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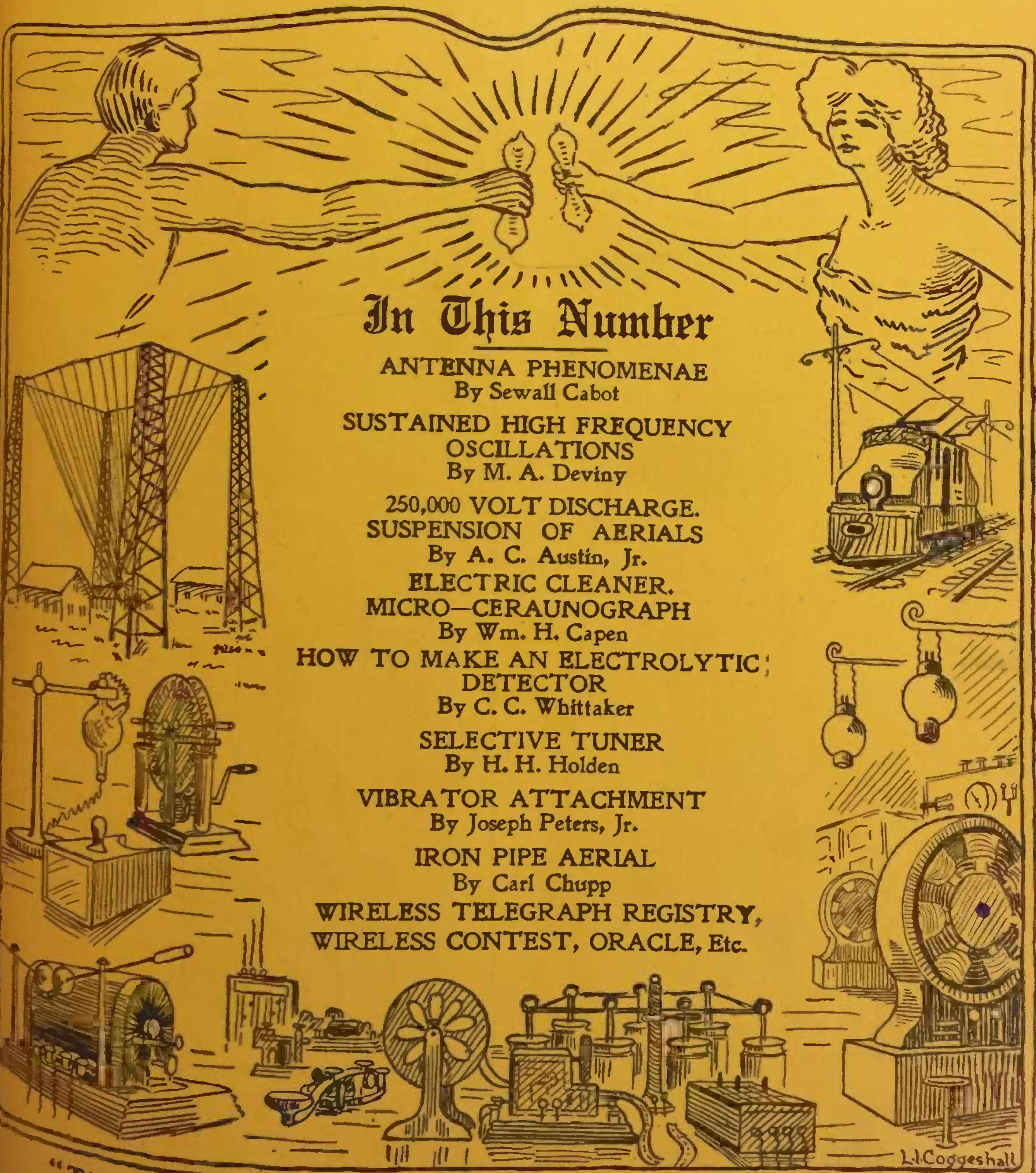

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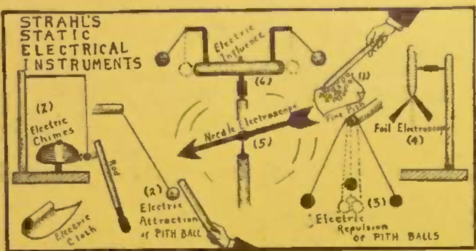

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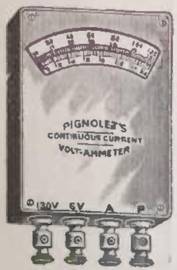

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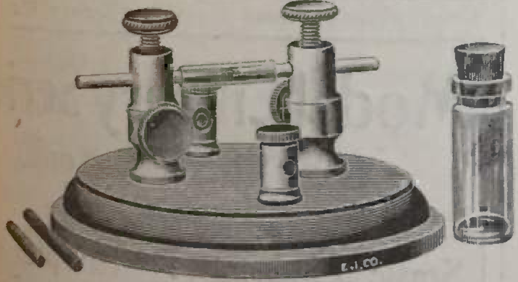

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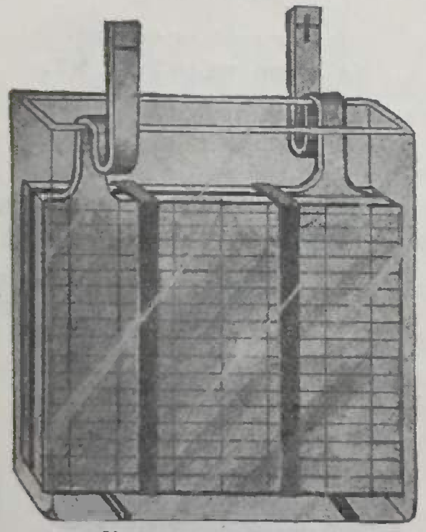

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MODERN ELECTRICS

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The Production of Sustained High Frequency Oscillations

By M. A. DEVINY.

From the many excellent articles appearing from time to time in MODERN ELECTRICS on the subject of aerophony, its readers have, no doubt, become more or less familiar with the greatest of all practical applications of "sustained"

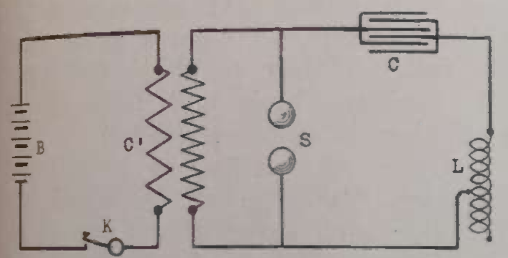

Fig 1

or "undamped" waves, and owing to their rapidly increasing importance in the fields of wireless telegraphy and aerophony, a brief description of some of their more important characteristics and the methods employed in their production may be of interest.

For the benefit of those who are not familiar with the differences existing between "undamped" oscillations and those of the "damped" variety, it might be well to briefly describe the conditions necessary for the production of both kinds. The different forms of apparatus for the production of electrical oscillations or high frequency currents may be divided into two general classes, as follows:

1. Those by which the oscillations are produced by suddenly discharging a highly electrified body through a circuit possessing capacity and inductance, and,

2. Those which produce the oscillations directly without employing a disruptive discharge. To the first of these classes belong the ordinary methods such as are at present employed in nearly all of our wireless telegraph stations, while the second form includes the various arc devices and high frequency alternators of every description.

In order to set up high frequency currents or electrical oscillations of any kind by the disruptive discharge of a highly electrified source, such as a condenser or a static machine, it is essential that the discharging circuit possess the factors of capacity and inductance and that the ohmic resistance be less than a certain maximum value. The exact functions performed by each of these elements require very complicated mathematical consideration for their thorough comprehension, but their general characteristics may be described as fol-

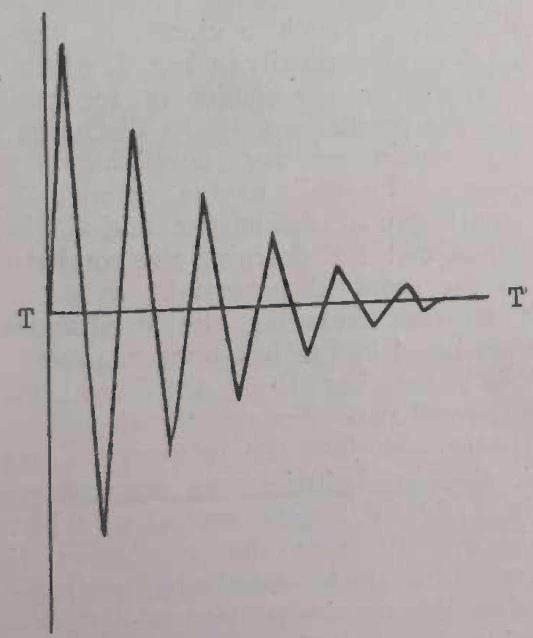

Fig. 2

lows. The capacity, or condenser effect, imparts to the circuit the ability to store up the electrostatic charges imparted to it by the induction coil, static machine or other source of electrification, while the inductance gives it the property of "electromagnetic inertia" or the quality of resisting all sudden changes in the value of the current flowing through it. This latter property is an-

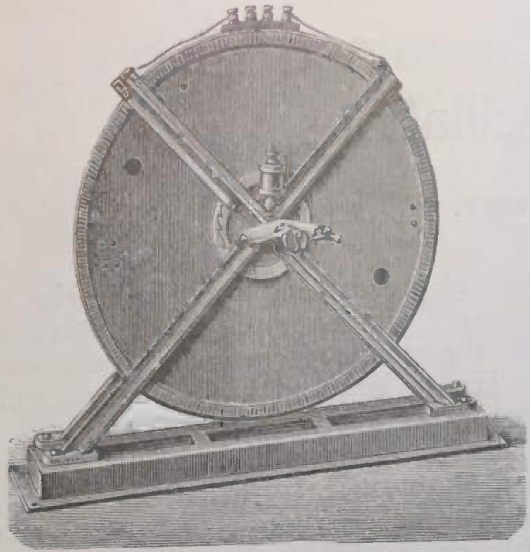

Fig. 3

alogous to the mechanical inertia possessed by all material substances.

In the ordinary tuned wireless systems the oscillations in the aerial are produced by the discharge of a condenser in a circuit connected to the aerial or inductively coupled to it by means of an oscillation transformer. In any event the discharge circuit is always found to possess the above mentioned properties in some degree. Such a circuit is illustrated diagrammatically in Fig. 1, wherein C represents the condenser for producing the oscillations by its discharge; L, the inductance for supplying the necessary "inertia" to the circuit; S, the spark gap or discharger, and C, the induction coil for charging the condenser to the required potential. In a circuit of this character, the oscillations are produced in the following manner:

When the key K is depressed, the current will rush through the closed interrupter and into the primary of the coil, thereby inducing an exceedingly high E. M. F. in the secondary which is impressed upon the condenser C, charging the latter until its potential reaches the maximum that the coil is capable of producing. At this point the interrupter suddenly breaks the primary circuit, thus inducing a powerful reverse E. M. F. in the secondary which suddenly falls to zero, leaving the condenser to discharge through the gap S. The flash which occurs, although appearing as a single spark, is in reality a number of exceedingly rapid sparks in succession caused by the rapid surging of the current to and fro in the oscillating circuit by reason of the presence of the inductance L. The first of these flashes which occur tries to establish an electrical equilibrium between the two sides of the circuit, but on account of its inertia it overreaches its mark and charges the other side up to a potential which is nearly equal to its initial value. This causes it to discharge backward again and to raise the potential of the first side to an almost equal value, and the process is repeated in this manner until the oscillations die away and equilibrium is restored; after which the interrupter again closes the circuit and the process is repeated.

We may compare this with a V tube filled with liquid. If we raise the liquid in one side, the column in the other will fall. If left to itself, the liquid will oscillate back and forward, till equilibrium is again established.

A train of oscillations is produced with each discharge of the condenser but after each surge of the current its value becomes less and less, due to the smaller E. M. F. producing it as equili-

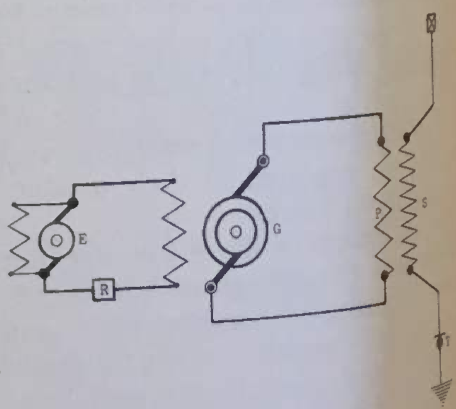

Fig. 4

brium is approached, thus causing the current wave to resemble that shown in Fig. 2. From this it can readily be seen that the oscillating current decreases very rapidly as the discharge progresses and is finally reduced to zero. This reducing effect or "damping" action reduces the effectiveness of the waves produced and renders them useless for aerophonic work.

It will also be noted that the oscillations are only produced when the condenser is discharging; the oscillatory system being idle during the charge, which naturally causes the produced oscillations to be of a very intermittent character. In sending a message, for example, a "dot" may represent two or three hundred separate damped wave trains, each separated by an interval of time which is relatively very long in comparison to the total time the oscillations are actually taking place.

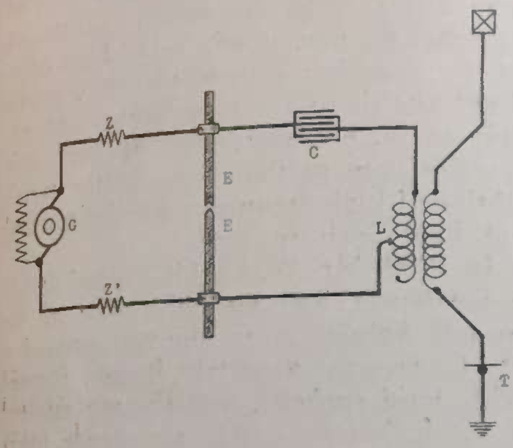

Fig. 5

As a practical illustration of this, suppose the oscillations in the circuit to be taking place at the rate of 500,000 per second and that each discharge of the condenser consists of 50 separate surges of the current. If the speed of the interrupter be, say, 100 per second, there will be 100 distinct discharges during that interval. This will make the time during which the oscillations are actually taking place only one per cent. of the total time of the operation, since 50 times 1/500,000 of a second is only 1/10,000 of a second.

From what has been said it is evident that the oscillations produced by discharging a condenser through a circuit possessing inductance are of a very intermittent nature, thus rendering them very inefficient for the transmission of anything but signals. Accordingly, the thoughts of investigators have been turned toward the production of some method whereby the oscillations might be sustained and made continuous throughout the entire time the circuit was closed, and thus render it possible for the aerial to emit waves continuously as long as the sending key was depressed. These investigations have led to the production of two very important systems, both of which are at present employed in the transmission of aerophone messages.

Perhaps the simplest of these, from an electrical point of view, is by the use of a high frequency alternator or a machine capable of generating alternating current of a frequency of 1,000 or more cycles per second. Several forms of high frequency alternators were designed by some of the earlier experimenters which were capable of delivering about 10 amperes at a pressure of 100 volts or so, but it has only been recently that machines have been so perfected as to render them suitable for aerophonic work. In fact, the difficulties, both of a mechanical and an electrical nature, that must be overcome, are so great that there have been but very few of such machines ever constructed. A prime requisite of machines of this character is the enormous speed at which they must be driven, in order to produce the required frequency. Tesla designed one which employed 384 field poles which were mounted on the periphery of a massive wheel which revolved inside of a stationary armature structure also consisting of 384 poles (Fig. 3). When driven at a speed of 3,000 r. p. m., or 50 revolutions per second, it produced a frequency of 10,000 cycles. But even this frequency is entirely too low for practical work in wireless telegraphy and aerophony, and until a few years ago it was impossible to produce machines suitable for this purpose.

