Hence the singing noise, the pitch of which depends on the natural periods of vibration of the diaphragms, the electrical constants of the circuit, etc.

OPEN CORE TRANSFORMER.

(1937.) Arthur Harris, Missouri, wants data for a half K.W. open core transformer.

Here you are Arthur: Core 11 inches

long by 1¼ inches diameter of soft iron wire. Primary winding 2 layers No. 14 D.C.C. wire. Secondary winding 26 pies ¼ inch thick, of No. 34 S.S.C. wire (about 8 pounds). Hard rubber tube ¼ inch thick separates primary and secondary windings. This transformer is for use on 110 volt 60 cycle current.

SPARK COIL DATA.

(1938.) Everett W. Davis, Illinois, asks:

Q. 1.—Will I obtain a 3 inch spark from the following coil, and if not how may I change things so that I will? Core 1½ inches by 12 inches of soft iron. Primary of 2 layers of No. 16 D.C.C. wire and secondary 5 pounds of No. 30 S.C.C. wound in 20 sections ¼ inch thick with heavy fibre tubing 3-16 of an inch thick.

A. 1.—No. Core O.K. Primary No. 14. Secondary 8 pounds of No. 32 S.S.C. (30 per cent. more if S.C.C.). Tube ¼ inch thick.

Q. 2.—How should I connect the pies of this spark coil to obtain the best results?

A. 2.—Connect them all in series. Top to top and bottom to bottom.

Q. 3.—What sized primary condenser should be used with this spark coil?

A. 3.—180 sheets tinfoil 7 inches by 9 inches. Paraffined paper insulation.

WAVE LENGTH.

(1939.) Ralph Miller, Iowa, asks:

Q. 1.—Does wave length depend only upon the length of the aerial and the height above the intruments or does the distance between wires or any other factor help to determine wave length.

A. 1.—All these and still others affect the wave length.

Q. 2.—If two aerials are the same in height, length and in every other way, does a tuner make signals between these aerials more distinct?

A. 2.—Theoretically, no; but on account of differences in local conditions at the two aerials, a tuner would improve the operation. For a small tuner wind 1 layer of No. 22 or No. 24 enameled wire on a core 3 inches diameter by 7 inches long.

Q. 3.—Is it all right to use No. 8 iron wire to lead from the sending instruments to ground, or should copper wire be used when sending between stations less than a mile apart?

A. 3.—Iron might be good enough in this case, but copper would be much better.

A CORRECTION.

In No. 1077 it was stated, in answer to Mr. Edwin Meyer's inqiury, that three 3-terminal, automobile spark coils might be connected with their primaries and their secondaries both in series, and used for wireless work with an electrolytic interrupter.

Mr. Henry L. Hoepner calls our attention to the fact that no matter whether the primaries are connected in series or in parallel, two of the coils will always be short circuited.

We cheerfully acknowledge the mistake, and thank him for bringing it to our notice.

Advice on Patents

HYDROTHERMOMETER SYRINGE.

(14.) Mr. F. J. Suchanek, of New York, sends us a drawing of a new device which he calls the "Hydrothermometer Syringe." He wishes to know if the idea is patentable.

A.—To our mind the idea is good and he should not have any trouble to secure a patent. There is a demand for such an instrument and while we cannot tell whether there will be a big demand, we think that there ought to be a good field in the storage battery business and perhaps also for owners of storage batteries.

TELEPHONE RECEIVER.

(15.) W. Scott Libbey, Jr., of Maine, writes:

"As I understand, the difficulty of making telephone receivers of two poles, lies in getting a large number of ampere turns, all turns well inside the flux of the magnet, and still have a sufficient low resistance. I enclose drawing herewith showing six magnets arranged in a circle and I would like to know whether such a device would be more sensitive and better than the ordinary two pole kind."

A.—We publish your idea for the reason that we do not think it practical. In fact, the same plan has been tried by Alexander Graham Bell a quarter of a century ago. The magnetic poles must always be as near the center of the telephone diaphragm as possible. As soon as you put the magnets near the edge of the diaphragm the action will be greatly reduced.

We advise you not to attempt to patent this, as even if you could get a patent, which is doubtful, the device would be useless.

WIRELESS TELEPHONE.

(16.) A. R. Coleman, of Virginia, writes: "Please advise if the method shown in sketch is a correct solution of your problem given on page 13, 'The Wireless Telephone,' second edition. Is the idea new, practical and patentable?"

A.—After carefully looking over your drawing we do not think that you have found the "Missing Link" as yet.

The idea which you show is practically nothing but a quenched spark gap connection, with some tuning coil, and we have no hesitancy in saying that the thing will not work. We do not think that it would do you any good to apply for a patent on this.

NEW SPARK COIL.

(17.) Edward Worth, of New York, writes:

"It is with some hesitancy that I seek your service in a matter which I think is out of your line. I hope you will not take it amiss if I ask your advice concerning an invention I have made. I am a reader of *Modern Electrics*. Briefly then:

I have an important invention on the in-

duction coil. It is a radical departure in the construction of one of the coils essential parts. Because of the lack of place and means I have been unable to make exhaustive experimenting to place its true value. So far as I have gone I have got surprising results that warrant me in saying that it may be possible to increase the efficiency of the coil not a little. Besides the simplicity of its construction is a thing that might recommend its general use. Incidentally it gives a new and true explanation of the action of the induction coil. My purpose in writing you is to ask what I might do in the case—whom could I interest and what steps should I take. I will be much indebted to you for what advice you may give."

