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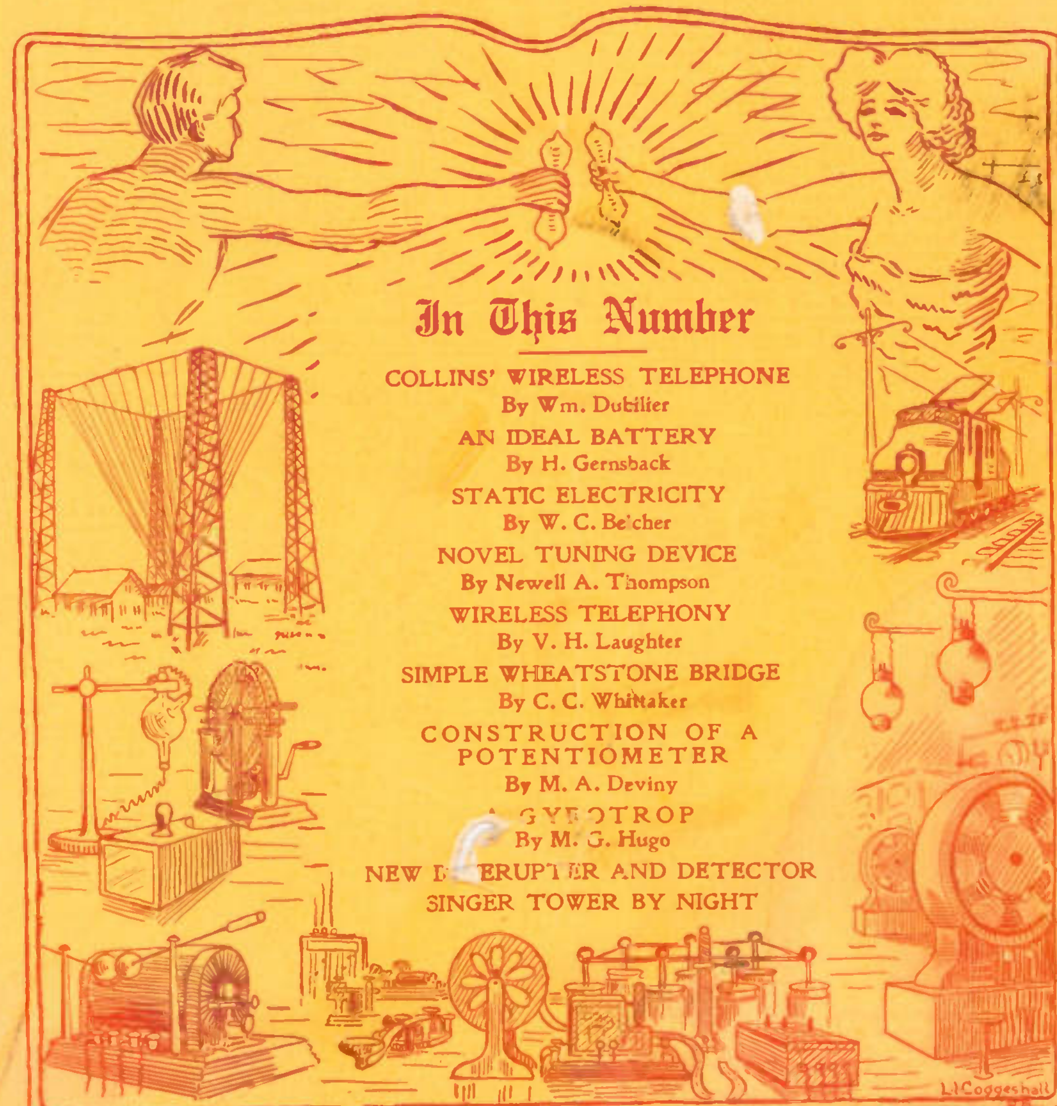

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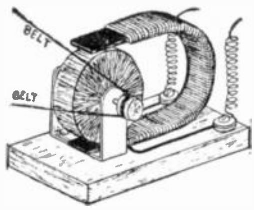

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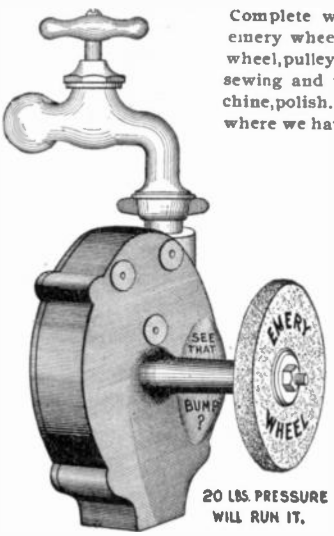

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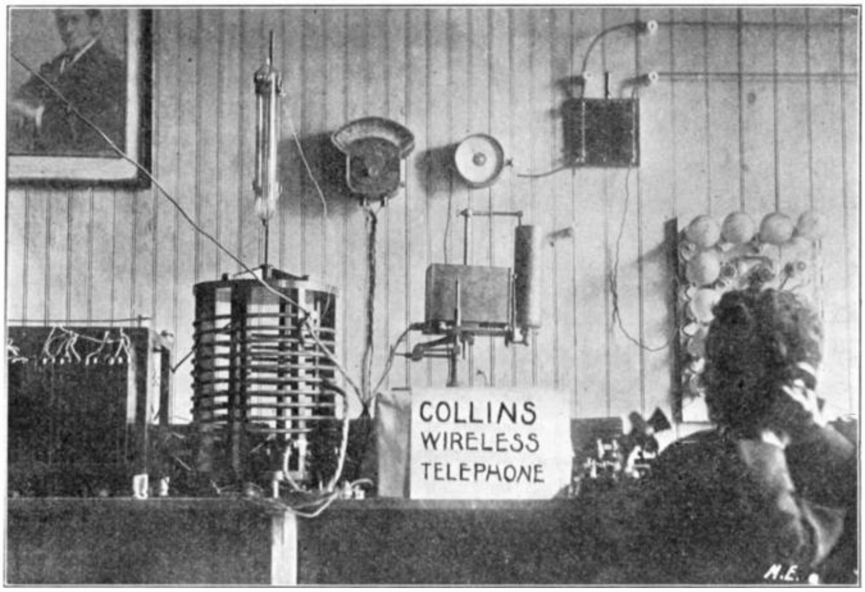
MODERN ELECTRICS

Vol. I. AUGUST, 1908. No. 5.

The Collins Wireless Telephone.

By William Dubilier,

Assistant to Mr. Collins.



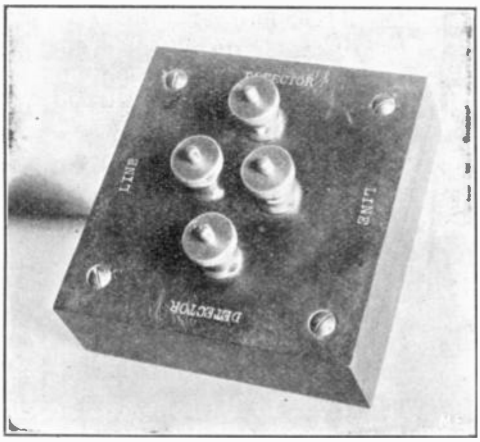
If fifty years ago the prophecy had been made that before the eyes of the then rising generation should be closed in death, this vast continent would be traversed from ocean to ocean within four days, and that we would be enabled to speak to friends and business associates through the medium of a thin wire reaching from the Atlantic Ocean to the Missouri River on the West, Canada on the North, and the Gulf of Mexico on the South, he who would have had the temerity to make such a prophecy would have, undoubtedly in that day, been consigned to an asylum for the insane.

In no line of scientific research have inventive minds had such wonderful possibilities available to aid in the progress of commerce and business of the world as in the field of electricity. To-day an elimination of the telephone in the service of mankind would mean the paralysis of all business and half of the social life of the civilized world. Following closely on, in the latter part of the nineteenth century, there was given to the world another discovery in which electrical energy was to be utilized for the transmission of intelligence. This time it was to be an innovation in sending messages by the telegraphic code, or wireless telegraphy.

Now another step has been taken that is as far in advance of the Bell wire telephone as the Marconi wireless telegraph is over the Morse wire telegraph. We refer to the Collins wireless telephone.

The Collins Wireless Telephone may he said to combine the principles of the Bell wire telephone with the Marconi wireless telegraph, in that speech is transmitted like the former, but without wires like the latter, and this combination enables the wireless telephone to do that which neither the Bell nor the Marconi instruments can do, viz.: to transmit spoken words between two points, in which either one or both stations are moving.

Different from the wireless telegraph, the wireless telephone is a first-hand instrument, and operates with greater certainty and instantaneousness and, like the Bell wire telephone, the Collins wire-



Collins Thermo Electric Detector Closed.

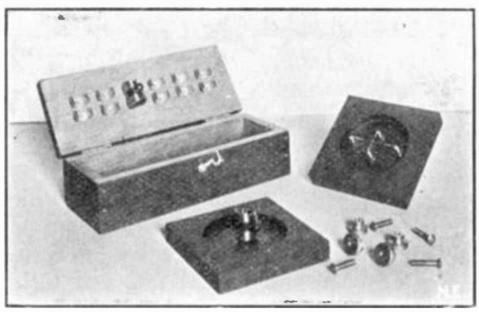
less telephone can be used by anyone who can speak an understandable language. In the operation of the wireless telephone when words are spoken into the telephone transmitter air waves are set up, causing the diaphragm to vibrate, and this action in turn varies the resistance of the transmitter. The current thus varied energizes an induction coil, which produces alternating currents and these are superposed upon a heavy current forming an arc light.

However small the variations of the superposed currents may be, these suffice to vary the resistance of the arc and consequently the heavy currents going through it. Shunting this circuit and including the arc in it as well is an inductance coil and a condenser, forming oscillation circuit and to which is connected by a conductive or inductive coupling, the aerial wire on the one side and the grounded terminal on the opposite side. Now when the transmitter is in operation, part of the direct current energy is converted into high frequency oscillations and when the oscillation system is properly tuned, there are set up, not only in the closed oscillation system, but in the aerial wire system as well, high frequency currents, and under these conditions electric waves are emitted, which are unbroken as they are in case of those produced by a disruptive discharge. Means are provided for tuning the open and closed circuits of the transmitter to within a half of one per cent.

In one form of receptor used in combination with the above transmitter, the electric oscillations actuate a thermo electric detector which emits light waves, and these impinging on a selenium cell connected with a battery and a telephone receiver, reproduce the voice in audible tones. To-day with the long distance Collins Wireless Telephone, messages can be transmitted thirty miles, and with improvements now being made it will be not only possible but practicable to telephone at least a hundred miles.

One of the most interesting features we have been called upon to solve is an intercommunicating system of wireless telephony. The question most often asked is how a person can be called on the Collins wireless telephone and supposing there are a number of phones in use, how can you converse with any person you wish?

In the first place each wireless 'phone has a telephone number just as the ordinary 'phone, but instead of a central station and a "Hello" girl the subscriber talks *direct* from one station to another. This is accomplished by having three dials similar to those used on a combination safe. Each dial is numbered from 0 to 9,



Collins Thermo Electric Detector Open.

and the indicators of these dials are set on a number to be called up. By way of illustration, suppose Smith's number is 620, Browns number 550 and Jones' 200; now, when Brown wishes to call Smith he moves the indicators of his dials on his telephone to 6, to 2, and to zero, respectively, thus placing both instruments in tune with each other; he next presses a button on his telephone, which rings the bell on Smith's telephone. Smith answers, and the conversation begins just as though they were talking over an ordinary 'phone. After Brown is through talking he turns his indicators back to his own number so that Jones or Smith can call him if they so desire.

By turning the indicators to these numbers more or less inductance, capacity and resistance is thrown in or out, and as these factors determine the rate of oscillation, and the number of oscillations per second determines the wave length, it is easy to see that if a sending station have the same values as the receiving station they will be in tune.

There is no doubt as to the position wireless telephony is to occupy. Its use on the ocean will be identical to the telephone on land, while its other fields of operation are practically without limitation. Governments will use it for their army posts and ships; islands in the ocean and harbors on the continents will employ it to speak with other parts of the world; every craft that sails the ocean must adopt it; isolated mining camps, rural districts and other places will be brought into touch with the civilized world—in fact, wireless telephony will enter a field entirely its own, in addition to being an aggressive competitor of the present telegraph and telephone system on land.

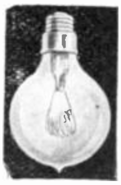
It will enter a new field by making it possible to telephone from automobiles to the garage when help is needed. There are thousands of automobiles in the United States, and, while touring the country in a powerful car is a delightful pastime, a breakdown several miles from a garage or other repair shop is not conducive to pleasure. Often some member of the party finds it his lot to walk to a house for supplies, while the rest of the party, patiently or otherwise, usually the latter, await his return.

Mr. Collins proposes to eliminate this decidedly adverse feature of automobiling by employing the wireless telephone. Consequently every garage or shop will be equipped with the wireless telephone, as they are now with the tire pump and ignition plugs, and this latter day telephone will always be set up ready for use. Likewise, every auto will be provided with a portable wireless telephone. Then in the event of the inevitable accident the 'phone can be taken out, set up ready for use and communication established with the nearest garage, and an auto with men and needful mechanism sent post-haste to the scene to repair it.

500 CANDLE POWER LAMP.

Most people who have never seen a stronger incandescent lamp than 32 C. P. would be surprised if suddenly confronted with the 500 C. P. lamp shown in our illustration.

A good idea of its size is formed by showing the "smaller" lamp, which, however, is twice as big as the regular 16 C. P. bulb to which we are so accustomed.



The large lamp is 13 inches high and measures 24 inches in circumference. The regular 16 C. P. globe measures only about 7¾ inches in circumference.

As the heat of the 500 C. P. lamp is so intense that it is well felt 10 feet away, a new method to hold the bulb in position had to be devised. This is clearly shown in our illustration.

The "filament" itself is a ribbon of carbonized fibre; it is not round, as the filament in an ordinary lamp, but is about ⅜ of an inch wide and quite thin.

This lamp uses 110 volts and 10 amperes, and has been designed for therapeutic requirements.

An Ideal Battery

By H. Gernsback.