Most of the recent high frequency alternators are of the "inductor" type, being provided with both a stationary

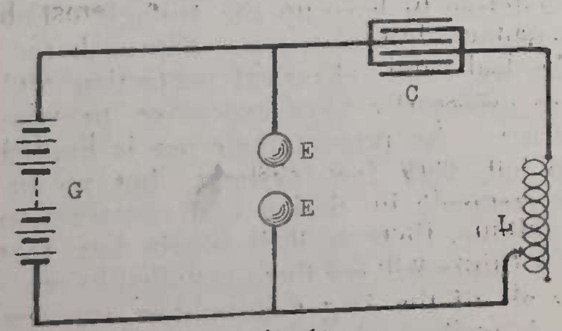

Fig. 6

armature and a stationary field, but employing a rotating mass of iron with teeth-like projections which rapidly change the magnetic relations existing between the armature and the field. This method obviates the necessity for all sliding contacts and renders it possible to give much greater mechanical strength to the moving member. Still other forms employ both a revolving armature and a revolving field which are rotated in opposite directions by means of suitable gearing. This method increases the relative speed between the two members without requiring as great a rotative speed of the shafts.

Among the most notable machines in use at the present time is that used bv Prof. Fessenden at his aerophone station at Brant Rock, Mass., which is capable of producing a frequency of 150,000 cycles or more when driven at a speed of nearly 150 revolutions per second. In fact, it is claimed that by the use of modern methods of construction and good design, it is possible to produce machines capable of generating alternating current with frequencies as high as 300,000 cycles. On account of the high speeds at which they must be driven, the machines are necessarily of small size and of low output, and a peculiar condition observed in their use is that as the speed is increased to raise the frequency, the output is greatly reduced, thus diminishing the efficiency.

In aerophone stations employing such machines, they are invariably connected to the aerial through an oscillation transformer, one method of which is shown in Fig. 4. These stations, although being limited to the use of comparatively long waves, are capable of much closer regulation and tuning than those employing other methods for producing the oscillations, as the frequency can be made anything desired by simply changing the speed and varying the field excitation to keep up the voltage. The machines, however, must approach mechanical and electrical perfection and are necessarily very expensive to construct. At present their use is limited to but very few systems, but as improvements in design and construction continue, there is little doubt but that the future will see them installed in nearly all of the larger aerophone stations.

A method of producing sustained oscillations that is very extensively used in many of the most successful aerophone systems, notably the Poulsen, DeForest and the Collins system, is by means of the "Duddell arc" or modifications thereof. The general principle of this apparatus was first evolved by Prof. Elihu Thompson, who in 1893 obtained a patent for the production of high frequency currents by "shunting a capacity and inductance around a direct current arc." His apparatus, a diagram of which is shown in Fig. 5, consisted of a direct current generator G, which supplied current at 550 volts to the metallic electrodes E and E between which an arc was drawn. This arc was shunted by the condenser C, which was connected in series with the inductance coil L. When the capacity and inductance had been adjusted to the proper values, an alternating current of very high frequency was found to be produced in the shunt circuit of the apparatus. This arrangement, however, was of very little practical use at that time as the possibilities of high frequency oscillations had not then been realized.

In 1900, Mr .W. Duddell found that if a condenser and an inductance of the proper values were shunted around a D. C. arc of a certain length, formed with *solid carbons,* that the arc emitted a musical note. He also made many researches on the subject of these musical arcs and so improved the apparatus that it was capable of producing frequencies far in excess of any then obtainable. It was also observed by him that in order to produce the effect, the following conditions had to be observed: 1. That the D. C. supply should be absolutely steadv, such as that furnished by a storage battery. 2. That *solid* carbons were necessary, no oscillations being produced when the cored variety were used. 3. That the ohmic resistance of the inductance coil should be very low; and, 4. That the condenser should be capable of withstanding very high voltages. The Duddell method is illustrated in Fig. 6.

Subsequent investigations by Poulsen, DeForest, and others have brought to light many new features in the apparatus that when applied, greatly increase the efficiency and the obtainable frequency. The chief among these are the use of carbon and metal electrodes in combination and the enclosure of the arc in an atmosphere of hydrogen or other gases. By the aid of these refinements it is possible to produce frequencies as high as 2,000,000 to 3,000,000 cycles per second.

The exact action of these arc devices, however, is not very clearly understood. Many theories have been advanced from time to time as to the exact cause of the production of the oscillations, each with its army of adherents, but none of these

(Continued on Page 294)

250,000 Volt Discharge

We are all accustomed to spark discharges of our regular spark coils, but there are few people who ever witnessed the discharge of a 250,000 volt transformer, giving flames two to four inches in diameter and three feet long.

This was actually demonstrated each night at the "National Electrical Show," which recently took place in New York. It goes without saying that the tests drew enormous crowds, who were soon fascinated by the weird antics of the flames and sparks, which played around the large insulators.

Six 14-inch diameter petticoat insulators of the underhung type, were suspended, one below the other.

Two wires leading from the high potential transformer led to the insulators. One wire to the upper, the other to the lower insulator.

To test the insulators the current was turned on by an operator. It was very gradually increased by means of a large water rheostat, till the highest potential was reached. No discharge was to be seen, the insulators being dry.

Then the water spray, which is clearly seen at the left in our engraving, was turned on. It directed fine water streams on the insulators and thus imitated a heavy rainstorm.

At the moment the water spray touched the insulators, flames and sparks commenced to play on the insulators in a truly remarkable manner. Violet-blue flames of incredible size shot actually out in the free air and disappeared, the same as if they had left a burning log. These flames did not shoot out with great rapidity, but were rather slow in action. Neither did they form in straight lines, but they wound and twisted themselves in snake fashion, doubled back and formed the strangest shapes

At the same time heavy blue sparks—the same as those of a spark coil—hit around the edges and over the surface of the insulators with a deafening roar and rattle that could be heard through the entire length of the big hall.

Finally one of the thin wires leading to the insulators fused and fell to the floor. A long flame immediately shot over the floor, but before the flame could reach the nearest onlookers, who were turning to run, the operator had switched off the current and the test was over.

Made important discovery. By greasing up my antenna, I find that the waves slip off much easier during sending, and when receiving they tumble down in the detector to make a greased lightning feel like fly paper. Better try it—"FIPS."

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Vol. I. NOVEMBER 1908. No. 8

The Editor is in receipt of several communications from government and commercial wireless stations, all of whom file complaints against wireless amateurs, who annoy the large stations throughout the country.

By publishing the call letters and names of the wireless stations in the U. S., we simply wished to keep our readers informed, so that when any of them "caught" a message they would be in a position to know from whence the message was dispatched.

MODERN ELECTRICS being the leading wireless telegraph magazine, naturally was appealed to by the large stations. It seems that a number of experimenters are in the habit of calling up government and commercial stations, thus interfering with regular work and annoying them a great deal. Usually the large stations do not know the location of the sender and they are thus quite powerless to stop the mischief.

This state of affairs can naturally not go on, and we most earnestly request all those who are in the habit of calling up the large stations to refrain in future from doing so.

We say this in behalf of all those interested in the wireless art, as several large companies are now endeavoring to have a law passed licensing all wireless stations in the U. S. This, of course, would be the end of the amateur and experimental wireless stations, as under the new law heavy licenses would be imposed.

In view that the art as yet is in its infancy, such a law would be deplorable, from the standpoint of the experimenter and amateur, and the Editor earnestly hopes that the mischief will come to a speedy end.

Nobody cares how many messages the amateur catches, as long as he keeps in the dark and does not "talk back."

While we talk of wireless mischief making, we must mention the wireless "joker" (?). This pest located in New York, Chicago or anywhere will send a plausible message, calling up an ocean liner, stating that the machinery of his ship is damaged, or some other plausible yarn. He signs off, giving the name of a large ocean boat, and does of course not forget to state position of his ship which—in the message—is about 2,000 miles from land.

Of course the result is that some stations in the vicinity of the "joker's" one, catch the message and next day the owners go bragging about that they were able by means of a "new connection" to hear such and such boat 2,000 or 3,000 miles away, far out in the ocean.

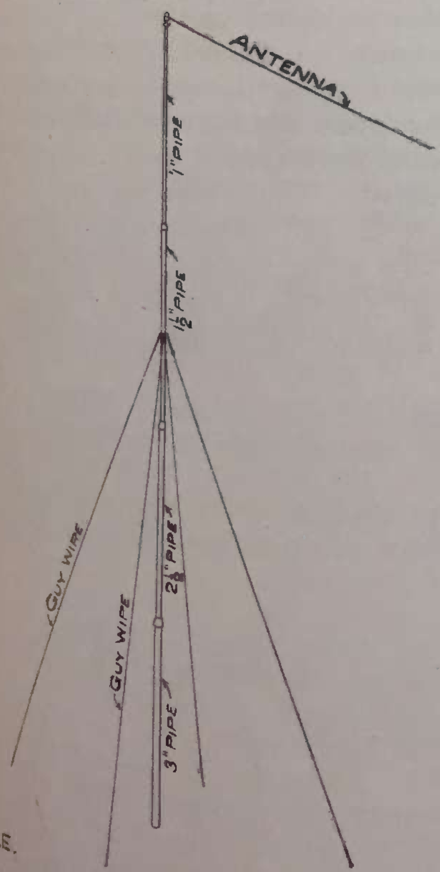
Naturally this nonsense only serves to mislead others, as it cannot but create wrong impressions in the minds of students who usually do not receive messages from more than 100 miles away and who perhaps are trying hard to improve or invent new instruments, etc. We earnestly hope that those in the habit of sending these "fake" messages will see the harm they are doing and that they will turn their efforts to more fruitful directions.

IRON PIPE AERIAL.

By Carl Chupp.

Realizing that Modern Electrics readers will welcome a few hints how to erect quite tall antennæ, the writer in the following lines will describe a cheap but very efficient method, used by himself.

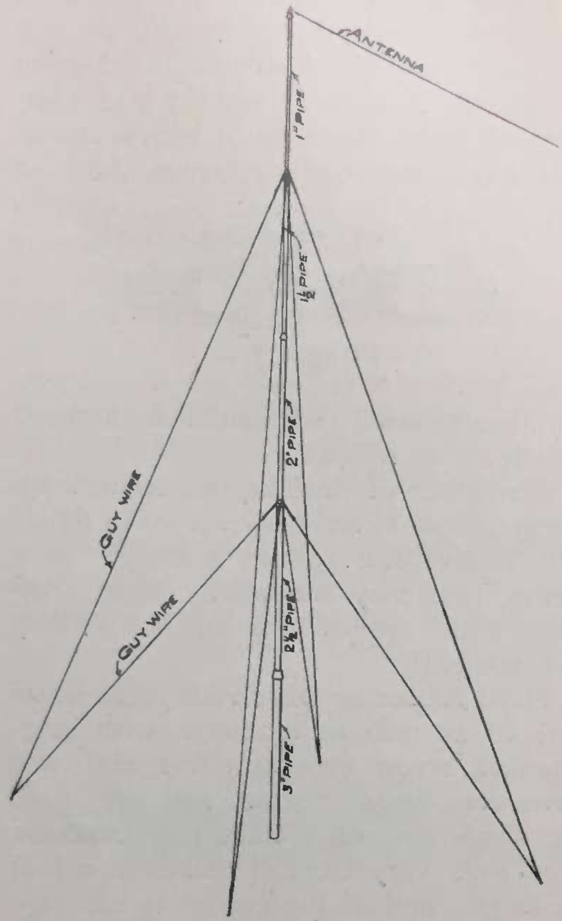
Purchase four or five joints of 20 ft. iron pipe (threads at both ends) from one inch to three inches (1 inch, 1 1/2 inch, 2 inches, 2 1/2 inches, 3 inches), also reducers to fit the different sizes. This is practically all that is needed in the construction of the aerial except the guy wires and wooden post. Erect your wooden post



-FIG. 1.-

(about 25 or 26 feet) where you wish to raise your aerial, then fasten a small iron sleeve or collar on top of the wooden post to let the pipe slip through so as to be held in place. Connect the two smaller joints together and slip through collar on post.

Rent from some supply house a good block and tackle and fasten one end on top of post and let other be fastened to



-FIG. 2.-

the lower end of pipe. If the pole is to be raised 60 or 70 feet it will need one set of guy wires (fig. No. 1), but if it is to be raised 80 or 100 feet, it will of course need two sets, one near the top, the other approximatly half way down (fig. No. 2).

Raising. After having connected the first two joints together slip through collar on post and fasten block as was stated. Next, get a few helpers and let them hold the guy wires. Pull on the block and raise the pipe high enough so as to fasten the next size into it. Loosen the block and fasten at lower end of joint and proceed as before.

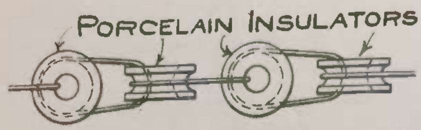
To fasten the antenna it is only necessary to attach a large insulator on top of the pipe, but the antenna should be fastened before raising.

What's the fastest thing on earth? A New York office boy. He tells you the boss isn't in before you ask him.—"FIPS."

Suspension and Insulation of Aerials

By A. C. Austin, Jr.

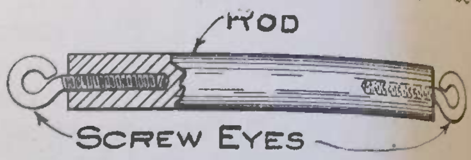
It is quite important that an aerial used for wireless telegraphy should be well insulated, and the insulators used must be capable of withstanding the strain impressed upon them by a heavy storm. The writer has used various methods of aerial suspension and insulation, some of which are as follows:



-FIG. 1.-

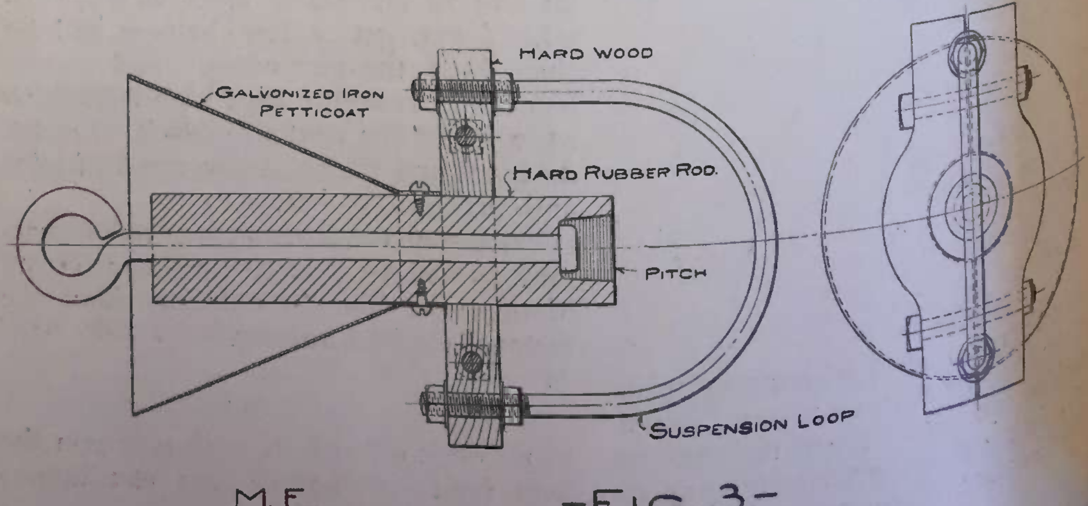
A number of ordinary porcelain insulators placed in series as shown in figure No. 1 give fair results, although in a heavy rain they sometimes leak. Another point against their use is that they are unsightly.

