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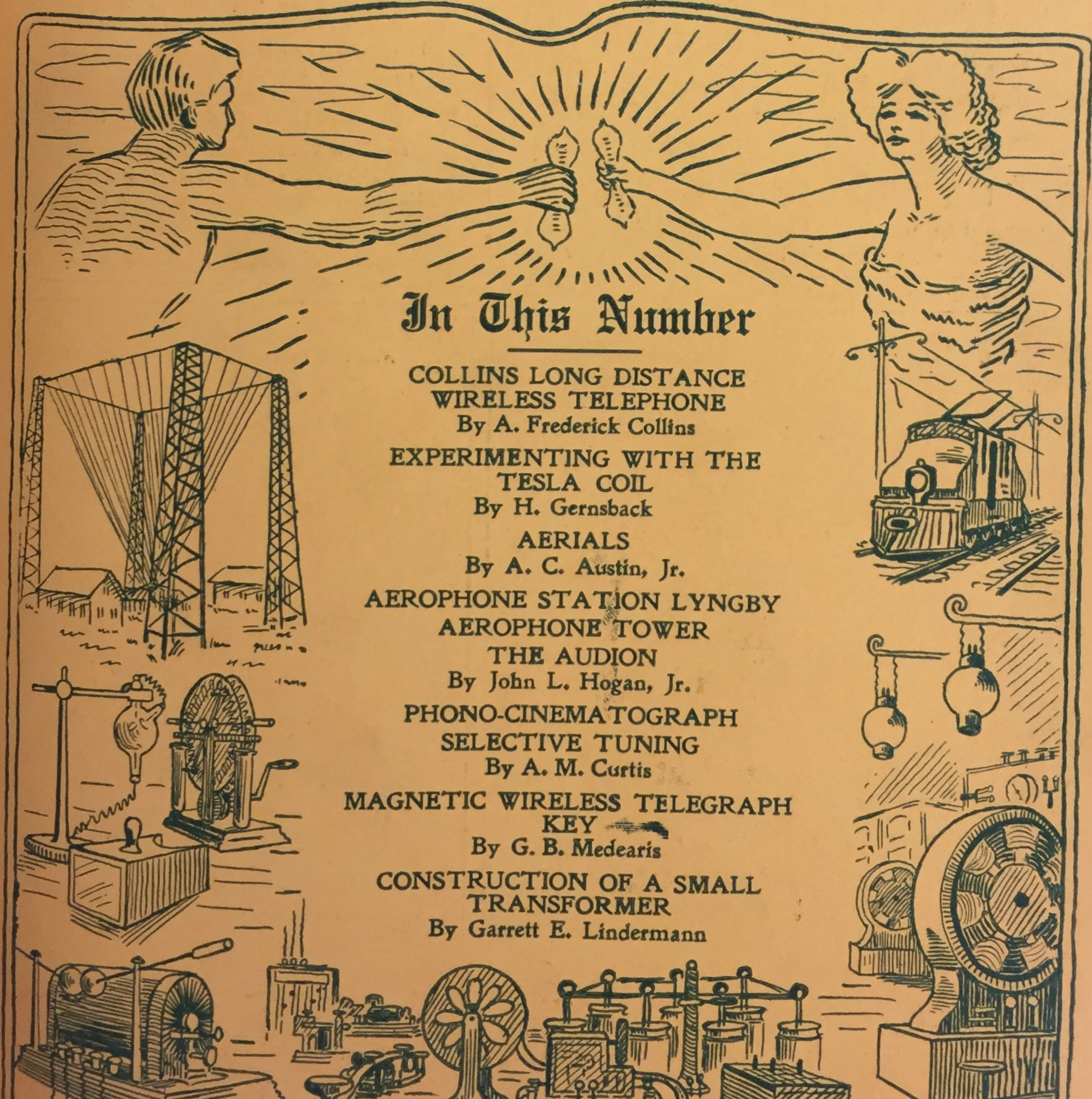

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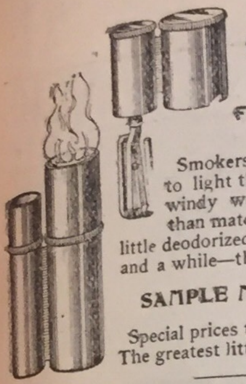

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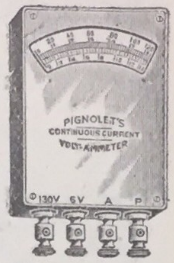

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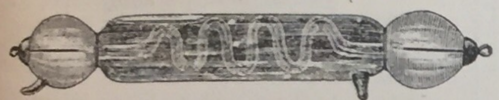

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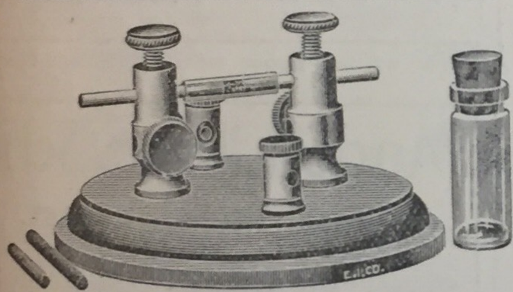

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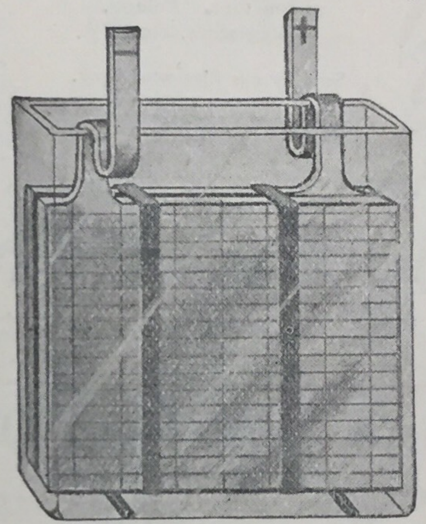

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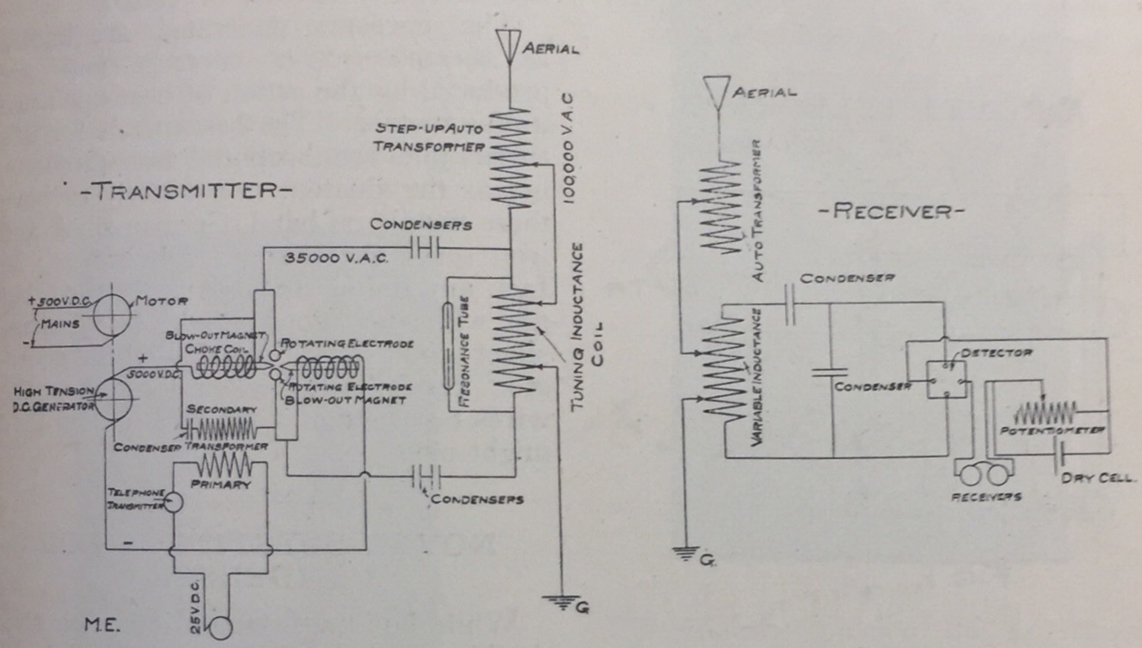
MODERN ELECTRICS

Vol. I. OCTOBER, 1908. No. 7.

Collins Long Distance Wireless Telephone

By A. Frederick Collins.



There has been a great deal of secrecy observed in the development of the wireless telephone, but the situation has now reached a stage where the general principles may be made public.

Commercially the Collins Wireless Telephone Company are manufacturing three types of apparatus for the transmission of articulate speech without wires, i. e., (A) inductivity wireless telephones, (B), conductivity wireless telephones, and (C) electro-magnetic wireless telephones. In the *Type A* apparatus the principles of electro-magnetic induction are utilized, and they are therefore suitable for experimental, lecture and interior purposes. The transmitter and receptor have no aerials, are not grounded, and there is absolutely no connection between them.

In the *Type B* instruments the transmission is effected by the conductivity system, and consequently grounds are necessary, but no aerials. By following certain well-defined laws, the transmitter and receptor can be placed almost any distance apart. Installations of this type are designed for commercial purposes, and will give satisfaction over ranges for which they are constructed.

The *Type C* equipments depend for their operation upon electro-magnetic waves and represent the most advanced thought in the art of the aerophone. A Collins *oscillation arc* provides the means for setting up in the radiating aerial wire sustained electric oscillations, and these are modified by the human voice, when they are emitted and propagated through space in the form of electric waves. Impinging on the receiving aerial the waves are reconverted into continuous electric currents of high frequency which, actuating a Collins special sensitive thermo-electric detector,* reproduce clearly and with precision, the spoken words.

The accompanying diagram shows all the elements of the *Type C* wireless telephone equipment for long distance work, and with which we were enabled to communicate between Newark and Philadelphia, a distance of 81 miles, without connecting wires. The obvious conclusion resulting from these tests is that almost any distance can be covered by amplifying the power of the sending station.

A NOVEL TELEGRAPH.

By Caleb Brokaw.

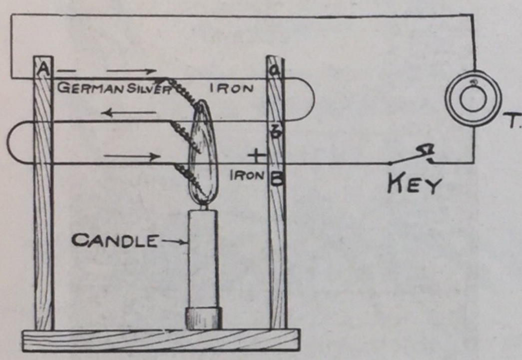


FIG. I.

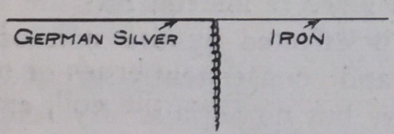


FIG. II.

M.E.

At first thought it does not seem possible that a complete telegraph set can be made from a candle, a piece of German-silver wire, an iron wire and a telephone receiver. However, this is the case and it can be made quite easilv.

To a base 5x4x1/2 in. attach two uprights 6 1/2x1x1/4 in. Procure about 15 inches of German-silver wire, No. 16 or 18 and fifteen inches of iron wire of the same size. Cut the wire in six lengths of five inches each and twist each iron wire with a German-silver wire, as shown in Fig. 2. Bore a hole at A, Fig. 1, and insert a binding post. Attach one German-silver wire to this post and stretch it to A, and run through a hole in the upright. Then fasten the *iron* wire to another *German-silver* wire and then back through "b," one inch below A, and so on until B is reached, where another binding post may be placed. The twisted portions of the wire are then bent as shown in Fig. 1, and a small lighted candle set underneath them. If now a wire be run from the binding post A and B to a telephone receiver, a click will be heard in the receiver every time the circuit is opened or closed.

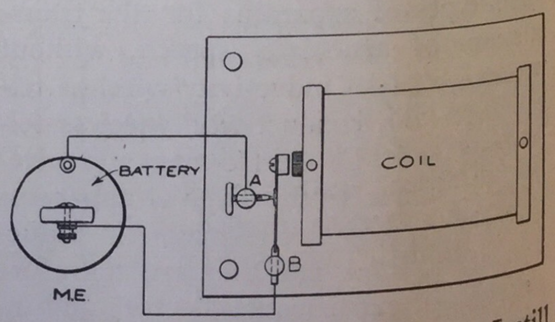
The currents generated are known as thermo-electric currents and are produced by the action of heat upon two unlike metals. The best metals for this thermopile are bismuth and antimony, but as the amateur is not likely to have these metals on hand, German-silver and iron serve the purpose admirably. In fact, any unlike metals may be used, but not with such good results as German-silver and iron. In using this "generator" care must be taken not to heat the wires to too high a temperature, as they might melt.

*See August issue.

NOVEL SUBSTITUTE FOR CONDENSER.

While building a small induction coil, the idea occurred to me, whether I could find a temporary substitute for a condenser, none being at hand at the time.

I took a completely worn out dry cell, as shown in illustration, and connected it to the vibrator, A, and to the set screw B. I found that the sparking on the contact points was reduced almost entirely and the "dead" battery did not interfere whatsoever.



The scheme works so well that I still have it in use.

Contributed by Howard Becker (age 14.)

Experimenting With The Tesla Coil

BY H. GERNSBACK.

(Concluded.)

Another interesting experiment is performed by running two fairly stiff copper wires parallel to each other and about 2-4 inches apart, fig. 12.

When the frequency is high enough the space between the wires will be filled with light, while the ends will show a flame-like discharge. Small flames are also playing continuously on both sides of the wires. When performed in the dark this experiment is very impressive.

A similar experiment is performed by forming two stiff wire loops, of heavy copper wire. The large loop is 80 centimeters in diameter, the small loop measures 30 centimeters.

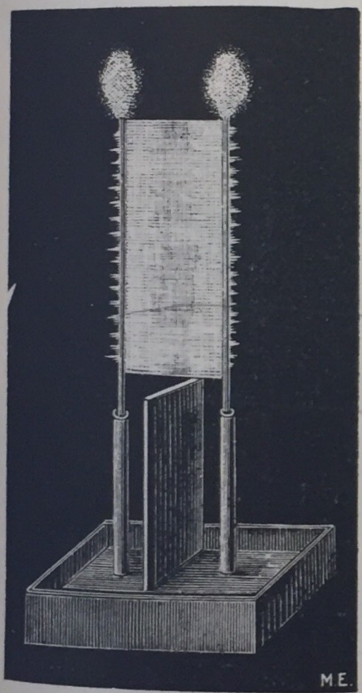


Fig. 12.

The two loops are placed concentrically, one into the other, and both are in the same plane. The space between the two loops will be filled with light when the coil is in operation, fig. 13.

An electrical flame is produced as follows: Allow two sharply pointed rods to extend from the top of the coil to the height of about 6 inches.

It is of utmost importance that all other metal parts are carefully covered at least 1/8 inch high with wax or paraffine. Likewise, the entire top of coil should be thus coated, and even the coil box itself, so that the current cannot leak out.

It will also be necessary to place the entire coil on glass insulators to prevent leakage into the ground.

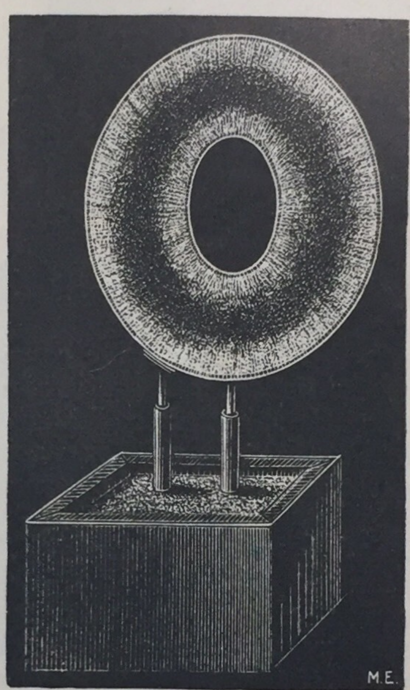


Fig. 13

The underlying idea of this experiment is to get an enormously high potential at the two metal rods and to concentrate the potential entirely upon the rods.

When viewed in the dark it is of the highest importance that no brush or other discharge emanates from the coil, except from the metal rods.

Any leaky corner or edge must be carefully covered. Of course all this depends more or less upon the ability of the experimenter, and if his efforts are successful, two *flames* several inches high may be obtained, fig. 14.

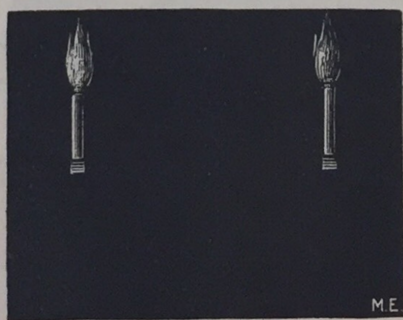


Fig. 14

The word flames is entirely correct, as they show all the characteristics of flames, such as are obtained by gas flames.