A. We would say that from your description we cannot tell whether the thing is any good or not. If you can give us any more particulars, we shall be pleased to go further into the matter and give you as honest advice as we can. We are sorry to inform you that we cannot give you any other advice, nor do we know where you could go with your invention before you have it patented, which would be a very poor idea anyway.

If you go to some manufacturer and explain to him, you always stand a chance that he will appropriate the idea himself and you will be the loser. You either will have to give us more information, or if you do not care to do so, you had better get in touch with a patent attorney.

SAFETY FASTENER.

(18.) Abner B. Shaw, of Massachusetts, has sent us a sketch and a sample of a new article of manufacture which is a safety fastener for scarf pins.

On account of the unique feature and the novelty of the device we do not wish to go further into the matter as we consider the idea too good to publish before it has been patented and we would advise Mr. Shaw to apply for patent on it by all means.

This is one of these little articles that will probably sell like wildfire, and can be manufactured for practically nothing, and can sell from anywhere from $.02 to $.10 apiece. If the article is made we would advise to make it out of phosphor bronze for the ones to sell at low price, and gold or silver material for the more expensive kind.

If such an article is marketed right and well advertised, it should prove a success.

ELECTRIC LIGHTER.

(19.) W. Neuman, of Newark, sends us a drawing of an electric watch lighter and after looking it over we find that there is absolutely nothing novel in this. In fact, a similar article is on the market now, made by a New York concern.

We would advise you not to apply for a patent on this particular article as you would probably not secure a patent on same.

RECTIFIER HOOK-UP.

(20.) A. R. Coleman, of Virginia, sends us a drawing and descripition of a hook-up to

get constant voltage and variable direct current from an alternator or the alternating side of a rotary transformer.

Its purpose is: 1st—To charge storage batteries with an alternator driven by wind power.

2nd—To use the energy of electric automobiles and storage battery street cars when coasting to recharge their batteries instead of wasting it on the brakes.

Please advise if this idea is original, practical, valuable and patentable.

A. In answer to same we would say that the idea is not original, not practical nor valuable. We would say that you probably could get a patent on this, but have no hesitancy in saying that it probably would not be a success as far as the financial end goes.

GALENA DETECTOR.

(21.) W. H. Roberts, of San Francisco, writes:

"Enclosed you will find description of a galena detector. I have used it successfully and I find that it is almost as sensitive as an electrolytic detector. I would like to know if there is any detector like it on the market and if not, is it patentable? Can I sell it without getting a patent?

A. We have carefully looked into the drawing and description, but failed to find anything novel or even original in same. This idea has been used dozens of times; in fact, very similar detectors have been described in *Modern Electrics* right along.

As far as patenting any detector of this kind goes, we would refer you to answer No. 12, page 731, January issue.

Will Mr. Rudolph Harris of whose wireless station a description appeared in the October, 1911, issue, please send in his correct address.

"The De Kalb Radio-Transmission Club," was formed on December 17th, 1911, for the purpose of promoting wireless telegraphy in De Kalb and vicinity. Applications for membership are open to all in a radius of ten miles from De Kalb, applications to be addressed to the president, Bayard Clark, Augusta avenue, De Kalb, Ill.. or to the vice-president, Bruce Sundberg, 304 S. 4th street, De Kalb, Ill.

NOTE.—In the Advertisement of C. Brandes, Inc., on page 733 of the January issue, the price of the Navy Receivers was shown as $13.50. This was incorrect. The proper price is **$13.00**—(Pubs.).

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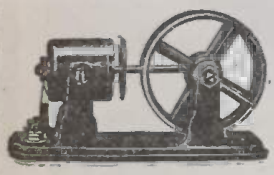

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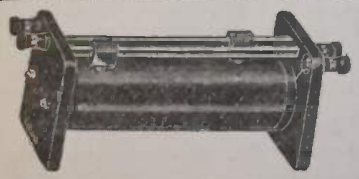

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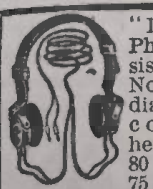

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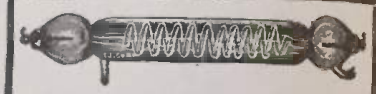

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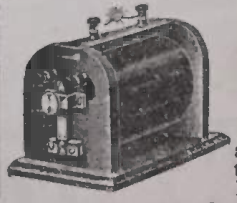

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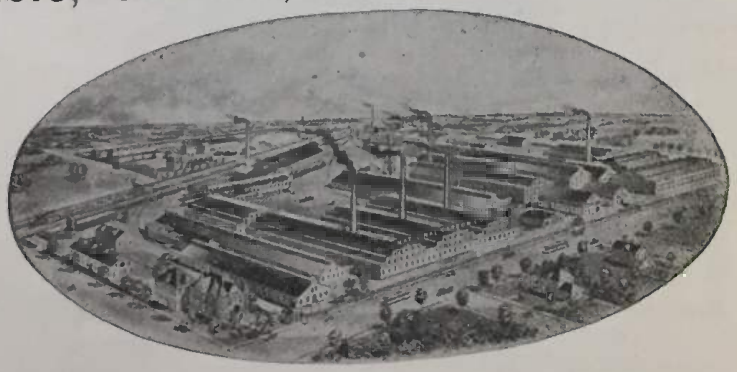

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