Hard rubber or fibre rods three-quarters of an inch in diameter, with long-shanked screw eyes at either end will give very good results, and are used at a number of commercial stations. The rods vary from 6 inches to a foot in length, and if the power is too high for one rod to hold, two or more are placed in series. This insulator is shown in figure No. 2. The only objection to rubber rod is that it carbonizes after continued use, and must be renewed about every year. Perhaps the best insulator which can be constructed by the amateur is shown in figure No. 3. This consists of a hard rubber rod with a small diameter hole bored through, and a cup at one end. A metal rod runs through this hole and the head of the rod sets in the cup. After placing this rod in position an eye is made on the other end and the cup is filled up with pitch. The whole tube is clamped between two pieces of oak about one inch thick to which the suspension loop is fastened. A galvanized iron petticoat may be added to further lessen the possibility of leakage. This insulator may be built of a size suited to the power used at the station. A complete aerial with hard rubber insulators and wooden space bars is shown in figure No. 4. The four wires forming the aerial are strung 18 inches apart and the connecting wires are twisted once around the main wires and soldered. The writer has used No. 14 B. & S. soft drawn copper wire but is now using stranded phosphor bronze antenna wire. This same wire is used on government aerials. Aluminum wire No. 14 gauge also makes a very good aerial, the greatest point being its lightness and cheapness. If the mast from which the aerial is suspended is guyed with steel guy wire this should be insulated at intervals of 10 to 15 feet with

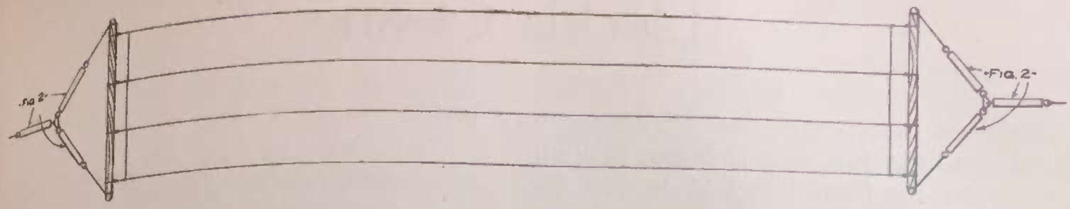


-FIG. 2.-

M.E.



-FIG. 3.-



M. E. -FIG. 4.-

strain insulators. A good waterproof pulley should be placed at the top of the pole and a stout paraffined rope run through same and doubled similar to a flag halyard.

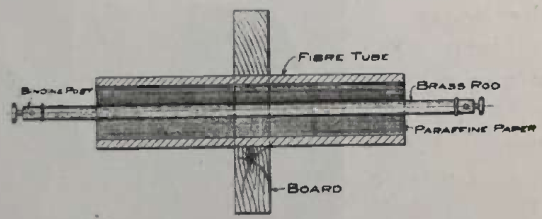
The aerial should be attached to this rope, this making it possible to raise or lower same very conveniently.

Insulation should be particularly well taken care of at the point of leading in to the operating room, as this is practically the hardest point to efficiently insulate. While the method mentioned in the October issue may be all right, still the writer's experience has been that the porcelain tubes will allow a certain percentage of the high frequency discharge to ground through the wood, consequently causing a loss in radiation. Personally the writer has used a fibre tube two inches in diameter with a glass tube one-half inch in diameter in the center of same, and the space between the two tubes filled in with pitch. These tubes are about ten inches long and are placed in a board one inch thick in the same manner as described in the October issue.

Pirelli cable is put through the glass tube, connecting the instruments and aerial.

A very good method of leading in is to take a brass rod one-fourth inch in diameter and about two feet long and place binding posts on each end. Wrap the rod with paraffined paper about 18 in. wide, leaving 3 inches rod projecting on either end. The whole should then be put in a fibre tube and mounted in the board, as previously mentioned. The thickness of this insulating wrapping depends upon the transmitting power used. The method is shown in figure No. 5.

A large number of amateurs have the idea that standard forms of lightning arresters can be used for safeguarding wireless telegraph instruments, but this is entirely erroneous. Any form of lightning arrester will allow the potential impressed upon the antenna when sending, to leak into the ground in exactly the same manner as the lightning discharge. The writer's experience has been that there are only two safe ways of protecting wireless telegraph instruments and the house in which they are located in an electrical storm. *The best is to lower the aerial.* However, if the aerial is disconnected from the leading-in rod and connected to a wire (not smaller than 10 B. & S. gauge) running on insulators in a straight line to a GOOD ground it saves the trouble of lowering the aerial and is to all intents and purposes just as safe.



M.E. -FIG. 5.-

WIRELESS IN BALLOON.

Interesting experiments were recently made by Robert Goldschmidt, an aeronaut, at Forest, a suburb of Brussels. Mr. Goldschmidt in his large balloon, "Condor," had a number of wireless instruments on board and he actually obtained messages from Paris, a distance of 180 miles (airline).

The main object of the ascension was to get in touch with the aerophone station erected in the lofty tower of the Brussels "Palais de Justice."

The experiments were indeed very successful, and left nothing to be desired. This in view of the fact that obviously no ground connections could be used.

Ether, they say, is an incompressible something. I suppose that vacuum is a compressible nothing!—"FIPS."

Electric Cleaner

It seems that people are beginning to get alive to the fact that it is not particularly good for their lungs to be fed day after day with germ-laden dust. It is therefore not surprising that the so-called "vacuum cleaners" are heavy in demand.

Until quite recently it was not possible for the housewife to actually get rid of the dust in her apartment. The ordinary brush will only scatter the dust into another part of the room. The dust, therefore, *stays in* the house. The important question was how to remove the dust *out* of the house.

Here the vacuum systems made their entrance. The method, however, was far from satisfactory. You had to write the company to send their wagon to your house, after which the operator would stretch a long unsightly hose all through the apartment, while below on the street a puffing gasolene engine did its best to suck down the dust, which was collected in tanks and carried away as "fertilizer," by the wagon. While satisfactory in operation, the "dust-sucker wagons" could not be called every day or even every week, on account of the great expense. This may be the reason that wagon vacuum cleaners lost much of their popularity.

Next we have the electrically operated house vacuum system.

A rectangular box has three compartments. At the bottom we find the electric motor which drives a small but very efficient rotary pump. In the center compartment a removable sheet metal box partly filled with water, is located which collects the dust and destroys it at once.

The entire arrangement is quite light and is easily transported from room to room.

All that is required is to connect the attachment plug with your electric chandelier and lo! the machine starts to eat dust. A flexible hose and different aluminum cleaning tools are on hand, some wider and some narrower, all depending if a carpet or your clothes are to be undusted, or rather ungermed. The entire operation of the machine is ridiculously simple and the wonder is why the machine has not been in every up-to-date household a decade ago.

One great advantage of the machine is that it actually *removes* the dust. This makes it possible to do much less cleaning and dusting as once *all* the dust is *removed* from a house it will take quite a while before a same amount has found its way in again.

For "brushing" clothes the electric cleaner is unsurpassed. Not alone does it remove all the dust, but it freshens up the texture of the material by righting up crushed and pressed down threads.

A word of warning to the uninitiated: Do not let $100 bills protrude from your pockets while using the electric cleaner. It has a bad habit of swallowing them in an alarming manner.

TWO NEW DETECTORS.

By OUR BERLIN CORRESPONDENT.

Detectors promise to be soon as worn out as trolley wheels. There is hardly a good electrician living to-day who has not to his credit at least one "new" detector, and although one would think that almost every possible and impossible substance and combination has been tried, we have surprises every day in form of new detectors. However, there is one point of advantage to most new detectors, compared with new trolley wheels. The latter get worse and worse the newer they are, while the former seem to improve every day, one more sensitive than its precedent.

Under the German patent No. 193,383, the "Gesellschaft fuer Drahtlose Telegraphie" shows a new gas, or rather metal-vapor detector, composed as follows:

a is the antennae, b aerial inductance, c a variable condenser, in series with the

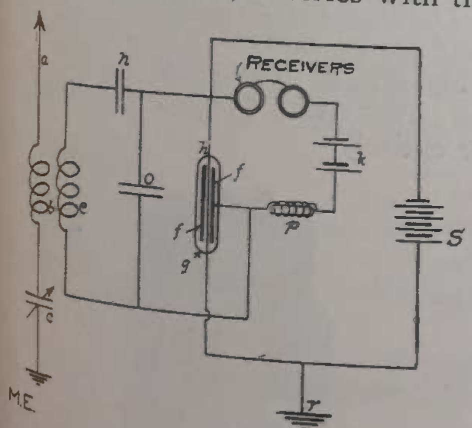


Fig. 1

ground. In the closed circuit is a coupled inductance e, condenser n, and parallel condenser o, battery k, receiver i, choke-coil p.

The detector itself comprises a glass tube g, filled with a gas or metal vapor. The anode f is cylindrical in shape of a tube, while the cathode h is a single wire h, passing through the center of the anode f.

The cathode h is covered with oxide of an alkaloid metal and then heated to a dull read heat by means of the supplementary battery s. Negative ions are thus shot from the hot cathode to the cold anode, which allows the current to pass between the two.

Under the influence of electrical waves the conductivity of the thin vapor column between f and g is changed, and these disturbances are recorded in the receivers i. This detector is said to be very efficient in aerophonic work.

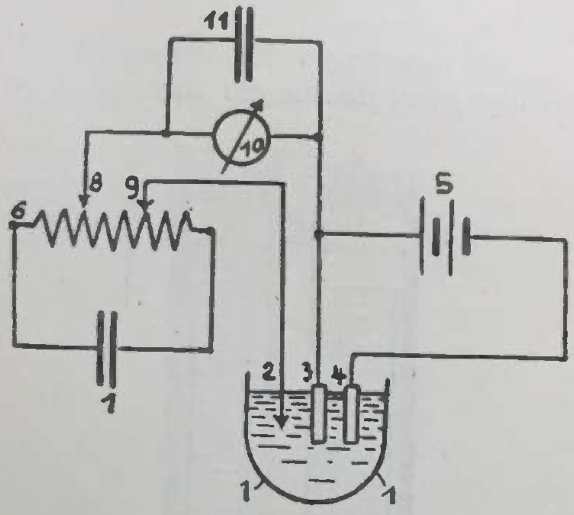


Fig. 2

The above-named company recently obtained another patent on an electrolytic detector as shown in Fig 2.

3 and 4 are two electrodes connected with battery 5, while the active point 2, is connected with the jigger 6, through 9; 10 represents the telephone receiver, 11 is a condenser, shunted across the latter.

The underlying idea of this arrangement is to prevent a constant current from flowing through 10, which may be a galvanometer, if desired.

THE FUTURE OF ELECTRICITY

by Prof. Chas. P. Steinmetz, A.M., Ph.D., is the name of a handsome 24-page book issued by the New York Electrical Trade School.

This little book gives us an insight how things will look in 300 years.

The book will be sent free of charge to anybody by addressing the New York Electrical Trade School, and by mentioning MODERN ELECTRICS.

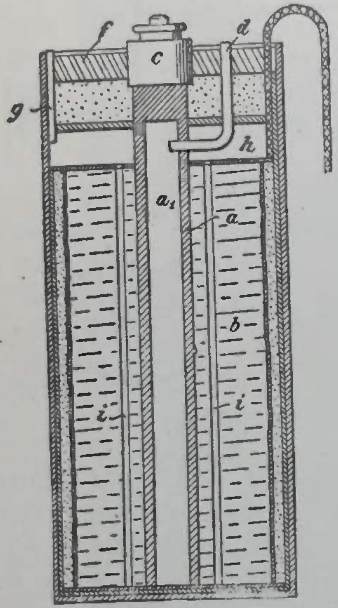
New Batteries

By Our Berlin Correspondent.

A German firm obtained lately a patent on a new dry battery, which, as official reports show, is fully 100 per cent. more efficient than any other dry cell ever constructed.

Tests of the Imperial Testing Laboratories with the new cell have shown the following results:

A cell weighing 4 lbs., which was 16 cm. high, was discharged through a re-



sistance of only 10 ohms. At the beginning of test the voltage was 1.60. The test was started February 29, 1908. The cell was never disconnected from its resistance and consequently never had a chance to recuperate. Despite this when a reading was taken on July 6, 1908, the voltage was still 1.18. The total capacity of the battery, consequently, was 163 ampere hours, which is a remarkable showing for a dry cell.

There are no new chemicals used in this dry cell. The usual zinc cup, peroxide of manganese and carbon in center are used. However, the inventor provides a great many air channels, i, i, in the depolarizer and also uses a hollow carbon cylinder (a), with the purpose to bring as much oxygen as possible in the depolarizing mass.

In this respect other dry cells lack, especially American ones, which are virtually choked to death, by letting the harmful gases act on the depolarizer because there are no channels to let the gases escape, nor can oxygen from the air help to regenerate the cell.

In the German battery this can not possibly happen. The small tube in connection with the hollow (a) brings constantly new oxygen to the carbon, and keeps same free from hydrogen, which is the greatest enemy of a battery. The hollow compartment (h) serves the purpose to keep the salts from creeping out of the cell.

The other battery shown in the accompanying cuts is constructed on the principle of the well known Edison-Lalande cells.

However, instead of using copper oxide plates, the Delef Battery uses Cupron plates, which not alone are more efficient than copper oxyde ones, but they *never wear out*. We had occasion to test out several of these cells and found that no matter how often the battery was discharged we could re-use the plates, simply by heating them in a hot oven, or exposing them to the rays of the sun for several hours.

When exposed to heat or sunlight these plates have the peculiar property to absorb great quantities of oxygen, which reduces the copper to cupron.

The new battery furthermore does not need to be covered with paraffin oil or other oils, as it has a very clever screw top cover which practically shuts off the air entirely.

In the small cells there are two cupron plates and one zinc plate. Voltage on open circuit 0.9, closed circuit 0.75 volts. Capacity of smallest cell made, 60 ampere hours. This cell furnishes 10 amperes when short circuited. For continuous current the cell gives 1.5-2 amperes. Size, seven cm. long, 7 cm. wide, 12 cm. high. Weight, 1 1/2 lbs.

These cells are transportable and do not spill, no matter what their position. They are used for continuous work and can replace storage batteries as they give continuous and powerful currents.

The only parts which wear out are the zinc plates and caustic potash.

We found that when using tantalum lamps, we could obtain steady light for hours and days at the remarkably low figure of about 1/3 cent per hour.

ARC LAMPS AS DETECTOR.

A curious fact has been observed recently in Brunswick (Germany). An operator of a moving picture machine, which was operated in connection with the usual arc lamp, one evening heard strange hissing sounds coming from the arc of the lamp.

The operator, who was a former telegraph operator, when listening attentively found that the hissing sounds were nothing less than dots and dashes spelling words and entire telegrams.

He found out that these telegrams were sent from a wireless station about three kilometers distant.

The surprising part of the discovery, however, is that one cannot suppress these hissing sounds in the arc. Condensers, choke coils and other appliances were used, however, without any success whatsoever.

The sounds emitted are by no means faint. In some cases they were so powerful that the greater part of the attendance was visibly annoyed by the sharp hisses.

FISHING BY MEANS OF TELEPHONE.

It appears that Norwegian fishermen are quite scientific as far as fishing goes, and they now use the well known telephone instrument for fishing with unquestioned success.

A very sensitive microphone, encased in a water tight steel compartment is submerged below the surface of the sea. The microphone is then connected with an ordinary telephone receiver and battery.