These electrical flames are of course not as hot as flames produced by the regular lighting gas, but if a coil was built

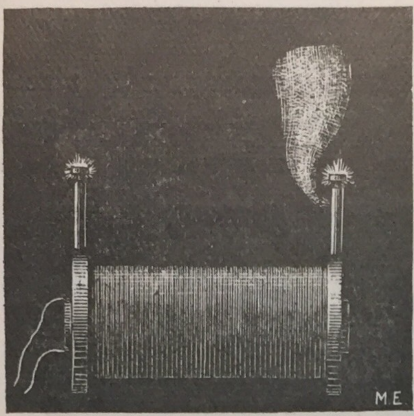


Fig. 15

sufficiently powerful, the flames could reach a very high temperature.

This seems strange, but if we consider that these electrical flames are produced by the molecules in the air colliding with each other with extraordinary rapidity and force, the phenomenon is understood much easier.

Fig. 15 shows the aspect of a thin bare copper wire, connected to one pole of the Tesla coil.

This is a similar experiment as that shown in Fig. 8. In this case, however, the wire revolves rapidly, forming a small circle.

It is impossible to state here the length of the bare wire to be used. Start with a piece about 8 inches long and cut short pieces off same, until the best results are obtained.

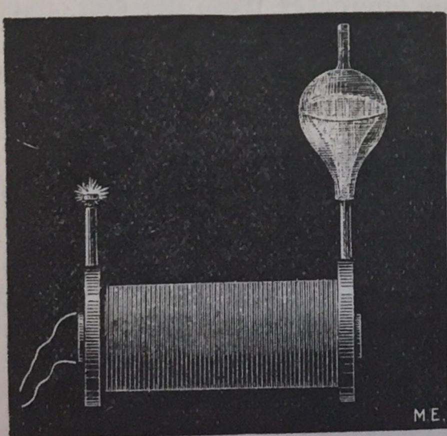


Fig. 16

Another similar experiment is shown in Fig 16. This represents the luminous top.

A very thin, bare copper wire is attached to one pole of the coil. Over this wire, a glass bulb, as shown in illustration (closed at the top), is placed over the wire. If the potential of the coil is high enough, the wire will become red hot and will also rotate very fast, describing a circle. In the dark the onlooker beholds a revolving luminous top.

The "electrical wind," which is observed on all static machines, can also be produced by a large Tesla coil, if its potential is sufficiently high. A small, sharp teethed—metal disc—preferably of aluminium and about 1/64-inch thick, when placed upon an axle upon which it can turn with practically no friction, will revolve with incredible speed as soon as the coil is operated.

Sparks will fly from the edge of the disc and very often it will be entirely enveloped in light, fig. 17.

If we connect two large metal balls to the terminals of the coil and place heavy glass plates between them, it seems as if the current was really passing between

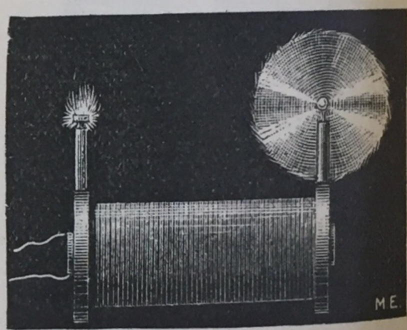


Fig. 17

the balls, through the intervening glass plates, fig. 18. This, however, is not the case, the luminous currents really being produced by the molecules of the air, which are made to move with tremendous speed between the two balls charged with the different polarities.

The electrical Phantom is shown in fig. 19. This experiment is a very odd one and completely mystifies the layman. Two thin metal discs about 1 inch in diameter have their circumference ground to very sharp edges; the sharper the better. These two discs are connected directly with the two poles of the coil.

As in this case, bodies of very small capacity are connected with the coil; same is in the position to develop extremely fast vibrations.

When the potential is high enough, white threads or light rays break from the edges of the discs. These rays are sometimes of considerable length.

If one holds the hand against them, nothing will be felt; even if the hand is brought quite close to one of the terminals, only a small spark will jump from it.

A very striking effect is produced by the experiment shown in fig. 20.

R, R, represent two hard rubber sheets, about 1/4 inch thick. A thin silk covered wire, No. 36, B. & S., is glued in form

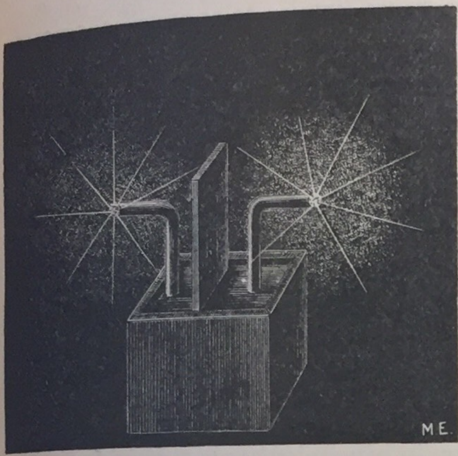


Fig 19.

of a name or characters on the face of each sheet. The back of the sheets is covered with a piece of tinfoil, t., t. Both are connected by a thin wire, C.

The terminals, W, W, of the coil lead to the name or characters, as clearly indicated in the illustration.

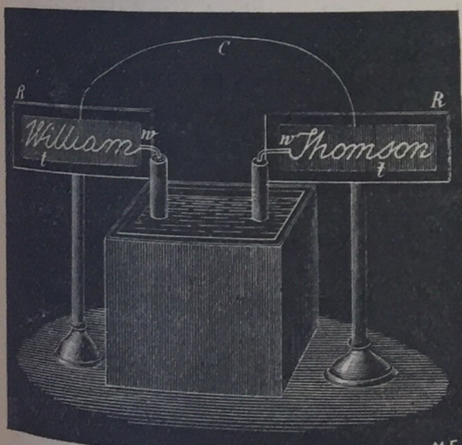


Fig. 20

The frequency of the coil is now regulated till the thin wire pasted on the hard rubber begins to emanate light. After a little experimenting the point will be found where the name or characters will stand out brilliantly, producing a very pretty effect.

The experiments cited above are, of course, only a few that can be performed by means of a good Tesla coil. Others and new ones will readily suggest themselves. Descriptions of new experiments should be sent to the writer, with a good sketch, if possible. They will be published from time to time in MODERN ELECTRICS if sufficiently original. The discoverer will, of course, get due credit.

The writer also wishes to state here (although it was explicitly stated in the September issue) that only a TWO-INCH spark coil (or a larger one) can be used in connection with the Tesla coil. A smaller coil would give no results. This is in reply to over one hundred letters from experimenters, asking if 1/2, or 1, or 1 1/2-inch coils could not be used successfully.

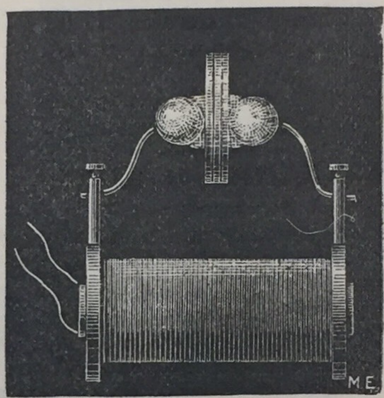


Fig. 18

AEROPHONE PARIS-DIEPPE.

Three French army officers who have been experimenting for several months past, have been very successful in transmitting speech wirelessly from the Eiffel Tower in Paris to Dieppe, a distance of 150 kilometers.

Not alone the voice, but the sounds of music, singing, and even the honk-honk of an automobile horn were heard with extraordinary clearness at Dieppe.

These experiments took place August 5 and 6.

Honolulu.—The recently equipped wireless station in this city has picked up several messages between San Francisco and vessels at sea.

We usually admire a "sticker," but we cuss if the sticker happens to be our vibrator.—"FIPS."

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EDITORIALS.

It affords the Editor great pleasure to present to his readers herewith the first "Aerophone" number.

As is most likely the case a good many readers were surprised at this title, and an explanation is due.

We have grown so accustomed to the word "telephone" that we use it over and over without being conscious that it really means "far voice." You will say: "I shall telephone you," but nobody would think to say: "I shall far-voice you."

A short word has long been needed to express what is known now under name of "wireless telephone."

It sounds decidedly odd to say: "I shall wireless telephone you," or I shall telephone you wirelessly."

The word "radio-telephone" expresses the idea a good deal better, but still it sounds strange if we say: "I shall radio-telephone you." Better would be the shorter word "radiophone." But it does not seem to sound quite right when we say: "I shall radiophone you," or: "I have received a radiophonic message."

Somehow or other it sounds harsh. The Editor suggests the word "Aerophone," which not alone sounds well, and is easily remembered, but expresses the idea correctly. Translated it means: "air-voice." In other words, talking through the air, while telephony stands for talking over the wire. The word radiophone does not convey tne idea that no wire is used, while Aerophone does.

The words, Aerophone, Aerophony, Aerophonic, sound good, and are to the point.

As will be seen by perusing this issue, the new word has been used almost throughout and the Editor shall continue to use it until a better one is found, or until another word is universally adopted.

The Editor shall furthermore be grateful if *every* reader would have the kindness to drop him a postal card stating which word he desires to become universal.

Results will be published in next issue.

MODERN ELECTRICS claiming several records, with this issue adds a new one to its list. No magazine heretofore issued an "Aerophone Number," or a "Wireless Telephone Number," the honor belonging entirely to MODERN ELECTRICS, leading, as usual.

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Electrical Baths

The accompanying illustration is not a gigantic sending helix to be used in wireless telegraphy, but it actually keeps a good many people from dying annually. At first thought this statement sounds somewhat doubtful, but it is nevertheless the truth.

A good many people suffer with a dreadful disease known as arteric sclerosis, which causes the arteries to lose their elasticity, and to assume a rigidity medically known under the name of "pipestem artery." Not alone old people, but also the young are liable to be thus affected, the patient usually dying through bursting of the arteries.

While hypertension (another name for the disease) can be counteracted by drugs, the improvement thus effected is only of short duration.

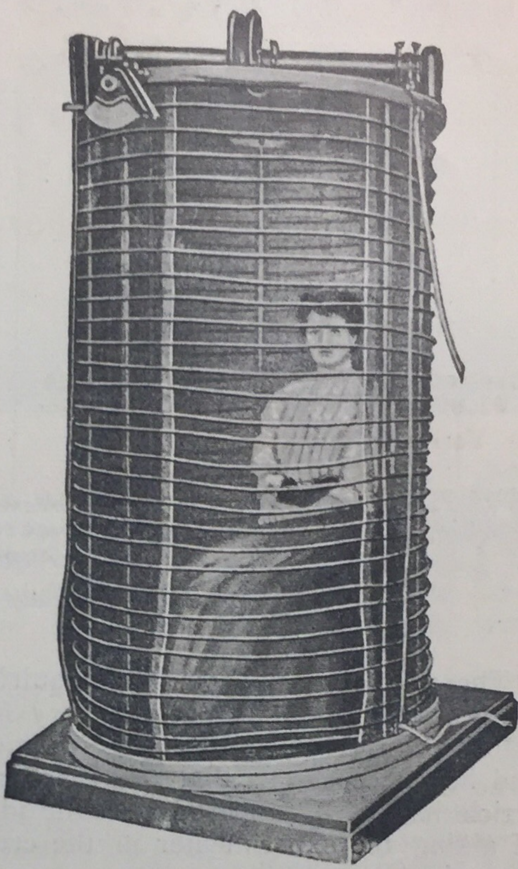
Hypertension is caused through slow and poor nutrition, or where nutrition has been retarded through intoxicants, such as alcoholic or tobagic, or where too much uric acid is in the blood.

Now the Frenchmen, D'Arsonval, and later Mortier, found that by subjecting patients suffering with arteric sclerosis to high tension currents, the hardening of the arteries could be actually stopped and brought back to their former degree of elasticity.

The patient is usually seated in a sort of helix formed of heavy wire. The cage itself has a pulley on top, as seen in illustration, by which it is raised up and down over the head of the person to be treated.

High tension currents of enormous frequency are then passed through the helix, and the patient, sitting on a chair, is bathed with torrents of the electrical fluid. His body is covered with sparks and brush discharge, in fact, he is the center of a veritable storm of fireworks. The strangest part, however, is that he feels nothing whatsoever, and he or she may read or talk, drink and eat if desired. After 30 minutes the patient leaves the cage, and finds the arterial tension very much improved.

Six to ten sittings are required to bring the tension back to the normal point. The cure, however, is not permanent, but the patient is out of danger for quite a length of time. As soon as necessary the treatment may be repeated, and so on, till the patient dies of old age, providing he does not acquire another disease in the meanwhile.



These high tension currents have also proved of high value in the treatment of neurasthenia, weak nerves, brain fag, and in practically all nervous diseases.

THERMO-ELECTRIC DETECTORS.

Mr. E. Branley, the original inventor of the Coherer, states that as far back as 1891 he used combinations containing tellurium as detectors for wireless telegraphy. Combinations such as tellurium-steel, tellurium-silver, tellurium-gold, also combinations of tellurium with mercury were included in his experiments.

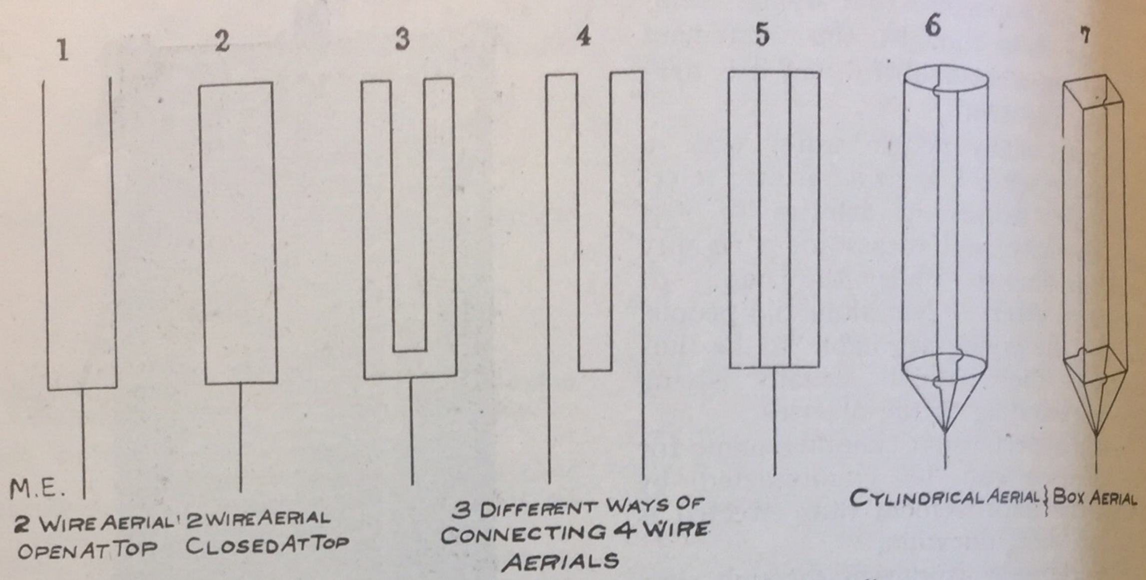
The usual arrangement was a tripod of tellurium on a polished steel disk. The circuit was completed through a telephone receiver, and a battery giving 0.1 volt.

This statement is made in reply to Mr. Tissot's recent description of his Thermo-electric detectors, using tellurium.

Mr. Branley furthermore found that the action is not thermo-electric, as if the tripod is provided with steel feet, the detector does not lose its efficiency.

Aerials

By A. C. Austin, Jr.

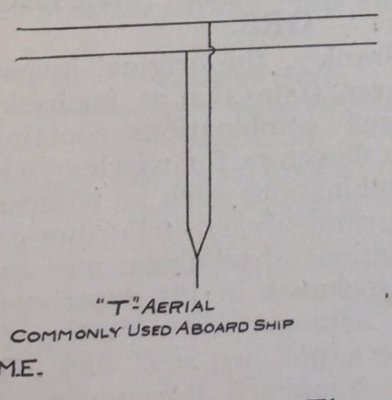


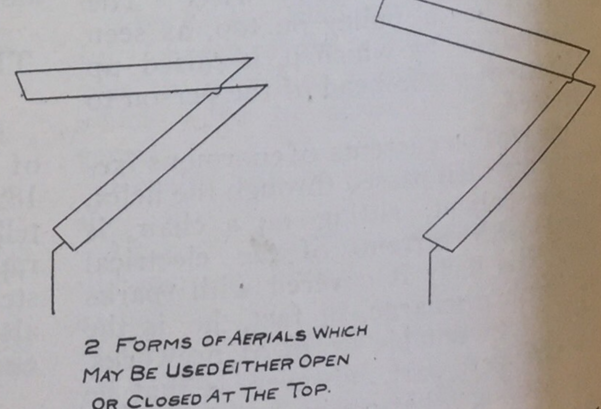
Suspended Vertically, at an Angle, or Horizontally.

There have been so many inquiri s from amateurs all over the country for information regarding the construction and height of aerials that the following article has been prepared with the idea of aiding the experimenter in the erection of an antenna.