There is hardly an electrical experimenter in this country who is not in urgent need of a *good* primary battery. Even experimenters living in localities where lighting current is available are not much better off, as mostly low voltage and high amperage is in demand for nearly all everyday experiments. The usual tension of 110 or 220 volts can not be reduced without complicated means as effectively as one desires, and one usually takes recourse to storage batteries, which, of course, for steady, strong current can never be equaled by primary batteries.

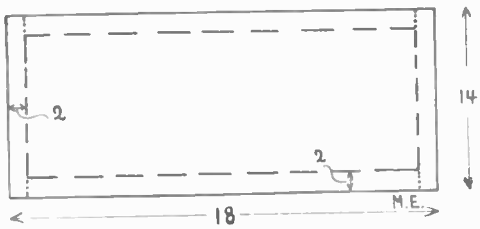


Fig. 1.

Our young friends, however, living in localities where direct current is not available, or those who are not connected to the supply current are greatly hampered in their experiments, and for their sake the author will describe below how an efficient and yet low priced battery can be constructed by almost anyone.

However, let us see first what good points a real efficient primary battery should have:

It should be able to furnish a strong current.

Its voltage should be as high as possible.

Its current should be very uniform.

It should be able to furnish strong currents constantly.

Its capacity should be large.

Its internal resistance should be very low.

Short circuits should not harm it.

It should not develop fumes of any kind.

The electrolyte (solution) must not be dangerous.

Local action (consumption of materials) should not take place when battery is not in use.

Its price should be low.

Its cost of renewals should be low.

It should need no attention when not in use.

The battery described below has all the good qualities enumerated, except No. 2. The voltage of the battery is only about 0.9, but considering all the other good qualities, which the writer believes are not found in any other existant battery, the experimenter, he believes, should not hesitate to own a number of these cells.

Low voltage is by no means a defect of a good battery. If the first cost is low, the slight deficiency will hardly count, because if enough cells are connected in series any voltage can be obtained.

The author several years back constructed 125 of these batteries to light up his home, and so successful were his efforts that one could light as many as 25 incandescent, 16 C. P., lamps at a time, the battery carrying the load remarkably well.

The batteries were also frequently used to light 2 large arc lamps or to run a sewing machine motor, to operate fans and electric sad irons.

In the winter the renewals were of course frequent, but as the batteries were quite large (24x16 inches) it was not necessary to change the zincs oftener than once in three weeks.

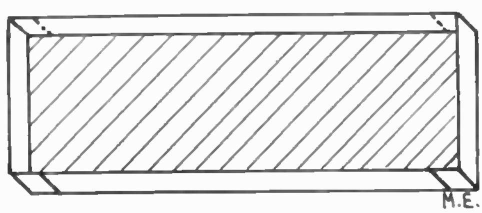


Fig. 2

An important point of the battery is that during use pure copper is formed electrolytically, which can be sold if enough has been obtained. As pure copper is in steady demand, it will be well worth to save the metal, which by no means is deposited in small quantities.

The battery described below is able to furnish as much as ½ pound pure copper per cell in three weeks. If one owns

12—20 cells the investment will be quite successful, as in other cells nothing is won, and some of the parts, even if not used up entirely, must be thrown away.

CONTAINER.

This may be made of sheet iron, lead or copper. The latter, however, is preferable. If sheet iron or lead is used, it will take some time before enough copper is deposited to obtain the maximum current from the cells.

A piece (of any of the above metals) is cut as shown in Fig. 1, and as per dimensions given there.

At each of the four corners an incision 2 inches long is made (shown in Fig 1 in punctuated lines). The four sides are then bent up at right angles, as indicated by dash lines. The four resulting squares at the corners, 2x2 inches, should lap over the long sides *on the outside* of trough. (Fig. 2.)

The four corners are then well soldered to make the container absolutely water tight. It is a good plan to paint the soldered parts, inside and outside, with two coats of black asphaltum paint. This does practically away with all corrosion.

The resulting trough (Fig. 2) is 14 inches long, 10 inches wide and 2 inches high.

A common binding post is slotted 1/4 inch deep at its base by means of a hack

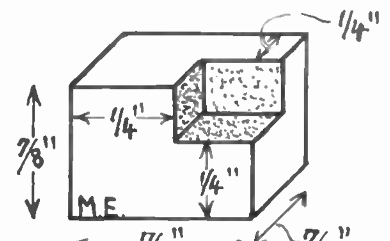


Fig 4.

saw and then soldered to one of the short sides of the container, as is clearly shown in Fig. 3.

Four insulators to support the zinc must now be made. It is important that the sizes as given in Fig. 4 are strictly adhered to, as upon this much of the success depends, for if the zinc plate is too far away from the copper oxide, the internal resistance of the cell rises quickly.

The insulators should be made of slate or marble. As seen from Fig. 4, a corner is taken out from the square insulator, which serves to keep the zinc plate from shifting or moving. This is also shown in Fig. 3 under L.

The next—and very important—step is to clean the entire bottom of trough in such a way that the bright metal will be exposed. This is done effectively by means of emery paper. If the container is of iron it is quite necessary that the metal be exposed over the entire surface, because rust or the black oxide of iron is practically an insulator and will cut down the efficiency of the cell a great deal, because the oxide of copper cannot come in direct contact with the container.

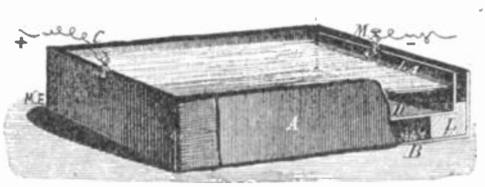


Fig. 3

From an electrical or chemical house obtain several pounds of black oxide of copper, which may be bought at 55 to 60 cents per pound.

Place the 4 insulators in the four corners of the container and carefully sieve a film of the oxide of copper about 1/16 inch high over the entire bottom of the trough, being careful not to pour any on the insulators, which of course must stay free.

With a flat piece of wood or other object smooth the surface of the oxide and press it down strongly, as it is important that it should make a good contact. The surface of the film must be perfectly smooth and straight, and not higher in one place than in another.

Positive Element.

The zinc plate or positive electrode must be made now.

Before going further it might be well to state for the sake of the inexperienced that in a battery, the electrode furnishing the positive pole is NEGATIVE and not positive, as is often thought. The negative electrode, on the other hand, furnishes the positive pole.

Why this is so may be understood by the following:

Consider a common dry cell. The current starts flowing from the positive *pole* (carbon), and goes to the negative *pole* (zinc). As soon as it enters the battery itself (through the zinc) it must, of course, still be positive. Now, the zinc may be considered "the end of the line," and the result is evidently that the zinc is positive. The other element (carbon) consequently must be negative.—

The zinc plate mav be cut from stock 1/8, or better 3-16 inch thick. The size is 15 1/8 inches long and 9 1/2 inches wide. Measure off 13 1/2 inches and bend up at right angles (Fig. 5.). The bent up part will be 1 5/8 inches high. This is also shown in Fig. 3. When the plate is placed upon the insulators the upright part will come flush with the vertical wall of the container.

A binding post similar to the one fastened on the trough is soldered to the zinc as shown in Fig. 5. The soldered parts must be painted with black asphaltum, to safeguard against corrosion.

Next the zinc plate must be amalgamated.

This is done as follows: In a glass tumbler mix 4 parts of water and one

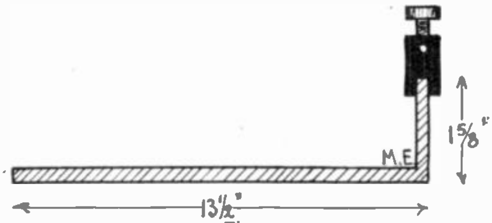


Fig. 5

part of muriatic acid. Wet an old rag with this solution, and apply to the zinc plate. A small drop of mercury (quicksilver) is then placed on the moist plate, and same is rubbed into the zinc by means of a rag. The mercury is then rubbed over the entire surface—both sides, including the vertical piece—till the plate is brilliantly white and shines like polished silver. The entire process will take not more than 2 minutes. The plate is then well washed off in water and stood up on one of its corners for at least 6 hours. This brings all the superfluous mercury down and it can be collected for further use.

Great care must be taken with amalgamated plates as the mercury renders them extremely brittle and breakable. Amalgamated metals can not be soldered.

If all the superfluous mercury has been collected the zinc plate is placed upon the four insulators.

Electrolyte.

The electrolyte or exciting fluid is prepared as follows: In 100 parts (by weight) distilled or rain water, 40 parts (by weight) powdered caustic potash is dissolved. This chemical is quite cheap, but not all grades are suitable for battery work; the right kind is usually carried in stock by electrical houses handling chemicals. It should be commercially pure.

The thus prepared electrolyte should never be used while warm. As soon as cold it should be poured *very* slowly on top of the zinc to break up the stream. If poured too fast the layer of oxide of copper will be disarranged, which should be avoided.

Enough electrolyte is filled in each cell till the solution stands at least 1/2 inch over the surface of the zinc plate.

On top of the solution slowly pour a film at least 1/4 inch thick of good paraffine oil, or if this cannot be obtained, kerosene oil can be substituted. This film of oil is quite necessary, as it keeps the electrolyte from evaporating and also from "creeping."

It is understood that once assembled these batteries cannot be moved around, and should never be shifted while assembled. On this the success of these cells depends.

Suitable racks with shelves one above the other should be built to keep the batteries, which latter should best be assembled while in the racks. The distance between the shelves should be about 4 inches. Each cell can then be watched easily.

If several cells are connected in series use small pieces of No. 14 or 16 copper wire to make connections. Thinner wire than this will cut down the current.

As soon as all the cells are connected up short circuit the entire battery for about 2—4 hours. This is necessary, as it will reduce some of the copper oxide to pure copper, which will establish perfect contact between the oxide and the container. This short circuit is not harmful, but beneficial to the cells. Of course after this first short circuit others should be avoided.

If the battery is now tested on open circuit each cell should read about 0.9—1.0 volts. The total amperage of each cell, if well constructed should reach from 20—25 amperes. One can draw as much as 4 amperes continuously without harming the battery. Under full load the voltage will hardly ever go below 0.7, and this figure should be taken

(Continued on Page 182)

Static Electricity as a Motive Power

By W. C. Belcher.

To the average electrical experimenter static, frictional or high tension electricity is an ungovernable something, prone to jump and kick, and to do everything except the expected.

As a matter of fact, it is as easily controlled as any electrical manifestation, provided the apparatus at hand is adapted to it.

Perhaps one of the most startling effects is caused by connecting two static

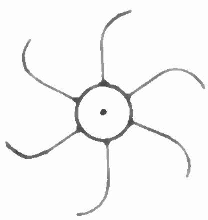


Fig. 1

machines in series and turning the handle of one of them. The other will then run as a motor, its plates being driven by the unseen attraction of a positively and negatively charged surface. Of course, an induction coil may be used instead of the driving machine, as the current from a coil and from a static generator are practically identical. The belts should

Fig. 2

be taken off the machine to be run as a motor, to decrease friction.

However, in this article we will deal with simpler forms of rotators, which are easily made, and give such unique and pretty effects as to amply repay for time consumed in building them. The simplest is the electric fly and its modifications.

It may as well be said now that it is the writer's purpose to give only basic forms. Apparatus mav be made up in

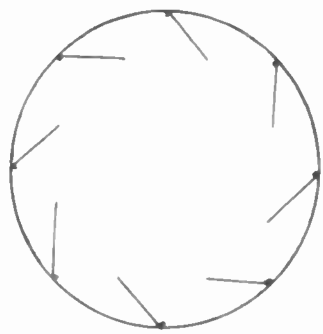


Fig. 3

endless variety by combining these forms. For example, in showing the spark board described in the June issue, the writer invariably fixes an electric light globe at each end, connecting the tin foil of the board to the metal bases of the lamps, and allows the wires from his coil to rest on the top of the lamps, *i. e.*, on the glass near the tips. The contrast between the cold white light from the globes and the hot sparks between the tin foil squares is very marked.

The simplest form of fly consists of a thin metal disc slightly indented at its center to serve as a bearing, and having a number of arms, sharpened at their points and bent as shown, soldered to the disc in Fig. 1.

This is balanced on a large needle stuck eye down into a suitable base; a wire is wrapped for 2 or 3 turns around the needle to connect it to one pole only of the static machine or coil.

The rotation is quite rapid, and in a

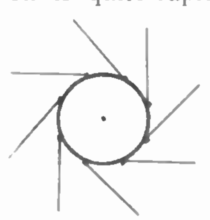


Fig. 4

darkened room shows plainly a luminous circle formed by the "brush" discharge.

This of course is a horizontal wheel, but for pretty effects the vertical wheels are much better.

One form consists of a ring of heavy wire having pins soldered at regular intervals, as shown in Fig. 3. This represents the "field."

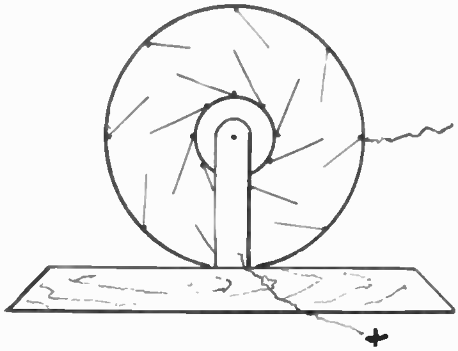


Fig. 5

Also a disc having pins soldered to its circumference, as shown in Fig. 4.

For bearings, nothing is better than a piece of stiff brass bored *nearly* through with a very fine drill. A fine needle held by tension of the two brass

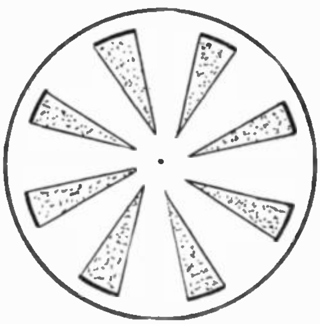


Fig. 6

uprights answers admirably for an axle.

The instrument is assembled as shown in Fig. 5.

Another form, which is historic because it was used to show that atmospheric electricity could really do work during a series of kite experiments at the Blue Hill Observatory, is made as follows:

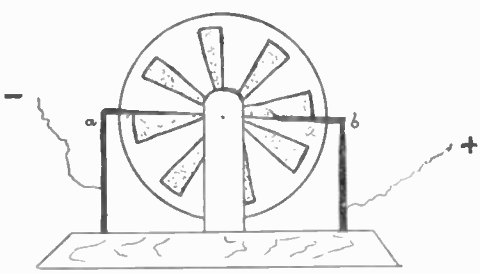


Fig. 7

Bearings, etc., are just as in previously described machine. The rotator, however, is a circular piece of hard rubber, to which tin foil segments are affixed as shown in Fig. 6.