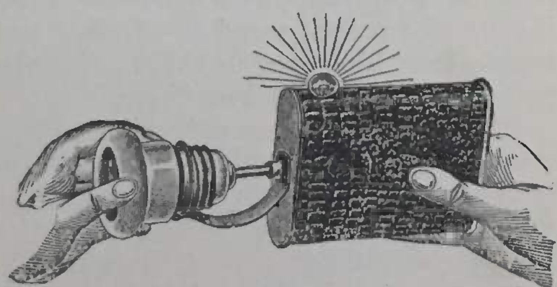
As soon as a band of fishes approaches, the telephone receiver emits certain low sounds which strange to say, vary with different kinds of fish. Herrings, for instance, are said to produce a whistling sound, while codfish make themselves known by a humming sound in the receiver.

FUSE TESTER.

If any one thinks that a flash light can only be used successfully in the dark, he will find himself very much mistaken.

A clever German has just obtained a patent to use flashlights in connection with the usual fuse plugs in the method illustrated in our cut.

As every electrician will readily assert, one can never tell when a fuse plug is in perfect condition, and by means of the new tester, one can



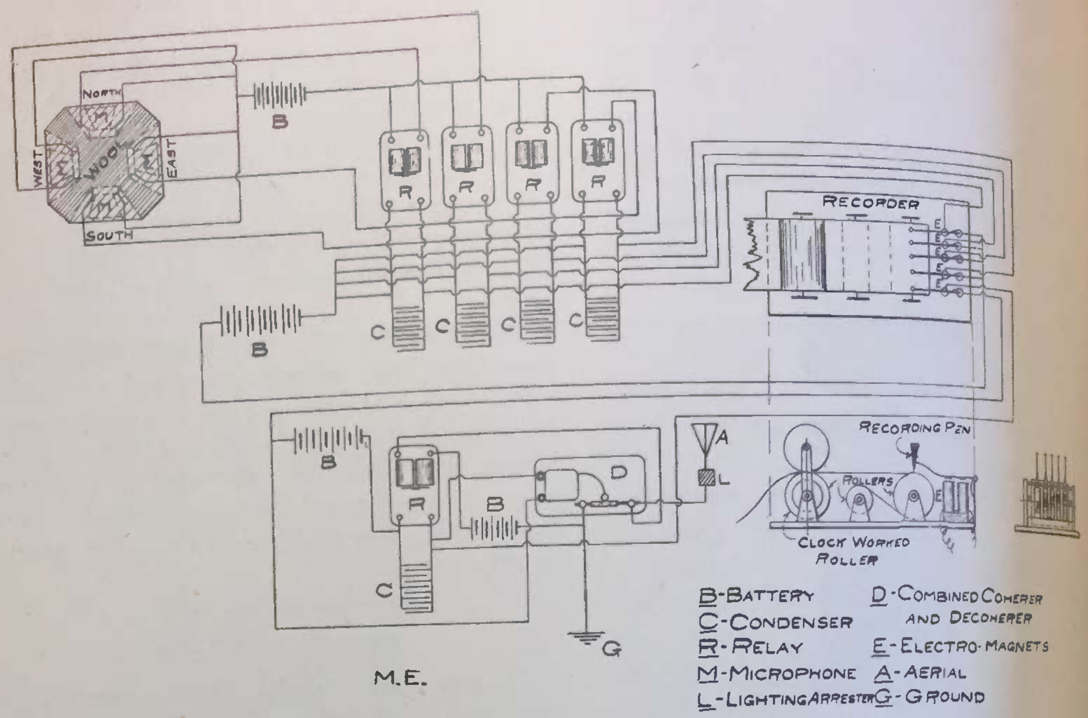
quickly prove if the lead wire inside the plug is in good condition or not.

By inserting the plug in the projecting metal ring, contact is made on the side and at the bottom connection of the plug. Lamp, battery and plug are then in series. If the lamp lights, the plug is in good condition.

Now that the roller skating craze is on why don't you equip your skates with a little dynamo? The power costs nothing, besides you can light up your sky-piece with the current thus obtained. Now, sports, get busy!—FIPS.

The Micro-Ceraunograph

B. Wm. H. Capen.



This apparatus is designed to show in what direction and approximately how far off lightning takes place.

Four microphones are placed in an elevated position, as for instance the roof of a house, etc. One of these microphones faces North, one South, one East and one West. They are then surrounded, except on the side in which each is pointing, with two or three inches of pressed wool or similar material (see diagram). Wool is also placed above and below them.

Each of these microphones, which must be quite sensitive, is then connected from a battery of five or six cells to a sensitive relay. Another battery of similar size is arranged in connection with these relays, so that when the contact in either one of the relays is made, it throws this battery into circuit with a pair of electro-magnets on the recorder. Each relay works one pair of magnets (see diagram).

The fifth pair of magnets of the recorder is connected with a battery and another relay. A combined coherer and decoherer is also connected with the relay, battery, aerial and ground connection, as in regular wireless telegraphy. Another small battery is in circuit with coherer and electro-magnets of relay, while the previously mentioned battery works the decoherer and the fifth pair of electro-magnets of recorder.

Small condensers are introduced at contact points of relays and decoherer to prevent local sparking.

The recorder is a board on which is mounted an arrangement of rollers. The middle roller is set lower than the others and is wound with the cross-lined paper, fig. 2, which passes around the right-hand roller (see diagram) and between the two left-hand ones. The upper one of these is covered with blotting paper, and is held against the lower roller by a spring at each end. The lower roller, which is covered with rubber, is run by clock-work, at such a rate that one of the cross-lines on the paper, passes a certain point a second.

The record is made on the paper as it passes over the right-hand roller. The five recorders are short pieces of glass tubing drawn to a fine point and filled with ink. Each of the glass tubes is fixed, as shown in diagram, at the end of an arrangement similar to a bell hammer, which is hinged at the other end and adjusted by a spring and screw above the pair of electro-magnets.

With this apparatus in order, an approaching thunderstorm will be recorded by the lower or lightning recorder before any visible signs are noticed. As the storm comes nearer, the lightning recorder will make more frequent dots on the paper.

The thunder will be heard awhile before any records of it are made, but when the storm has come within ten or fifteen miles the noise of the thunder will be great enough to affect the microphones, thus operating the relays and the electro-magnets on recorder, and dots and dashes will be made on the recording paper.

If the thunder comes from the north, the sound will strike and affect the microphone facing that direction. It will not affect the others, as the sound waves can not pass through the wool, therefore, only the recorder which is connected with this microphone will make a record.

If the thunder comes from the north east, both the north and east recorders will register simultaneously.

Fig. 2

When it lightens the lightning recorder will make a dot on the paper which will move on at the rate of one space a second, each space representing one mile. A few seconds later the thunder is heard, and one or two of the thunder recorders will make a series of dots and dashes. By counting how many spaces there are between the lightning record and thunder record, and by noticing which thunder recorders made the record, it is possible to tell in what direction and approximately how far away the lightning was. The lightning is as far away, approximately, as there are seconds between the flash and the thunder.

The record made by the micro-ceraunograph will be similar to the record shown in fig. 2.

Must be pretty cold at times in Alaska. Fellow writes and asks the "ORACLE" what to do in case the electricity "gets frozed up" in the wires in the winter. I advised to short circuit the whole line until it gets red hot, and place drip pans under the wires to collect the juice!—"FIPS."

A BALLAD IN IX.

MODERN ELECTRIX,
Certainly clix.
It shows you some trix,
Where the rest show you—nix.
You don't ride on old rix,
But you get the best mix.
There ain't no false wix,
Guess nobody kix.
It hatches its own chix,
Before you count six,
It usually lix
The rest and does fix
Their poor old jix.
It fairly prix
You with news and stix
To it. Each month it tix
Louder and it also dix
Deeper without using derrix.
It throws brix
At mathematix
And all theoretix,
Go in the River Stix.
The wireless mix
Each month has new twix.
No wonder everybody stix
To the youngster, MODERN ELEC TRIX.

"FIPS."

WIRELESS CRAZE.

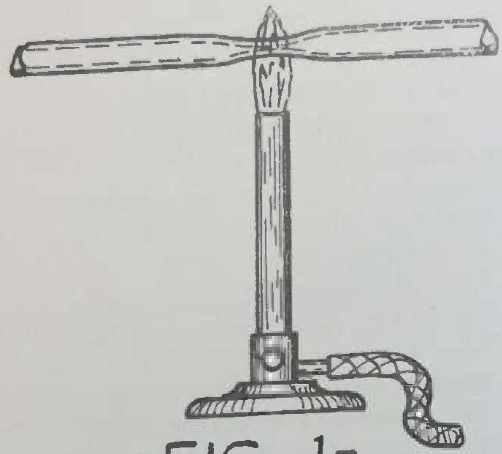
The year gets old,
The weather is cold,
Rig up your station
Without hesitation.
Wireless is in the air.
To catch it is only fair.
Get out your coil,
Adjust the gap,
You have to toil,
No time to nap.
For the year gets old,
And the weather is cold .
Don't forget the antenna
And do it *now,* because when a
Snowstorm is setting in,
You'd better not fool with the riggin'.
You should be at the switch,
Trying to tune to the right pitch.
You ought to be at the 'phones,
And not outside chilled to the bones.
You learn telegraphy free,
Better get busy. See?
The cost is slight,
Wireless career quite bright.
The quicker you get the craze
The sooner you find it pays.
It won't take many days
Before you get a "raise."
There's no charge for all these tips;
They're given cheerfully by

"FIPS."

How to Make an Electrolytic Detector

By C. C. Whittaker.

The following directions will enable the amateur to make a very sensitive wireless detector, one which will receive messages up to five hundred miles. However, the operating radius of any detector depends largely upon the height

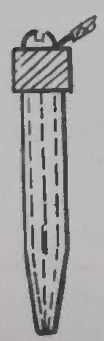


-FIG. 1-

of the aerial, the ground connection, and the tuning coil.

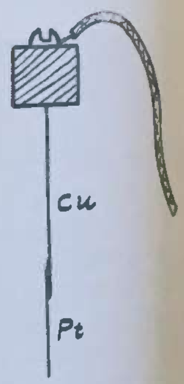
The material needed is a piece of thermometer tubing about three inches long, having a bore of not more than 1/64 in. diameter, two pieces of platinum wire, one 1/2 in. long and .001 in. diameter, the other 3/8 in. long of No. 20 or 24, a piece of glass tubing 2 in. long having an inside diameter of 1/4 in., a brass cap which will just fit over the top of the thermometer tube.

Hold the thermometer tube in the flame of an alcohol lamp or bunsen



-FIG. 2-

burner, preferably the latter, turning it continually. When it begins to be red-hot pull gently upon each end until the thinnest part of the tube is about 1/16 in. diameter (Fig. 1). Quickly take the tube from the flame and hold it suspended by one end and allow it to cool. When cool cut or break it in two at its thinnest part. Take the smaller piece of platinum wire and solder one end to a piece of copper wire. Place these joined wires in the best piece of the tube so that the tip of the platinum wire protrudes at the end of the pointed part of the tube. Place the cap on the other end of the tube, letting the copper wire stick through a small hole in the top of the cap (Fig. 2). Bend the wire over on the cap and remove both cap and wire from tube. Solder this wire and the flexible lead to the cap as in Fig. 3. Replace the wire in the tube and seal the



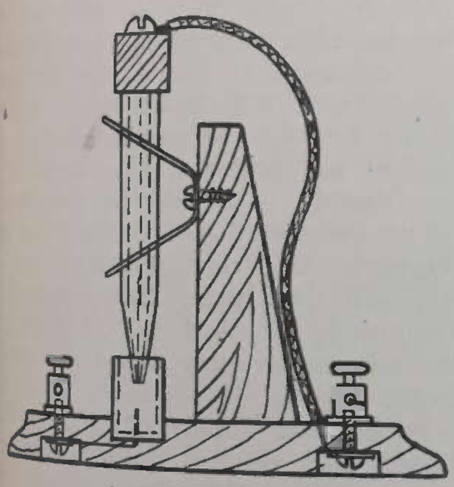
M.E. -FIG. 3-

cap to the tube by means of sealing wax. Seal the small end of the tube to the platinum wire by directing the flame of the blowpipe upon it. When cool rub the point on an oil stone to make sure that the platinum point is exposed.

The cup which contains the acid is made by fusing the larger piece of platinum wire into one end of the remaining glass tube. This is done by directing the flame of a blow pipe upon the edges of the end of the tube until the opening left is slightly larger than the diameter of the wire. Insert the wire with a twisting motion by means of a pair of pliers until about 1/16 of an inch is left projecting. Now direct the flame upon this wire and the glass immediately around it so as to thoroughly fuse the two together.

As soon as this is finished, a small piece of copper wire, about four inches long, should be soldered on to the outside end of the platinum wire to serve as a connector. Now place the whole in a place where no draft will strike it and allow it to cool gradually. After it has once cooled it will require no little skill to heat it without cracking it. This is because platinum conducts heat much more readily than glass.

Cut off the end which contains the platinum wire, making it 3/4 of an inch long. Fig. 4 shows the detector complete. The solution for the cup is sulphuric or nitric acid one part, water four parts. The platinum point will need cleaning from time to time on a whet stone.



-FIG. 4-

No, Alexander. You cannot charge Leyden jars by connecting your cat's tail to the jar and stroking pussy. You see pussy might JAR *you* a little bit. Better try it on Fido first.—"FIPS."

At last we have the electric boy. Must be kind of nice to pull out an electric bulb, stick it in the mouth, and, lo! she lights! Mighty convenient too, in summer to have such a boy around. You say: "Here, Freddy; swallow this plug and make the fan go!" Or when the trolley car refuses to run on account of lack of juice, presto! Freddy kneels down, licks the rail, and zz! the car runs!—"FIPS."

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.
Melvin Getchell, West Medford, Mass..	M.G.	185	1½ ins.
Fred Klingenschmidt, New York City,	T.T.	61	½ "
Coke Flanagan, Montclair, N. J..	F.N.	530	1 "
V. S. Ivey, Lenoir, N. C.,	S.I.	100	4 "
David Marcus, St. Louis, Mo.,	D.M.	500	2 "
Neat M. Tate, Vacaville, Cal.,	N.T.	218	2 "
Ben Orr, Dallas, Texas,	B.O.	77	1 "
Bowden Wasington, New York City,	B.W.	185	1½ "
Melvin M. Bonham, Covina, Cal.,	M.B.	75	½ "
John D. Kattenhorn, Jr., New York City,	D.K.	135	½ "

Mr. C. Ries, a German scientist recently read a paper on the effect of humidity on the electrical properties of selenium. He said: The electric resistance of selenium and its sensitiveness to light depend primarily on the method of heating and the humidity of the selenium and of the air, while all other factors are only of secondary importance. Humidity may have a very great influence. With respect to the heating process, care must be taken to heat continually without interruption to the proper temperature and for the proper length of time. The time of cooling and the atmosphere are also of great importance. It seems advisable to place the selenium in an evacuated tube.

Wireless Department

Antenna Phenomenae

By Sewall Cabot.

In the October number of MODERN ELECTRICS there appeared an article by Mr. A. M. Curtis, describing experiments in selective tuning, using an antenna consisting of a single wire about 1,000 feet long, running over the roofs of houses, and mentioning difficulties in receiving the shorter wave lengths used about New York City.

It has been the writer's experience that a number of wireless experimenters are using similar forms of antenna, and are noticing the same difficulties with the shorter wave lengths. It therefore seems that a discussion of the reason for these difficulties may prove of interest and save considerable time in looking to the wrong source for their remedy.

To obtain the best results in an oscillating system comprising an antenna connected to ground through an inductance, to which is coupled a secondary resonant circuit including the detector, we should take pains to make sure that the point of maximum current in the circuit or "current loop" exists at this inductance so as to give the greatest possible magnetic field wherewith to excite the secondary circuit. This state of affairs will always exist if the wave length received is longer than the "fundamental" of the antenna, thus causing the antenna to be the electrical equivalent of a condenser which when an inductance of the proper value is placed in series with it to ground will form an oscillating circuit in resonance to the wave length in question.