The illustrations show a number of different methods of connecting the wires forming the antenna. The original Marconi aerial, namely, a single vertical wire, is very seldom used now, and the idea of the net aerial has also been almost entirely discarded, it having been theoretically determined that the number of wires placed in parallel, as shown in figure 5, are equivalent in capacity to a solid sheet of metal or a net, and the wires offer much less resistance to wind pressure, hence an aerial constructed of wire is much easier to erect and much less liable to wreck in a wind storm.

The following table will give a fairly good idea of the necessary height of an antenna to be used for receiving from various distances, although, of course, conditions will vary in different parts of the country and will also vary much when the station is in the heart of a city. For instance, the author has an antenna only 30 ft. high and with an Electro Lytic detector has been able to receive messages from a station 800 miles distant. However, this was on a very favorable night, when there was not much static and the ether was practically undisturbed. In general, though, the receiving distance of the author's station is about 200 miles.

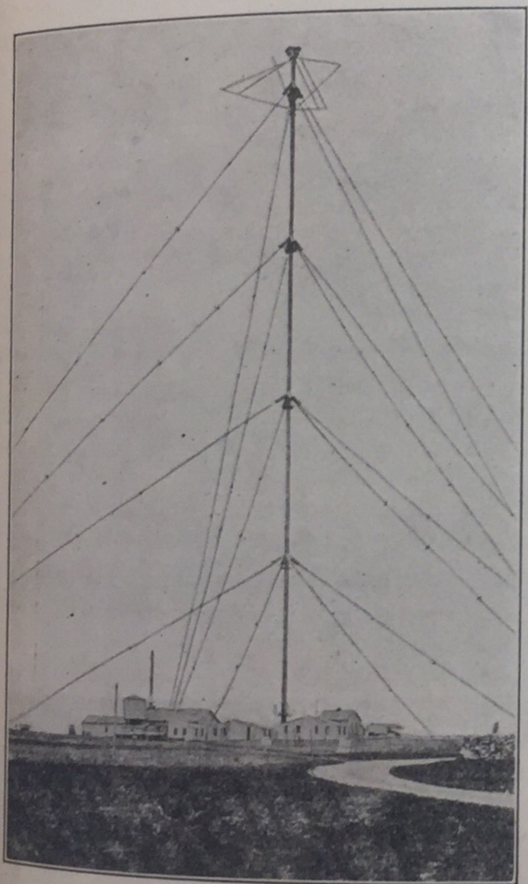




Approximate Height of Aerial.	Approximate Receiving Distance with Electro-Lytic Detector.
30 feet	150- 200 miles
50 feet	300- 400 miles
75 feet	500- 700 miles
100 feet	800-1000 miles
150 feet	1000-1500 miles
200 feet	Practically any distance.

Of course it is understood that this table is only approximate, as stated before, and a great deal depends upon the construction of the antenna and the capacity of the same.

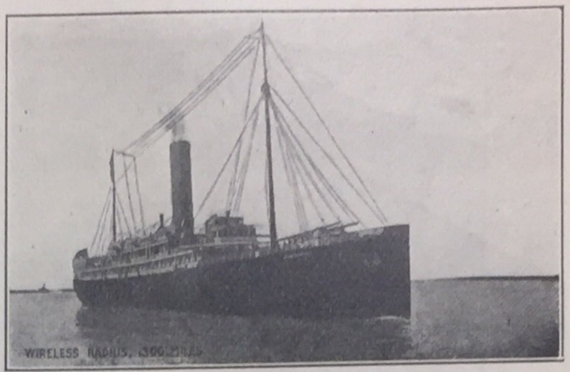
If the antenna is only to be used for receiving, the insulation need not be so well taken care of, but if it is to be used for transmitting, then it must be highly insulated from its supports and at the



Fessenden's Station at Brant Rock.

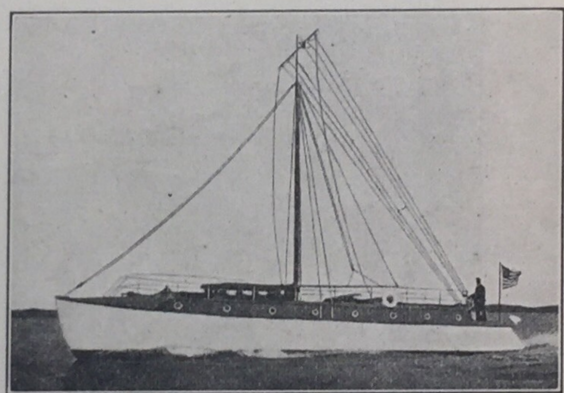
point of leading in. In next month's issue we shall show some method of suspension and insulation of aerials, giving some points on the care of same and a number of methods of leading in to the operating room.

It might be further said that there are very few aerials much higher than 200 feet, that is, from the instruments to the top of the antenna, and these few are the very high power long distance stations, such as Fessenden's, at Brant Rock, Mass., where the aerial is 420 feet high and is supported by a steel tube three feet in diameter, placed on an insulated platform. The illustration reproduced herewith gives a fair idea of



Ship Aerial.

the aerial of this station, although the aerial itself cannot be seen in the illustration; the wires leading down being the guy wires and the dots on same being the insulators dividing the guy wires



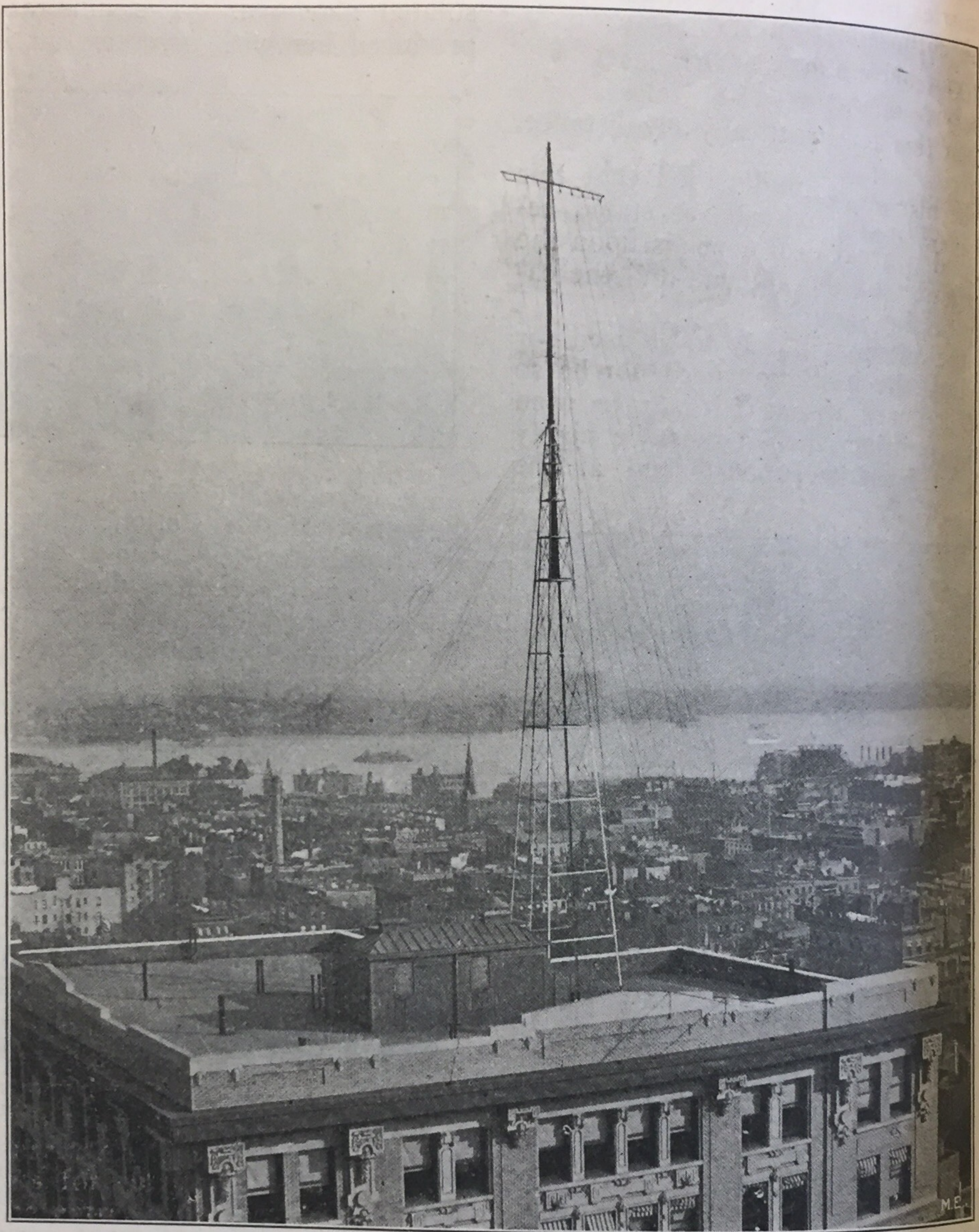
Aerial on Yacht.

into sections. The aerial wires are suspended from the cage at the top of the pole. The other illustrations give an idea of the different ways aerials are erected on board ship.

Miracles still happen. The postmaster of Pottsville, Pa., asked us last month to stop sending MODERN ELECTRICS to N. E. H., of the same town, stating that Mr. N. E. H. was dead. Of course we were sorry and stopped the subscription.

To-day Mr. N. E. H. writes and complains why we don't send him his paper. Address is correct. Uncle Sam says N. E. H. is dead. N. E. H. says he's not. Who's right? Was Mr. N. E. H. in heaven? Anyway, old chap, welcome back to earth. Didn't like it up there, hey? Next time you go give us your heavenly address and your box number.

Aerophone Tower



Aerophony, the youngest branch of the electrical arts, is rapidly coming to the front. While as yet largely in the experimental stage, the art has progressed sufficiently to become commercially feasible.

As is only too well known wireless telegraphy, even to-day, is looked upon with suspicion by the layman and even if one goes as far in a demonstration as to equip him with the usual telephone receivers, the faint and often indistinct buzzes convey little to him.

Take, for instance, an owner of a small boat or a yacht. He does not mind to spend several hundred dollars to install a wireless telegraph outfit, as he thoroughly appreciates the importance of being able to call up land stations at a moment's notice. "But," he says invariably to the man who wishes to equip his boat wirelessly, "you know that I am not an operator. I could no more take or send a message than send a wire to the moon. I can't afford an operator nor would I care to have one on a small boat like this. He'd be in the way."

The "wireless chap" knows this well, bows his head and walks away—and loses the business.

Next comes the aerophone man. He brings with him a small box, two by one foot, and tells the man who owns the boat to "pull out."

Three miles away from the shore the aerophone man plays with his "chopper," then switches over to the 'phone and talks to the land station. The boat owner tries the thing himself and is, of course, enthused at once.

He can aerophone *himself,* and will be his own operator.

When the aerophone man goes home he carries with him an order to install the instruments. This is now being done every day in the week.

The Radio Telephone Co., of New York, who, as will be remembered,* installed the aerophone system used on nearly all the ships of the Atlantic fleet, now on their cruise around the world, is fastly erecting commercial stations of the DeForest system.

Our illustration shows the first station erected on top of the twelve-story Terminal building near 42nd street and Park avenue, New York City.

The tower itself, 125 feet high and partly constructed of steel, is a fine example of an aerophone tower. Its highest point is 310 feet above the street level.

The horizontal cross arm at the top is movable and can be lowered for inspection or repairs by means of a rope going over a pulley.

From the cross arm a net formed of eight wires drops down to the edge of the roof of the building. These wires form the antenna proper. Each wire is composed of seven strands of No. 20 B. & S. phosphor bronze wire, which being very flexible and strong forms an ideal material for an antenna.

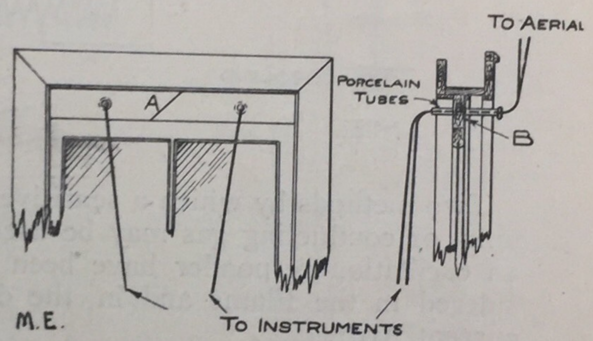
The front of the net usually faces west, but can of course be turned in any direction desired. The maximum distance covered thus far from the new tower is 75 miles, but this distance can be easily increased as soon as more powerful instruments are installed. Dr. Lee De Forest, in Paris last March succeeded in sending from the Eiffel Tower, which is one thousand feet high, messages to a distance of four hundred miles, while giving a demonstration before a commission of army and navy officers. Within a week, while experimenting at Marseilles in connection with the exposition in progress there, he succeeded in both sending messages and receiving replies over a distance of seventy-eight miles.

The sending apparatus, which is the same as the one described in the August issue radiates only about 1 1/2 amperes from the antenna. Direct current of 220 volts is used exclusively in the sender.

A novel and very simple plan has been adopted to lead out the high tension wires connected to the antenna. Only two such wires are used.

By referring to illustration Fig. 2, the details are clearly shown and should interest the experimenter who does not want to bore holes in the window pane or through the wall.

A board 1/2 to 1 inch thick and about 8-10 inches high is measured off so that it will fit into the window sash. The board is then cut *slantingly,* as shown in illustration A. The right piece is first put in position, then the left piece. When the window is shut on the boards a practically airtight and weatherproof fit is secured.



Two holes are drilled to let through two porcelain tubes, each about 18-20 inches long. These tubes should fit quite snugly. The aerial wires are then carried through the tubes. Leakage is practically impossible with this method. The construction has furthermore the great advantage that the boards can be taken off at a moment's notice and be replaced in another window. No unsightly holes remain nor will walls or window be damaged in any respect.

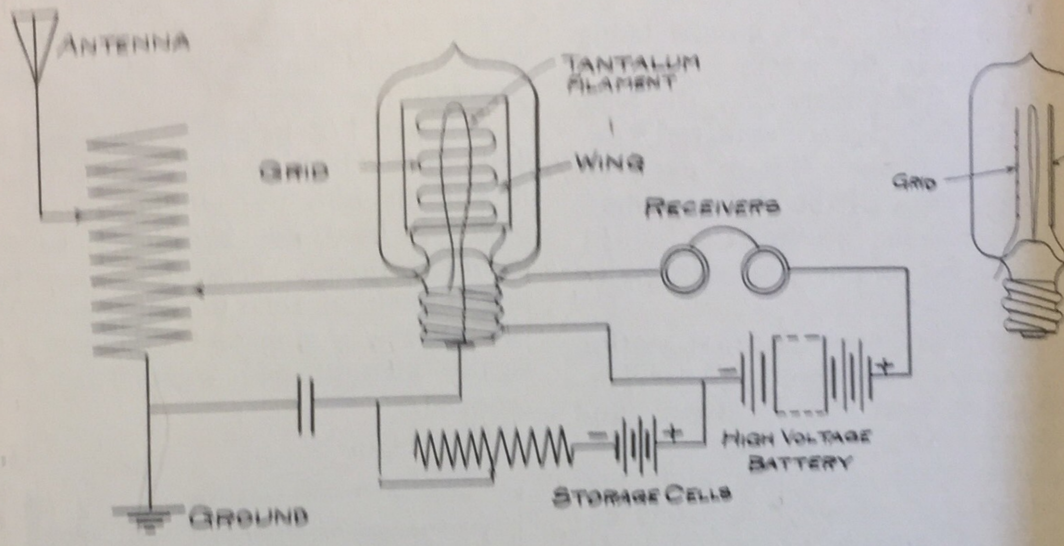
It is, of course, understood that the arrangement can also be used at the bottom of the window if so desired.

The Radio-Telephone Co. is just getting ready to install a chain of aerophone stations along the Atlantic Coast, commencing at East Port, Maine, taking in Portland, Portsmouth, Gloucester, Boston, Plymouth, New Bedford, Fall River, Providence, Newport, Westerly, New London, Saybrook, New Haven, Bridgeport, Asbury Park, Atlantic City, Philadelphia, Wilmington, Baltimore, Norfolk, Charleston, Savannah, Jacksonville, Pensacola, New Orleans, Mobile, and Galveston, besides other stations at intermediate points.

*See article in August issue.

The Audion: A Third Form of the Gas Detector

By John L. Hogan, Jr.



M.E.

Two methods by which a sensitive column of conducting gas may be used as an oscillation responder have been considered in the Flame and in the direct current Arc*.

It has been found that the gas column is a most delicate medium upon which to build the trigger action of a responsive device. But it has also been found that the conducting gas flame and the arc are unsteady—that their very sensitiveness operates against their practical efficiency because they respond emphatically not only to Hertzian waves, but to *air currents.* This of course makes them useless for commercial wireless.

The extreme delicacy of the gas detector of course renders it sensitive not only to complete starts and stoppages of received electric waves (as in wireless telegraphy), but also to slight *variations* in them. Therefore the apparatus may be believed highly suitable for aerophony, if it could be caused to respond to Hertz waves only, and kept from hissing and rattling in the telephones at every gust of wind.