A wire is now made to nearly touch the wheel at A and another at B, as shown in Fig. 7.

These wires are connected to your coil or static machine as usual. It may be necessary to start this "motor" by hand.

Before leaving this subject of motion it may be well to show the time honored chime. The illustration (Fig. 8) is self explanatory. Gongs C and B being in metallic connection with supporting bar. The center gong being insulated from the bar by a SILK thread having metallic ground connection as shown. Two small metal balls attached by SILK threads are hung between the three gongs. If M is now connected to the generator C and B are charged. They attract the metal balls, are immediately repulsed, and both fly to the center gong, striking same. Here they lose the charge and they are attracted anew by C and B,

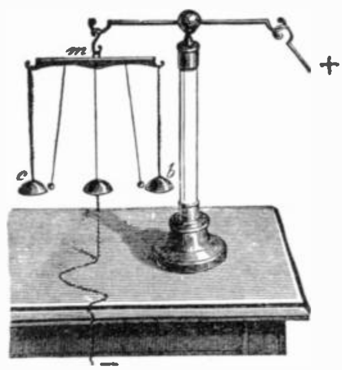


Fig. 8

after which the same play is repeated. This chime will sound as long as the generator is in operation.

Later we will show how to make a *battery* which will strike this chime for many years without renewal.

I have given no dimensions in this article, as wide latitude is allowed by nature of apparatus.

A GREEN WRAPPER

means your time is out. Renew your subscription to-day without fail. Positively no copies sent to expired subscriptions. MODERN ELECTRICS is mailed always before the first of the month. If your copy is not received in due time drop us a postal and we will send another copy.

Singer Tower By Night

The striking photograph reproduced herewith shows the Singer Tower by night. This photograph was neither retouched nor "faked up" in any respect, which seems hard to believe at first glance, but it is true nevertheless.

The management of the tower decided to adopt an entirely new arrangement for lighting up the structure, as it was realized that the architectural beauty of the tower could only then be brought out in prominent relief by using reflected light.

To this effect 1600 incandescent electric lamps were arranged in such a manner that the lamps were all hidden from actual view, on somewhat the same plan as the footlights of a stage. Thanks to this, no light is wasted, and the onlooker below is not blinded by a mass of lights, but beholds a soft, glowing pillar of light, towering majestically into the dark sky. Every feature of the architecture is preserved, as may be seen from our photograph, the contrast of the white structure against the dead black background being quite impressive.

It was comparatively easy to arrange the lamps at the upper part of the tower, as there are many niches and corners above the 33rd floor reaching all the way up to the 45th floor. It was, impossible, however, to properly arrange lamps below the 33rd floor, and to this effect a battery of 28 powerful searchlights were placed on the lower buildings below, surrounding the tower.

These searchlights were then trained on the structure in such a way as to wash the smooth walls up to the 33rd floor and flood them with light. Shutters were provided on all the searchlights to confine their light to the tower only, as stray light beams would reduce the general effect considerably.

How carefully the whole plan was carried out may be judged by the flagpole and the flag itself, which are well defined against the black sky; an extra searchlight was installed at the 46th floor for this purpose.

When seen from the lower New York Bay or from the Jersey shore, the lighted tower furnishes a striking sight extremely pleasing to the eye.

In fact the electric lights bring out the details of the tower much better than the sunlight in the daytime. The tower was seen by numerous people from great distances, and even Montclair, N. J., 13 miles away from New York, had no difficulty to make out the tower.

If something hits your head and you see "sparks" for the next five minutes, don't attribute the cause to a spark coil. It might have been a plain fist!—"Fips."

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The Editor confesses that he is pleased lately.

MODERN ELECTRICS, he believes, is emerging from the "experimental stage" through which every magazine must pass.

It is not an easy matter to satisfy every reader, nor to satisfy every taste—there are too many. However, our motto: "To print what our readers WANT, not merely what strikes the Editor's fancy," has proved its worthiness.

Very few letters suggesting changes in the text pages of MODERN ELECTRICS have been received lately. In fact, only two for the month of July, against 28 in May.

The Editor therefore has reason to be pleased.

However, he is not satisfied as yet, far from it!

MODERN ELECTRICS, you see, is only a little baby, just 5 months old! Its dress is light as yet—only 36 pages. It could just as well possess 100 pages, which, for a magazine, even in hot weather, is not too heavy a dress.

The Editor has enough material to put into 100 pages each month—but a 100-page magazine is an expensive proposition, as everybody knows.

However, the Editor wishes to present his readers with a 100-page magazine every month, without raising the price of the subscription, and to give his readers the same good reading material as he does now—and he hopes to do even better.

How can he do it? By having a very large amount of subscribers. You see, it is this way: If you order a single thousand letterheads from your printer he will charge you about $3.50 for them. If you should order 100,000, each thousand would only be about $1.50. It is the same with a magazine, the greater the amount to be printed the smaller the cost per copy.

If every reader could only bring us one new subscriber, we could at once increase the magazine to 64 pages. Almost everybody has a friend who will readily part with a dollar bill if you show him MODERN ELECTRICS, putting a few good words in for it. Or if you do not care to do this, why not make your friend a present of a year's subscription? It is a most sensible present which nobody can fail to appreciate.

You are not asked to do this work for nothing — MODERN ELECTRICS gives valuable premiums for every new subscriber you bring us.

To further stimulate subscriptions, MODERN ELECTRICS will award a prize of

25 DOLLARS

in gold to the person having secured the greatest amount of subscriptions for

MODERN ELECTRICS between now and October 1st. These 25 dollars have been deposited at Henry Bischoff & Co., Bankers, of New York City, and the winner will promptly receive the prize as soon as the returns will be checked up, which will be not later than October 6th.

The name of the winner will be announced in the November issue of MODERN ELECTRICS.

In addition premiums will be sent on all new subscriptions for this prize contest. Anybody can join the contest. It is not necessary to be a subscriber.

WIRELESS 'PHONE NEW YORK TO NEWARK.

For the first time in history New York has been connected with Newark by wireless telephone, a distance of 8 miles by air.

The first tests were made July 9th, and the inventor, Mr. A. Frederick Collins, was entirely satisfied with the trials.

The messages were sent from the laboratory of Mr. Collins at No. 54 Clinton street, Newark. A horizontal antenna, composed of 4 phosphor bronze wires each 375 feet long, and suspended between two buildings at a height of 90 feet, was used to radiate the oscillations.

The receiving station was located in the Singer tower, New York, at the 25th floor. An aluminum wire fastened to the top of the flagpole—612 feet above the ground—was then led to the 25th floor, where it entered the receiving room through an insulated tube.

To keep the wire from touching the tower, it became necessary to install short wooden poles, having an insulator at the end, at three different places, on which the wire was let down. The antenna has not been taken down as yet, and may be seen at the south side of the tower.

The voice could be heard plainly from Newark, the speech being distinct and articulate and free from other noises.

A description of the apparatus used at the tests is found elsewhere in this issue.

A green wrapper means your subscription has expired; order at once to keep your file complete. Do it NOW.

LOUD SPEAKING TELEPHONE.

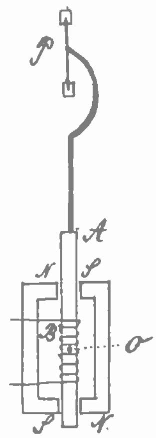
A new loud speaking telephone has recently been invented by Mr. D. Marzi.

A soft iron armature A is made to turn freely on its axis O. It is suspended between two permanent magnets NS and SN. A spool of thin wire B is fastened permanently on A.

On the upper part of A a lever is fastened, which rests lightly on the diaphram P.

As soon as a current flows through B, A will be made to turn back and forward more or less, all depending on the amount of current flowing through B.

These oscillations of A are transmitted through the lever to P, which is thus brought to sound.



It is claimed that this apparatus transmits the voice very clear and loud if put in circuit with the usual transmitter.

The great advantage of this telephone over others is, that the diaphram P may be made of any material having good accoustic qualities.

The metallic sound experienced so much in the regular telephone is done away with entirely.

It is sad to remember that Napoleon at Waterloo sent a "wireless" asking for help. The saddest part, however, is that at Paris they hadn't erected the Eiffel tower, with its antenna as yet, nor were any detectors invented to catch the message. Poor Napoleon!—"Fips."

It's easy to invent something new. The hard part, though, is to produce something that is actually needed, or does the same thing better than some other existing device.

NEW ELECTRIC LAMP.

By Our Berlin Correspondent.

An original incandescent lamp has recently been put on the market.

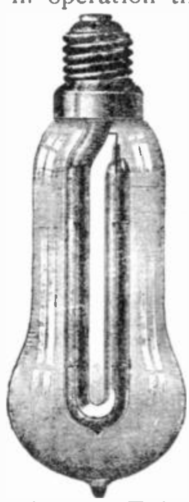
It is an ingenious combination of the mercury vapor lamp and the old incandescent lamp. Enclosed in the usual bulb is a U tube of glass about ½ inch in diameter. A carbon filament such as used in the common lamps is led through this tube and held in position by four wires, so as not to touch the walls of the tube.

A portion of mercury mixed with a small percentage of several metals is in the lower end of the tube.

As soon as the lamp is operated, the heat of the filament causes the mercury to evaporate, the consequence being that the entire tube is filled with a very soft but strong, absolutely white light.

The yellow light of the filament is "drowned" by the mercury vapors, which, in turn, by absorbing the yellow light, lose some of the ghastly green rays, and a white light is the result. This is further enhanced by mixing the above mentioned metals with the mercury.

This lamp uses 1.2 Watts per C. P., and the peculiar thing is that the longer the lamp is in operation the less cur-



rent it will draw. This is the first lamp ever constructed which claims such an important point, as all other lamps, either carbon or metal filament ones, use more current the longer they burn.

The new lamp can be operated in any position, even upside down; it is made for 110 and 220 volts.

Another novelty is the "coin-in-the-slot" electric meter, as shown in illustration. This automatic meter installed on your premises sells you current the same way as the slot machines sell you chewing gum. No money, no current.

The idea is good, but suppose you invited some friends to dinner and while you are carving the duck—sst—out go all the lights! You see your 10 Pfennigs are used up and the meter wants more.

You fumble in your pockets and after finding the coin you push it in the slot. Alas, it was a "copper"! You say a few things, and go back to the dining room with a lighted match, and ask your guests to be kind enough to loan you 10 Pfennigs (2 cents.) Alas, they only have gold pieces (?) or large coins, everything but a 10-Pfennig piece. You leave them in the dark and walk downstairs to the next corner to get change, and coming back you feed your obedient meter, and everything is happiness again—till next time.

The translation of the directions is thus: "Own Cashier Electricity Counter" 5 amperes, 220 volts, 12 revolutions=One Watt Hour. One 10-Pfennig coin furnishes 150 Watt Hours.

In the case of the "filings" Coherer its sensitiveness may be somewhat increased and its life greatly lengthened by enclosing the same in a small box. This box must be absolutely tight and the door or opening for the adjustment must shut *tight* preferably on a rubber gasket.

Keep in this box a small glass dish containing a piece of caustic potash or better still a bit of *fused* chloride of calcium.

This will keep the coherer *absolutely dry.*—Contributed by W. C. Belcher.

A Simple Form of Wheatstone's Bridge

By C. C. Whittaker.

The Wheatstone Bridge is barred from the use of the average amateur on account of the cost of a sufficiently sensitive galvanometer. The following arrangement I have found to work very satisfactory in measuring resistance down to .1 of an ohm. It can be used to measure the resistance of incandescent lamps, motors, wire, etc.

In the diagram, the wires AB and EH should each be one yard or one meter in length. EH should be either No. 12 or 14 copper wire, so that the resistance of it may be small. AB should be about No. 18 copper wire. The binding post P should be exactly in the center of EH. The size of the wire connecting the telephone receiver with P and C is optional, but flexible lamp cord is advisable because of the convenience with which it can be handled. One cell, either dry or wet, is sufficient, and is connected as shown in the diagram. X represents the object whose resistance is to be measured.

R is some known resistance, preferably a multiple of ten ohms for convenience in calculating. For most purposes, 10 ohms will be found adequate. This may be obtained by measuring off 40 feet of No. 34 copper wire. This should be wound upon a spool and connected as in diagram. C is a movable contact capable of connecting with the wire AB at any point between A and B.

When all connections have been made as in diagram, throw in battery by switch S, and hold the receiver to your ear. Touch AB at one end with C and then make a series of contacts, following AB to the other end. At some contact point there will be no sound in the receiver. When this point is found, measure the distance from A to C and from B to C. The resistance of X is now to be found by the following proportion: X : R :: AC : CB, (the proof of this, if desired, may be obtained from any text book on physics) whence, $X = \frac{R. \times A.C.}{C.B.}$. X and R are expressed in ohms, AC and CB in inches or centimeters.

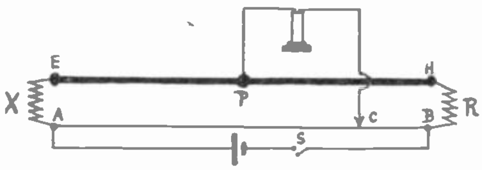
For example: Let us suppose your wire A-B measures 1 meter (39 inches). At X you have a piece of wire the resistance of which you desire to ascertain. R is 10 ohms. By sliding C back and forward you find that at a certain point the telephone receiver does not sound. The distance from A to that point, let us imagine, is 45 centimeters, while the distance from C to B is 55 centimeters.

Substituting figures for letters as per above equation, we have:

$$X = \frac{10 \times 45}{55} = 8.18.$$

The unknown resistance at X is therefore 8.18 ohms.

If a series of contacts of C should extend an inch or two along AB while no sound is being heard in the receiver, the middle point of this space should be taken as the point from which to measure; thus, if sound is heard in the receiver when C is 29 inches from A, then ceases and is again heard 30 inches from A, the point which has the same potential as P would be situated 29½ inches from A.



This experiment should be conducted in a quiet place and the contacts should be made with care so as to avoid all unnecessary noise.

ULTRA-MODERN ELECTRICS.