Now let us consider the electrical state of affairs which exists as we gradually shorten the wave length we desire to receive from the condition of longer than the "fundamental." As we approach the "fundamental" the antenna becomes the electrical equivalent of an increasingly larger condenser in a closed oscillating circuit and the inductance necessary to produce resonance correspondingly decreases. When the fundamental is reached this inductance vanishes and the antenna is in a resonant condition when put directly to earth. In order to get a magnetic field to excite the secondary circuit, an inductance completely neutralized for this wave length by a condenser in series must be inserted between the antenna and the ground.

As the wave length is still further diminished a distressing state of affairs commences. The point of maximum current flow no longer exists at the foot of the antenna, but commences to climb up. We are therefore unable to couple our secondary circuit where there is the greatest magnetic field without the use of a stepladder. During this period the antenna is the electrical equivalent of an inductance increasing to infinitely large.

When we finally reach a wave length half as long as the fundamental, this point of greatest current flow is in the middle of the antenna, and at the ground end there is no flow of current, and therefore no possibility of producing a magnetic field to excite the secondary circuit, thus rendering reception inefficient unless we resort to the use of an artificial line enabling us to pass over this current "node" to the next current "loop."

The antenna will always be extremely inefficient at all wave lengths anywhere in the neighborhood of half the fundamental wave length as the bulk of the energy picked up is re-radiated or dissipated in heating the antenna itself.

It may be of interest to note that on still further decreasing the wave length a new current "loop" commences to make its appearance at the foot of the antenna, reaching a maximum when the wave length is one-third of the fundamental. During this period the antenna is the electrical equivalent of a condenser changing from infinitely small to infinitely large.

Let us now return to a consideration of Mr. Curtis's antenna which was approximately 300 meters in length.

The fundamental wave length of an antenna consisting of a single wire cannot be less than four times its length. Owing to the fact that it consisted of a single wire the fundamental would in all probability be not much greater than this value.

Assuming then a fundamental of 1,200 meters, it would be inefficient to receive wave lengths in the vicinity of 600 and 300 meters due to their forming "nodes" of current at the foot of the antenna, and possible to receive wave lengths in the vicinity of 400 and 240 meters due to their forming "loops" of current. Even in this latter case, however, the antenna would be inefficient as most of the energy picked up would be reradiated or turned into heat in the antenna.

This antenna would be excellent for receiving wave lengths of 1,000 meters and over, such as Wellsfleet and Brant Rock, if it were pointing away from the direction of the source of waves to be received. It would, however, be inefficient for other purposes.

The obvious remedy would be to run wires, not over 150 feet long, out radially in as many directions as possible, instead of using one wire 1,000 feet long. This would form an antenna giving good results for all wave lengths over 300 meters, and would pick up all the energy of the ether in a 300 foot circle instead of that in a narrow strip 1,000 feet long.

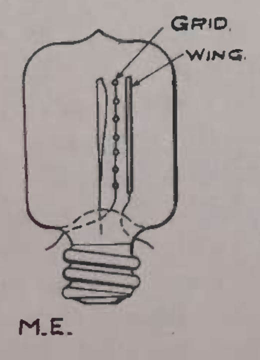
To sum up the problem of antenna design is to get a grip on as large an amount of space in the ether containing radiant electrical energy as possible without allowing the fundamental to become long in comparison with the shortest wave length it is desired to receive.

An insight into the electrical behavior of the antenna may be obtained if we think of it as a condenser having the earth for one plate and the antenna for the other plate with air for the insulating medium. The wire of the antenna has a certain amount of inductance so that it is the electrical equivalent of a capacity and an inductance in series. Starting with a slow frequency of impressed alternating EMF corresponding to a long wave length and gradually increasing the frequency we arrive at a point where the reactance of the inductance completely neutralizes the reactance of the capacity. This is the "fundamental" frequency. A farther increase in frequency causes stationary waves with "nodes" and "loops" of current to manifest themselves at the base of the antenna, the first current "node" appearing at twice the fundamental frequency, the second at four times the fundamental, etc. As we pass through one of these nodes at increasing frequency the antenna changes from the electrical equivalent in a closed resonant circuit of an infinitely small capacity.

Thus to obtain perfect resonance at these frequencies it must be completely disconnected from ground and allowed to oscillate by itself with a "loop" of potential at each end.

AUDION.

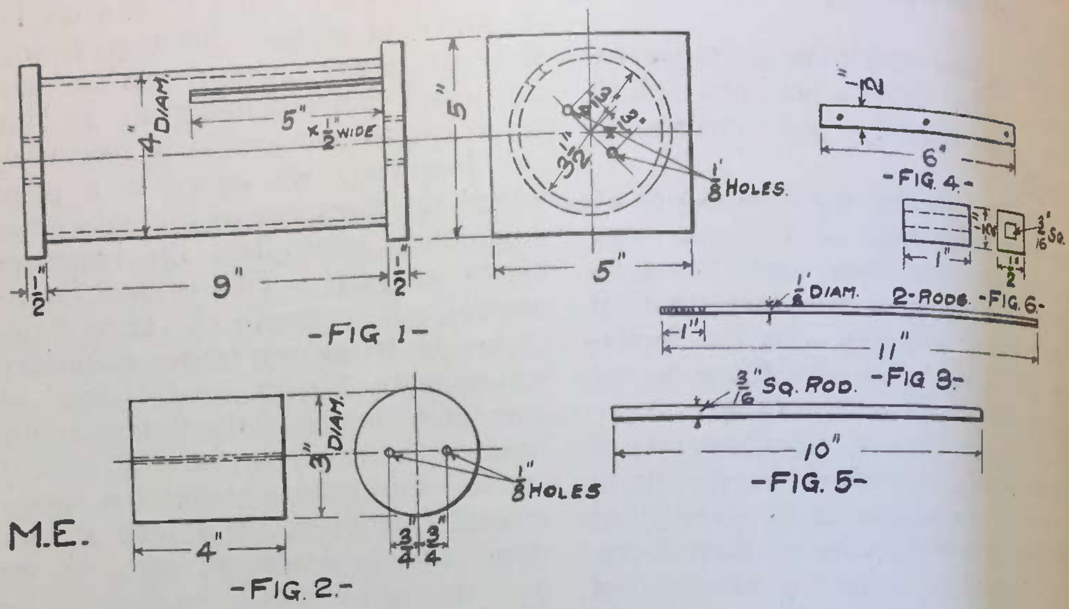
We hasten to correct two mistakes made in Mr. J. L. Hogan's article of the "audion" in the October issue. Our artist when showing a side view of the instrument made a slight mistake. The grid should be placed *between* the filament and wing as per our illustration herewith.



The last words of Mr. Hogan's article should read thus: "In the serious undertakings of radio-communication."

Selective Tuner with Weeding Out Circuit

By H. H. Holden.



-FIG 1-

-FIG. 2-

Tuning is probably one of the most important points to be considered in constructing a wireless telegraph set, especially where one has to work under difficulties, such as being unable to secure the proper height from which to suspend the aerial wires, and the cost or inconvenience in using powerful transmitting instruments, and interference from various other stations. The last difficulty is possibly the one which will be most hard to overcome.

However, by the use of proper tuning instruments this interference can be, in a great many cases, partially if not nearly altogether overcome. The following apparatus, if carefully constructed, will be found to give good satisfaction.

First, have a wood tube turned four inches outside diameter by nine inches long and three and one-half inches inside diameter; sandpaper it so that it will be smooth, then saw two pieces five by five inches out of a board one-half inch thick, fig. 1, and have a round stick turned, three inches in diameter and four inches long, fig. 2. Now get two brass rods one-eighth inch in diameter and eleven inches long, cut a thread one-half inch long on one end of each to fit the thread in a binding-post, fig. 3. Procure two strips of sheet brass one-fourth inch wide and six inches long; drill three small holes in each, one near the ends and one in the center, fig. 4. These are to be screwed to the inside of the tube one-half inch apart, having one end of each come even with one end of the tube. Drill two holes lengthwise through the round stick one and one-half inches apart, and large enough to allow the brass rods to slide through easily, but not too loose.

Get a piece of brass rod ten inches long and three-sixteenths inches square, fig. 5; file the holes in two large binding posts (made to hold wires) so that the holes will be square and large enough to pass the brass rod through them. Now cut a piece of hard rubber 1 inch by 1/2 inch by 1/2 inch, making a square hole lengthwise through the center of it slightly larger than three-sixteenths inch, fig. 6. This should slide over the square rod snugly, and without binding. Now attach a small piece of spring brass to this so that it will rub on the brass rod and also on the wire which is to be wound on the tube later.

The tube should be well shellaced and allowed to dry, when one layer may be wound closely with No. 27 D. S. C. wire, starting at one end and winding toward the center until four inches of the tube has been covered; the ends are then fastened under the heads of small screws, the wire and tube are given a heavy coat of shellac and when dry the covering on the wire half an inch wide and the whole length of the coil may be scraped off and the wire made bright. This bare part of the coil is to come on top, so that the sliding contact can travel over it. This is the primary coil.

The round stick may then be shellaced, dried and then wound with one layer closely with two No. 30 D. S. C. wires parallel to each other, the entire length and the ends fastened under screws; the finished part may be given a heavy coat of shellac. This represents the secondary.

The two five by five-inch pieces of board can be held together and two one-eighth inch holes drilled through them three-fourths inch each side of the center; one of these is fastened to the end of the tube so that the wire comes even with the two strips of sheet brass fastened to the bottom of the inside of the tube one-half inch apart and on the end on which the wire has not been wound.

Cut four pieces of spring brass one-fourth inch wide and one inch long, bending two so they will, when screwed on to one end of the secondary bobbin one-half inch apart, slide over the brass strips in the tube. Now bend the other two so they will, when screwed onto the opposite end of the bobbin, make contact with the brass rods on which the bobbin will slide. Connect the springs at each end with the ends of the coil, terminating at their respective ends.

Saw out a slot one-half inch wide and five inches from the end of the tube, not wound, two inches below the top; this is to allow a knob (which can be attached to the bobbin) to slide through, moving the bobbin in and out of the portion of the tube wound with wire.

The two rods may now be put through the bend which has been fastened to the tube, the bobbin slipped in on them, the other head put on, and two binding posts screwed onto the ends of the rods, having brought two wires from the two connecting strips in the tube to binding posts on the other end.. In the center of the top of each of the two heads, screw one of the large binding posts and slide the square rod through with the sliding contact on it.

It should be understood, of course, in making this coupling that primary, secondary and weeding out circuits must be wound all in the same direction.

Two variable condensers of fair capacity must be used with this system. Figure 7 shows all the connections, P, Primary; S, Secondary; W.O.C., weeding-out coil; S.C., sliding contact; V. C., variable condenser; A, aerial; G., ground.

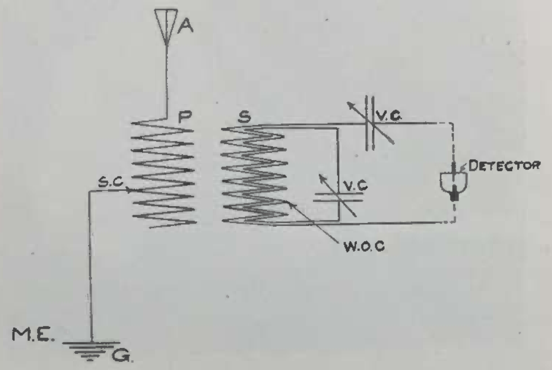


Fig. 7

It may be seen from diagram that very sharp tuning can be realized by varying the inductance in the primary, by sliding the secondary and weeding-out coil in or out of the primary, or by varying one or both condensers.

NEW KEYLESS BANK.

We are in receipt of a sample of Grab's keyless basket bank. We do not hesitate to say that it is the slickest bank of this kind we ever came across. It takes only dimes, locks after the first dime and will not unlock unless 50 dimes are deposited. It fascinates you to save.

We know it must be good because "Fips," our office boy, tried to get out a dime which he tried on the bank, but somehow or other the bank refuses to "cough up." He tried a hammer with poor success, then tried to feed the bank with pennies, which it promptly refused to take. He'll have to wait now till there are 50 dimes in the bank! Poor "Fips!"

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.

I am sending you herewith photographs of my wireless telegraph station. I am nineteen years of age. I have done

considerable work experimenting with and comparing the various systems of wireless telegraphy. As a result of my experiments I have just completed a system of "Spontaneous, automatic repeating wireless telegraphy," which for the benefit of the many readers of your most valuable paper I will endeavor to explain.

By the aid of my system I can positively determine whether the station I am in communication with is receiving my message, and whether that station is receiving my message properly.

As soon as the station I am communicating with receives a signal from my station, the coherer from the receiving station spontaneously and automatically closes a local circuit communicating with the sending apparatus of that station, and thereby repeats back to sending station the signal that has been received.

This system though seemingly complicated is very simple and accurate indeed.

Fig. 1 shows the writer receiving a message by the aid of a 1,000 ohm head receiver used in connection with the E. I. Co. electrolytic detector, which can be seen on the table at the elbow of the writer's right hand.

Fig. 2 shows a side view of the complete apparatus consisting of several "Hertz oscillators," a five-inch spark coil, a Morse key, a transmitting tuning coil, a receiving tuning coil, a 200 ohm sounder, a 1,200 ohm relay, a coherer-decoherer, auto coherer, an "Electro" lytic detector, corborundum and silicon detector, several switches and cut-outs, several E. I. Co., rheostat regulators, a powerful reflector for night work, several Leyden jars, and storage batteries underneath the table not shown in the photographs.

The mast, network, antenna, spark coil, oscillators and several other instruments such as the receiving and transmitting tuning coils were made by the writer through the aid of instructions given in "MODERN ELECTRICS," which latter I heartily recommend to all inter-

ested in wireless telegraphy or general electrics.

DAVID MARCUS,
St. Louis, Mo.

HONORABLE MENTION.

Enclosed please find a photograph of my wireless station, which is fitted up in a corner of my work shop.

My transmitting apparatus consists of a one-inch induction coil, seen in the picture, in the right-hand corner of the bench. To the left of the coil is a telegraph key, and two Wehnelt interrupters of my own construction.

The receiving instrument is of an electrolytic type, arranged in a box in front of the coil. On the box are mounted two brass standards which suspend a zinc rod and a platinum point in a solution of sulphuric acid and water, twenty per cent. strong. In the box is a small condenser, and the wires connecting the different binding posts, besides a buzzer for "clearing the line."

On the front side of the box is a pole changing switch to throw in my coherer and relay outfit, seen in front of the dynamo. I only use this set for calling purposes, as I find the electrolytic much more sensitive, and capable of receiving messages with greater speed.

Between the coherer and electrolytic box is a piece of glass covering copies of different codes, abbreviated words, and call signals. This is a very convenient way of having the codes always before you.

The dynamo shown is of 1/5 K. W. capacity, and generates 110 v. at 2,000 R.P.M. It is run by a one-horse power Pelton waterwheel. I use the current for experimenting and lighting purposes.

To the right of the dynamo is a home made Leyden jar, which I use in conjunction with the induction coil in experimenting with spark effects.

The switchboard is made of one-inch red wood. At the top are four lights for testing circuits. Below there are two rheostats. The left-hand one controls the current generated by the dynamo, and the other regulates the alternating current which lights the house. Near the bottom are switches and cut-outs controlling the current distributed throughout the work shop and part of the house. The double throw switch in the center throws in alternating current when it is up, and direct current when down.