It was found, over twenty-five years ago in Germany, that if a metallic plate and a filament were sealed side by side in an evacuated globe, a current could be passed from the filament to the plate while the filament was lighted, but not otherwise. After a long series of tests it was discovered that the hot filament emitted a flow of ions which carried the current from filament to plate. This flow is exactly analogous to that in the gas flame and in the arc, but for a long time it was not considered that it could be used as a nearly ideal wave detector.

After several notable steps of development by different workers, the device now known as the Audion was produced. This has been modified and so changed in the course of its growth that there are now some six or more distinct varieties. In all these the operating principle is the shattering of a column of conducting gas by a received electrical impulse. But, unlike the flame and arc detectors, the gas column is protected from air currents by the globe of the Audion-lamp, so it is evident that the great difficulty mentioned above has been eliminated.

The most sensitive type so far designed is called the Grid Audion. This is usually a six-volt low candle-power incandescent lamp with a tantalum filament, having a small platinum plate (about 10x15 millimeters) fastened approximately three millimeters from the filament, and a "grid" bent from rather large (say number twenty-two) platinum wire placed nearly midway between the two. The filament is lighted by three small storage cells, whose output is varied by a rheostat having continuous smooth adjustment. From the positive terminal

*See article by Mr. Hogan in the June and September issues.—Editor.

of this storage battery a wire is led to the adjustable high voltage battery of the telephone circuit, as shown in the diagram. The two leads from the tuning apparatus are respectively connected to the grid and to the negative side of the storage cells.

It has been definitely stated that the Audion is a potential operated device. But on the same authority it is said that the Audion is dependent for its response upon the total energy received, so the class to which the apparatus really belongs is somewhat hazy.

It is undoubtedly true that the Audion, when in its best condition, is highly sensitive and that it is therefore well suited to aerophony. But unfortunately the sensitive condition is extremely difficult to find and still more difficult to maintain. Some Audion-tubes show an extraordinary sensitiveness at first, but quickly grow dull when in use. Other lamps are nearly worthless from the beginning, and none remain sensitive very long.

The Audion is capable of being developed into a really efficient detector, but in its present forms is quite unreliable and entirely too complex to be properly handled by the usual wireless operator. The principles involved are of the utmost importance, but their application is crude and irregular.

The Audion offers another fascinating field for investigation and improvement, and it is to be hoped that it will be taken up and the work so well begun carried to a satisfactory conclusion. For aerophony a detector is needed which will reproduce with fidelity the higher harmonics of the voice. The Audion, when carefully handled, is such a detector, but the best adjustment is so very critical that the manufacturers of aerophonic apparatus have found that almost no demand for the tubes exists, and are therefore supplying crystalline thermo-electric detectors with their outfits. This fact, together with the unsatisfactory results of tests made by the Government and by one of the foremost wireless companies in America, would seem to indicate that as yet the device is not to be absolutely depended upon and is therefore not to be used in the serious undertakings of aerophonic communication.

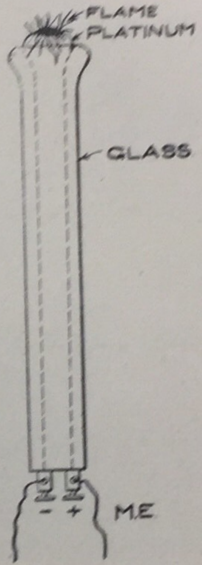
Now that we have the Aerophone, to whom shall go the honor to invent the first Hot-Aerophone? "FIPS."

ELECTRICAL SURGERY.

By Our Berlin Correspondent.

Surgery by electricity is what is alleged to be possible with a remarkable electric knife just devised by a Berlin firm of medical instrument manufacturers. The knife is now undergoing exhaustive trials at the hands of Prof. Bier, the head of the university of the surgical clinic, with the view of demonstrating its efficacy.

It is claimed for it that operations can be performed more quickly and that the healing process is more rapid than in the case where the ordinary scalpel has been used.



Referring to our illustration two platinum wires pass through a glass handle 6 to 8 inches long. These two wires are made to protrude at the top for about 1/4 inch. As will be seen there is no cutting edge.

A high frequency current is employed, and, when this is turned on, a spark half an inch long appears from the points of the knife or probe. The spark incises the soft tissues with the same ease as a hot knife goes through butter without any apparent cauterization, but Prof. Bier's experiments have so far shown that a more profuse hemorrhage ensues than by the use of the common knife.

It is further claimed for the instrument that it sterilizes as it cuts, requires no sharpening, and can be easily cleaned.

SPECIAL.—To new subscribers we will furnish free of charge all back numbers (except April, which will be mailed as soon as reprinted). You therefore get 1 1/2 years for the same price as the yearly subscription.

The Phono-Cinematograph

By Our Paris Correspondent.

While the idea of combining the phonograph with a moving picture machine is an old one, the apparatus invented by the well-known Paris constructor, Mr. Gaumont, deserves recognition, as this inventor is the first one to design a synchronising arrangement, making it possible for the two machines to work hand in hand. It further accentuates the illusion of the so-called "moving picture shows," and tries to impress upon the senses of the audience that a real scene is witnessed.

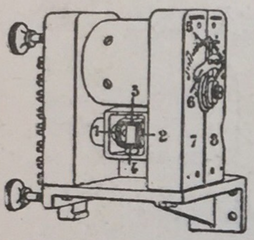


Fig. 1

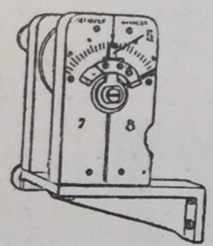


Fig. 2

In other words, the phonograph of the new arrangement will not yell "help" five seconds after the heroine in the picture disappeared in the river, nor will it say, in other instances, the wrong word at the wrong time.

Mr. Gaumont attacked a very knotty problem when he tried to successfully synchronise the two machines, and he is to be congratulated in the way in which he overcame the almost insurmountable difficulties. His arrangement is the outcome of six years' unceasing experimentation, and by persuing the somewhat technical description following, everybody must recognize the great amount of thought and labor evolved in the arrangement.

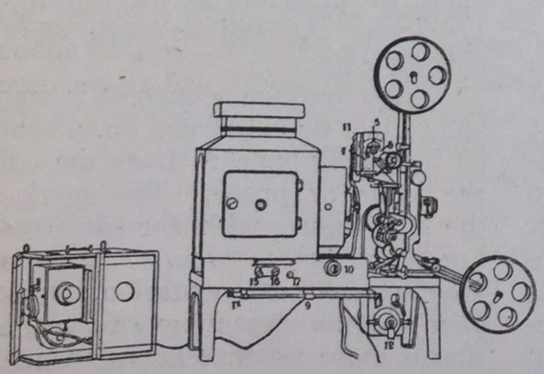


Fig. 3.

The phonograph and cinematograph are connected electrically by a multiple cable. A telephone is used to connect both machines.

The patented arrangement consists of two contact brushes, which are mounted on one of the movable parts of the phonograph. They receive the current of a battery and transmit it by means of special contacts and wires on a very small motor, which forms the main regulation-organ. The motor is usually mounted direct on the cinematograph.

The current arriving from the contact brushes of the phonograph operates the motor at the same identical speed.

The armature of the little motor drives the wheel 1, of a small differential, fig 1. Wheels 3 and 4 of differential also operate the pointer, 5, of the speed regulator, fig. 2.

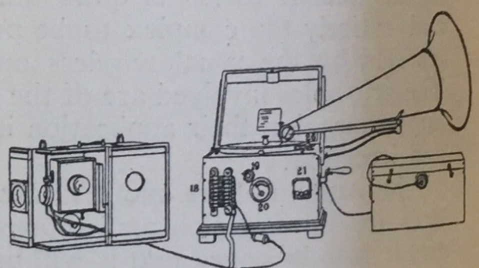


Fig. 4

When phonograph and cinematograph run absolutely synchronous, the cog wheels 1 and 2 turn at equal speed in opposite directions. Wheels 3 and 4 rotate "standing," and pointer, 5, does not move.

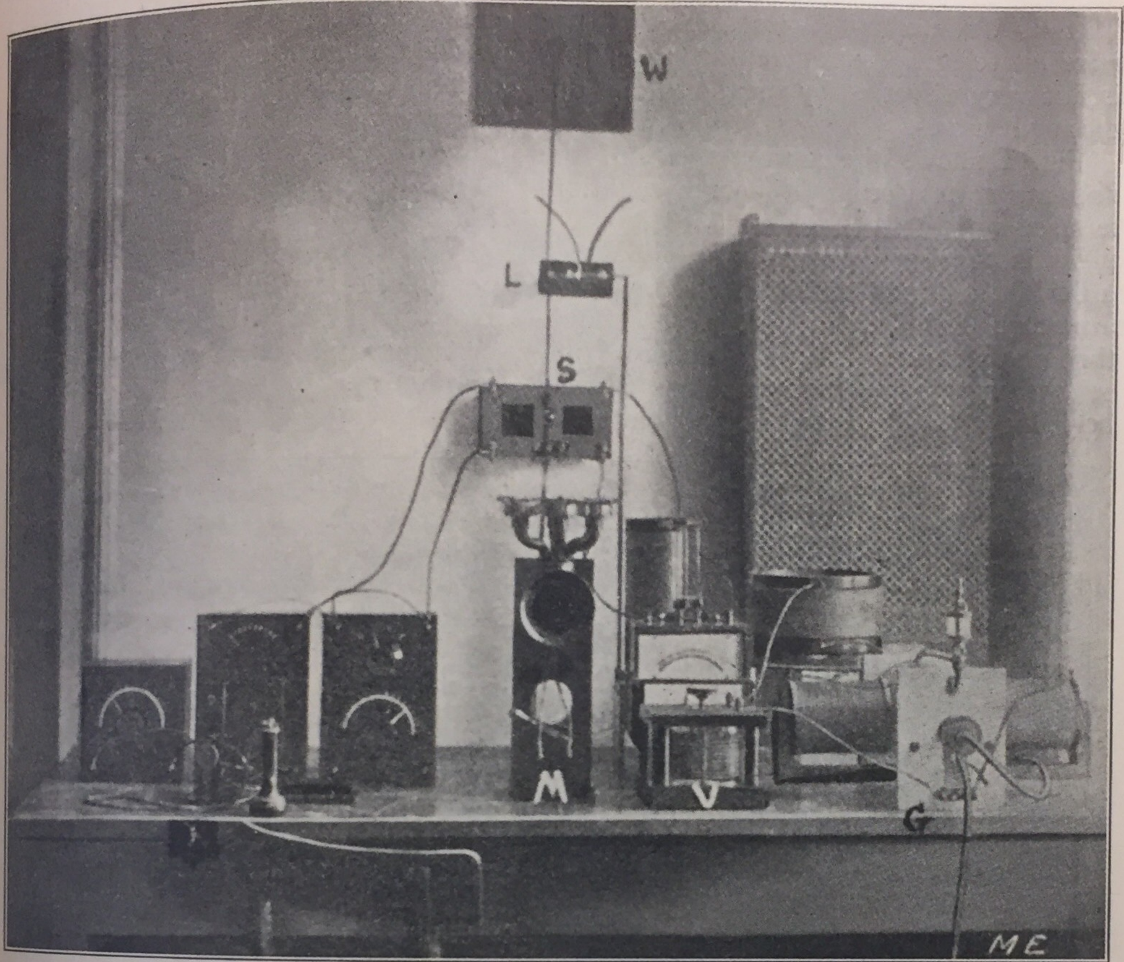
If, however, the cinematograph runs faster than the phonograph, 3 and 4 change position and carry the pointer to the left. If the phonograph runs faster, the pointer goes to the right. To keep the two machines together it is only necessary to arrange the speed so that the pointer, 5, does not move from the center.

Usually the phonograph requires to have about five pictures run ahead of it, as else the eye would get the impression too soon; it was found by experiment that the effect was reduced when cinematograph and phonograph started simultaneously. The eye must first get

(Continued on Page 252)

The Aerophone Station at Lyngby

By Our Berlin Correspondent.



In the June issue the writer described Poulsen's new aerophone station, and as in the meanwhile great progress has been achieved by the great Danish "wizard," Modern Electrics' readers will undoubtedly be eager to hear the latest news.

Before going further, it might be well to point out the great difficulties as yet to be overcome in *all* aerophonic systems.

By glancing over current articles appearing from time to time in the press, the reader is usually informed that such and such inventor talked so and so many miles wirelessly, and most readers labor under the wrong impression, that aerophony has been perfected in every respect.

While great things have been accomplished, it may be well to point out the various difficulties as yet to be overcome.

The hardest nut to crack so far, has been the microphone, or transmitter, used to take up the vibrations of speech to be transmitted.

In fact, there is no transmitter invented as yet that will take as much current as it really should, and we usually find in the present day systems three, six, eight, and even twelve microphones arranged in such a way that all the mouth pieces come together in a single shell, so that when spoken into, all the diaphragms vibrate in unison.

Obviously this arrangement is far from being satisfactory, as a single mouthpiece and a single diaphragm would be a great deal more efficient, but so far all attempts to construct such a microphone to stand from 5-10 amperes have proved unsuccessful.

The next difficulty which will hardly ever be overcome, is that in aerophony one cannot talk and hear at the same time, as on a wire 'phone.

You cannot "talk back" or interrupt the talking party, but you must patiently wait till he is through talking and has switched over to the receiver and you to the sender.

The reason for this is, that in sending a great amount of current is used, which would damage the receiving instruments instantly, if they were connected with the sending circuit.

It is furthermore necessary to use wireless telegraphy for calling, as calling is not very effective by means of the undamped waves.

Fig. 1 shows the arrangement of the apparatus in Poulsen's Lyngby station, as used now.

W is the hard rubber window which leads the antenna out, L is the lightning arrester; S is the double pole, double throw switch; G is the well-known Poulsen generator, in which an arc is formed between a water cooled copper electrode and carbon electrode. The arc is maintained in an atmosphere containing hydrogen and is placed in a transversal magnetic field. This magnetic field has a variable oscillating circuit for the production of the undamped waves.

In the center the transmitter, M, is shown, consisting of 8 carbon-ball microphones, all connected in series. This transmitter is in series with the antenna:

On the left we see the receiving apparatus. The antenna leads the arriving energy first to a variable receiving oscillation circuit. Over this circuit a large condenser is shunted, the latter being in circuit with a thermo-electric receiver, which is in parallel with the telephone receivers.

Fig. 2 gives a better view of the receiving instruments.

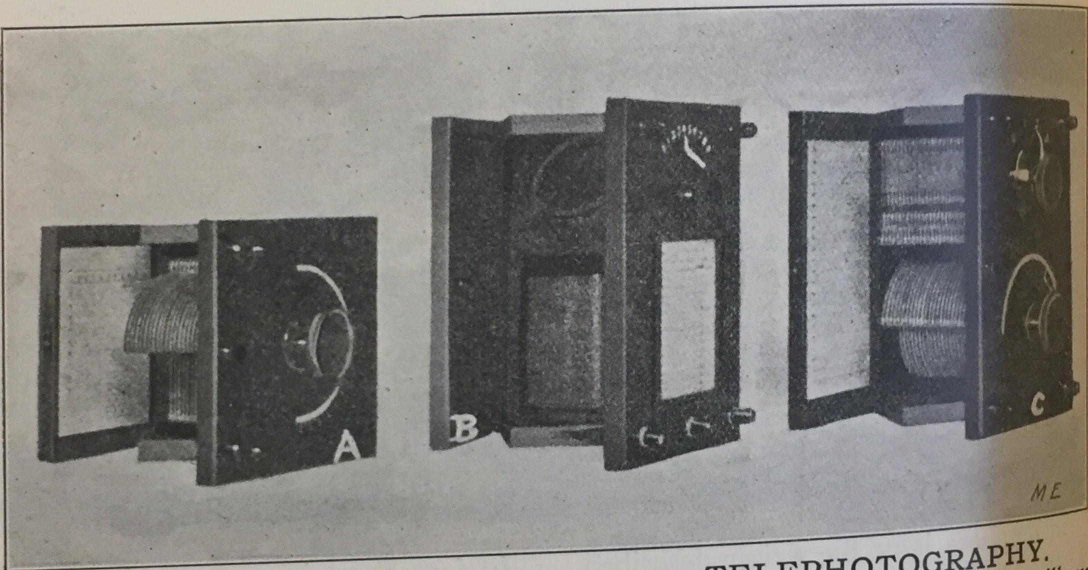
B contains the primary and secondary coils; one can be turned against the other at the will of the operator, resulting in a close or loose coupled circuit.

The aerophonic transmission between Lyngby and Esbjerg, a distance of 270 kilometers, is now in constant operation, using the system described above.

The transmission is not alone perfectly sure, but it is so clear and pure that one can recognize each voice with ease, notwithstanding the great distance.

The height of the mast is 60 meters, the wave length 1,200 meters The energy used is 900 watts, of which only about 300 watts radiate from the antenna.

With greater energy it was recently possible to transmit a phonograph record from the Poulsen station at Weissensee, near Berlin, to Lyngby, a distance of 520 kilometers.



TELEPHOTOGRAPHY.

MODERN ELECTRICS readers will undoubtedly like to hear the progress which Prof. Korn is making. In a previous issue the writer described the system of the German inventor.