'Tis true that modern methods turn electric, one and all,
The spark is in the larger things and even in the small,
A flash, a whirr, a clicking note and flared from sea to sea
Man's stubborn tongue goes on the jump straight through Eternity.
But I am waiting for the time when Summer drinks will boast
Electric bubbles for the thirst that makes a fellow roast.

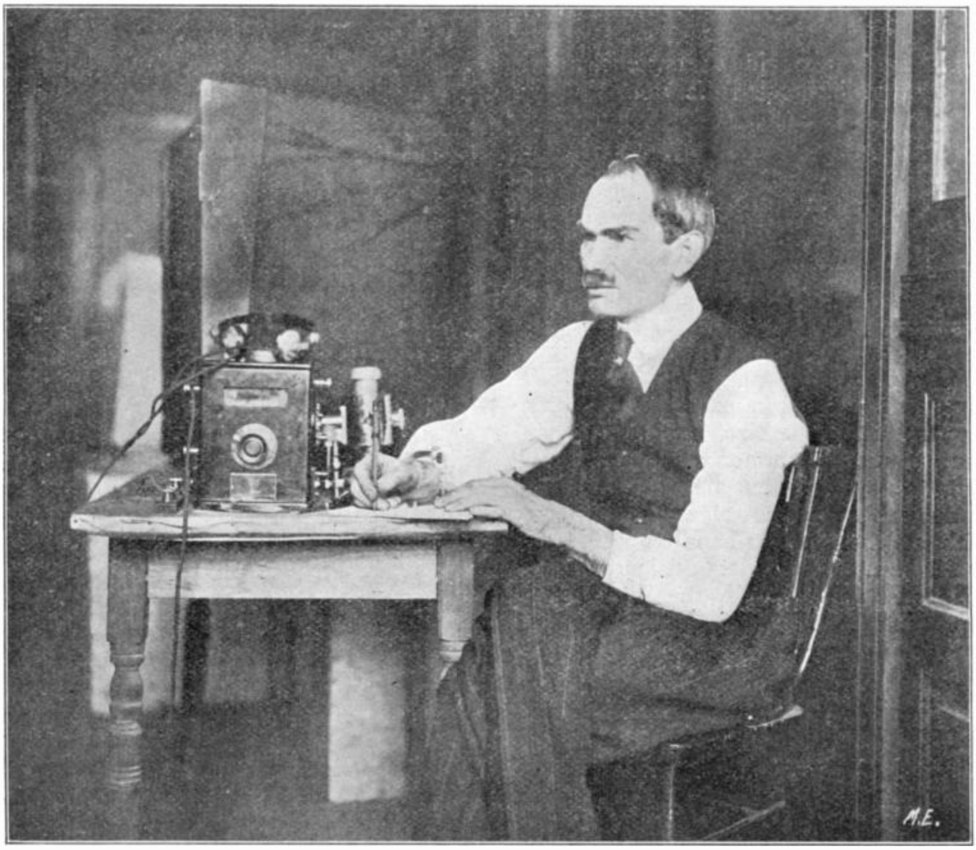
An engine, now, with effort small goes buzzing on its way,
We have our brogans brushed and shined by currents ev'ry day;
And even monster large machines submit with effort mild
To mystic spark that sets the heart of them to going wild.
But, still, I patiently await Electric's greater dawn
When some new-fangled patent thing will put my collar on.

We write and talk and draw and read and think and run around
Through agencies of spark and flash; we even dig the ground;
In fact, most everything is done with it, from cooking meals
To showing Dobbins and his mare a pair of motor heels,
But still my fondest hope I hold is yet to gaily dote
Upon a fine Electric hand to help me cast my vote.

W. LIVINGSTON LARNED.

Wireless Telephony

By V. H. Laughter.



Dr. Lee DeForest at the Instrument.

The new art of wireless telephony has advanced to such a stage that the U. S. Navy has lately equipped 32 war vessels with complete sets. This point alone is a guarantee of the practicability of the wireless telephone, as it is a well known fact that the government does not adopt any apparatus until its utility has been proven.

The sets were sold under a contract to hold unbroken communication up to a distance of five miles regardless of fogs or atmospheric disturbances. This distance, however, has been doubled several times, and the latest records show that a distance of 26 miles has been covered, the messages being picked up by the receiving end of a wireless telegraph set which no doubt could have been farther extended by the use of the special telephone receiving sets as employed with the telephone.

The fleet which sailed around the Horn to the Pacific was equipped with complete sets. Admiral Evans could keep in constant communication with any of the ships—directing the movements of the whole fleet from one point which may sound the death knell of the old wig-wag system of signalling used for an indefinite period by the navy.

The naval attachés are particularly proud of the fact that the U. S. navy is the only one in the world utilizing this means of communication but already foreign ambassadors are negotiating with the makers for like sets.

In operation the wireless telephone is very simple, and depends on the same principle as telegraphy, that is, the generation of Hertzian waves that pass through space 186,000 miles per second. While the principle is the same, yet the actual working is vastly different, as was soon realized by the numerous investigators who took up the subject with the introduction of wireless telegraphy. In telegraphy the transformer or transforming device is supplied by alternating current with

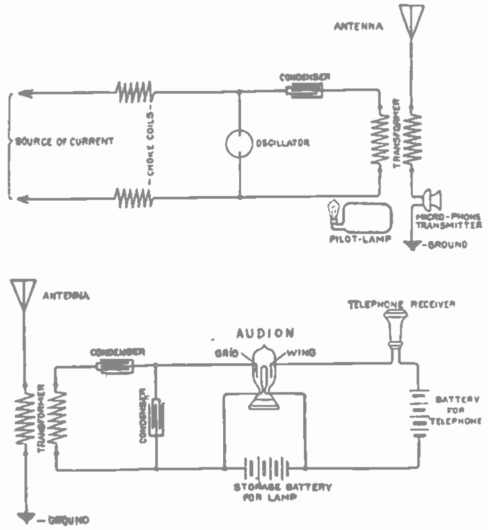


Fig. 1

periodic break or direct current with mechanical break. In either case the emitted wave is periodic. This, however, would not answer for wireless telephony, as the break would destroy all properties of speech.

The problem now was to provide some means for generation of a continuous wave current and impress thereon the modulations of the human voice which would possess the same qualities when caught at the distant receiving end and reproduce the spoken words.

The generation of such waves was made possible by the use of Duddell's arrangement, which is identical with the wireless telephone of the day with the addition of a few changes.

The circuits of the DeForest sending and receiving ends as shown in the May issue are repeated here for sake of clearness.

The transmitting set consists of an ordinary arc lamp (oscillator) burned in the flame of an alcohol lamp from a 220-volt circuit, which sets up oscillations. The latter flow through the condenser and primary of transformer, exciting the secondary, which has one terminal leading to the ground through a telephone transmitter, and aerial wire.

It can now be understood that the wave current in flowing through the transmitter to the ground and aerial wire will be changed to the same proportion as the voice which falls against the diaphragm of the transmitter. A certain portion of this wave is caught by the antenna of the receiving end, which flows through the primary of a transformer set to the same wave length; passing the secondary, it flows through the capacity condensers to the "Audion"; here it produces a like change in the ionized gases which changes the current from a local battery flowing through a telephone receiver, resulting in the spoken words increased in sound to a large extent.

Here we have the complete DeForest system, which of course required a considerable amount of ingenuity and work on the part of Dr. DeForest to bring the apparatus to its present stage of perfection.

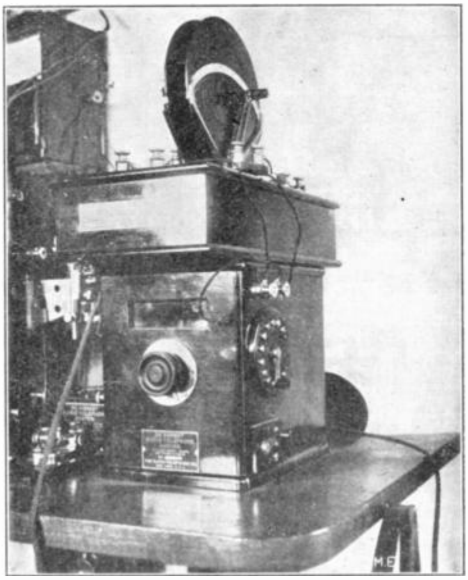


Fig. 4

In the June issue of this magazine was described a "Flame Audion" which works on the same theory as the one employed in wireless telephony. The "Audion" used by DeForest is an ordinary incandescent lamp with a platinum grid and wing sealed in a lamp bulb, as shown in the diagram. The "Flame Audion" has the platinum contacts inserted in the flame impregnated with certain salts.

In Fig. 3 is shown a set designed for portable use, and is packed ready for transportation. With this set communication can be established in a short while, as portable and easily handled aerial arrangements are being provided for this purpose.

To the left is the transmitter, consisting of the high tension coil placed in case with telephone transmitter mounted on an arc lamp in the back. The telegraph key and a device known as the "chopper," which resembles the ordinary buzzer, are shown in the front. The "chopper" is inserted in the aerial wire, and when the key is pressed operates the wireless telegraph apparatus, for calling, etc. The complete receiving set is shown in Fig. 4. Here we have the "pancake" syntonizer on top, adjustable condenser, tuning arrangement, and reserve "audion" for use in emergency. In Fig. 2 is shown Dr. DeForest at the instrument, the audion is seen between his hands.

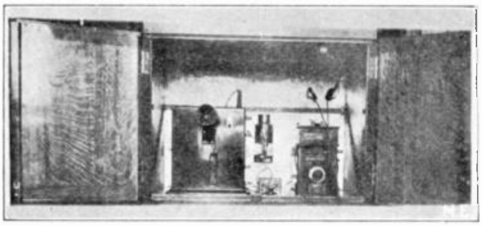


Fig. 3

From the experiments carried on in both this country and abroad, one can readily believe that the distance to which speech can be transmitted wirelessly will soon be indefinite.

If a highly charged trolley wire falls down, pick it up with your bare hands, by all means. It might hurt somebody else.—"FIPS."

Franklin—"Wonder if the motormen on trolley cars ever get an electric shock?"

Penn—"No; they are non-conductors."

No, you misunderstood Alexander. A Static machine is not used for statistics. Shocking!—"FIPS."

"Fips's" Editorial Column.

(NOTE.—Some of our readers have greatly enjoyed our office boy Fips's humorous notes and we decided to give him a column of his own. We however disclaim all responsibility in connection with his notes and reserve ourselves the right to stop him from mischief if he goes too far. We are neither responsible for his grammar nor his language.—EDITOR.)

Well I guess after this swell introduction I can shoot loose and vent my ideas on several points which have caused to keep me awake lately.

There is no use to ask the boss about anything, because he throws me out of his office and says: "Don't bother me."

For instance I asked him a few days ago, why it was necessary to hide that lady's face with a mask (see page 104, June issue). I said that if he didn't like her face, why print the picture at all? I wouldn't be so uncourteous towards a lady. Would you?

Another silly thing is that electric automobile with its trolley, to the right of the lady. What's the use of inventing such a thing; has Mr. Potter never seen a trolley car before? If he could put a trolley on the poor horses that pull those fine horse cars in New York, I would say yes at once.

Also that new electric shoe shiner described in the June issue is a fine piece of work—not! It says there that it is an "almost thinking piece of machinery," but the one I tried last Sunday must have been out of its mind.

Although my new tan shoes did'nt need a cleaning I thought I'd try the electric shiner anyway, just for fun. I never thought that the old thing would put black dressing and black polish on my tan shoe, but that's just what it did! When I saw what this "thinking piece of machinery" had done, I got mad as the dickens and kicked the machine right in the face. The glass broke and the lights went out and they threw me out of the place too. I guess I was a sight walking home in one tan and one black shoe. Never again.

I would also like to know why the old witch, pictured under the "Oracle" is smelling the flame of that oil lamp for the last four months. I should think she'd get tired of it.

A NEW INTERRUPTER AND DETECTOR.

By H. Gernsback.

Experimenting with different magnetic and electrolytic interrupters, the idea occurred to me that it might be possible to construct an interrupter whose chief functions would be based upon the expansion and contraction of mercury, when heated, by passing a current through it.

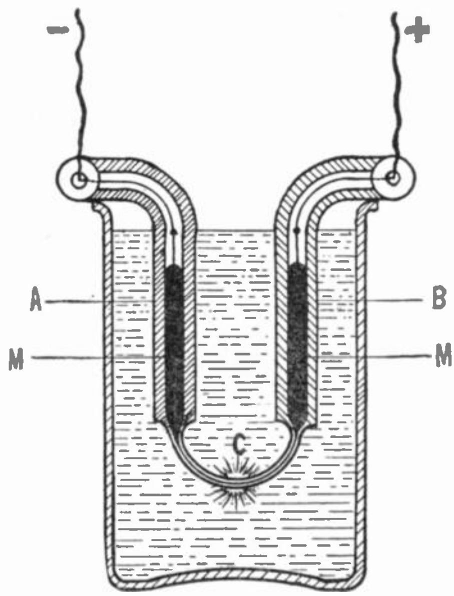
After many fruitless experiments I succeeded in making such an interrupter, and the definite form that proved most satisfactory is explained in the following lines:

A barometric glass tube of about 15 centimeters length, with a central opening of 3 millimeters, is heated in an alcohol flame and drawn into the shape, as shown in the accompanying drawing. This is by no means easy, as the tube, C, which represents the main part of the interrupter, must be so attenuated as to leave a capillary bore within, its minute diameter not surpassing ⅛ of a millimeter.

Heat the middle part of the tube over the flame by constantly rolling the ends between three fingers of each hand, till it is red hot and soft. Take the tube quickly out of the flame, and draw it straight out, till it is thin enough; then bend it into the right shape, and let it cool slowly. Of course, these manipulations have to be done quickly, because the glass will not remain soft very long in the open air, and it is nearly impossible to draw the capillary tube when the flame touches it. The tube has to be filled then with chemically-pure mercury, which is easily done by placing the end of the open column, A, in a receptacle containing the quicksilver. By drawing the air out of B, the mercury will quickly mount in A, then pass through C, and rise up in B. It is well to only half fill both columns. The apparatus will generally work satisfactorily, when the whole arrangement can be placed in any desired position without the mercury flowing out of it. This is a sign that the capillary tube, C, is sufficiently attenuated.