My aerial is suspended from a twenty-five foot pole mounted on our house and has a total height of sixty-five feet.

I have been experimenting with wireless telegraphy for about a year, and must say that MODERN ELECTRICS is the best paper published on that subject, which I have ever come across.

RICHARD B. CATTON.

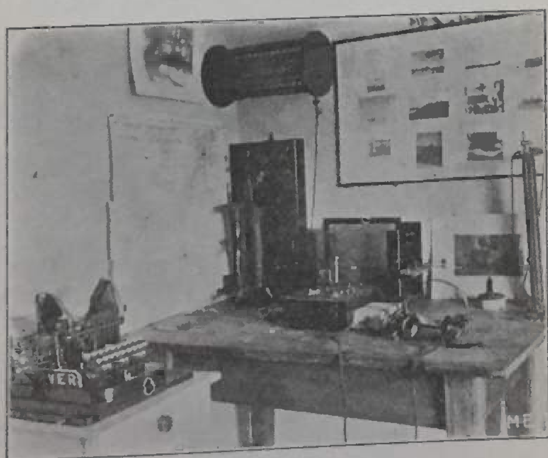
Honolulu, Hawaii.

HONORABLE MENTION.

Herewith a photo of my wireless station.

On the left, in the corner, will be seen the coil; to the right of it is the glass plate condenser which I use in the transmitting circuit. Above the coil is the transmitting tuner. The key is on the right hand side of the table.

At present I am using the silicon detector, which may be seen in the picture mounted on the box in the center. The phones which I use in connection with this wave detector are seven hundred and fifty ohms resistance each, making the pair fifteen hundred ohms.



On the extreme right is a small tuning coil, used in connection with the detector.

The typewriter shown is used when receiving from the local government station, which "comes in" like a "goat on a tin roof." It is difficult, though, to take a distant station on the mill, as it makes too much noise to hear the signals above.

The coil shown is capable of giving a

four-inch spark. I use about a quarter of an inch in actual work.

At the present time I am using three wires strung on my attic for an aerial. Each wire is about fifty feet long and they are about two feet apart. I intend to erect a mast on the top of the house before long. With my small aerial I have been able to receive steamships about a hundred miles away. The Marconi station on the Cape Cod "comes in" here so strong that I can lay my head-gear on the table and hear it.

The silicon is a good wave detector, but for real fine work the Electro-lytic is the best that I have ever tried.

The local station at Newport is about a mile away and makes a great deal of noise when it starts up, but with the little tuning system that I use, I am able to cut it out completely and tune Cape Cod in very strongly. This may seem an easy matter considering the difference in the wave lengths, but the government station is so close that it is quite a difficult matter.

Wireless telegraphy is the greatest of modern inventions and MODERN ELECTRICS is doing a great deal in developing the ideas of the ones that are interested in it. It is the amateur's friend.

Rhode Island. LLOYD MANUEL.

HONORABLE MENTION.

Enclosed find photographs of my wireless outfit. The coil used is a 10-inch induction coil operated as a 1/2 k. w. transformer, and is connected to the A.

C. lighting current through an impedence. The inductance coil shows plainly in the photo and contains the spark gap enclosed in hard rubber tubing. The condenser is composed of 1/4-inch glass plates enclosed in a box and set in wax. It is made in three sections and the total capacity is .02 microfarad. The aerial used is horizontal and 175 feet long, three parallel wires, No. 8.

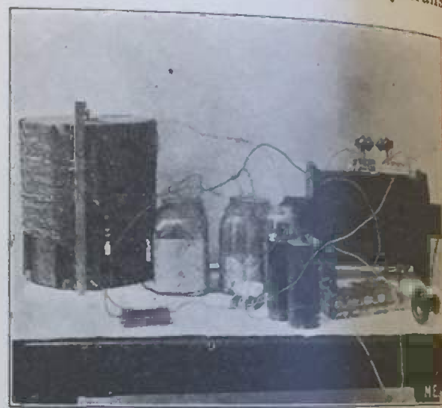
My receiver consists of the usual tuning coils and I use both electro-lytic and silicon detectors.

I do not subscribe to your magazine, but buy it from our local dealer every month and enjoy it immensely.

Mass. W. ALLEN TAFT, JR.

HONORABLE MENTION.

Enclosed you will find a photograph and description of my wireless apparatus which I made myself. My trans-



mitting apparatus consists of an induction coil, five Leyden jars, tuning coil, plate glass condenser, antenna switch, ground switch, and an ordinary telegraph key.

The induction coil was made as follows:

The secondary of the coil has thirty-one miles of No. 34 double silk covered wire. The wire is wound into one hundred sections 1/8 inch wide.

The coil was assembled by placing the ebonite tube vertically upon the work bench. The sections were put on alternately with three thicknesses of paper cut into discs that had been previously boiled in paraffine to exclude the air. As the coil was being built up the inner ends of the sections were connected. After the coil was completed, it was placed in a hermetically sealed cylindrical shaped steel tank, and with the aid of a mercury pump all the air was exhausted.

At the bottom a hole was bored and to it a brass tube with a valve was fitted, and when the valve was open the paraffine which was under the tank being heated to a certain temperature by a gas stove, was allowed to run in. After the paraffin had filled the tank it was allowed to cool. After cooling it was heated a little so as to loosen the paraffine from the sides of the tank, so the entire mass would slip out.

After the coil was taken out of the tank all of the surplus paraffine was shaved off.

The ebonite tube is two feet long, four inches diameter, and one-half an inch thick. The core consists of a number of bundles of fine Swedish iron wire.

Over the iron wire is placed some insulation, and over this is wound four layers of No. 12 double cotton-covered magnet wire, and all slipped in the ebonite tube, with ends left out for terminal connections.

My receiving apparatus consists of a tuning coil, microphone detector, ground switch, antenna switch, telephone receiver, two dry batteries. The tuning coil is made by winding on a frame of 14-inch diameter and two feet long, one layer of No. 18 bell wire, consisting of one hundred and fifty turns.

The antenna was made of three iron barrel hoops ten feet apart, with ten small wires fastened to the hoops, equal distance apart, and same supported horizontally between two poles approximately seventy-five feet high.

I might say in conclusion that I read your very instructive and interesting magazine each month and gain a great many good points on carrying out my experiments.

While the above described apparatus may not be of the very best, I feel that it might be of interest to boys like myself, fifteen years of age, carrying out some of their work.

CARSON SHAFFNER,

Chicago, Ill.

AEROPHONY IN ITALY.

Prof. Majorana, who actually established aerophonic transmission in a very satisfactory manner over a distance of 60 km., is now experimenting, with the assistance of the Italian government, to establish permanent stations on the shore line. The chief object is to get aerophonic connections with ships in the Thyrrhenian Sea and with the island of Sicily. To this purpose the Italian government has placed the different wireless stations at Prof. Majorana's disposition.

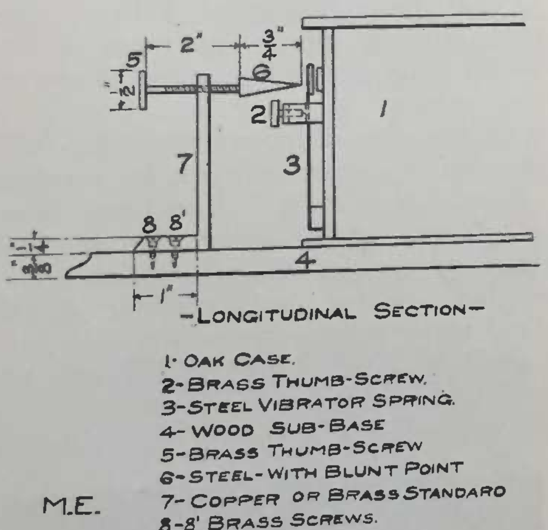
VIBRATOR ATTACHMENT.

By JOSEPH PETERS, JR.

Some time ago the author, while experimenting with his induction coil, accidentally discovered that, if a piece of iron or steel was held against the vibrator spring, the interruptions were very perceptibly increased. With this fact in mind he constructed an attachment at a cost of practically nothing, as the materials used are generally found in the kit of every experimenter.

Only the more important dimensions are given, as the others, such as height of standard, distance from coil, &c., vary with almost every different make of coil.

The sub-base of "4" is made of oak or other hard wood, and is stained and varnished to match coil-case. Make



this sub-base 1 and 1/4 inch wider, and about 5 inches longer than "1" as shown on drawing. Mount coil on same 5/8 inch from one end. Next procure some 1/8 inch, or better, some 1/4 inch copper or brass, one inch wide, and about 5 1/2 inches long. About 1 in. from one end bend same over until a perfect right angle is formed. If the experimenter is handy, this part may be cast. This is the standard marked "7" on drawing. The brass thumb-screw "5" was taken from an old "Edison" primary battery, but any brass bolt 1/2 inch in diameter, and of proper length, will answer the purpose. Thread same with any convenient small thread. Trim up a piece of iron or steel to the shape as shown at "6," making same 1/4 square at the heavier end. Next drill two holes to ac-

(Continued on Page 291)

Laboratory Contest

FIRST PRIZE THREE DOLLARS.

The enclosed pictures show the arrangement and a part of the contents of my laboratory.

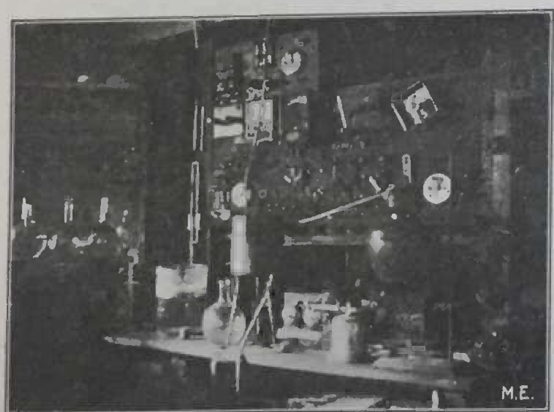
No. 1. This is my workshop where I have constructed most of the instruments shown. I have a small lathe not shown in the photo which I use for winding and turning small metal parts.

I derive my current from 40 dry cells which are placed on a shelf behind the switch board. I also have a half-dozen Leclanche cells. All of these are controlled by three 12-point switches, two reversing and three knife switches, shown on switchboard. A volt and ampere meter are attached to the board. A wire rheostat is also included. The jar at the left is used for nickel-plating.

From the switchboard I have four wires running up to my room on the second floor, where I do most of my experimenting.

Picture No. 2 shows the table with some of my more efficient instruments.

From left to right: Electro-lytic detector, mirror galvanometer for bismuth, antimony couple, analytic balance and weights, mirror galvanometer (1,000 ohm) with reading mirror attached, half-inch Ruhmkorff induction coil and two reading telescopes for the mirror galvs. The lower row consists of voltmeter,



one to twenty volts, oil condenser, telegraph set, 1,000 ohm relay, commercial sounder, commercial type transformer, ratio one to ten, 1 1/2 inch induction coil and 12-inch Geissler tube, standard rheostat and a Scranton tangent galvanometer. The collection of small vials shown at the extreme right consists of specimens of rare minerals and elements. I have used and made all kinds of detectors except Marconi's magnetic, which I intend to construct shortly, but I prefer the Electro-lytic with a good 1,000 ohm receiver. I get rather good results with my filings auto-coherer as a detector, also with the relay-tapping arrangement. To the right of the spark coil is shown a Tesla coil, not yet completed.

A milliamperemeter and a pocket volt ampere meter are also shown.

Most of the instruments are home constructed, some have been purchased in a worn and damaged condition and repaired and made serviceable, while the rest have been much cheaper to buy than construct.

I wish to state that I am greatly indebted to MODERN ELECTRICS for many a good suggestion and solution to many questions relative to electricity.

Chicago, Ill. W. FERD OHLSON.

HONORABLE MENTION.

Enclosed is a photograph of my laboratory. At the lower right-hand corner is a motor which I made from directions in a book, and connected to it is a rheostat of my own design, containing 25 feet of small iron wire, and having 79 contact points. In the lower left hand corner is a motor which I designed and made. It consists of an electro magnet attracting in turn eight iron pieces attached to the wheel, the current being broken at correct intervals by a toothed contact wheel.

In the upper left hand corner two coils are seen, one of which I am using as the secondary in an induction coil.

Toward the right is another rheostat which I made by winding iron wire on a small board five by seven inches, using copper rivets for contact points.

Further to the right is a little battery motor, some wire and other things which I use in my experimenting.

I was taking another electrical magazine, but when I saw a copy of "MODERN ELERTRICS I stopped the other and subscribed for MODERN ELECTRICS. It

is the best paper for the amateur I ever saw. PLEASANT W. DENNISON.
Indiana.

HONORABLE MENTION.
"MY LABORATORY."

My laboratory occupies about half of our attic, and is quite a mixed-up affair, for I have a little of everything. To make the picture clearer I will explain a few of the important things. With the exception of a few instruments that it would be quite impossible for me to make, I have made all of the apparatus myself at a slight cost.

In front of the table at the extreme right and on the floor is a movable base with two dynamos attached, a shunt of 36 watts and a series of 60 watts. The shunt dynamo is belted to an old bicycle that is raised up on jacks, but only the rear wheel can be seen in the picture. By shifting the base from right to left either one of them can be brought in line with the bicycle and belted to it. There is a rheostat connected to both in the usual manner, and everything is controlled at the switchboard.

Next comes the table at the right, which is my wireless table, and includes a tuned sending and receiving outfit. I have experimented with nearly all of the popular detectors, and have had best results with the Electrolytic. In sending, I use a half-inch spark, but it is a good fat one, and delivers a great deal of energy, which is important in sending. My antenna is about 35 feet high, and is on the roof. I have caught messages from ships coming in and going out of New York harbor, and heard the Brooklyn Navy Yard.

Next comes my batteries, which are on the floor at the left of my wireless table. I have practically two batteries, one primary of ten Leclanche cells, and a secondary of three storage cells, which I charge with the bicycle power dynamo. I use my batteries mainly for testing and for wireless. A few dry cells and a water rheostat can also be seen with the batteries. The rheostat reduces the electric light current, which is A. C. 104 V., so I can use it at the arc light, which is on the table right above it.

Next comes my switchboard, just above the batteries. With same I can control all the electrical apparatus in my laboratory, and can at any time tell just what voltage or amperage either the batteries or dynamos give.

Now comes my work bench, where I construct and mend all my instruments. On it can be seen an A. C. motor, a small model steam engine, a transformer I am constructing, and the arc light.

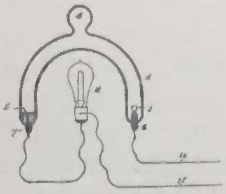
I also have a wire telegraph that goes over to the next house, where there is a boy also interested in electricity, and I have a fine library on electricity, and every number of MODERN ELECTRICS that has been published, and I can tell you truly that it is the best book of its kind on the market, and I for one would not be without it.

Yonkers, N. Y. Lewis A. Morrison.

Electrical Patents for the Month

901,294. APPARATUS FOR ELECTRIC LIGHTING. PETER C. HEWITT, New York, N. Y., assignor, by mesne assignments, to Cooper Hewitt Electric Company, a Corporation of New York. Original application filed Apr. 5, 1900, Serial No. 11,608. Divided and this application filed May 3, 1902, Serial No. 105,723. Renewed Apr. 15, 1908. Serial No. 427,208.

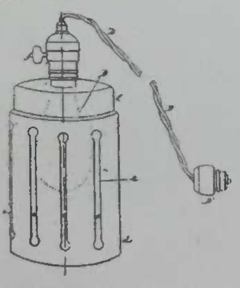
1. The combination with a U-shaped vapor lamp having electrodes, at least one of which is vaporizable, the operating position of the said lamp being one in which the arms of the U are lower than the bend, of a cooling chamber located above the bend and a neck or constricted portion connecting the cooling chamber and the main body of the lamp.