Last month, for the first time, Dr. Korn transmitted pictures electrically from Copenhagen to Berlin, a distance of 210 miles by air and about 390 miles of wire and underwater cable.

The transmission was very successful from every point of view, large photographs being transmitted in 10-12 minutes from the Danish to the German Capital.

The evening before the formal opening of the station, Prof. Korn delivered a lecture describing his system before a large assembly, amongst whom a great many scientists and even the royalty were present.

The line in use now is the first long distance telephotographic system in existence.

The Construction of a Small Transformer

By Garrett B. Linderman, Jr.

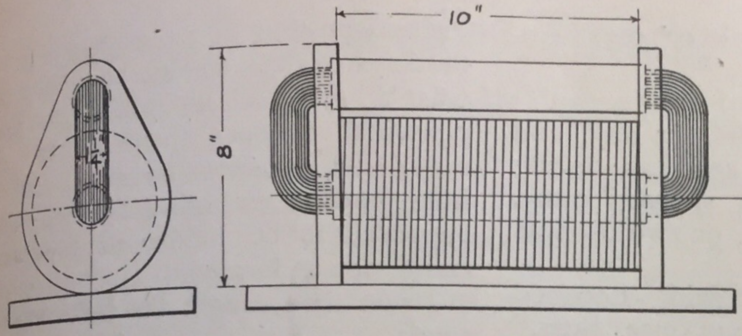


FIG. 3.

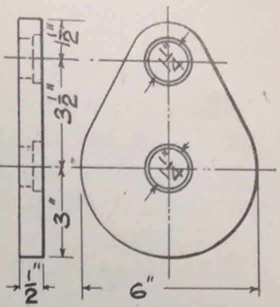
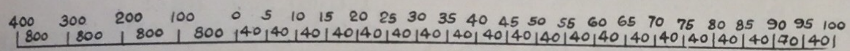


FIG. 1.



M.E.

FIG. 2.

In looking over my scrap book I find the description of a small transformer that I once had occasion to make. It worked so well that I have decided to give the description of it to readers of Modern Electrics.

First procure a smooth wooden roller 1 3/4 inches in diameter and about 10 or 12 inches long. Now soak several pieces of cardboard 9 1/2 inches wide and of any convenient length in hot water until they are soft. Wind them on the wooden roller to a thickness of about 1/16 of an inch, fastening them with any good paste. Place it in a moderately warm oven for at least 6 hours, to get thoroughly dry. When taken out of the oven and off the roller you should have a strong roller of about 2 inches external diameter and about 9 1/2 inches long.

Next make two spool ends of any good hard wood, 1/2 inch thick and of the form shown in fig. 1. The two holes are for the iron core and should be about 1 1/4 inches in diameter. On the inside of each spoolhead a recess should be cut about 1/4 of an inch deep for the accommodation of the roller ends. When this has been nicely done and the roller put in place, shellac the whole very thoroughly and let stand over night.

Now get about 20 pounds of No. 18 B. & S. gauge single cotton-covered magnet wire. Drill a small hole in one of the spoolheads, near the paper roller, thread the wire through this and begin to wind. Shellac each layer, and when this is dry wind on about two thicknesses of paper and fasten with shellac. Keep on winding in this way until you have wound on just 800 turns, then take out a tap and proceed with the winding, taking out taps at every 800 turns, until you have wound on 3,200 turns. Be sure to keep all the taps numbered, because if you don't you will be sure to get them mixed. Now proceed with the winding, only take out taps at every 40 instead of every 800 turns. When you have wound on 5,000 turns in this way, stop.

The next thing to do is to get about 5 lbs. of No. 22 B. & S. gauge soft annealed bare iron wire. Cut this up into 45-foot lengths and thread them, first through the coil, then around through the lobes of the spoolheads and through coil again. When you get the coil and holes in the lobes full of wire you will have a very good soft iron core. Your transformer is now finished and should be mounted on a suitable board of hard wood.

Now you must get 25 binding posts and set them in a line in front of the transformer on the baseboard. Begin at the left and mark them in the following or-

(Continued on Page 254)

Fips's Editorial Columns

Went abroad last week on the "Moretania."

I tell you I had lots of fun.

When we were out about a day, and after I had fed the fish and was resting in my steamer chair, a steward came, presenting a silver tray, on which was an envelope.

"Marconigram, sir," he said. I opened it. It read: "Come home at once. Boss." This chagrined me somewhat, but as I knew it was a joke of the substitute office boy who took my place, I wirelessed back: "Will take the 7:62 P. M. aerial subway. Fips."

"You know, of course, that the 'Moretania' has a wireless station on board, and I bet that they never had more excitement in that little wireless cabin than when I was on board of ship.

I had brought with me a little 1/2-inch coil, a few dry cells and a telegraph key.

My cage, I mean my stateroom, not being far from the wireless cabin, it was an easy matter to call it up. As I had a small head receiver and a detector I could of course hear everything they were sending.

The poor operators of course thought that the messages which I sent, came from the sea, and as I changed the distance between my spark balls for every message, they were naturally under the impression that the messages came from a greater or a smaller distance, as the case might be.

The first message I sent ran thus: "'Moretania.' Airship follows you. Report where seen. Hot Airship Co., New York, N. Y."

Pretty soon they posted up bulletins in all the saloons, and every passenger went out with glasses to search the horizon. Somehow or other the airship must have passed us in the night. At least nothing was seen.

Second message:

"'Moretania.' Two passengers hidden in large trunks on your boat, trying to beat their way over. Hold and deliver to Queenstown police. Findem Detective Agency, New York, N. Y."

The captain had bills posted up at once, requesting all passengers to give up the keys to their trunks, and while there was a row, all the passengers finally consented to open their trunks. You never saw a busier scene in all your life, but somehow or other the two rascals supposed to be hidden in the trunks, could not be located.

I just then caught the following message:

"Findem Detective Agency, New York, N. Y. Can't locate trunk travelers. Mistake. 'Moretania.'"

I then sent this:

"'Moretania.' Positive men are on 'Moretania.' Search smokestacks and boilers, also ventilators. Findem Detective Agency, New York, N. Y."

When I saw the captain ten minutes later, he seemed very much disturbed.

We weren't out two days when I discovered that my former boss, Flip Pickels, of the "N. Y. Evening War Whoop," was on board.

What that fellow didn't do to me while I was in his employ, isn't worth mentioning. Suffice it to say that when I put a harmless little tack on his chair (on which he promptly sat), he got a hold of me, and while we had an argument, he broke eleven of my inner ribs, and kept half of my left ear for a souvenir. He also left several impressions on me, that is, somewhere down my back and on various other parts of my anatomy.

Of course, you readily understand that I was not exactly in love with him.

I sent the following wireless:

"'Moretania.' Flip Pickels, dangerous lunatic, escaped. Put in irons and deliver to Queenstown agent. Bloomingdale Lunatic Asylum, N. Y."

Well, he was sitting in his steamer chair, smoking a cigar, when they got at him! Four robust fellows sat on his chest, while six others tied him up. Of course he raised a rumpus, but it didn't do him much good. They put him in irons all right, and when we got to Queenstown, later, he was the sorriest Pickel you ever saw in your life.

(To be continued.)

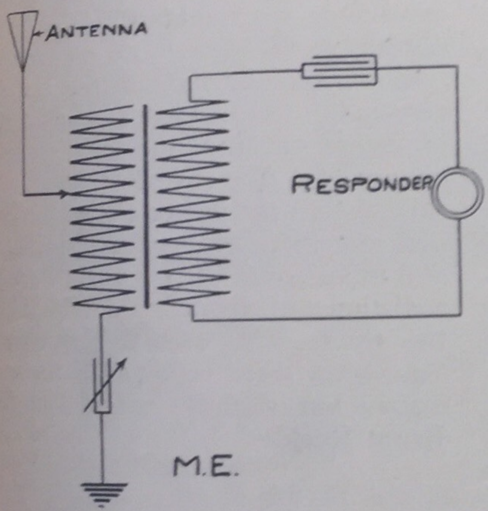
Wireless Department

Selective Tuning

By A. M. Curtis.

With the multiplication of wireless stations, resulting from its growing commercial importance, the necessity of a tuning system in the receiver much more sharply syntonic than the ordinary "close coupled" tuning became early apparent. This need has been met in a variety of ways, some mechanical, but usually with some form of tuner employing an air core transformer, technically called a "jigger."

FIG 1.

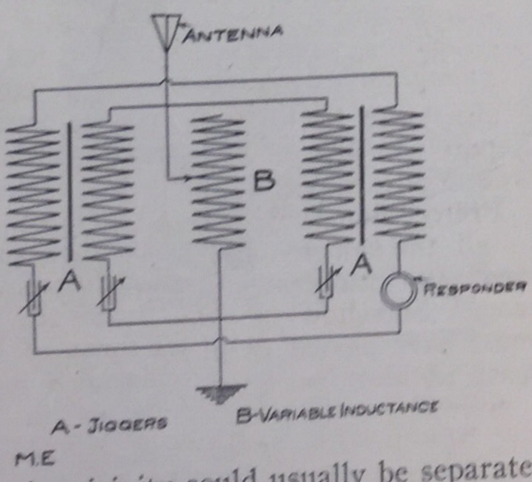


The jigger in its original form was used by Marconi with his coherer sets. It consisted of a small glass tube upon which primary and secondary coils of fine wire were wound, the secondary in some forms being wound in a sort of a pyramid to distribute its capacity evenly throughout its length.

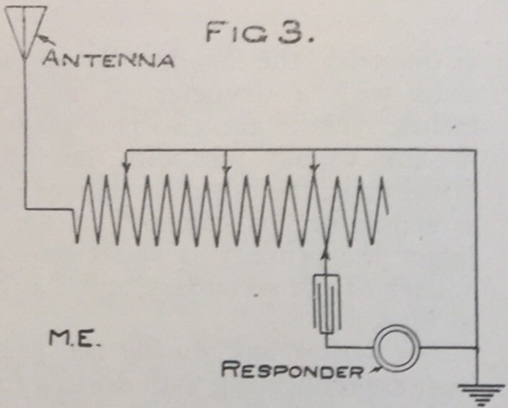
The original jigger has, however, been discarded and an instrument of much larger dimensions and coils, consisting of one layer of wire being substituted. The simplest form consists of two coils wound on wooden or cardboard frames, each with a single layer of wire, and placed one inside of the other, a very simple form of transformer. The dimensions of those now used vary immensely, the largest having a primary 18 inches long, with a secondary two feet in diameter, the smallest having secondaries with a diameter of about three inches. There are also two forms; one, the one usually met with, having cylindrical coils, the other having coils wound in spirals or "pancakes." In the typical jigger the primary is about half the diameter of the secondary and 2 1/2 times as long.

The writer has, during the past year, been experimenting with devices for close syntony employing jiggers. One of the first used was very large, the primary about eighteen inches long by six in diameter, wound with one layer of No. 14 copper wire; the secondary wound on a wooden frame, eighteen inches in diameter, with a height of about five inches, with a single layer of No. 22 copper wire. Both coils were adjustable by sliding contacts, while the position of the secondary with reference to the primary was also adjustable. The connections are shown in Fig. 1. An antenna consisting of a single wire about one thousand feet long, running over the roofs of houses, was used. The results obtained were very good compared with the ordinary close coupled tuning. Different stations

FIG 2.



in the vicinity could usually be separated without much trouble, although there was no way of determining how far their wavelengths varied. But this instrument was much more successful for long wave stations, the writer being able with it to separate, and read the Cape Cod Marconi station 220 miles away, through the Brooklyn Navy Yard and New York Deforest stations, three and four miles away, respectively. In this case, however, the differences in wave length were great. Although this worked well for



long waves, it was very hard to tune in short wave stations with it, and on this account it was discarded.

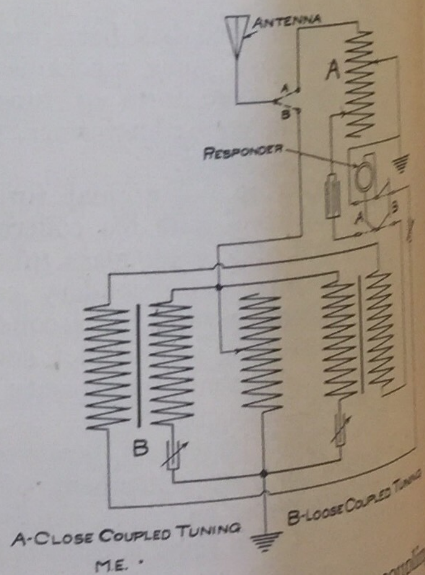
The next trial was made with a jigger having a secondary about seven by five, wound with No. 22 wire, and a primary slightly smaller, wound with the same wire, the only adjustment being a variable condenser in the primary circuit. The results obtained were more uniform than with the first, but still it balked on some short wave stations.

An attempt to produce a jigger which would take in all waves went to the other extreme, and produced one with coils twelve inches in diameter by one in length, fitting closely. This let in everything at once and was no closer than an ordinary close-coupled tuner. Considerable more experimenting led to the adoption of a system which employed two jiggers, three adjustable condensers and a variable inductance which is the most satisfactory selective tuner the writer has come across.

The jiggers useed are the ordinary form, wound on cardboard reels. The primaries are 2 1/2 inches by 2 1/2 inches, wound with 80 turns of No. 26 copper wire; the secondaries 4 inches in diameter by 2 1/2 inches in length, wound with 50 turns of No. 22 copper wire. The condensers are two sliding concentric brass tubes, 7 inches by 1 1/2 inches, insulated by oiled paper. The adjustable inductance may be of any form, preferably with plug or clip contacts. The connections are shown in Fig. 2. It makes some difference which terminals of the secondaries are connected, but this may be determined by experiment.

Using this tuner with a ship's antenna containing about 800 feet of wire, it was found that for usual ship waves, from 8 to fifteen feet of inductance is necessary in the shunt, while the position of the condensers varies with the particular wave. For longer waves the inductance is increased up to a point where, to take in still longer waves, the inductance must be disconnected, one of the primary condensers short circuited, and the tuning done with the other condenser. As the tuner is so close, it can not be used steadily, as a station with a wave slightly different from that to which the receiver was set, might call for an hour and not be heard. Therefore, a close-coupled tuner is ordinarily connected with the responder (Fig. 4) and when a station is heard calling the connections are changed to the selective tuner. Using this system the writer copied the Fessenden station at Brant Rock, Mass., while 400 miles south of San Juan, Porto Rico, a distance of about 2,000 miles, although the thirty KW sets at Key West and San Juan were sending all the time on waves but slightly longer than that of Brant Rock.

FIG 4.



The closest tuning with close-coupling is shown in Fig 3. A coil wound on a reel about 4 inches by 8 inches, of about No. 26 wire, has four sliding contacts, three of which are connected to the rod upon which they slide, the fourth insulated. The coil must be large enough in

(Continued on Page 252)

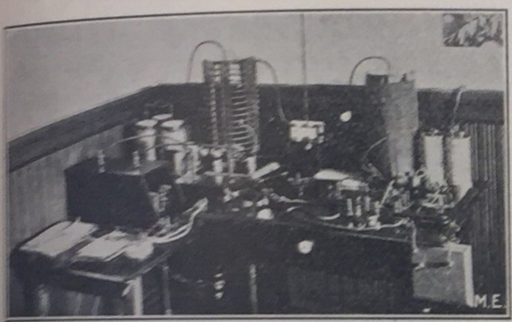
Wireless Telegraph Contest

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 photograph of my wireless station.

To the left of the aerial switch located in center are shown the transmitting instruments, consisting of low tension condensers, 4-inch coil, spark gap, Leyden



jars, inductance coil, aerial switch, and key. The switch appearing at the right of paper condensers is used to throw in or out the initial battery current exciting the induction coil.

To the right of switch appears the receiving apparatus, which consists of the tuning coil, microphone detector, head phone, potentiometer, small condenser in ground, and a S. P. D. T. switch, which is used to throw into service either the above-named instruments, constituting the receiving station proper, or the auxiliary apparatus which is made up of an E. I. Co. precision coherer and decoherer, and the usual relay, sounder, and bell. The three dry batteries at right of tuning coil furnish the necessary current for the receiving instruments. The receiving tuning coil, detector, condenser, and potentiometer were made by myself.

I use a small choke-coil inserted in circuit between coherer and battery, as I find that same aids greatly in keeping impulses in right direction. The larger of the two condensers shown on the left is used in connection with the coil interrupter, while the smaller one is shunted across the key to cut down the sparking there as much as possible.

A 30-foot pole on top of house supports my aerial, which is formed of four No. 12 bare copper wires connected in multiple and separated by 3-foot spreaders.

I realize that I owe much to MODERN ELECTRICS, and I shall put in a good word for the magazine whenever I find occasion.

North Carolina. V. S. IVEY.