Two thin platinum wires are introduced into A and B till they dip in the mercury. The apparatus is put into a vessel containing water, which serves to constantly cool C, which part would soon break in the open air. Connect the two wires with two small storage cells, and the interrupter will start instantly. In the middle of C there will be a bright bluish-green spark, and a high-pitched tone will emanate from the interrupter, indicating that the interruptions are of high frequency.

I found that this interrupter works most satisfactorily with 4 to 6 volts; it will consume, when made according to directions, from ¼ to ½ ampere, and run as long as desired. By making the part C, of a larger cross-section, the voltage may be higher and more current will be absorbed, but the interruptions will be very unsteady and irregular, and will very often give out entirely.



If we fill the V tube with diluted sulphuric or nitric acid, or with a solution of caustic potash, and if the part at C is sufficiently attenuated, quite a sensitive oscillation detector is produced. As may be easily understood, the opening at C must be extremely small, in fact the entire success of this detector depends upon this.

Two different liquids may be used in the U tube, and these liquids do not mix, owing to the minute part at C. If two liquids are used the sensitiveness of detector is about 20 per cent higher.

The explanation as to how this interrupter works is as follows:

The instant the current is closed, the mercury at the smallest cross-section in

(Continued on Page 180.)

Wireless Department

The Construction of a Potentiometer

BY M. A. DEVINY.

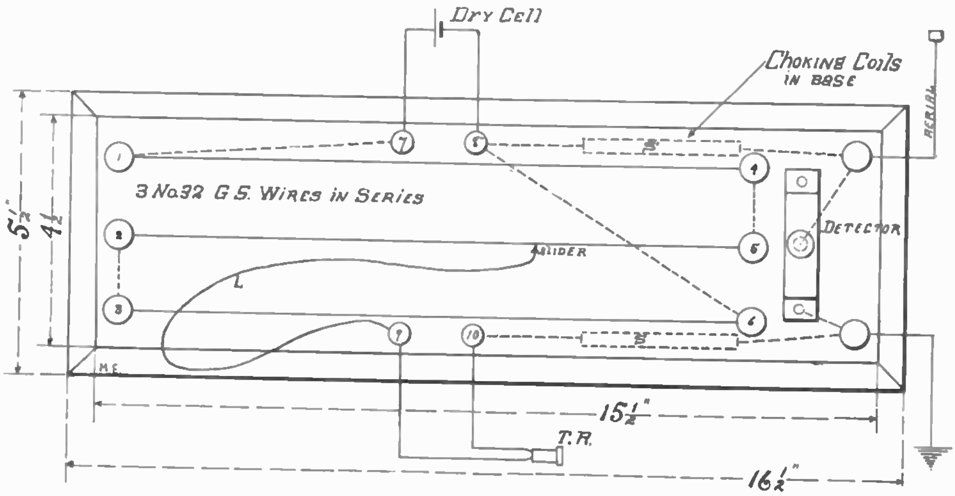


Fig. 2

No doubt many of the readers of MODERN ELECTRICS have noticed that nearly all forms of detector employing a local battery require very fine regulation of the E. M. F. in order to secure their most efficient and satisfactory operation. Several methods for obtaining the necessary variations are now in use, the two principal ones being by means of a finely adjustable rheostat or a potentiometer. The latter, however, is capable of such exceedingly fine adjustment that it is the one most frequently employed in all of the larger wireless stations. The potentiometer differs considerably from the rheostat in the fact that it varies the applied potential (E. M. F.) directly, while the latter only causes a reduction of the current by introducing additional resistance into the circuit.

The principle of the potentiometer, which is very simple, can best be understood by reference to the diagram, Fig. 1. Suppose a long thin high resistance wire of uniform cross-section be stretched between the two terminals M and N, and a potential difference of say 10 volts be maintained between its extremities by means of the battery B. The amount of current that will then flow through the wire C will depend upon its resistance, while the potential will fall uniformly throughout its length from M to N. If the wire be divided into ten equal parts in the manner shown, and one terminal of a galvanometer G be connected at M and the other terminal led to a slider by which contact may be established at any point throughout the length of C, any desired voltage from 0 to 10 may be impressed upon the galvanometer simply by touching the slider at the proper point on the wire. If a single cell of 1 volt E. M. F. be substituted for the 10-volt battery, each of the ten divisions of the wire will then represent .1 volt, and any desired fraction of the volt can easily be obtained in a similar manner.

Potentiometers are used chiefly for calibrating voltmeters by a Clark Standard Cell, and they differ widely in their construction and appearance. They are also so expensive as to be quite out of reach of the average wireless experimenter. A very satisfactory form for wireless purposes which was recently designed by the writer for use with an electrolytic detector is shown in the accompanying photograph. This instrument, although not very elaborate, serves its purpose admirably, and can easily be constructed by any amateur as follows:

Procure a base of any suitable wood about 15½x4½ inches top surface and 1 inch thick. A very good oak mounting of these dimensions can be had at any planing mill for about 25 cents. It will then be necessary to get ten large binding posts from some supply or importing house. These may be of any form, but those of the type shown will be found most satisfactory for the purpose.

Three of these should be firmly fastened close to one end of the base exactly 1 inch apart (between centers). In a line with these and at a distance of one foot, fasten three more, similar to the first three, in such a manner that when the wires are drawn between them they will be parallel. In order to fasten them it will probably be found necessary to countersink the holes in the base, as the screws on the posts are not usually long enough to go entirely through it. After this has been accomplished it will be necessary to connect posts 4 and 5, 2 and 3 together by means of a piece of stout copper wire. This can best be done beneath the base by cutting two shallow grooves between the screws and joining them by means of a short piece of No. 18 wire, as shown in Fig. 2.

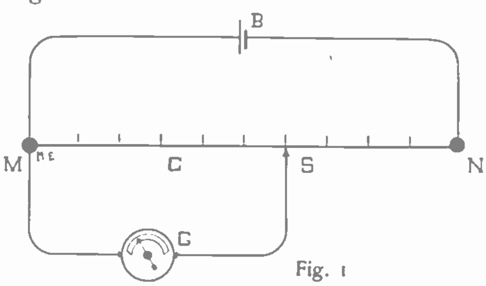


Fig. 1

Three pieces of No. 32 or 34 B. & S. German silver or other high-resistance wire (bare) about 13 inches long should then be fastened between the six posts on the top of the base and drawn very tightly. These form practically one long wire 1 yard in length, as the three 1-foot lengths are connected in series. Two of the four remaining binding posts should next be fastened near the lower edge of the base at a point half way between the two sets carrying the resistance wires. One of these is connected beneath the base through a choking coil S to the detector, while the other post is joined to a flexible lead L by which contact may be made at any point on the three wires. This lead may consist of a single piece of stranded "lamp cord" such as is used for suspending incandescent lamps. It will be necessary to solder a small spring clip or an "Electro Spring Binding Post" to one end of the cord in order to make firm contact at any point on the wire, while the other end is joined to the base of post No. 9.

The two remaining binding posts, 7 and 8, should then be fastened directly opposite 9 and 10. These should be connected beneath the base as shown: No. 7 being joined to No. 1, and No. 8 to No. 6, while No. 8 is also connected

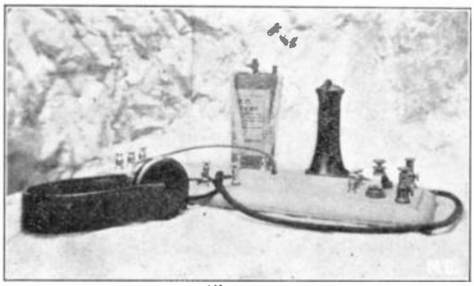


Fig. 3

through the choking coil S′ to the detector.

The two choking coils S and S′ are easily made by winding three layers of No. 24 B. & S., S. C. C. copper wire upon a small piece of soft iron wire about three inches long and ⅛ inch diameter. They may be mounted in small grooves cut in the base of the instrument as shown, or they may be placed upon a separate base, as desired. It is not necessary that the detector itself be mounted upon the same base if it is not so desired, but such an arrangement avoids the necessity of operating two individual instruments, and is more compact and accessible.

In order to operate the potentiometer it is only necessary to move the slider along the wire until the signals from the distant station are heard to the best advantage. Fig. 2 illustrates the general arrangement and all of the necessary connections for the satisfactory operation of the instrument.

The base may be varnished and finished to suit the taste of the experimenter or to harmonize with the other instruments of his set. Many variations of the above design are possible which may be better suited to the individual requirements of the amateur, but the form shown has proved very satisfactory and can be depended upon to produce good results.

Wireless Telegraph Contest

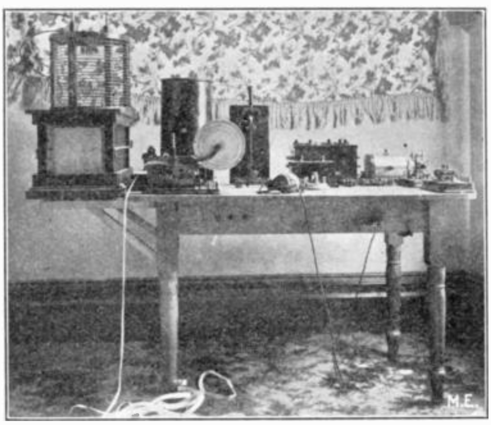
Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three ($3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have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

FIRST PRIZE, THREE DOLLARS.

On the left is the transmitting condenser and tuning coil, followed by the induction coil standing vertical, in front of which is the recording machine for wireless messages.

The large switch is to be replaced by an automatic machine, enabling any other station to stop me instantly when sending aerograms, or should anybody "butt in" while I am sending, I can hear them, thereby preventing messages from being mixed.

A 1500-ohm head phone is used in connection with the "Electro" Lytic detector.



A small box containing adjustable condensers, potentiometer and three electrolytics, interchangeable by plugs, to be in readiness in case of a burnout from other powerful stations, and delicate rheostat are not shown, having not been completed when photograph was taken. Directly to the right is the receiving tuning coil, coherer, with decoherer and polarized relay for the recording machine.

A plugging arrangement in front of the table enables me to change headphones of any resistances to different receivers without being compelled to bother with disconnecting any instruments.

The aerial is supported horizontally between two masts, 75 and 50 feet high respectively, and 350 feet long on spreaders 8 feet wide.

F. ARNBERGER, JR.

THE IMPORTANCE OF GOOD GROUND

As is nearly always the case with electrical apparatus, it is the small thing that gives the most trouble. Many amateurs fail to recognize the importance and necessity of a good earth connection when setting up their wireless apparatus. Their instruments are properly connected, their aerials of the right hight and carefully insulated; yet they fail to send or receive beyond a certain distance.

If we were to look into their complaint, nine cases out of ten we would find that the antenna was grounded simply by burying the metal plate a few inches below the surface, without considering the nature of the soil in that locality.

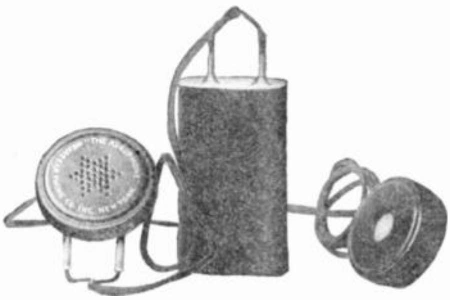
In those sections of the country where it is low and swampy or on the sea, a foot or two below the surface will generally suffice. I refer, however, to those parts where the ground is mostly hard clay or rocky. In such places there is always much trouble experienced in obtaining good connection with the earth. For instance, a few days ago the author in erecting an experimental station thought that a metal plate buried a few feet below the surface would be a perfect ground, but when everything was connected up for receiving, the signals did not come as clear and sharp as was expected. It was found that the plate was surrounded by a good deal of hard clay which offered a high resistance. The plate was then buried three feet deeper and the efficiency increased 100 per cent.

In mountainous regions or wherever the earth is hard or rocky great care should be taken. If possible the connection should be made in a lake or stream or if this is impossible a place where the earth is permanently moist should be selected.

Contributed by I. H. FENTRESS.

THE AUROPHONE.

This new instrument has been constructed to take the place of the barbarous "ear trumpet," and, thanks to its numerous merits, there is no doubt that it will soon be popular. In fact, hundreds of people partly deaf are benefiting by its use.



The underlying principle is a marvelous sensitive microphone transmitter and an equally sensitive telephone receiver of minute dimensions.

The battery is usually carried in the pocket, while the microphone, shown at the left of the battery, is carried under the coat; or if the owner is a lady, it is carried under the waist.

The telephone receiver is carried in the hollow of the hand. As soon as the wearer wishes to hear, the telephone receiver is placed to the ear, and the sound waves, striking the transmitter, are conveyed to the telephone.

As the transmitter is very sensitive, it magnifies the sounds and reproduces them very clear and loud. The in-

struments are very light and can be carried entirely concealed.

Funny to think that you can send a wire by wire-*less*.—"Fips."

You can transfer money by wireless now. And still some folks desire "elastic" currency!—"Fips."

Correspondence.

Editor Modern Electrics, New York.

Dear Sir:—We are waiting for and wish very much to see the following article published in MODERN ELECTRICS. It was promised in the introduction letter, but has not appeared as yet: "How to make a sensitive voltmeter indicating 1-100 volt."

We suppose you have some good reason for not having published it, but we feel sure that we are not the only ones who are waiting for it.

Respectfully,

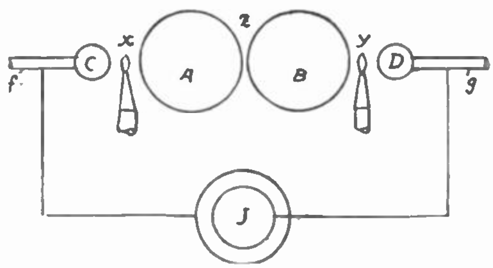
"Three Subscribers."

Waltham, Mass., July 20.

"Three Subscribers" are mistaken. The article *was* published as promised in the first (April) issue. It will be found there on page 17.—EDITOR.

HIGH FREQUENCY SPARK GAP.

Mr. I. Koehler made an interesting discovery how with a small spark coil, or with a small static machine, high frequency currents can be obtained.



Two small balls, C and D, ¾ inch diameter are connected to the induction coil (or static machine) J.

Between these small balls two larger ones, A and B, 2 inches in diameter, are placed, between which the high frequency discharge passes.

In the gaps X and Y two small hydrogen flames, of about ¼ inch flame length, are stationed. These hot flames act as conductors for the current, and no sparks will pass at X and Y. A high frequency spark, however, passes at Z as soon as J is operated.