900,292. ELECTRIC CURLING-IRON HEATER. WYNN MEREDITH, San Francisco, Cal., assignor to Pacific Electric Heating Company, Ontario, Cal., a Corporation of California. Filed Sept. 25, 1907. Serial No. 394,583.

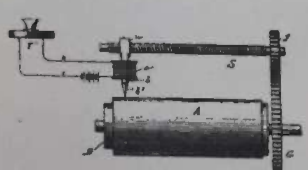
1. An electric curling iron heater comprising a tube adapted to receive a curling iron, a heating wire wound close to the tube, a thin electric insulation between the wire and tube, a thick heat insulation around the heating wire, a perforated shell surrounding the latter insulation with an air space between the shell and said insulation, a ring of insulation supported at the lower end of the shell, an insulating cap at the other end of the shell at the inner end of the tube, and washers encircling the tube at each end and fitting the shell for holding the tube concentrically in the shell.

900,493. APPLIANCE FOR THE CURE OF RHEUMATISM AND OTHER DISEASES. DANIEL R. DEWEY, Hamilton, Ontario, Canada. Filed Dec. 26, 1907. Serial No. 408,053.



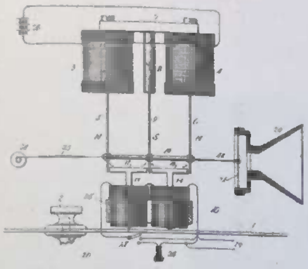
1. An apparatus for the cure of disease, comprising a glass receptacle, an incandescent electric lamp inclosed in the receptacle, a perforated inner coating of a non heating substance as asbestos, felt, paper or kindred substance, lining the interior of the glass receptacle, and a perforated jacket or coating of a similar substance cov-

900,392. SOUND RECORDING AND REPRODUCING INSTRUMENT. GEORG KIRKEGAARD, New York, N. Y., assignor to Stilson Hutchins, Washington, D. C. Filed Nov. 18, 1899. Serial No. 737,406. Renewed Mar 5, 1908. Serial No. 419,301.



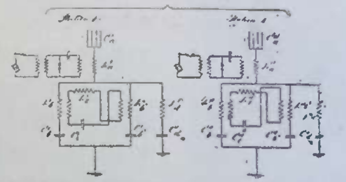
1. A sound recording and reproducing instrument consisting of a number of magnetizable bodies arranged in a series, means for successively magnetizing said bodies in accordance with sound waves and a diaphragm subjected to the successive action of said bodies.

901,397. APPARATUS FOR RECORDING AND REPRODUCING BY THE TELEGRAPHONE PRINCIPLE. HARVE R. STUART, Wheeling, W. Va. Filed Mar. 2, 1908. Serial No. 418,690.



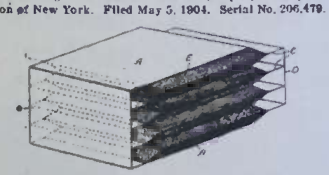
1. In a telegraphone, the combination of a recording body, a vibratory diaphragm, two magnets of constant force, and means whereby the vibrations of said diaphragm will alternately cause the lines of force of said magnets to traverse the recording body, substantially as described.

901,649. SPACE TELEGRAPHY. OSCAR C ROOS, Newton, Mass., assignor to Stone Telegraph and Telephone Company, Boston, Mass., a Corporation of Maine. Filed June 10, 1907. Serial No. 378,093.



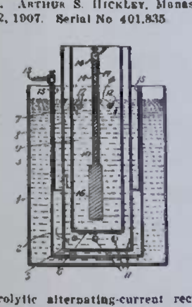
1. In a space telegraph system, an elevated conductor, a parallel-branch circuit connected in series therewith and containing capacity and inductance in each of its branches, a resonant receiving circuit associated with both branches of said parallel-branch circuit and an oscillation producing circuit associated with said elevated conductor, the said resonant receiving circuit having a very high impedance for oscillations of the frequency generated by said oscillation-producing circuit and the system comprising said elevated conductor and parallel-branch circuit having a very low impedance for oscillations of the frequency to which said resonant receiving circuit is attuned.

901,498. CONDENSER. ELIHU THOMSON, Swampscott, Mass., assignor to General Electric Company, a Corporation of New York. Filed May 5, 1904. Serial No. 206,479.



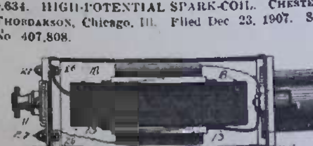
1. In a condenser, a pair of active conductors of opposite polarities, and one or more stress-equalizing conductors between said active conductors and insulated therefrom.

900,278. ELECTROLYTIC ALTERNATING-CURRENT RECTIFIER. ARTHUR S. HICKLEY, Manasquan, N. J. Filed Nov 12, 1907. Serial No 401,835.



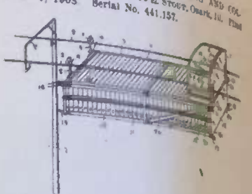
1. An electrolytic alternating-current rectifier having insulating members extending into the electrolyte and above the cell for protecting the terminals against short circuiting.

899,634. HIGH-POTENTIAL SPARK-COIL. CHESTER H THORDARSON, Chicago, Ill. Filed Dec 23, 1907. Serial No 407,808.



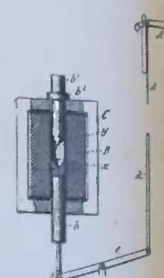
1. A high potential spark coil having an air gap formed transversely through the magnetic circuit thereof, an inclosing casing for said coil, and an armature arranged outside the casing and adapted to be operated by the magnetic field generated within the casing.

901,847. ELECTRIC MAIL DELIVERING AND COLLECTING MACHINE. OTTO E. STOUT, Osark, Ill. Filed June 30, 1908. Serial No. 441,157.



1. In a device of the character described, the combination of a trackway, a carrier movable thereon, receptacles within the carrier, outwardly flared springs at one end of the carrier and means for delivering a receptacle at one end of the carrier and withdrawing a receptacle from the opposite end of the carrier.

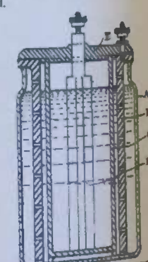
899,398. SOLENOID-MOTOR. LEMUEL F HOWARD, Edgewood Park, Pa., assignor to The Union Switch and Signal Company, Swissvale, Pa., a Corporation of Pennsylvania. Filed Oct 23, 1906. Serial No. 340,130.



1. A solenoid motor having a core comprising two sections normally tending to move inwardly in opposite directions, one of said sections having a conical inner end and the other a conical recess in its inner end to receive said conical end, and one of said sections being free and constructed to move outwardly when engaged by the other section on its inward movement but provided with means for limiting its inward movement under the influence of magnetic forces of the coils.

899,823. PRIMARY BATTERY. WILHELM A. F. BLECK, Brisbane, Queensland, Australia. Filed Mar. 30, 1908. Serial No. 422,324.

1. In primary batteries of the double fluid type the combination of sodium hydroxid as excitant with a depolarizer consisting of chromic acid dissolved in a solution of hydrogen peroxid with the addition of hydrochloric acid as described.



900,386. TELEPHONE-TRANSMITTER. ADOLPH G KAUFMAN and LEOPOLD J. LIPPMANN, New York, N. Y., assignors to American Callaphone Company, New York, N. Y., a Corporation of Georgia. Filed Jan. 18, 1907. Serial No. 353,004.

1. A telephone transmitter comprising a casing, a diaphragm, a conducting carrier facing the diaphragm, loose conducting material between the carrier and the diaphragm, and ball shaped contact members projecting into said loose conducting material.

Original Electrical Inventions for Which Letters Patent Have Been Granted, for Month Ending October 20th.

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

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

COIL QUERIES.

(90.) THOS. H. BLOUNT, JR., N. C., asks:

1a.—What is the size of enclosed wire?

A. 1a.—Sample of wire enclosed is No. 24 single cotton covered.

1b.—How many pounds would it take to make a ten (10) inch spark coil?

A. 1b.—Wire in question is altogether too heavy for a 10-inch spark coil. No. 30 or No. 28 is about as heavy as you should use.

2.—Will a magneto of 10 volts light a 10-volt lamp?

A. 2.—Yes.

3.—What number wire will it take to carry the discharge from a ten-inch coil?

A. 3.—Any wire will do, even the thinnest, as the amperage of the 10-inch coil is very little. Of course, if the wire is too thin, it will heat up somewhat.

4.—I have an aerial made of No. 14 wire—3 strands. Will it have to be enlarged? It is 35 feet long and 6 feet wide.

A. 4.—It all depends how far you wish to send. There is no way of telling by the way you put your question.

5.—Can a pair of oscillators be made from sheets or dics of brass?

A. 5.—Brass or zirc balls are used usually.

DETECTORS.

(91.) GEORGE W. TAYLOR, Pa., asks:

1.—What are the best kind of carbons to use in the microphone detector as described in the May issue, soft or hard carbons, and 1-2 or 1-4 inches thick?

A. 1.—Hard carbon, such as is used in arc lamps, will serve the purpose.

2a.—How far could I receive with an "Electro"-lytic detector, 75 ohm telephone receiver, 60 aerial, and potentiometer as described in the August issue?

A. 2a.—It all depends on your apparatus, but we have no doubt that you could reach as far as 200 to 250 miles.

2b.—How far using the tuning coil as described in June issue?

A. 2b.—This will increase the range of your station fully 50 per cent., as you can then get in tune with stations having greater wave length than you could catch without using the coil.

CARBORUNDUM DETECTOR.

(92.) LOUIS BONSIE, Ind., writes:

1.—Could messages be received for a distance of 52 miles with a carborundum detector and 1,000-ohm telephone receiver and 60-foot aerial? What is the greatest distance such an equipment could receive?

A. 1.—Yes, you should be able to receive about 100 to 150 miles with your equipment.

2.—Are carborundum detectors as good as liquid or electrolytic detectors as regards sensitiveness, etc.?

A. 2.—The "Electro" Lytic detector is a good deal more sensitive.

3.—Can you tell me where I can obtain practical information on the construction of a wireless telephone?

A. 3.—We recommend you our new book, "Wireless Telephony," by Ernst Ruhmer, showing all the different systems, for $3.75.

STATIC MACHINE.

(93.) ROSCOE FREY, Ia., asks:

1.—Please tell me if a static machine giving a three-inch spark will work satisfactorily in a wireless set, and if so, will it send as far as a coil, giving the same length spark?

A. 1.—A static machine will not work as far as a spark coil. The machine you are speaking of will not work further than 1-4 mile, while a 3-inch spark coil under good circumstances, will work as far as 20 miles and more.

AERIAL.

(94.) F. W. MORRIS, California, asks:

1.—Will an aerial composed of a triangle 75 feet by 30 by 30, strung in the shape of a large harp, with wires in between, and stretched between two poles 50 and 50 feet high, be as good as the same suspended from a mast 70 feet high?

A. 1.—We believe the former arrangement is the better one.

2.—Where can I get a silicon button (not crystal), for use in a silicon detector?

A. 2.—From the Electro Importing Co., New York.

3.—With my carborundum detector, which is supposed to use batteries, I find I can get better results without batteries. Can you explain this?

A. 3.—You probably have a large station working in your vicinity, and you will find that even if you leave the detector away altogether, you can get just as good, and probably better results.

RECEIVING DISTANCE.

(95.) V. S. IVEY, N. C., writes:

1.—Would it be possible for me to catch signals from the Cape Hatteras station by using a temporary aerial erected on the summit of a mountain near here which rises abruptly 1,100 feet in height above sea level, being 2,200 feet? The Hatteras station is about 300 miles distant. I propose using the electrolytic detector in conjunction with sensitive receivers.

A. 1.—We believe so; there should be no trouble to even receive messages from further distant stations. See article on "Aerials," by Mr. Austin, in this issue.

2.—Should a filing coherer, when used for calling, be placed in the same tuned circuit with the microphonic detector which is used for general conversation, a switch being arranged of course to throw out either?

A. 2.—Yes.

PIERCING GLASS PLATE.

(96.) EDDIE C. ESTES, Minn., asks:

1.—Will a 1-inch E. I. Co. spark coil work up to 1 1-2 miles with a "Electro"-Lytic detector under best conditions and a 50-foot aerial (with a 4x4 foot screen)?

A. 1.—Yes, it should work up to about 6 miles.

2.—Would two masts, each 50 feet high, and 6 copper wires running horizontal, be better for an aerial than the above named in No. 1?

A. 2.—Yes, much better.

3.—What is meant by "Sustained Oscillation"?

A. 3.—Undamped.

4.—In finding the "wave length" do you multiply the length of the aerial wire or the height of the antenna by 4?

A. 4.—Multiply the *total* length of the aerial wire. This is, of course, only approximate.

5.—Will a one-inch spark coil pierce a glass plate 1-16-inch in thickness; if so, how do you adjust the spark balls?

A. 5.—Yes, if condensers are used, shunted around the spark gap and sharp points are used instead of spark balls.

AUTO COHERERS.

(97.) DOUGLAS HILLYER, N. Y., writes:

1.—Should the sound be regular, or interrupted, at the proper point of tuning, when heard in the receiver?

A. 1.—The sound should be regular and clear.

2.—Which is the more sensitive coherer, with mercury *and* carbon grains, or with either alone?

A. 2.—The most sensitive combination is with the carbon rod and iron rod, and a drop of mercury between, forming the so-called "Solari" detector.

3.—How far should the space be between the two arms of the coherer when it contains the mercury, etc. (inside coherer glass)?

A. 3.—Adjustment is found by forcing the arms together until a sharp click is heard in the telephone, and then drawing apart until a hissing noise is heard.

4.—How far away will I be able to receive messages from, with 5 square feet of chicken netting on a pair of 60-foot poles, and a tuning coil, 75-ohm receiver and auto-coherer?

A. 4.—We refer you to article on aerials by Mr. Austin, in this issue.

MILLIAMPERE METER.

(98.) D. L. HAY, Wis., asks:

I have a milliampere meter which has the needle suspended by a thread of some kind. I have tried everything I know of, but it wouldn't turn easy enough. Do you know of anything I can use?

A.—We would suggest what is known as a quartz suspension. Write to Manufacturers' & Inventors' Electric Co., New York City.

MAGNETIC DETECTOR.

(99.) J. R. WEEKS, N. J., asks:

1.—Would No. 30 S. S. C. wire or No. 40 S. S. C. be right for the magnetic detector, and how much would it need of each?

A. 1.—We would refer you to Query No. 79, answer to Question No. 1, in October issue.

2.—Does it need a tuning coil and condenser with same?

A. 2.—Answer to Question No. 2 in the same query will give you the desired information.

WIRE RESISTANCE.

(100.) HARRY FREUND, N. Y., writes:

1.—How much of No. 40 S. S. C. wire is required to make 1,000 ohms resistance?

A. 1.—979.84 feet.

2.—How much wire of the same size is required for 75 ohms resistance?

A. 2.—78.67 feet.

3.—Which poles are placed together in the Marconi magnetic detector?

A. 3.—North poles of the magnets are placed together in the Marconi detector. These magnets should be mounted on an adjustable holder.

TUNING COIL.

(101.) FRED G. WALDRON, Mass., asks:

If the receiving tuning coil described in June issue were prolonged to 36 inches, would it be of any advantage?

A.—Not particularly, as the one described in the June issue is large enough to tune up for almost any wave length.

WAVE LENGTH.

(102) VERN LAWLER, Wis., writes:

1.—What is meant by wave length in meters, and how figured out?