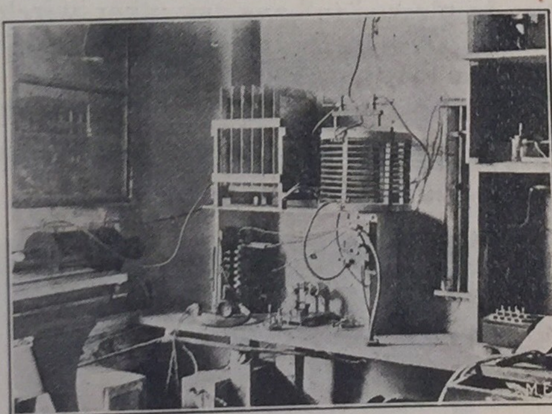
HONORABLE MENTION.

I inclose herewith photograph of my wireless set.

To the left is the coil, which will give a 7 1/2 inch spark, and with the sparking points set at two inches apart the spark will light a piece of paper. I use nine storage cells, 18 volts and about 6 or 7 amperes, when sending.

The sending condenser consists of six 10x12 inch glass plates, with tin foil on each side, 7x9 inches. These plates are arranged in multiple, and with the coil and battery as above the discharge of the condenser completely fills the spark gap when the zinc electrodes are set 1/8 inch apart.

I use a mechanical interrupter with the coil, which shows very plainly in the photograph.



The tuning coil is shown at the right of the picture. It is made in two sections, 23 D. C. C. wire, with two sliding contacts. The connections are such that all wire in both sections above the top sliding contact is in series with the aerial, while the lower sliding contact grounds the tuning coil. I find this coil gives very good results, besides being very compact.

The sending inductance is shown very clearly in the photograph. It is made from No. 4 hard copper wire, wound on hard rubber posts.

The multiple switch is shown underneath the sending condenser, and I consider it a very desirable thing to have in any wireless station. Bv simply throwing the handle from one side to the other the connections are changed from sending to receiving. When set for receiving, it is impossible to get current through the coil, so there is no danger from shock. When set for sending, both telephone leads are disconnected, so the telephone can be kept on the head without danger from shock from the heavy sending current. In addition, the switch short circuits the detector, so that immediately on turning the switch from sending to receiving the answering signals can be heard.

The switch underneath the aerial is used for grounding the aerial during thunderstorms. In the photograph it is shown in grounded position.

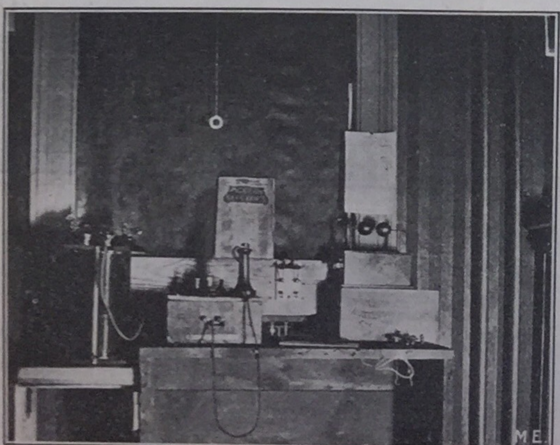
I use an umbrella aerial, composed of eight wires each about 30 feet long radiating from the top of a 35 feet pole. The wires are composed of seven No. 22 copper wires twisted together. These aerial wires also act as guv wires, three insulators being inserted in series between each wire and the place where it is fastened. I get very good results from this style aerial, hearing Bridgeport, Conn., quite clearly.

My wireless call is WB, and I should be pleased to have any other wireless enthusiast in the neighborhood call me up any evening around eight o'clock.

Brooklyn, N. Y. W. S. BROWNE,

HONORABLE MENTION.

Enclosed please find photograph of my



wireless station. For the sending instruments I use a one-inch induction coil and a Morse telegraph key.

The receiving instruments consist of a tuning coil, electrolytic detector, and one receiver. All the receiving instruments except the tuning coil are contained in and on a hard wood box. The tuning coil has a capacity of 620 meters wavelength. My aerial is suspended from a 30-foot pole on top of my house. I have received messages from incoming steamers 150 miles away.

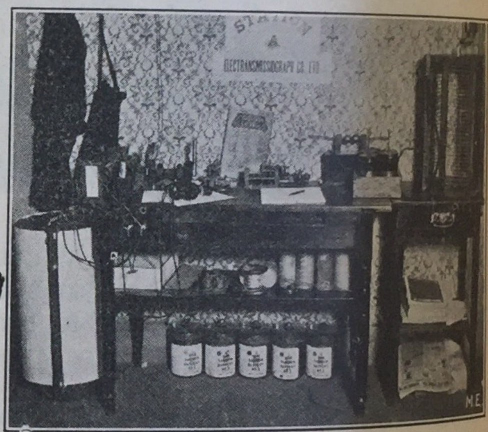
MODERN ELECTRICS is the best magazine I have ever read on wireless telegraphy.

My age is fourteen.

Florida. CROMWELL GIBBONS, JR.

HONORABLE MENTION.

The accompanying photograph shows a wireless set, the instruments of which



are of home manufacture, with exception of the head-phones, Morse key and induction coil, which is an E. I. Co. coil of one-inch spark length.

The tuning coil now in use, shown at the left of picture, is of same style as described in the June issue of MODERN ELECTRICS, wound with No. 20 wire and having one meter to each turn.

Besides the variable sliding plate condenser, at left end of table is inductance coil of No. 24 wire, wound on a 2 1/2-inch mailing tube 12 inches long, having a sliding contact, which in series with another condenser, is connected in shunt to the detectors.

For convenient form of receiving on long and short distance work, or in case a detector responds unsatisfactorily to certain stations, another may be plugged in quickly by the use of a plug switch. This switch, at left of centre, allows for plugging in five different detectors, namely: the electrolytic, of open type, silicon, liquid barretter of own style and design, carbon microphone, and any other desired for testing. The silicon proves fairly sensitive, but the least trouble and most satisfactory results are obtained by the electrolytics.

Near the centre of table is the potentiometer, which has a resistance of about 300 ohms connected in shunt with three cells of battery. It is wound on a spool with No. 33 special resistance wire s.s.c., the insulation being scraped on top for a slider to vary the potential.

In front of the induction coil, having two solid brass balls for oscillators, stands the battery of four leyden jars. They are made from half-pint jars coated in the usual manner on inside and outside with a layer of tinfoil.

On the stand at right of table is sending helix, wound on a wooden frame, which stands 18 inches high, having 31 turns of No. 14 copper wire. Clips are used on flexible leads to vary the number of turns of inductance.

Above this coil may be seen the anchor gap, which is set about 1/32 inch, from which is connected the leader running to aerial cage. This cage is hoisted to top of pole on house 65 feet high, and supported horizontally to peak of barn 110 feet away. It consists of four 105-foot lengths of double stranded No. 18 bare copper wire connected in multiple. The ground is made by a heavy wire soldered to water-pipe in basement. The equipment also comprises a portable set of special design, which, on experiments in another town, has received messages from South Wellfleet, at a distance of sixty miles, without the erection of aerial wires.

With the apparatus of this station may be heard the experimental, commercial and naval stations along the Atlantic Coast, and with additional capacity in the aerial, Glace Bay becomes readable. Frequently the conversations on experiments with aerophony at Fessenden's Brant Rock station are plainly overheard.

Massachusetts. CHESTER E. ROGERS,

It's mighty hard, boys, to write jokes in this sizzling weather. Besides, if you think you struck a particular bright and witty one, the boss tells you that the "joke" is all right, except that Adam told it already to Eve, and she said, yawning: "Oh, please don't tell me such old jokes, my grandfather used to tell that one, and even he knew it was pretty old."—"FIPS."

MAGNETIC TELEGRAPH KEY FOR WIRELESS.

BY G. B. MEDEARIS.

The regulation induction or spark coil that has been used so much in wireless experiments is being replaced in commercial stations by the transformer, which is more efficient. But this transformer must have a higher voltage in the primary, usually 104 volts, alternating cur-

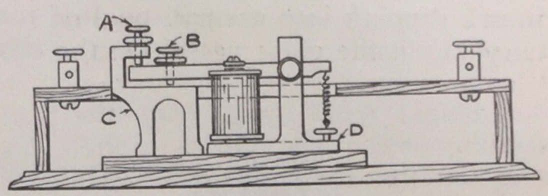


FIG. 1

M.E.

rent, and the telegraph key used with the small coils becomes quite useless on account of the sparking at the contacts. So the magnetic key has come into use, but its cost is so great that the amateur must either do without and use an induction coil or pay the price.

This key I am to describe is easily made and at small expense out of a 20-ohm sounder and a regulation key.

A box is made about 9 inches square, and just deep enough to allow the ends of the bobbins to come up flush with the

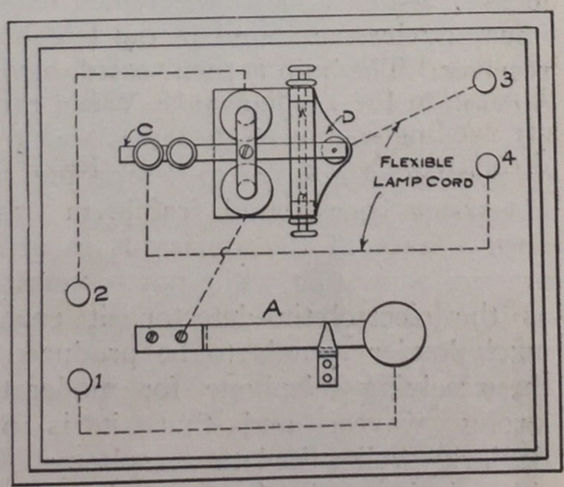


FIG. 2.

M E.

top. Holes are bored in the piece of wood intended for the top, to allow the bobbins to come through; holes are also bored and cut for the standard C. and D. The set screw A is removed, and in its place is put a pin of hard rubber, hard wood, or ebonite, that has been

(Continued on Page 250)

Tantalum Detector

Mr. L. H. Walter, of London, has just invented a new wave detector, which promises to play an important role in aerophony, as it is practically the only detector outside of the Audion which can be used for that purpose.

A simple construction for stationary purposes is shown in Fig. 1. P is a sealed-in platinum wire, forming one terminal, dipping into a small pool of mercury M, in the glass vessel G; the other

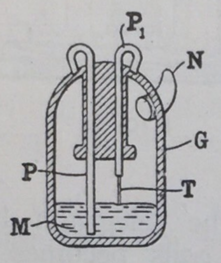


Fig. 1

terminal is also a platinum wire P', having a clip at its end, holding a short length (1/16 in. about) of tantalum wire T of 0.02 mm diameter. The sealed-in platinum loops form a handy means of connecting up. Before sealing up, mercury is poured into the bulb, through a small side neck N, to such a level that the tantalum point is just immersed, which is best ascertained experimentally by the sound in the telephone receiver. The bulb is then sealed, having previously been exhausted. When properly constructed, such detectors appear to be permanent and not to deteriorate, nor have they been found fragile in transport. Tests of the apparatus in actual practice show that while not so sensitive as the electrolytic detector, it enables much louder sounds to be produced in the receiving telephone for moderately strong waves, and that it is particularly well suited to aerophony. Besides, it is much cleaner and easier to handle. A modification of the apparatus which may be subjected to shaking or shocks in use is shown in Fig. 2. The tantalum wire is fastened in a platinum clip, and at the end of the tantalum encased in glass by a special method, necessitated by the impossibility of sealing-in tantalum in the ordinary way as is done with platinum. The platinum wire is sealed into a minute glass bulb B, blown on one end of a glass tube; the other end of the tube is connected to an air pump and the interior exhausted. The glass tube is next heated, when the external pressure causes it to collapse onto the tantalum wire. The end of the glass-sheathed wire can then be ground down so that the tantalum surface is just flush with the glass. The mercury is contained in a glass tube G, having a bore of 5/32 in. A larger tube would be better, but the sensitiveness to shaking then reappears; a smaller tube gives a less sensitive and more variable detector. An ivory plug, I, through which a platinum or nickel wire passes and projects, is placed at one end of a length of a few inches of such glass tube with thick walls. A few drops of mercury—enough to form a pellet (M) about 5/16 inch long—are then put in, and a second ivory plug, I', this one with the sheathed tantalum wire passing through it and projecting about 1/20 inch, is inserted so that the tantalum glass surface just dips into or under the mercury surface.

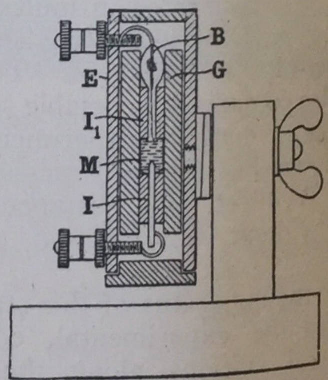


Fig. 2

The most sensitive position is that shown in Fig. 2, with the glass tube vertical, and the tantalum electrode at the top; this arrangement gives a detector which may be roughly shaken or tapped during the reception of signals, without affecting their sound in any way. For sealing up, the whole arrangement is encased in an ebonite tube, E, and the ends are filled in with insulating compound. The detector is adjusted by loosening the wing nut on the right and by bringing the body of the detector in a more or less oblique, or even horizontal position.

Laboratory Contest

FIRST PRIZE THREE DOLLARS.

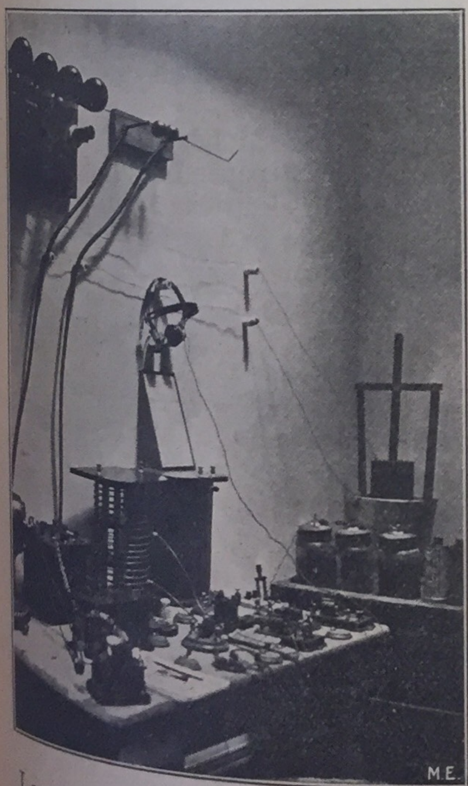
I enclose herewith a photograph of my wireless station, which forms part of my laboratory.

The sending instruments are: One 1 1/2 induction coil, operated by either storage battery or lamp rheostat (on wall) which reduces 110 volts; spark balls (on wall); sending Helix; anchor gap (not shown in photo), and Morse key.

The receiving instruments consist of a filings coherer, in series of two relays, one operating the decoherer, the other operating the sounder; an "Electro" Lytic detector; an "Auto-coherer," condensers, and the necessary tuning apparatus, all of which can be connected with the tuning coil by switches.

A pair of 1,000 ohms head 'phones can be connected by switches to either of the detectors.

The motor operating the dynamo is used on 110 volts current as a transformer by means of the water rheostat (on extreme right) in connection with motor.



I can vary speed of motor, getting from the dynamo any desired current for operating some of the instruments, notably the sounder.

The batteries in front of the water rheostat are used for the receiving instruments.

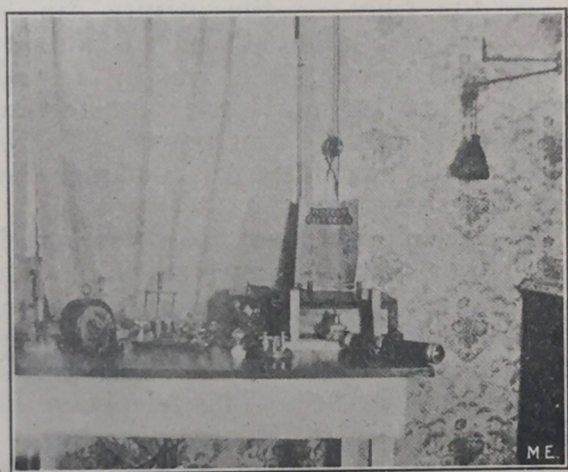
On top of the receiving tuning coil is a list and call numbers of the wireless stations in the United States (Supplement to MODERN ELECTRICS), which I had framed.

I am a constant reader of MODERN ELECTRICS and gladly recommend it to all those interested in electricity.

New York City. A. RUSCH, JR.

HONORABLE MENTION.

Inclosed is a flash light photo of my laboratory which is in part of my room.



I am fourteen years old and have experimented with electricitey for about two years, and I think MODERN ELECTRICS is the best magazine for an experimenter.

The switches at the back of the table control my wireless telegraph instruments, which have a range of about four miles. The three point switch in the middle not only controls the secondary and detector circuits, but also the key and potentiometer circuits. To the right of the switches, is an E. I. Co., one-inch coil which charges a condenser made of Welsbach chimneys, coated inside and out with tinfoil. A zinc spark gap is on top of the condenser box to the right of the coil. I also have a carbon gap of my own design, which seems to work very well in the flame of an alcohol lamp. It is to the right of an auto-coherer seen in the front.

I have had the best results with a microphone (shown at the left) and a pony telephone receiver (on the wall over MODERN ELECTRICS).