If J is a static machine and if it is run slowly, intermittent sparks will jump at Z. If the plates are revolved faster, a broad flame-like ribbon will be formed as a result of the high frequency oscillations.

"Knick-Knacks"

A Gyrotrop

By M. G. Hugo.

The Gyrotrop or current reverser is a device to change direct current of any tension into alternating current.

The reverser as shown below can be easily constructed by anybody in a few hours' work, and we think no experimenter will feel satisfied till he has acquired one of these interesting machines. The reverser will change the direct current of a few dry cells or storage batteries into alternating current; higher or lower frequency is easily obtained by turning the handle of the apparatus faster or slower, to suit requirements.

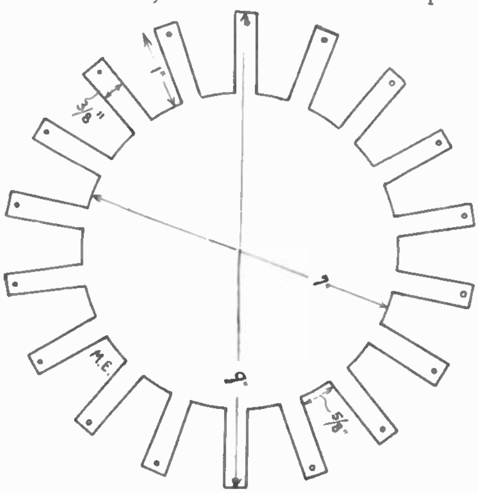


Fig. 1

First we need two thin disks of brass, copper, or even tin, thickness about No. 28. Diameter of disks 9 inches. Strike a center, and by means of dividers trace a circle of 7 inches diameter. (Fig. 1.) Mark off at equal distances 18 tongues ⅜ inch wide and one inch long. The space between the tongues is a trifle (1-64 inch) over ⅝ inch. By means of old scissors or chisel cut the space between tongues, which will give a disc having 18 tongues each 1 inch long, as clearly shown in Fig. 1. Two such discs of exactly the same shape and dimensions are required.

Each tongue, about ⅛ inch away from edge is then punctured with a nail hole to receive a small nail afterwards.

In the center of each completed disc solder a brass or other round rod, each about 2½—3 inches long, to serve a axle. (See Fig. 2.)

Construct a round wooden disc 7 inches in diameter and 1¼ inch thick. Take one of the discs and nail it on the wooden wheel. Each tongue of the disc is then nailed down, the nails passing through the previous punched holes. The other disc is fastened in the same manner, but in such a way that the tongues of the second disc come between the ones of the first. Great care must be taken that none of the tongues touch each other, as a short circuit would result afterward. The wheel when completed will look like the one shown in Fig. 2. The white places on the face of the wheel represent the metal tongues D E, while the dark portions represent the wood. Black dots on the tongues are nails.

The base is made next. A piece of heavy wood 1 inch thick, 10 inches long and 7 inches wide will do. Two supports for the axles are made of two pieces of wood 8 inches high, 2 inches wide and ¼ inch thick.

Two long brass springs (F and G), fairly stiff, are then connected to two binding posts. The springs must always make good contact with the axles.

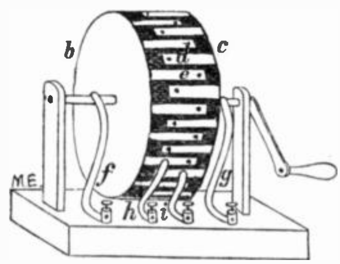


Fig. 2

Two smaller springs (H and I) are constructed, which also go to two posts, as shown in the illustration. Great care must be taken when placing the last mentioned springs, as they always must touch two different tongues. The tips of these two springs must be bent inwardly, so as not to short circuit two tongues.

To complete the machine, a handle or crank is attached to the right axle.

To operate, connect your source of direct current (dry cells, storage cells, etc.) to the posts F and G. Two wires lead from H and I. If the wheel of the reverser is operated, an alternating current can be taken from H and I. By turning the wheel faster quicker alternations will result. The philosophy is as follows:

Suppose B is connected to the positive, C to the negative of your direct current. In the sketched position H is positive, I is negative. If the wheel is turned forward H will come in contact with that tongue I had touched just before; H therefore gets —, while I, now touching a tongue of disc B, gets +. The faster the wheel rotates, the quicker the polarity is changed and an alternating current is produced.

This Gyrotrop can be used for numerous experiments. A polarized telephone ringer is operated successfully. The hand of a galvanometer, volt or ammeter having the zero point in the centre of the scale will oscillate from right to left. A common bell, deprived of its make and break mechanism, having the electromagnets only connected to the Gyrotrop will ring the same as before, no make and break on the bell being required.

By connecting H and I to the primary of a spark coil, and the secondaries of the coil to a Geissler tube, the polarity of the tube will be reversed constantly, producing a strange effect in the tube, the light jumping back and forward as it were.

Other experiments will suggest themselves readily.

A NOVEL TUNING DEVICE.

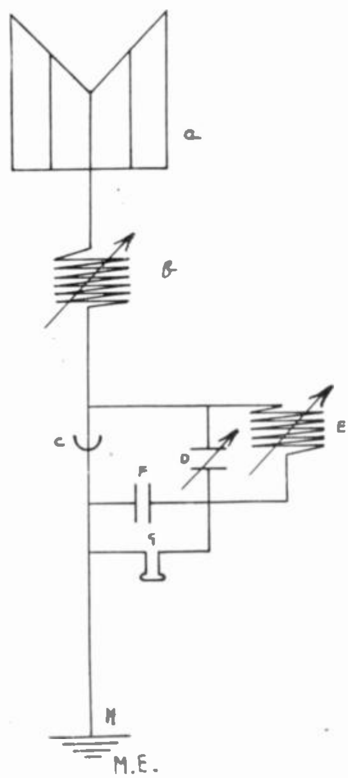
By Newell A. Thompson.

Many experimenters in the wireless telegraph field experience great difficulty in constructing a simple device to tune their instruments so as to "pick up" high power stations and passing ships. This difficulty, for the most part lies in the failure to recognize the fact that most commercial stations operate on a long wave. It is the purpose of this article to describe a simple yet efficient circuit which is especially adapted to tuning to very long wave lengths.

The entire device is simply an adaptation of the transmitting circuit of the "Telefunken" system to a receiving circuit. It works best when used in connection with a silicon detector, and it is thus shown in the diagram: A being the antena; B the tuning coil, C the detector, D an adjustable condenser, E a small adjustable inductance, F a fixed condenser, G the telephone receiver, and H the ground.

The tuning coil described in the June issue of MODERN ELECTRICS, or any similar coil, will operate very well in the antenna at B, the one change needed in its construction is that only one adjustable contact is required.

A similar coil one half size and wound with No. 28 D. C. C. magnet wire with only one adjustable contact can be used



for the inductance E. The condenser F is formed of eight sheets of tinfoil 3x6 inches, while the adjustable condenser F is formed by five plates of glass or thin mica upon which have been fastened with shellac sheets of tinfoil 3 by 3 inches, so that the capacity can be varied at will by simply sliding the plates apart. The telephone receivers should be of as high a resistance as possible, 1,000—1,500 ohms being a good size.

The operation of this device is exceedingly simple. First adjust the tuning coil B until the proper wave length is obtained; then "juggle" with the ad-

(Continued on Page 182)

Laboratory Contest

FIRST PRIZE. THREE DOLLARS.

My laboratory occupies the greater part of our attic. It is well lighted and is a very good place to experiment in. I am 16 years old and have been experimenting with electricity for about 2 years. I have experimented in "wireless" a great deal, and have constructed a complete outfit, most of which is shown in the picture.

The Transmitter.

The sending apparatus consists of coil, interrupter, sending key, switch, condenser and spark balls. The coil is shown in the center of the table. This coil is capable of giving a 3-inch spark, and will send messages 6 to 8 miles. The coil is immersed in transformer oil in a large gravity jar to insulate it, and is operated on the 110-volt lighting circuit (alternating current), using a Wehnelt interrupter or two in series to increase the spark. The interrupter is shown at the left of the coil, and the condenser, which consists of 4 sheets of tin foil and 12 plates of glass, is shown in the box just in front of the coil. The 2-point switch on the face of the box is for cutting in either plate condenser or Leyden jar into circuit. The brass balls on the top of the box are for sending wireless messages, and are non adjustable. The smaller set mounted on the slate base at the foot of the condenser box is for experimental purposes and is adjustable. Either set may be cut in by a double-throw knife switch. The sending key is home made.

The Receiving Apparatus.

For receiving messages I have several kinds of wave detectors. The one from which I have got best results is a microphone detector using a "pony" telephone receiver. I also have a carbon grain filings coherer and an "Electro" Lytic detector. The microphone detector is just in front of the electrolytic. The filings coherer is on the oak box at the left on the table, and is connected with the Morse sounder and relay.

Between the sounder and the relay is a buzzer for signalling purposes. All of these instruments are controlled by the 12-point switch in front of the spark balls, and any one of the wave detectors may be brought in circuit by moving the switch. The Morse sounder may also be cut out of the wireless and into the wire line by this switch. The batteries for the receiving instruments are on the shelf in front of MODERN ELECTRICS, and the batteries for experimenting are underneath the table.

The Aerial.

The aerial consists of a piece of wire screen 12x12 inches, mounted on a mast on the top of the house. Its height from the ground is 60 feet, and its wave length is about 120 meters. My tuning coils are constructed of springs taken from old curtain rollers, in the form of the E. I. Co.'s Rheostat Regulator. I have a knife switchboard arranged so that the aerial may be grounded in case of lightning and either sending or receiving instruments may be connected to the aerial. I use the gas pipe for ground.

Besides my wireless, I have several other instruments for experimenting. On the shelf behind the table are shown several arc lights which I operate on the 110-volt circuit, using water resistance and resistance coil. On the shelf also are an induction coil, a small transformer and an uncompleted jump spark coil which will now throw about ¼ inch spark. The transformer will reduce the 110-volt current to about 25 volts. The dynamo at the left of the picture is a 100-watt 10-volt 10-ampere machine, and will run a motor giving 1-6 horse-power. This may be run on the 110-volt current by using the transformer and rectifier. To the right of the dynamo is a Tesla coil, and attached to the spark balls is a small incandescent lamp which I use in performing vacuum tube experiments.

I could not get all of my apparatus in the picture, owing to its small size. On my switchboard, which is not shown, I have, besides several knife switches, a selective switch with which I may cut in any number of batteries, any amount of resistance, or reverse the direction of the current. I own a small motor, electric engine, shocking coil, wire telegraph line, and several other pieces of battery apparatus. I own a small lathe, which I built especially for winding coils, and I am now at work on a 60-watt dynamo.

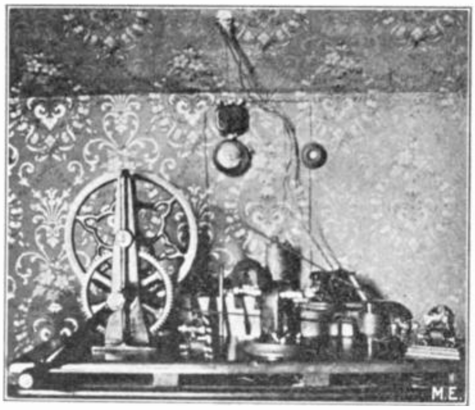
I have built most of the apparatus, with the exception of the Morse sounder and 3-inch coil. Ever since I began experimenting I have looked for a good magazine that would really be a help to an amateur, and I think I have found it in MODERN ELECTRICS.

LOUIS BONSIB.

Vincennes, Ind.

HONORABLE MENTION.

The following is a description of my laboratory: At the left is a hand-power which drives a midget dynamo, 10 volts, 1½ amperes; it lights the incandescent light above, 6 C. P. 10. volts. At the extreme right end is an Ajax motor; in the middle of the baseboard is a Wonder alternator and Albert motor;



still behind these are a 4-inch and 6-inch horse shoe magnets and 6-inch bar magnet; also a small electromagnet; above these are a thriller, shocking machine, dry battery, and on the wall is an electric bell and push botton, worked from a Leclanché battery on the floor.

STUART K. HARLOW.

Morristown, Ind.

A NEW INSULATION FOR WIRES

An important discovery has been made by an Englishman, which is sure to revolutionize the present methods of insulating electrical wires with rubber, silk, etc.

By using the new material, the wire is covered with a thin film, which is elastic, very strong, is an excellent insulator and adheres to the wire with a force that is surprising.

Besides the new material is waterproof and cannot melt nor burn; wires insulated with the new material can be bent down to the sharpest angle without its insulation suffering the slightest damage.

Anyone can prepare this wonderful insulation material as follows:

Heat some linseed-oil to a temperature of 400 degrees Fahrenheit and add under constant stirring 2 per cent. oxyde of zinc and 2 per cent. oxyde of lead. Now heat the mixture till it acquires the required consistency, then add to it 26 per cent. oil of rosin and let cool off.

If this substance is now applied on a wire any degree of elasticity can be obtained by heating it. After cooling, heat nor cold will have any effect on the material.

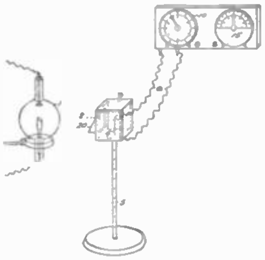
AERIAL AND GROUND,

The aerial wire should be made very strong, as it may have to stand strong winds and sleet storms. If you have a high tree near your house, you can easily suspend not too taught a hard drawn or stranded copper wire equal to No. 12 B. & S. from a place near the top, insulating it well from the tree to your window if convenient, or if necessary, you can use a small pole or other means of guying to clear it from other branches of the tree. The wire should be brought into the house through a porcelain bushing. The higher you get the aerial wire from your instruments, the better the results will be.

The ground wire should have very little resistance. You can use No. 10 copper wire, connecting it to a city water or gas pipe. Should you not have city water, dig a hole in good *moist* earth 3 or 4 feet deep and place a number of pieces of metal in it, soldering to each piece a wire and lead all the wires to the large wire running to the instruments.

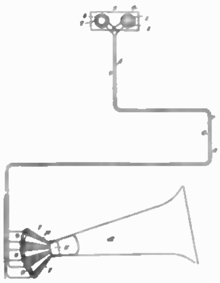
Electrical Patents for the Month

893,244 X RAY METER George C. Johnston, Pittsburg, Pa. Filed June 30, 1906. Serial No 324,275.