A. 1.—A meter is equal to 39.25 inches. For finding wave length in meters we would refer you to editorial in July issue. Calculation is, of course, only approximate.

2.—What is the general use of the anchor gap; does it regulate the spark or electricity which passes through the air?

A. 2.—The anchor gap acts as a switch on the aerial, to prevent the waves passing to the ground through spark coil when receiving.

3.—Would a Leyden jar put in circuit of spark coil, key and batteries reduce sparking on key points the same as a made condenser?

A. 3.—A Leyden jar when connected to key points will reduce sparking thereon.

4.—About what part of a horse-power dynamo would be right for a one-sixth horse water motor with 20 lb. pressure?

A. 4.—1-8 to 1-10.

SPARK FROM COIL.

(103.) GEORGE CRABTREE, N. Y., asks:

1.—Will the insulation on my aerial of No. 18 copper wire effect my sending to other stations?

A. 1.—If you mean insulated wire—no; if you mean insulation of your aerial at point of leading in and wire suspended—yes, if it is poor.

2.—Why don't I get the same length spark from my coil when the aerial and ground are switched in that I get when they are not?

A. 2.—On account of the large capacity added, when the aerial and ground are switched in.

3a.—What spark coil should I purchase to send a message one-half mile?

A. 3a.—One-half inch would transmit satisfactorily the above distance under almost any conditions.

3b.—What kind of batteries, other than storage cells, are best suited to this kind of work?

A. 3b.—Edison primary batteries.

WIRELESS QUERIES.

(104.) J. M. Walsh, Pa., asks:

1.—What is the greatest distance a message can be sent with a ½-inch coil, having an aerial wire 40 feet high, and a tuned transmitter?

A. 1.—Approximately 1 mile, depending upon the sensitiveness of the receiving instruments. Under good conditions you may reach as far as 2 miles.

2.—What is the greatest distance messages could be received with above antenna using an Electro Lytic Detector and tuning coil?

A. 2.—With apparatus mentioned general range should be from 200 to 300 miles. It is possible to sometimes get 800 to 1,000 miles, with the antenna mentioned.

3.—What is the greatest voltage and amperage you could use on a ½-inch coil?

A. 3.—Two amperes and anything up to 6 volts.

4.—How many amperes does a ½-inch coil consume in 1 hour?

A. 4.—Two amperes.

5.—What is the best form of antenna?

A. 5.—We refer you to article on "Aerials" in our October issue.

COIL QUERIES.

(105.) Leslie Mills, Iowa, asks:

1.—What size spark should I use for sending wireless messages for 75 or 80 miles?

A. 1.—A coil rated at 5 to 6 inches should be used for accurate transmission over this distance under all conditions.

2.—Would the insulation be good enough for a 7 or 8-inch coil, made as follows: Winding bare wire and thread alternately by a winder and shellacing each layer and then wrapping each layer with paraffined paper; then, when the coil is wound, to boil it in paraffine?

A. 2.—No, any coil wound to give more than 1-inch spark should be made up in sections. We refer you to our book. "Coil Making," by Norrie. Price, postpaid, $1.00.

TUNING QUERIES.

(106.) Arthur A. Oswald, Mont., writes:

1.—How is the coil of wire on the exciter connected to the other instruments? The wiring diagram only shows the connections of the condenser gap in your July issue.

A. 1.—By flexible connections clipped on.

2.—In the secondary condenser is tin foil used on both sides of the glass plates?

A. 2.—Yes.

3.—In the wiring diagram, what is the sign represented by the two parallel lines crossed with an arrow, below the receiving tuning

A. 3.—Variable condenser.

4.—What does the arrow across these lines point to?

A. 4.—Arrow across lines of the condenser means that same is variable.

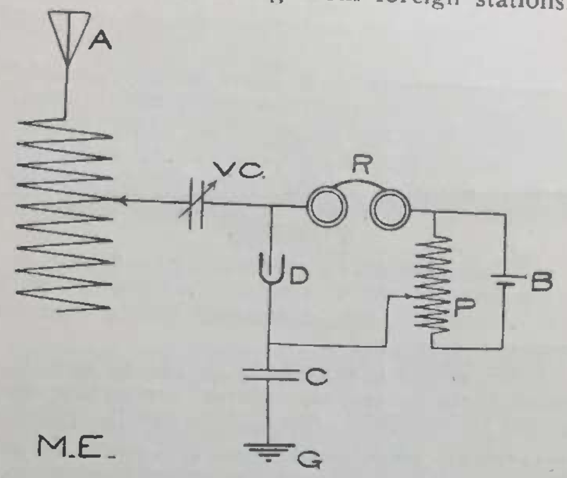
5.—Is the switch in the closed receiving circuit between the condenser and variable resistance open or shut when receiving?

A. 5.—Closed.

TUNING.

(107.) Anthony Verinsky, N. Y., asks:

For diagram of wireless receiving station, using tuning coil, potentiometer and Electro Lytic detector. Also is variable condenser necessary for receiving from foreign stations.



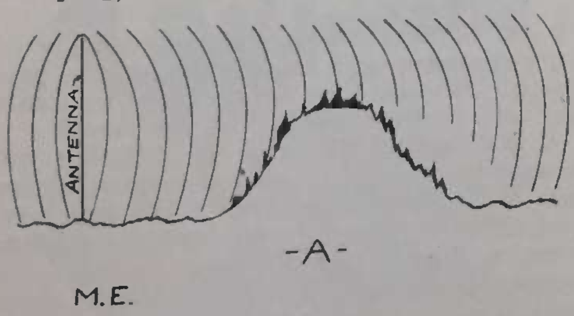
Ans.—The above diagram shows a very sentitive receiving arrangement. While it is not absolutely necessary to use a variable condenser, it is by all means preferable, as by using same, stations not wanted may be tuned out, also the sound in the phones will be greatly increased.

DIRECTION OF WAVES.

(108.) William H. Capen, Mass., asks:

1.—My aerial is between two houses, the top of it is about 50 feet above the ground and comes only three or four feet above the top of one of the houses. The houses are *not* close together. By using a "Telim" auto-coherer with one iron and one carbon plug, and carbon grains and a drop of mercury between them, in connection with a 1,000-ohm receiver and a tuning coil, how far should I receive messages from? Do the houses hinder any?

A. 1.—With the instruments mentioned, you should be able to receive stations within a radius of 150 miles. We would suggest leaving out the carbon grains, and using only carbon plug, iron plug, and small globule of

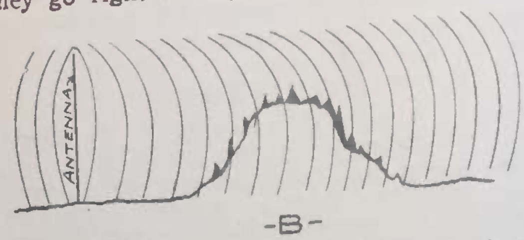


mercury between them. If the buildings mentioned do not contain any iron work there will be hardly any interference.

2.—How much battery power should I use with the above receiving arrangement?

A. 2.—One or two dry batteries, in connection with potentiometer.

3.—How do the wireless waves travel? Do they run at the same height above the ground as the aerial from which they are sent, or do they go right through a hill which is in the



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way? Which of following diagrams shows correct way?

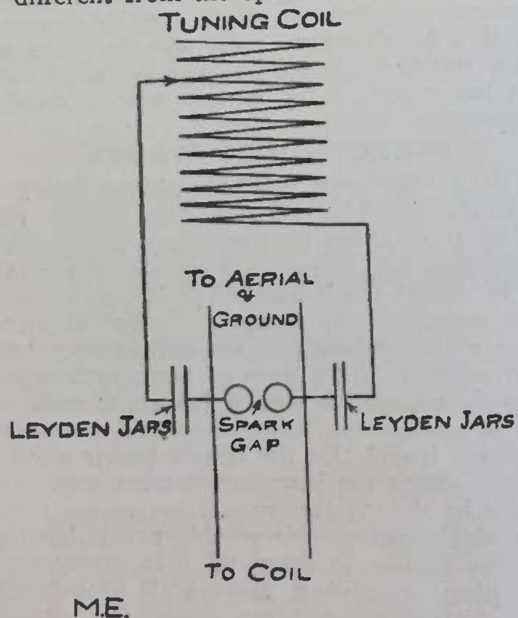
A. 3.—Diagram A is the generally accepted theory of the propagation of wireless waves. Diagram B is not accepted as being correct. For further information we would refer you to page 54 of the May issue, article by Mr. G. Marconi, "Wireless Telegraph Oddities."

TUNING

(109.) ROBERT F. ADAMS, Tex., asks:

1.—Can I tune a wireless transmitter with the tuning coil, etc., connected like shown on enclosed diagram?

A.1.—While it may be possible to use this connection, we would advise connecting the aerial by flexible connection to the tuning coil, taking the ground from the point shown on the negative side of the gap. Connection shown in diagram seems to us to be but slightly different from the open circuit tuning.



2.—If the discharge from the secondary of a 1-inch spark coil should accidentally pass through the windings of a high resistance telephone receiver, would it injure same?

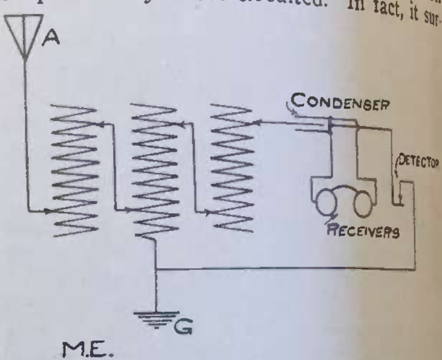
A. 2.—Passing discharge of a 1-inch coil through the coils of a high resistance telephone does not always injure same. We have several times accidentally allowed a discharge from a 2-inch coil to pass through our phones, and same are still uninjured. However, we do not mean to say that this would hold good under all conditions.

WIRELESS CONNECTIONS.

(110.) NEW ORLEANS, La.

One of our correspondents encloses diagram "A," showing connections of his wireless instruments and saying he has tried various connections with condenser, and everything else suggested, but failed. The extreme limit of his set is less than 5 miles. He also says his instruments are carefully made and well shellaced, all joints soldered, inlets through insulating tubes. His aerial is hung on porcelain insulators, and his insulation is good all through. Says he fails to see what he can do to improve on present conditions, and asks the Oracle to help him out.

A.—We are not surprised that receiving distance of our correspondent's station is less than 5 miles, provided we have interpreted the diagram correctly. The detector in the above diagram is practically of no use at all, and the head receivers connected to the condenser are practically short circuited. In fact, it sur-



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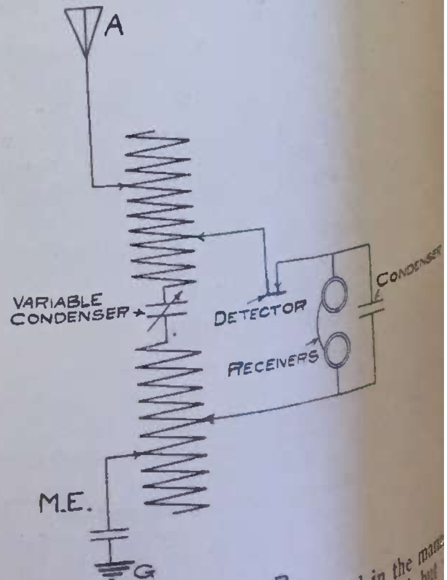
prises us that any result at all is obtained with the above connections. The only way we can explain this slight result is that when the high power government station a few miles away from this station is operating, the energy received is enough to cause a condenser action. We believe that by connecting the phones directly between the aerial and the ground that this government station could be heard quite a little better than is now possible.

The "Oracle" suggests the use of two tuning coils only, connected as per diagram B. A silicon detector is shown in this diagram, as we are under the impression from diagram A that our correspondent is using this detector. Of course it is understood that any other kind



B

of detector should be connected in the manner best suited to the particular one used, but would suggest that tuning coils and condenser be connected as per diagram B.

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

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? WIRELESS ?

Of course we have it. Coherers, Detectors, Auto Coherers, Rheostats, Static Machines, in fact all the Electrical "knick-knacks" you have been looking for. All apparatus carried in stock in St. Louis. Why pay freight and expressage to get goods from the East? Come and look over our stock. HANCE ELECTRIC CO., Olive Street, St. Louis, Mo.

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NAVY TRANSATLANTIC type Double Head receiver, 1,800 ohms, 20,000 turns copper wire. Highest efficiency, latest improvement, very sensitive, $10.00. Do rewinding of receivers of any kind, also make receivers of very high resistance. C. Brandes, 135 William street, New York City.

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MOVING PICTURE MACHINE (French), finest precision, guaranteed in every respect. Everything but the lenses. Big electric, hand fed arc lamp Generator (enclosed in metal square box) and gas apparatus goes with machine. Will sell for $20.00. Big bargain. Photo sent upon request.
B. S., care of Modern Electrics Publication

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FOR SALE.—Magneto in good condition; has been used only three months. Price, $6.00. New 10-Watt Dynamo, price, $3.00. Thomas H. Blount, Jr. Box 242, Washington, North Carolina.

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FOR SALE—1-8 H. P. dynamo castings. Photo and price for the asking. Crihfield Motor Works, 225 Third street, Lincoln, Ill.

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VIBRATOR ATTACHMENT.

(Continued from Page 281)

commodate 1/2 inch brass wood-screws, countersinking them to add to the neatness of the finished part.

Before mounting standard on sub-base, ascertain just at what point vibrator will work best with this attachment. This is done as follows: Operate coil and speed up vibrator as much as possible, then take a small screwdriver and place same against vibrator-spring just above contacts. By moving screwdriver up or down, or forward or backward, just a trifle, until vibrator "sings," the proper adjustment will be obtained. Mark the point on vibrator where interruptions are the most rapid, and on line with this mark, make a mark on standard.

Drill and tap a hole at this point, to accommodate brass thumb-screw "5," as shown in drawing. Before inserting "5" in standard, equip same with a check nut (not shown on drawing) to secure adjustment, as the vibrations speedily jar "5" out of place. Now insert thumb-screw "5" in standard, and secure part numbered "6" to "5." The author used solder for this purpose. Next screw standard to sub-base by wood screws as shown. Connect up your coil, start same operating, and adjust attachment by turning thumb-screw until it bears against vibrator-spring with just the right pressure. This adjustment is easily ascertained, by the increased length of discharge from secondary terminals.

The author finds that attachment works best when three to nine dry batteries are used.

PRODUCTION OF SUSTAINED HIGH FREQUENCY OSCILLATIONS.

(Continued from Page 260)

has as yet been verified or accepted as final. The theory proposed by Mr. Duddell is that the production of the oscillations depends upon a certain "negative resistance" possessed by the arc itself. When the current is first admitted to the shunt circuit the latter tends to absorb from the arc some of its current in order to charge the condenser C (Fig. 6). This current, he claims, does not decrease the potential difference between the carbons, but slightly increases it, which causes it to further charge the condenser. As soon as the charge is complete, the current through the arc is once more normal and the condenser discharges back through the arc. This, of course, increases the current through the arc and decreases the potential difference of the carbons, thus causing the condenser to charge again and repeat the process; these operations occurring with tremendous frequency as long as the arc is maintained.

In the systems employing this method, the inductance used in the shunt circuit is usually in the shape of the primary of an oscillation transformer, the secondary of which is connected in the aerial as shown in Fig. 6. The frequency and consequent wave length are controlled by the value of the current supplied to the arc, which may be done by varying its wave length.

Various modifications of the above methods are sometimes employed with more or less success, and as improvements in this field are rapidly being made, there is but little doubt, that in view of the many advantages possessed by undamped waves, that they will finally be adopted by most of the leading systems now employing the older form of condenser discharge methods.

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