The aerial wire runs up behind MODERN ELECTRICS also. I get all my power from Edison primary cells, which I find much cheaper and better than dry cells.

CHAS. BOEHNLEIN,

Minneapolis, Minn.

HONORABLE MENTION.

The inclosed picture shows me at work on a coil in my laboratory. My laboratory was designed for mechanical and electrical work. Here I have all my tools and material for making apparatus.

The switchboard, which is placed directly above the table within convenient reach, contains ten knife switches and a double point switch. The switchboard controls the electric lights in the room, as well as a power motor, shocking coil, and batteries.

To the right of the picture can be seen part of a lathe on which I can turn metal and wood. It is run by a small motor when turning wood; for turning metal it is run by foot power. To the right of the switchboard is a plunge battery that I made.

The telephone shown is a very crude affair, but serves its purpose well. The receiver and transmitter were turned on the lathe out of wood, and then arranged as ordinary instruments. The bell is a common door-bell. This telephone line leads to one of my friends near by.

My wireless, together with all finished instruments is on table directly in front of the one shown. The wireless is operated by a separate switchboard. I shall

not describe it, since it is not complete. I am now at work on a large coil for my wireless and X-ray experiments.

Since I have taken MODERN ELECTRICS I have learned many new and interesting things from its columns. It is the best paper that I have ever read on the subject.

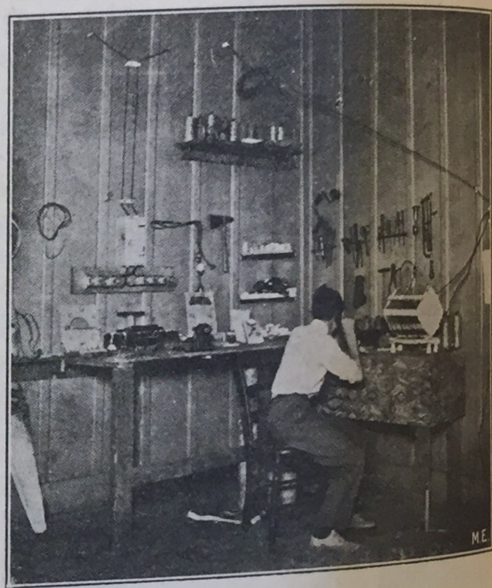
I am 17 years of age, and am a native of Italy.

FRED. BERGAMI, N. H.

HONORABLE MENTION.

Enclosed you will find a flashlight photo to of my electrical apparatus. The bench to the right contains my wireless outfit, which consists of a one-inch spark coil, run on ten dry cells, a key, telephone receiver, a coherer and a Helix.

On the bench to the left of the picture, I have a telegraph sounder, a small dynamo, a small motor and a miniature railway car.



I think that MODERN ELECTRICS is the best electrical paper out, and every boy interested in electricity should take it, for it not only keeps you up in wireless, but also in the new inventions and modern electrical things of the world.

EDWIN LAMMERS.

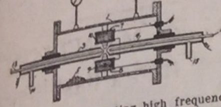
Dallas, Texas.

The last issue of the New England Automobile Journal, Sept. 12, is before us. We have never seen a magazine containing more information for the layman, as well as for the mechanic. Unusual attention is paid to the automobilist having trouble and who is seeking information.

We doubt if there is a single item of interest concerning automobiles, not contained in that issue of the journal. Anybody interested in automobiles should apply for free sample copy to the "New England Automobile Journal," Dept. H., Providence, R. I.

Electrical Patents for the Month

897,279. MEANS FOR GENERATING HIGH-FREQUENCY ELECTRIC OSCILLATIONS. REGINALD A. FESSENDEN, Washington, D. C. Filed Dec. 17, 1906. Serial No. 348,194.

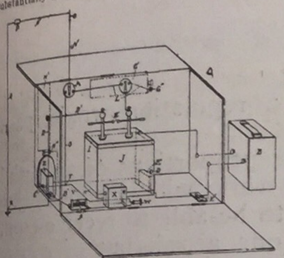


1. In apparatus for generating high frequency oscillations, a pair of spark gap terminals, one of which terminals is made of very thin sheet metal, and means to keep said terminal cool.

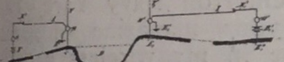
898,197. WIRELESS-TELEGRAPH APPARATUS. HALSEY DUNWOODY, U. S. Army. Filed May 21, 1907. Serial No. 374,914.

1. In a radio electric circuit, the combination of an aerial, means to impress oscillations thereon, and a current rectifier or separator in said aerial, substantially as described.

2. In a radio electric circuit, the combination of an oscillating circuit having an aerial, means to impress oscillations thereon, a ground connection for the same, and a current separator or rectifier connected with said aerial, substantially as described.

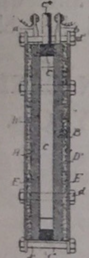


899,239. SIGNALING SYSTEM. SEWALL CABOT, Brookline, Mass., assignor to Stone Telegraph and Telephone Company, Boston, Mass. Filed Mar. 10, 1906. Serial No. 305,260.



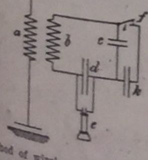
1. In a signaling system, a wireless telegraph system and a wire telegraph system operatively associated therewith.

897,633. ELECTROLYTIC CELL. GILBERT C. LANDIS York, Pa. Filed July 2, 1907. Serial No. 381,915.



The combination of a plurality of graphite plates having terminals for connection with a source of current, a frame of insulating material extending around the edges of the plates and interposed between the graphite plates so as to form a circuitous course for liquid flowing from the inlet to the outlet, metallic plates outside of the graphite plates and provided with lugs, an asbestos plate interposed between each of the graphite plates and each of its adjacent metallic plates, and bolts extending between the lugs of said metallic plates for clamping together the various parts

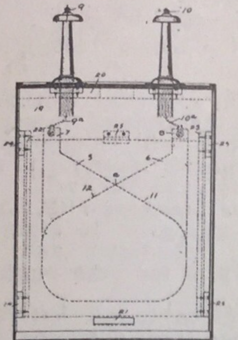
897,779. RECEIVER FOR WIRELESS SIGNALING. VALDEMAR POULSEN, Copenhagen, Denmark. Filed Mar. 6, 1907. Serial No. 360,959.



1. The method of wireless signaling which consists in impelling the energy from a resonant oscillation circuit having inductance and capacity through a detector having admittance by periodically unbalancing or destroying the condition of resonance in said circuit.

2. A receiving apparatus for a wireless telegraph system comprising a circuit in which oscillations are set up, an oscillation circuit in resonance therewith, a detector having a comparatively large reactance, and means for unbalancing or destroying the condition of resonance in said oscillation circuit, whereby the energy accumulated by resonance is caused to discharge itself suddenly through the detector.

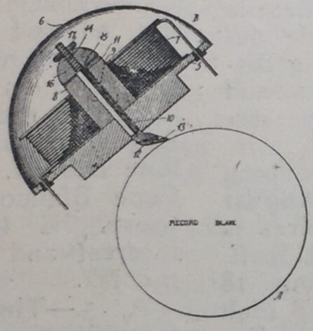
897,500. CONDENSER. WILLIAM B. TAYLOR, Lynn, Mass., assignor to General Electric Company, a Corporation of New York. Filed Jan. 5, 1907. Serial No. 350,905.



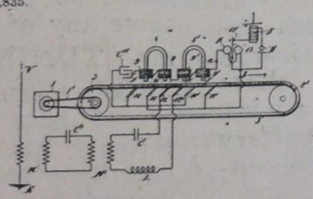
1. In a condenser, active plates of opposite polarity and terminal-projections or ears on said plates, each of said plates being cut away at points adjacent a terminal of opposite polarity.

897,670. ELECTRICAL IMPULSE-RECORDER. AUGUSTUS K. SLOAN, Jr., Brooklyn, N. Y. Filed Apr. 22 1908. Serial No. 428,673.

1. An electro-magnetic recording instrument comprising a record blank; a solenoid; a stylus movable endwise through the core of the solenoid; and an armature carried by the stylus for moving the latter in the direction of the record blank under the influence of the solenoid.

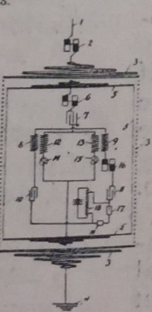


899,243. SPACE TELEGRAPHY. SEWALL CABOT, Brookline, Mass., assignor to Stone Telegraph and Telephone Company, Boston, Mass. Filed Apr. 4, 1906. Serial No. 309,835.



1. In a detector for electrical oscillations, a closed electrical circuit, means for producing a magnetic field, means for producing relative motion between said field and said circuit, means for varying the magnetic flux threading said circuit by the electrical oscillations to be detected, and means so relating the field-producing means and the closed circuit as to convert the energy of motion of said circuit into electrical energy.

897,278. WIRELESS TELEGRAPHY. REGINALD A. FESSENDEN, Washington, D. C. Filed Oct. 6, 1906. Serial No. 337,733.

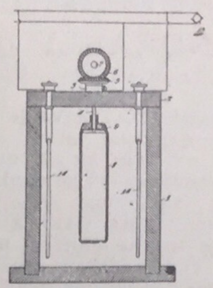


1. In signaling apparatus an inductive coupling, and a receiver placed in the secondary of the coupling, and without the influence of the primary so that the primary acts to shield it from disturbing influences.

2. In signaling apparatus an inductive coupling, and a receiver connected in the secondary of said coupling, the receiver being placed within the primary and being protected thereby from disturbing influences.

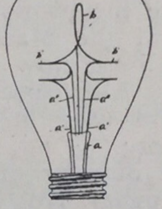
3. In receiving apparatus for wireless telegraphy an inductive coupling comprising a primary, and a secondary and a receiver in circuit therewith,—all inclosed within the primary of the coupling.

898,404. PROCESS OF MAKING ARTICLES BY ELECTROPLATING. THOMAS A. EDISON, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J., a Corporation of New Jersey. Original application filed Oct. 5, 1903, Serial No. 175,818. Divided and this application filed Nov. 3, 1906. Serial No. 341,801.



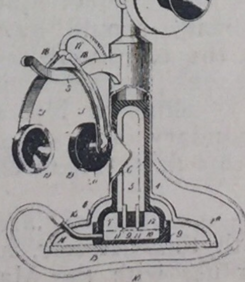
1. The process of making a storage battery can or receptacle, which consists in electro-plating a coating of copper on a former, in electro-plating a film of nickel on the copper coating, and in electro-plating a film of iron on the nickel film, whereby a seamless article will be produced, substantially as set forth.

898,715. INCANDESCENT LAMP. FREDERICK M. BENNETT, New York, N. Y. Filed Mar. 6, 1908. Serial No. 419,536.



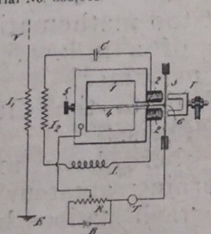
1. In an incandescent lamp, a spread coil filament comprising a substantially vertically disposed loop, and a plurality of loops each constructed and arranged to lie in a relatively approximately horizontal direction the planes of the latter loops intersecting the longitudinal axis of the lamp.

898,796. TELEPHONE SET SOL S. SONNEBORN, New York, N. Y. Filed Oct. 1, 1907 Serial No. 395,393



1. In a desk telephone, a hollow standard or column having a transmitter and a switch hook, a telephone receiver forming part of said standard, a pair of ear cups or pieces, and tubular connections therefrom to said receiver.

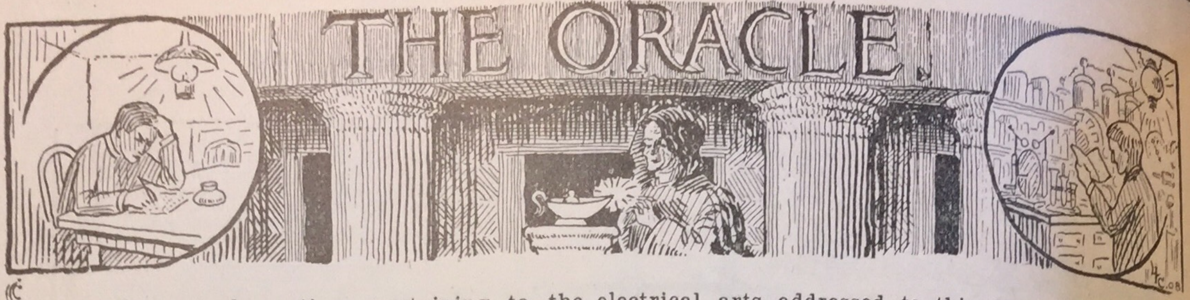
899,264. OSCILLATION-DETECTOR. CHARLES E. RUSSELL, Cambridge, Mass., assignor to Stone Telegraph and Telephone Company, Boston, Mass. Filed Sept 4 1906. Serial No. 333,041.



1. An oscillation detector comprising a magnetizable member forming part of a magnetic circuit, a source of constant unidirectional magnetomotive force associated with said magnetic circuit, means whereby the permeability of said magnetic circuit may be increased by the electrical oscillations to be determined, a movable member of magnetic material arranged so as to be actuated by the resulting increase in the magnetic flux in said magnetic circuit, an electric circuit including a signal-indicating device and a source of electromotive force, and means whereby current variations may be created in said electric circuit by the movement of said movable member.

Original Electrical Inventions for Which Letters Patent Have Been Granted, for Month Ending September 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.

MARCONI DETECTOR.

(79.) SYDNEY A. VINCENT, Cal., asks:

1.—What are the proportions and details of each part of the Marconi magnetic detector such as he is now using or long distance work? Also specify the sizes and amount of wire used in the primary, secondary and core.

A. 1.—Some of your questions have been answered in query No. 56 in the August issue. The revolving core of iron wires is composed of 35-50 turns of No. 36 S. S. C. iron wire. The cord itself is about 18 inches long, and should be about 1/8 inch thick. The primary wire for the smaller spool is made up of No. 33 S. S. C. copper wire, and is about 8 feet long.

The secondary should have as much resistance as the telephone receiver. If a 75 ohm telephone receiver is used, there should be 75 ohms of No. 40 copper wire, on the secondary, and so on. No battery is used in this detector, in either of the circuits.

2.—What connections are best adapted for use with this detector, and how shall I connect for use with the Massie tuning system? Also if any condensers, etc., are used where are they used?

A. 2.—Consult diagram on page 178 of August issue. Condensers are not absolutely required.

3.—Where can I obtain the formula (if possible not too mathematical) showing the proportions of a 2 k.w., 40,000 volt, core type oil transformer?

A. 3.—Write to the Clapp-Eastham Co. of Boston, Mass.

4.—Have there been made any regulations concerning amateur or experimental wireless telegraph stations by the Government which have been, or will shortly go into effect? If so, where can I obtain a copy of such?

A. 4.—There are absolutely no regulations whatsoever concerning amateur and experimental wireless stations, in this country. Commercial stations may be probably regulated before long by the Government, but nothing has been done so far, and we doubt that such a regulation would pass congress.

5.—What are the proportions of an aerial best adapted for work with the following stations? I wish to be able to receive from any of them on one aerial, but of course intend to use a tuning coil: Pt. Loma, Pt. Arguella, Goat Island, Mare Island, Farralone Islands, Table Bluff (or Table Head), Cape Blanco, Bremerton Navy Yard, Tatoosh. I find your magazine of great interest and value in my wireless experiments.

A. 5.—The wave length of these stations is given in last month's supplement, and with a good tuner, and with aerial about 60 feet, you should be able to receive any of said stations.

TUNING COILS IN SERIES.

(80.) CYRIL GORMAN, N. Y. City, writes:

1.—I have 4 tuning coils, each 70 meters capacity, wave length 280 meters. Can I connect these so that I can get 4 by 280 or 1120 meters' wave length? How?

A. 1.—Connect the 4 tuning coils in series, and you will have 1120 meters wave length.

2.—What current does a E. I. Co. 1/2 inch coil take?

A. 2.—Three to four dry cells, 1-2 ampere.

3.—What resistance are regular telephone receivers used on N. Y. telephones?

A. 3.—Seventy-five ohms.

ANTENNA.

(81.) PHILIP WOOD, Mass., writes:

1.—What is the best book on the principles of wireless telegraphy?

A. 1.—Maver's "Wireless Telegraphy" is about the best book we know of. Sent postpaid for $2.20.

2.—What is the best text-book on the study of elementary electricity.

A. 2.—"Lessons in Practical Electricity," by Swoope. Sent postpaid for $1.50.

3.—What telegraph code is mostly used by wireless telegraph operators?

A. 3.—The Continental code.

4.—Does the size of the wire in the antenna have any effect on the wave length of a station; that is, would the wave length of an aerial wire 75 feet long and of 12 gauge differ from one of the same length, but of 16 gauge?

A. 4.—Any size wire may be used for the antenna. It should, however, not be thinner than No. 20 wire. The wave length is not changed by the size of the wire.

COMPOUND WIRELESS SYSTEM.

(82.) ALLEN E. DUDLEY, Mass., writes:

1.—In adjusting a compound tuning system for receptors, to respond to a certain wave-length, does that part of the inductance included between the aerial and the ground furnish the necessary inductance to make the aerial equivalent to 1-4 the wave length, or does the closed resonating circuit, with its inductance, have any effect?