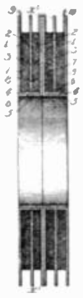
1. Apparatus for measuring radiant energy, comprising an electric circuit having therein a meter and a selenium cell, and fluorescent material arranged to cast its light on said cell.

893,286. MULTIPHONE Kelley M Turner, New York, N. Y., assignor to General Acoustic Company, a Corporation of New York. Filed Dec. 21, 1905. Serial No 292,677



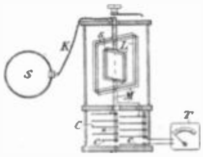
In a multiphone, a pair of transmitters connected in multiple, a horn having a block with convergent passages, a plurality of receivers inset in said passages and connected in a multiple circuit with said transmitters, said transmitters being included in a box having a battery

892,763. INDUCTION-COIL UNIT. Carl A. Pfanstiehl, Highland Park, Ill Filed Nov 11, 1907 Serial No. 401,640



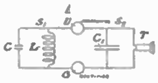
A coil section or unit, comprising a pair of outer spool heads formed with central orifices and annular necks, one of which necks fits over the other, an intermediate head formed with a corresponding orifice and with a small passage adjacent to said orifice said intermediate head being minuged intermediate of the outer spool heads, and rerved coil windings in the annular cavities between the heads aforesaid and connected together by a wire extension passing through the small passage aforesaid, substantially as set forth.

892,311. APPARATUS FOR PLOTTING RESONANCE CURVES. Otto Scheller, Steglitz, near Berlin, Germany. Filed Mar 9, 1906. Serial No 419,961.



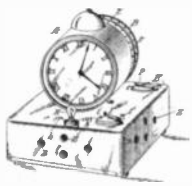
1 An electrical instrument of the character described, comprising a variable self-induction element including a movable coil, a variable condenser provided with movable plates, means connecting the movable coil and the movable plates to cause the adjustment of one to adjust the other accordingly, and fixed electrical connections between the self-induction element and the condenser.

892,312. SYSTEM FOR RECEIVING UNDAMPED ELECTRIC OSCILLATIONS. Otto Scheller, Steglitz, near Berlin, Germany Filed Mar 9, 1906. Serial No 419,962



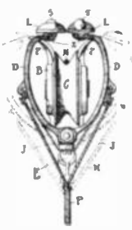
1 In a system for receiving substantially undamped oscillations, the combination with a high frequency circuit, and a circuit of lower frequency of means connecting said circuits and adapted to transmit current impulses of determined directions from the high frequency circuit to the circuit of lower frequency and working synchronously with the fundamental oscillation of the circuit of lower frequency and means permitting energy to be transmitted in one direction only.

890,134 ALARM-CLOCK Valeer S Gaillard, Torrington, Conn Filed Mar 16, 1908 Serial No 421,353



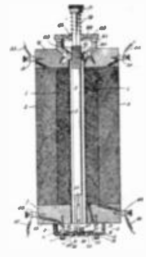
1. Alarm mechanism comprising a clock train, an electrically operated alarm, a contact operating device moved by the clock train, and a contact actuated to move at a speed greater than that of its operating device to momentarily close the circuit of the alarm

892,272. TROLLEY GUARD AND GUIDE. Charles Latsch, Cleveland, Ohio, assignor of twenty-four one-hundredths to C A Mueller and twenty-four one-hundredths to Joe H Wenneman, Cleveland, Ohio. Filed Sept 3 1907 Serial No 391 161



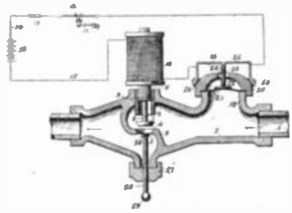
1 A trolley harp having a trolley wheel mounted therein and a pole supporting the harp, in combination with an arm fixed detachably on said pole and extending beneath said wheel, a pair of guard members pivotally supported from said arm across the axis of the trolley wheel, rollers mounted in the free ends of said guard members and arranged to meet over the trolley wheel, springs to hold said arms in working position, and guards on the trolley harp bridging the space at each side between the trolley wheel and the said rollers.

891,320 INDUCTION-COIL Donald H Yost, York Pa., assignor of one-half to Frederick R. Yost York Pa Filed Oct 23, 1907 Serial No 398,785



1. An electric circuit having portions which are electrically disconnected from each other, whereby the said circuit is interrupted, an electro-magnet and the armature for the electro-magnet located between the said magnet and the said circuit and in contact with the disconnected portions of the circuit to complete the latter, and the said armature being adapted to oscillate between the said electro-magnet and the said circuit

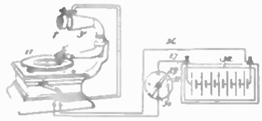
891,568 VALVE-OPERATING MECHANISM Wilson B. Runnion and Edward Runnion, Spencer, W Va., assignors of one-half to Lewis S Goff, Spencer, W Va. Filed June 22, 1907 Serial No 380,275



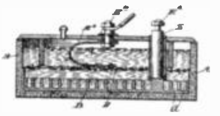
1 In apparatus of the character set forth, the combination with a conducting pipe, of a controlling valve therefor, an electro-magnet, means for energizing and deënergizing the magnet, an armature for the magnet constituting operating means for the valve, said armature being out of the range of magnetic action of the magnet when the valve is in one position, and means for moving the armature into the range of magnetic action of such magnet

893,151 DEVICE FOR TRANSMISSION TO A DISTANCE OF SOUNDS PRODUCED BY TALKING-MACHINES Eugene Ducretet, Paris, France Filed Mar 4, 1907. Serial No. 360,429.

1. The combination with a reproducer trumpet of a talking machine, of a supporting rod secured to the said trumpet substantially parallel to the axis of the latter, a microphone, and means for connecting the microphone to the supporting rod and to hold it in front of the trumpet-opening, in adjustable relation thereto and means for supplying electric current to the said microphone



892,608. ELECTRIC BATTERY William Morrison, Chicago Ill assignor to George Rumrill Coryell, Chicago Ill Filed Aug 11, 1902 Serial No 119,204



1 In a storage battery, the combination with a cell of non-conducting material, negative and positive elements, the negative element being imperforate, a deposit of bromin supported entirely by the negative element, and means for preventing the deposit of bromin from being displaced from its support

Original Electrical Inventions for Which Letters Patent Have Been Granted, For the Month Ending July 21st.

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

WIRELESS REGISTRY.

This Department has been started with the idea to bring the wireless amateur in closer touch with commercial land and ship stations. Each month a list of new members will be printed here and once each year an official BLUE BOOK will be issued by MODERN ELECTRICS, giving a list of all the members who registered during the year. Each member will receive the Official Blue Book free of charge. The Blue Book will also contain a complete list of commercial and government stations, their call letters, wave length, etc.

To register a station requires: Total length of aerial (from top to spark balls), spark length, call letter (if none is in existence M. E. will appoint one), name and address of owner.

Fee for Registry (including one Blue Book) 25 cents.

For other particulars see June issue of this magazine.

NAME AND ADDRESS OF OWNER.	CALL LETTER	APPROXIMATE WAVE LENGTH IN METERS.	SPARK LENGTH OF INDUCTION COIL.
11—Kendall Bushnell, Arlington, Mass.	K.B.	80	1½ ins.
12—A. K. Braman, Newport. R. I.,	P.S.	245	1 "

SHOCKING.

It is suprising to find how many well informed and intelligent people still believe that standing upon a charged third rail or touching it means instantaneous electrocution.

An equally large percentage of these "well informed" people are awed by the sight of a charged "live wire" carrying a high voltage and of course they imagine, that the mere touching of such a wire means certain death.

They never stop to consider how a mere sparrow can sit for hours on such a "deadly" wire apparently enjoying its deadliness and the accompanying picture, taken from one of the leading New York Evening papers, shows how even a "well informed" artist deliberately misstates facts.

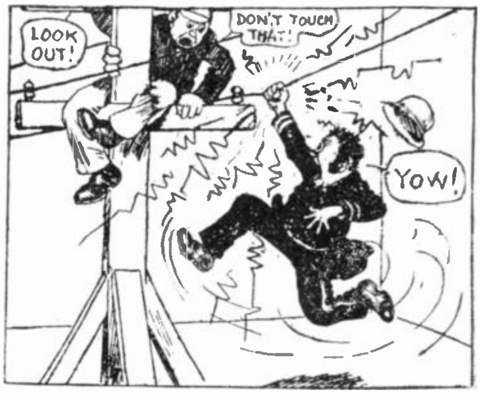
Such a picture cannot but convey the idea to the layman that if you jump in the air and grab a single high tension wire you will be slowly shocked to death!

The facts, of course, are that the policeman whom we see dangling in the air and who is apparently being slowly roasted alive, would not feel the slightest shock, because he is not standing on the ground, nor does he touch another wire or object to allow the current to complete the circuit.

However the public, reading the comic series, enjoy the sparks and fireworks around the policeman and the wrong idea is converted to them that to touch a light wire means death.

The above reminds the writer of an incident witnessed some years ago in New York on a downtown Elevated Railway station.

On a late afternoon, with the platform almost deserted, he overheard two young men talking about the wonders of electricity. One of the youths seemed to be pretty well informed of electrical matters and the close sight of the third rail suggested some ideas to the other young man.



He wanted to know how long it would take a person to be shocked to death by standing on the third rail

"About a hundred years or so," suggested his friend.

This the other fellow took as a joke, so his friend informed him that for five dollars he'd stand on the third rail for a minute.

jokingly the other bet 10 dollars that he would not, and without hesitating his friend jumped down the platform, before the other one could hold him back. He then jumped with even feet on the third rail and calmly lit a cigar while his friend on the platform had all to do not to faint of fright.

After taking a few puffs of his cigar the one on the third rail jumped down and climbed back on the platform to collect his $10.00. His friend probably thinks him a wonder, as he very likely has not been informed yet that to be killed one must touch or stand upon *two* rails, at the same time.

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. Common questions will be promptly answered by mail.

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, as *all* questions will be answered either by mail or in this department.

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

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than five questions answered at one time. 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.

HIGH TENSION MAGNETO.

(47.) C. THOMPSON, Victoria, B. C., asks:

1.—How is a glass plate condenser made?

A. 1.—You will find this described under "A 2-mile Wireless" in the July issue.

2.—Is the current from a magneto the same as that from a spark coil?

A. 2.—The current from a high tension magneto such as used in automobiles for igniting purposes, in a great many respects acts like a spark coil. Of course this does not refer to a magneto which is not able to throw a jump spark similar to a spark a coil gives.

3.—Can a magneto giving large enough current take the place of the spark coil in a wireless telegraph outfit?

A. 3.—Yes, although it would be rather hard to use it for signalling purposes, but good results might be had for experimenting purposes. Of course you understand it must be a magneto as explained in answer No. 2 above.

MEDICAL COIL—110 VOLTS.

(48.) RAYMOND M. LELONG, Cal., writes:

1.—How could I operate a small medical induction coil on a 110-volt circuit? (A. C.) How much resistance would it require?

A. 1.—You could not use a medical induction coil on alternating current at all; direct current must be used.

2.—What would it cost me (approximately) to install a wireless telegraph, if I were to buy the instruments?

A. 2.—We advise you to get the prices from manufacturers of this material; we could hardly give you an idea as to prices because we are not acquainted with your requirements.

You will find a number of manufacturers of wireless goods in our advertising columns.

TO LAY UP STORAGE BATTERY.

(49.) C. H. HARPER, New York, asks:

1.—I wish to lay up a storage battery for about three months and would like to hear from you which method you recommend as the best.

A. 1.—Pour off the acid by standing the battery upside down for fifteen minutes; fill up all the cells with clean water (rain water preferably), and after about ten minutes let this water run out again from the cells. Let it drip off thoroughly and pour in all the cells distilled water so that the plates are completely covered. Carefully oil the connections, and if the battery has vent-caps screw these in and place the battery where it cannot freeze or heat too much.

2.—Also advise how to put the battery in commission again?

A. 2.—Fill all the cells with electrolyte prepared as follows:

In a clean earthenware tank or porcelain vessel pour three ½ parts (by bulk) of distilled or rain water. Into this pour under constant stirring one part of chemically pure sulphuric acid (oil of vitriol) 66 degrees Beaume. If this solution has cooled, test it with a hydrometer. It should now read 1260° specific gravity.

The electrolyte is then filled in carefully through the vent tubes of each cell until it stands ¼ inch over the top of plates. Battery should then be charged as per directions given on the label.

Commercial acid or hydrant water should under no circumstances be used; it will spoil the plates in a few weeks. Battery should now be charged the same as usual and discharged as soon as charging is completed. This is necessary because a battery that has been out of commission will only give the full capacity after the second charge.

WHISTLING TELEPHONE.

(50.) ROBERT ALTONA, Ill., writes:

Will you kindly explain why the whistle is heard, and what causes it, when the receiver of a telephone is held about two inches from the mouth piece. This seems to be common with all the standard telephones, especially the farmers.

A.—This has been demonstrated quite often, the philosophy and phenomenon being as follows: As soon as the receiver is held to the mouth piece of a fairly sensitive transmitter the little noise caused by various sources (which is always heard when the telephone receiver is held to the ear) sends sound waves to the transmitter. As the telephone receiver is connected with the transmitter, this little noise will be enlarged—magnified—in the receiver. More sound waves will therefore be sent to the microphone transmitter, and so on, until enough noise is produced to make the telephone receiver hum.

TWELVE-INCH COIL.

(51.) ARTHUR E. LUND, Kansas, writes:

1.—Please give dimensions of an induction coil capable of giving a twelve-inch spark?

A. 1.—Length of core 20 inches, diameter 1½ inches.

Primary: Diameter over winding, 2 1-16 inches; size of wire, No. 10; weight of wire, 42 ounces.

Secondary: Length, 16 inches; diameter, 6½ inches; size of wire, No. 36; number of sections, 200; weight of wire, 12 pounds.

Condenser: 12x8 inches; number of sheets, sixty.

Current: Twenty-four volts, 10 amperes.

2.—Would it be all right to give the secondary wire a light coating of rubber, using liquid rubber for coating?

A. 2.—No, this would hardly do at all, because such coating would take up too much space. The wire should be run through melted paraffine.

THEORY OF DETECTORS.

(52.) STUART K. HARLOW Ind., writes:

Describe the theory of working of a carbon needle coherer and electrolytic detector.

A.—The carbon needle coherer is based upon the principle that a fine needle placed on the carbon blocks does not make good electrical connection on account of the lightness of the needle. As soon as an electrical wave strikes the needle, the resistance of the circuit of which the needle forms part, is greatly reduced, the needle making better connection. As soon as the wave passes, the needle again passes in the first state, making less good connection, and so on.

No satisfactory explanation has been offered on the exact working of the Electrolytic detector. Various theories have been offered, but none is quite satisfactory. Some investigators think that the working is based on polarization, and some others think that the fine Wollaston wire does not make actual contact with the liquid until a wave strikes the wire. The last view is probably the most satisfactory.

LEYDEN JARS.

(53.) HOWARD E. BAGNALL, Mo., asks:

1.—How can I introduce a Leyden jar into the circuit so as to increase the sending distance of my wireless?

A. 1.—This has been explained in various issues of this magazine; we refer you to the article appearing on page 49 of the May issue.

2.—Can a Leyden jar increase the receiving distance of a detector?

A. 2.—Yes, providing you have a tuned circuit on the receiving end.

3.—Can the aerial for a temporary station be put on a common kite?

A. 3.—Yes.

4.—Will a 1½ inch spark coil work 4 miles under favorable conditions?

A. 4.—Yes; it may even work 6—8 miles with tuned circuit and sensitive detector.

5.—How far will a ½ inch coil work under the best conditions and a carborundum detector?

A. 5.—About one mile.

SPARK COIL QUERY.

(54.) A. SCHOMSTEIN, Brooklyn, N. Y., writes:

1.—How far (in miles) will a ½ inch spark coil send a message?

A. 1.—This is explained in the previous inquiry.

2.—I am making an induction coil which is five inches long and three and one-half inches wide. Please tell me how much wire and what number I will need to get a two-inch spark.

A. 2.—You will need 2½ pounds of No. 36 wire for the secondary, and about 15 ounces of No. 14 wire for the primary.

The length of coil for the primary must be at least 8 inches.

DETECTOR QUERIES.

(55.) JAMES D. THOMAS, Pa., asks:

1a.—Can a carbon cup be used instead of a glass incandescent lamp in the electrolytic detector as described in the May number of MODERN ELECTRICS page 58?

A. 1a.—Yes.

1 b.—Will it be as sensitive?

A. 1b.—Yes it will be more sensitive.

2.—With a ½ inch coil could I receive messages 1000 feet with above detector with 40 feet aerials?

A. 2.—Yes.

3.—Where can I buy a vibrator for a ¾ inch Ruhmkorff type induction coil?

A. 3.—From the Electro Importing Co., New York City.

4.—Will the microphone coherer as described in the May number work at a distance of 1000 feet with ½ inch coil and 75 Ohms telephone receiver?

A. 4.—Yes, providing aerial is high enough.

5.—Which is the best type of coherer or detector for the amateur experimenter to telegraph 1000 feet or more?

A. 5.—The so called "Auto coherer," or "Electro" Lytic Detector will give best satisfaction.

STORAGE BATTERY QUERY.

(56.) O. C. DODSON, Pa., asks:

1.—Can a 100 A. H. storage battery be charged at a 25 ampere rate?

A. 1.—No; a 100 A. H. storage battery should not be charged with a higher current than 15 amperes.

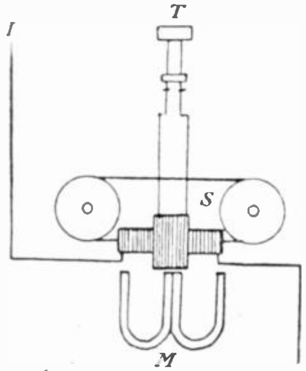
2.—How far will an E. I. Co. 1 inch spark coil work on a wireless with an "Electro" Lytic detector at the receiving end?

A. 2.—It has worked up to 6 miles, in connection with tuning coil and proper aerials.

3.—What is a magnetic detector and how does it work?

A. 3.—We give you below illustration on the Marconi magnetic detector.

An endless cord of silk covered iron wire No. 36 is made to pass through a spool of wire forming the primary; another spool of wire is slipped over the primary. This latter spool has very thin wire. The telephone receiver is connected to the latter spool of wire, the aerial and ground are connected to the primary spool. The endless cord of iron wires passes over two



pulleys and rotates through the hollow primary by means of clock work. Two permanent magnets are placed at M.

TEN INCH SPARK COIL.

(57.) CLIFFORD CORNELI, Mo., writes:

1.—Please give your estimate of spark length of following coil: Core, 3x24 inches; primary, 2 layers of several wires connected in multiple equal in cross section of area to one No. 12; secondary: 12x12 inches, in 60 sections, wound with 12½ pounds No. 28 S. C. C. wire; insulation between primary and secondary to consist of a vulcanite tube about 3-16 inch thick. How about the proportions?

A. 1.—The proportion of the coil seems to be right, except for the core, which, in our estimation, should be about 20 inches long by 1½ diameter. The secondary should be wound in about 100 sections, as the discharge might prove too strong per section if the coil is wound in too small a number of sections. You should at least get 9-10 inch spark from this coil, providing you have a fast interrupter, and insulation is good.

2.—We have been recommended by an expert coil-maker to use ⅛ inch square iron for core of above coil; is that better than one composed of No. 20 or 22 iron wire?

A. 2.—We do not consider it wise to use ⅛ inch square iron for coil, and your expert coil maker does not seem to have manufactured many coils. A core built of such iron would heat up very soon, and would cut down the spark length considerably. Use nothing but iron wire, No. 18 or No. 20.

3.—What size of and how many storage cells should be used to supply current for above coil?

A. 3.—About 20 volts and 8 amperes.

4.—Would it not be better to use condensers of sheet glass and tinfoil than Leyden jars, in tuned transmitting circuit with 10 inch coil?

A. 4.—A glass plate condenser is considered better than Leyden jars, and is less expensive.

5.—What would be the necessary resistance of a polarized relay to operate in connection with electro-lytic detector?

A. 5.—You can not use any of the existing relays in connection with an electrolytic detector, unless you have in mind the Allström relay, described on page 65 of the May issue.

OSCILLATORS.

(58.) HERMAN BABIN asks:

1.—What is the theory of the electrolytic detector?

A. 1.—This is explained in another query in the "Oracle" of this issue.

2.—What advantage has an open magnetic circuit induction coil over one with a closed magnetic circuit when a "Wehnelt" interrupter is used?

A. 2.—The frequency will be somewhat higher.

3.—Which gives the best results in wireless telegraphy, large oscillators or small ones, say about ¼ or ¾ inch diameter?

A. 3.—The oscillators used now by most wireless stations are about 1 inch to 1¾ inches in diameter.

CARBORUNDUM CRYSTALS.

(59.) "BRIGHTWOOD AVE.," Wash., D. C., asks:

1.—Is the Carborundum Crystal enclosed of any use in wireless telegraphy? I have about 1 pound of them.

A. 1.—The crystals in question are too small, and would hardly give much result. The best crystals used are usually ⅛ to ¼ inch long.

2.—What is a magnetic detector and how is it made?

A. 2.—This has been explained in this issue.

3.—What is the cost of making the tuning coil described in June?

A. 3.—About 5—6 dollars.

4.—What is the anchor gap used for?

A. 4.—The anchor gap is used instead of a switch to disconnect the spark coil automatically from the receiving instruments. Incoming waves cannot pass the gap, but in sending the spark from the coil easily jumps the minute gap.

ARC LIGHT FROM BATTERY CARBONS.

(60.) LARRY J. BARTON, Cal., asks:

1.—Can an arc light be made out of battery carbons? If so, how?

A. 1.—Yes, provided that you have about 30 volts at your disposal. Two carbons must be filed until both have a very fine point. A small arc can then be produced between them.

2.—How many feet are there in the secondary and primary winding of a small telephone induction coil?

A. 2.—It is impossible to give you any data on these, because you state no size. A standard coil has 15 feet wire on primary and 450 feet wire on the secondary.

3.—Sometimes when you scratch wires from some strong batteries what is the name and cause of that queer smell that arises?

A. 3.—If you short circuit a strong battery which has enough current to heat up the wire, you can smell the peculiar odor of the metal. All metals when hot will emit a certain odor.

WIRELESS QUERIES.

(61.) LEO LUDEKENS, Cal., writes:

1.—Is it best to put wireless instruments directly under, or to one side of the aerial?

A. 1.—It does not make any difference where the instruments are, as long as they are connected with the aerial.

2.—I have a 60-foot pole, 40-foot aerial net or antenna, 1½ inch coil, and my instruments are in the upper part of my house, about 10 feet from the pole. What will my wave length be in meters?

A. 2.—This has been fully explained in an Editorial in the July issue.

3.—I have a sensitive "Electro" lytic detector and two sensitive 1000 Ohm receivers. How far will I be able to receive over land?

A. 3.—Without a tuning coil, you should be able to receive about 300—400 miles; with the tuning coil you could easily catch messages double the distance, and maybe more, under favorable circumstances.

AERIALS.

(62.) DeWitt Van Patten, Mich., writes:

1.—Will a ½ inch spark coil be large enough to work a coherer and a 5 Ohm sounder up to ½ mile?

A. 1.—Hardly; you had better use a one-inch coil.

2.—How high must the aerial be for the above?

A. 2.—About 40 feet high.

3.—Must a tuning coil be used with a silicon or electro-lytic detector?

A. 3.—If a tuning coil is used with any kind of a detector, you will increase the efficiency of the station quite a good deal, because you can get in tune with other stations.

4.—How high must the aerial be to catch messages from 500 to 800 miles distant with the "Electro"-lytic detector?

A. 4.—About 75 to 80 feet.

POTENTIOMETER.

(63.) James J. Ryan, Mass., writes:

1.—What is the size of wire of which sample is enclosed? Is it German silver, and would 220 feet of it make a good resistance for use as a potentiometer in wireless telegraphy.

A. 1.—The size of enclosed wire is No. 30 G. S. You will not need 220 feet; two yards will be enough. Consult article on potentiometer in this issue.

2.—What are good dimensions for a 4 inch spark coil, and will it work over 5 miles on water?

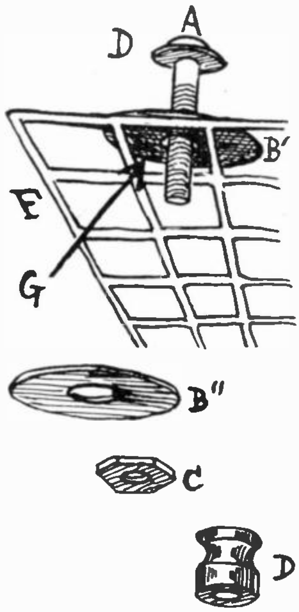
A 2.—You will not need a 4 inch spark coil to send 5 miles. A 1½ or 2 inch spark coil, in conection with a sensitive detector will work that distance. A good dimension for 4 inch spark coil is as follows:

Core, 8½ inches length; size of primary wire, No. 12; weight of wire, 16 ounces.

Length of secondary, 6 inches; 4½ pounds No. 36 wire; condenser, 60 sheets of tinfoil 8x5 inches.

A SIMPLE METHOD OF FASTENING THE AERIAL WIRE TO SCREEN.

Procure a binding post as shown in the sketch or the binding post from the carbon of an old dry battery and two large Washers B' B". After placing one Washer B' on the post A, insert in the space G, in the screen F, (which



should be very clean). Then place the other Washer B" on the post and screw on the nut C. The aerial wire is then turned around the post and the thumb nut D, screwed down.

Contributed by, LESLIE MATHIAS.

A NEW INTERRUPTER AND DETECTOR.

(Continued from Page 165.)

C will become so heated that it commences to boil, and the force of the resulting bubbles, falling against each other, will be sufficient to make a momentary rupture in the thin mercury column. There will be a little shock, and the expanding quicksilver will rise in A and B. Of course, a vacuum will be created at the place where the rupture occurred; and as the tube is immersed in water, the mercury will stop boiling; it cools instantly, then contracts, and the atmospheric pressure, combined with the weight of the quicksilver columns in A and B, will help to bring the metal in contact again, after which the same play recommences as described. — Reprinted from "Scientific American."

AN IDEAL BATTERY.

(Continued from Page 154)

as an average when computing the installation. For instance, if we desire a battery of 6 volts we must have eight, or better, nine cells.

These batteries are well suitable to run spark coils, to charge storage batteries, driving motors, to light lamps; in fact, for everything where a steady, strong current is desired.

Once assembled the cells need practically no attention at all, and will not deteriorate when not in use.

For several reasons, not to be enumerated here, the battery should never be entirely idle. While not in use it should be shunted through a high resistance, which may be made by using an incandescent lamp having three times the voltage of that of the entire battery. On a ten-volt battery a 30-volt lamp should be used, and so on. The lamp will glow barely red and will use very little current. It may be left in the circuit all the time and will not interfere when battery is used for other work.

These batteries will furnish a steady and strong current till the zinc is entirely worn off and the copper oxide reduced to pure copper.

When renewing cells use fresh electrolyte, as the old one has lost its usefulness by the time the zinc has dissolved. The copper which has formed on the bottom of the trough can be peeled off easily and should be placed in a box till enough is gathered.

A NOVEL TUNING DEVICE.

(Continued from Page 171)

justable capacity D and inductance E until the circuits are in resonance, which can be easily determined by the loudness of the sound of the received signals in the telephone receivers. After experimenting some time with the device, an operator will discover the best method of adjustment to obtain the highest degree of selectivity, since it lends itself readily to that end.

With this receiving circuit I am able to cut in or out any station that I please with only a slight decrease in the strength of the received signals. It is, indeed, the simplest device for tuning a receiver that I know of, and the amateur will be amply repaid for his time spent in its construction.

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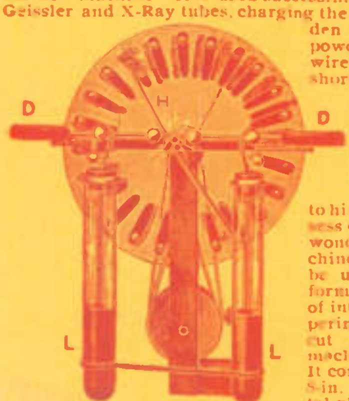

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