A. 1.—Yes, the closed resonating circuit will not have much effect.

2.—In a compound tuning system for receptors, of what value is a variable condenser in the ground wire? (Not meaning the condenser in the closed resonating circuit.)

A. 2.—We have often personally tried a variable condenser on the ground wire, and in several cases found that the efficiency of the station was actually cut down. We do not believe that such a condenser will be of much practical use. Of course in certain systems it might really help, but with such systems we personally have no acquaintance.

3.—How can a station having a compound tuning system and an aerial 50 meters high, be tuned to a short wave length, say 100 meters?

A. 3.—It is very hard to tune such a station as you describe, and the receiving is usually only done by means of forced oscillations, or by varying the capacity of the condensers.

4.—Why cannot Marconi's new arrangement for producing sustained oscillations be used for wireless telephony.

A. 4.—Marconi's new arrangement for producing sustained oscillations, as described on page 139 of MODERN ELECTRICS, has frequently been used for wireless telephony.

DEFINITION OF THE COULOMB.

(83.) ALFRED O. BRAGG, Maine, writes:

1.—I have read that both the ampere and the Coulomb express the quantity of electrity. Please explain the difference.

A. 1.—The Coulomb has been defined as follows:

The unit quantity of electricity is the amount of electricity that flows per second past any point in a conductor when the current strength is one ampere, and this unit quantity has been called the Coulomb.

2.—Please give specifications for a condenser to be used with a coil 7 inches long, core of No. 18 well annealed soft iron wire, primary of 1 pound of No. 16 D. C. C. wire, and secondary 1 3-4 lbs. No. 30 D. C. C. wire, B. & S. gauge.

A. 2.—You will need about 50 sheets of tin foil, 4x3 1/2 inches.

3.—Which have the most power in respect to size, gasoline or electric motors?

A. 3.—Gasoline motors.

4.—Explain the following terms: Tuning of wireless sets. Wave length.

A. 4.—This has been described in various issues of this magazine, and we refer you especially to the July issue.

5.—How long would it take to charge a 16 ampere hour storage cell with a generator of 6 1/2 volts and 6 amperes?

A. 5.—It would take about 4 hours with a continuous current of 3 amperes. 6 amperes would be a little too high for such a small battery. Use a small rheostat to cut down current.

EDISON TASIMETER.

(84.) BRUCE ROSS, Ottawa, Canada, asks:

1.—Please give the dimensions of a 3-inch induction coil?

A. 1.—14 ounces of No. 12 wire for the primary, 3 1/2 lbs. No. 36 wire for the secondary, 60 sheets of tin foil 8 x 4 1-2 inches. Current to be used 12 volts 4 amperes.

2.—Could bare No. 36 wire covered with the insulating compound mentioned in the August issue page 173, be used in the 3-inch coil?

A. 2.—This insulation is quite too heavy for spark coils, and you should use D.C.C. wire.

3.—Is an Edison Tasimeter very sensitive, i. e., will it change the amount of current that passes through it as quickly as the amount of light that strikes it varies?

A. 3.—The Edison Tasimeter is the most sensitive instrument to detect heat or cold. It will change as quickly as the amount of light that strikes it.

4.—What is the price of the wire used in the electro-magnetic detector (silk-covered iron wire No. 36)?

A. 4.—This wire usually sells at $5 per lb.

POCKET STORAGE CELL.

(85.) A. B., Carman, Ia., asks:

1.—Can a storage cell of small size be carried in the pocket and used for lighting a lamp?

A. 1.—Pocket storage batteries are manufactured by a number of makers. These cells are usually carried in a rubber bag, so that the acid spilling out by accident, will not destroy the clothing.

2.—How could I make a storage cell of about 2 volts and 1-2 or 1 a. h., for above purpose?

A. 2.—We recommend to you our small 10-ct. book, "How to make a pocket accumulator," which explains all in details.

3.—Is there more than one secondary coil in a one-inch coil? If so, how are the coils used?

A. 3.—Only one secondary coil is used. We recommend you our 25-ct. book: "Induction coils, how to make and use them."

TROUBLE WITH SPARK COIL.

(86.) A. LINDAHL, Mass., writes:

1.—I have an E. I. Co. 1 inch spark coil which gave a 1 inch spark when new, on four dry cells, but lately I can not get more than a 3-4 inch spark from it on five new dry cells. Is it possible that I have injured it by occasionally working it without any connection or spark between the secondary terminals, and if so, how?

There is quite a lot of sparking at the vibrator contacts of the above coil. Does this mean that the condenser is injured, and if so, could I remedy it by shunting another condenser around them, and of what size?

A. 1.—It is quite clear to us that the condenser is pierced or injured, on account of you leaving the secondary open while coil is working. It is a dangerous thing to leave any spark coil work with open secondary circuit, and any coil would sooner or later be injured.

Get a new condenser from the makers and bridge it across the vibrator.

2.—How many amperes does the above coil consume?

A. 2.—About 2-3 amperes.

3.—My coil has a little spring in the end of the vibrator screw on which the contact point is mounted. Could I not improve my coil for wireless telegraphy by stopping the action of this spring, thereby getting higher frequency oscillations?

A. 3.—The spring in question is for the purpose of producing faster vibrations of the vibrator. If the action of the spring is stopped it will cut down the spark length.

4.—Are Edison primary batteries easy to take care of, or will it injure them to stand unused in any condition for any length of time, or have they much local action when not in use for a month or so?

A. 4.—Edison primary batteries are very easily taken care of, and they will not be injured even if left for months on open circuit. There is no local action worth mentioning.

WAVE LENGTH.

(87.) Sam Fleenor, Oklahoma, asks:

1.—Why is it necessary to know the wave length of a wireless station in order to communicate with same?

A. 1.—You can not call a wireless station unless you can get in tune with same. You have to know the wave length in order to call them.

2.—Is there any way of signalling selectively over party telephone lines having 15 or 20 'phones on the circuit? If so, give description of apparatus used.

A. 2.—We do not think that much success could be had with such a large number of telephones on a line. Usually only 3 or 4 are placed on one line. We advise you to get our excellent book, "Telephony" by Homas, which we will mail to you on receipt of $1.00. This explains the matter fully.

DYNAMO.

(88.) Melvin Getchell, Mass., writes:

1.—Are the poles of the field magnets of small dynamos like those shown in Catalogue No. 4 of the Electro Importing Co., the list No. of which is 2011, permanently magnetized?

A. 1.—Dynamo in question is made on the principles of the large dynamos, and is not permanently magnetic. The machine is self-magnetizing.

2.—Where can the latest 1908 issue of "Rules and Requirements of the National Board of Fire Underwriters for Electric Wiring and Apparatus" be obtained?

A. 2.—Write to the Board of Fire Underwriters, 34 Nassau street, N. Y. City. They will supply you with the desired information.

WIRELESS QUERIES.

(89.) Wyatt Anthony, Me., writes:

1.—How far will a spark coil of three inches send wireless messages if I have an aerial 40 feet high?

A. 1.—Twenty miles or more, depending upon conditions.

2.—How wide would a piece of 1-8-inch copper ribbon have to be in order to be of the same carrying capacity as 4-0 wire?

A. 2.—Approximately 1 3-8 inches wide.

3a.—Do the wireless telegraph stations of the U. S. Government use alternating or direct current?

A. 3a.—Alternating current and transformers, so far as we are able to determine.

3b.—Do they have secondary condensers?

A 3b.—Yes.

4.—Is there a wireless station near Portland, Me.? If so, what is its call-letter?

A. 4.—There is a station at Portland. Call letter "D." We refer you to our supplement of the September issue.

MAGNETIC TELEGRAPH KEY FOR WIRELESS.

(Continued fron Page 243)

threaded. This screw is only used as a stop, and some insulating material has to be used. This will be seen more clearly when the operation is understood.

The set screw B is also removed and a hole drilled in its end to accommodate a piece of No. 14 platinum wire, 1/4 inch long. Another hole is drilled immediately beneath this platinum-tipped screw and a piece of wire like the above is driven in. Care must be taken not to allow these pieces of platinum to project too far; some play must be allowed, as in a vibrator. The magnetic key is now completed and the connections with the operating key is next to be taken up.

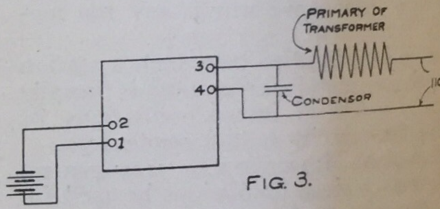


FIG. 3.

A key such as is used on line systems is fastened to the top of the box; a key may be made like the one in Fig. 2 out of a strip of spring brass, an ebonite knob fastened on one end; the contact point is screwed directly under it.

The connections are: One terminal of the bobbins is taken to binding post No. 2, the other terminal is connected to the key A, the contact point is connected to No. 1.

The magnetic key is connected to Nos. 3 and 4. The standard C, carrying the platinum contact, is taken to 4, and the standard carrying the arm with B screwed in it is joined to 3.

Fig. 3 shows connections to transformer and separate battery systems.

It will be found that the signals are transmitted accurately and that the sparking is not very great. However, if the wireless enthusiast wishes to almost eliminate the sparking entirely, a condenser is better placed in parallel with 3 and 4.

CLASSIFIED ADVERTISEMENTS.

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

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

Advertisements for the November issue must be in our hands by Oct. 25.

ELECTRICAL APPARATUS.

STUDY ELECTRICITY AT HOME—A complete electrical course at home, containing 30-page detail book, 220-page text-book, 200 experiments and over 100 pieces of apparatus. Price, complete, only $5.60. Catalogue "M. E. S." explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Ave., New York.

When writing please mention "Modern Electrics."

EXPERIMENTERS send for our special bargain list of motors and supplies. Also samples of the most wonderful aluminum solder, bars by mail 25 and 50 cents. Electrical Maintenance & Repair Co., 200 Market street, Newark, N. J.

When writing please mention "Modern Electrics."

WOLLASTON WIRE is our specialty. We quote the most popular sizes, .0001-inch (smallest made) and .0002-inch at 25 cents per inch, or $2.50 per foot, postpaid. Also a good compass, 6 inches in circumference, suitable for a galvanometer, for 20 cents, postpaid. Lewes Sales Co., 16 South st., Lewes, Del.

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ELECTRICAL BOOKS, BLUEPRINTS, ETC.

WIRELESS CODES. Send 10c. for blue print showing Morse, Continental and Navy Codes. A. C. Austin, Jr., Hasbrouck Heights, N. J.

When writing please mention "Modern Electrics."

WIRELESS EXPERIMENTERS. If you wish to have a successful station, you need tuned circuit apparatus. Our set of ten blueprints of tuned transmitting and receiving stations show all that is necessary, 25 cents Blueprints for construction of electrolytic detector, 15 cents. Imperial Wireless Co., 230 South Pacific ave., Pittsburg, Pa.

When writing please mention "Modern Electrics."

EVERY WIRELESS EXPERIMENTER SHOULD HAVE THESE DRAWINGS: Ten standard tuned circuit diagrams, 50 cents; four wireless telephone diagrams, 25 cents; drawings and operating notes on tuned circuit instruments, four in set, 25 cents. The following sets give all details and dimensions necessary in actual construction. Twelve detail drawings, giving over 30 types of tuned circuit apparatus, $1.00; twelve drawings giving complete design of four sizes of induction coils for wireless, $1.00; six drawings of transformer to reduce 110 v. to 10, 20, 30, or 40 volts, 50 cents; ten drawings of high tension transformer for wireless transmitters, $1.00. W. C. Getz, 645 N. Fulton ave., Baltimore Md.

When writing please mention "Modern Electrics."

PHOTOGRAPHS wanted of amateurs' laboratories, apparatus, etc., for publication in electrical magazine, with short description. Prices vary according to quality. Sample copy of magazine to every address. Payment made on publication. Box 117, Byhalia, Miss.

When writing please mention "Modern Electrics."

WIRELESS APPARATUS.

WIRELESS DETECTOR. This is the detector for amateurs; compact, efficient, and easily adjusted. Price, postpaid. $1.00. We also handle a complete line of wireless supplies. Circular on request. Address, Vulcan Detector Co., Box 50, Mt. Vernon, N. Y. (oc.)

When writing please mention "Modern Electrics."

WIRELESS TELEGRAPH OUTFITS and wireless supplies for amateurs. If you live near St. Louis, write us, we can save you money on these goods. Send 2-cent stamp for descriptive pamphlets. Linze Electric Co., Olive Street, St. Louis Mo.

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AT LAST! Silicon and carborundum detectors, $1.50 each! These detectors are the best and most efficient on the market. Wireless Detector Co., 2120 S. Union avenue, Los Angeles, Cal.

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WIRELESS APPARATUS is our specialty. Our prices are within reach of every person. Send for circular. Northwestern Wireless Co., 8 Banning Bldg., Duluth, Minn.

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ATTENTION WIRELESS EXPERIMENTERS! Fused silicon, piece large enough for one Detector, 20 cents; Pneumatic Rubber Ear Cushion, fits any telephone receiver and positively excludes all outside noise, each 50c.; Wollaston Wire, 25c. per inch; Condensers for receiving stations, 40c.; Carbon Cups for Electrolytic Detector 20c.; Carborundum, finest selected crystals, 25c. per ounce; Pirelli High Tension Rubber Cable, 10c. per foot. Send 2c. stamp for 100-page Catalogue No. 4, ELECTRO IMPORTING CO., 86-Z West Broadway, New York City.

When writing please mention "Modern Electrics."

FOR SALE.

FOR SALE. One 1-inch spark coil, $5; one pair 75 ohm telephone receivers, 50 cents; one pair oscillators, 1 3-4 inch balls. Write F. E. Webster, 2309 Beverly Road, Brooklyn, N. Y.

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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.
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THE PHONO-CINEMATOGRAPH.

(Continued from Page 234)

acquainted with the scene before the ear is ready to listen.

Two set screws, marked: "Retarder" and "Avancer," control practically the entire mechanism. It is an easy matter for the operator to keep the two machines together by means of the set screws.

Besides, the synchronous regulator controls the speed of the cinematograph automatically.

The pointer, 5, has a double friction contact, 6, which is made movable on the two insulated metal pieces, 7 and 8. These pieces are connected through a resistance, through which the motor current flows.

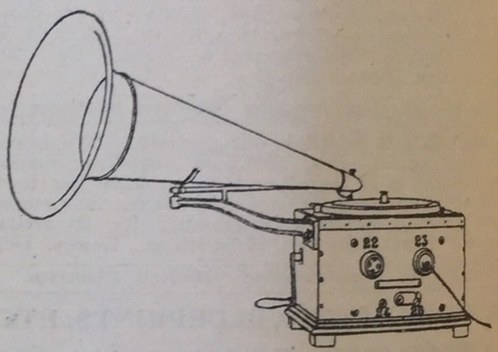

Fig. 5

Fig. 3 shows the general arrangement of the cinematograph and the speed controller. Figs. 4 and 5 show the phonograph which may either be run by battery or lighting current.

SELECTIVE TUNING.

(Continued from Page 239)

relation to the wave so that four standing waves are formed. The nodes of three of these waves are grounded at the three ground slides, while the loop of the fourth wave actuates the responder. Any wave varying in length with the chosen one is grounded at the three ground slides, as they are not at the nodes of the extraneous wave. Although this tuner is very close, its use is limited to short waves and those of perfect form, as it will readily be seen that a wave with two or more "humps" would cause serious complications. It is also inefficient, and is successful for at most one hundred miles, while with a good jigger set the distance is limited to the power of the transmitter and the sensitivity of the receiver.

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THE CONSTRUCTION OF A SMALL TRANSFORMER.

(Continued from Page 237)

der: 400, 300, 200, 100, 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100. Connect the wires from the coil to the binding posts in the same order as they come from the coil, that is, connect the wire that you started with to binding post marked 400; tap No. 1 to binding post marked 300; tap No. 2 to binding post marked 200, etc. The winding is shown diagrammatically in Fig. 2, the small upright marks denote the binding posts and the numbers between stand for the number of turns.

To use the transformer proceed as follows: If your circuit is 110 volts alternating current connect one of the electric light wires to binding post marked 100 on the left of the O post and one wire to binding post marked 10 on the right of the 0 post, or any two posts that have from 100 to 110 numbers between them. If your circuit is 52 volts connect the wires to two binding posts that have from 50 to 55 numbers between them, etc. Now, if you connect two wires to binding posts marked 0 and 5 you will get approximately 5 volts, if to posts marked 0 and 25 you will get 25 volts, etc. If you want more than 110 volts, move the left hand wire to the post marked 100 on the left of the 0 post, then you must add 100 to the number of the post that the right hand wire is connected to. If more than 200 volts are wanted, move the left hand wire to post marked 200, etc. In this way any voltage from 5 to 500 may be obtained. Fig. 3 is a drawing of the complete transformer.

When working with voltages of more than 200, good rubber gloves should be worn, because a current of 200 volts is very dangerous, sometimes proving fatal.

Although the above transformer was designed to work on a current of 60 cycles, it it will work equally well on currents of 133 cycles.

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