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The Oscillation Transformer

With Special Reference to The Oscillation Auto-Transformer

By M. A. Deviny.

At the present time there is a marked tendency among amateurs to employ oscillation transformers in the aerial circuits of their receiving sets. This movement is the outcome of a generally prevalent notion that the so-called loose coupler possesses some remarkable properties which enable it to greatly increase both the selectivity and the efficiency of a station. As to whether it materially improves the selectivity through any of its own properties is a matter of doubt, but a certain increase in the effectiveness of a receiving set may be secured by its use.

The increase in efficiency is brought about in a rather indirect manner. It is well known that the various types of detector depend up on different principles for their operation. Some act upon the application of a rapidly alternating electro-motive-force to their terminals, while others depend upon the strength of the oscillatory currents flowing through them. From this, it is evident that the successful operation of a set will be more or less influenced by the type of detector used, provided alterations are not made in the oscillation circuit. If a voltage-operated detector be employed, it is evidently advantageous to have the voltage of the received oscillation as great as possible, while if a detector of the current-operated type is used, a relatively large current is desirable.

If we connect the detector directly in the aerial circuit, as was the practice in the earlier installations, we must take conditions as they exist. The satisfactory operation of the detector will then greatly depend upon the point in the aerial at which the detector is inserted.* The early investigators realized the limitations of this arrangement, and produced several devices for overcoming the difficulties. Among these was the oscillation transformer.

This instrument is based upon the principle of the alternating current transformer of every-day use,** but it differs considerably from the latter in both design and construction. It consists of a primary winding P (Fig. 1) connected in the aerial circuit. A secondary winding, S, of somewhat smaller wire, is inductively associated with the primary, the detector being connected in the secondary circuit. In this manner two separate and distinct coils are used,

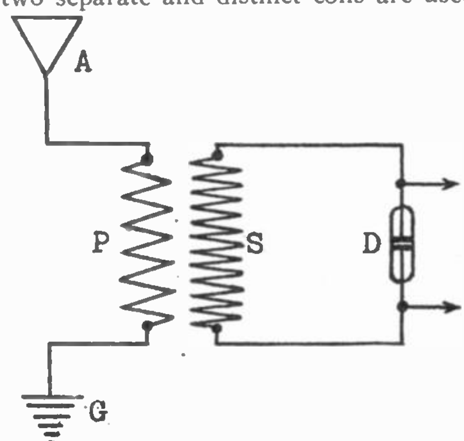


FIG. 1

the energy being transferred from one to the other by electro-magnetic induction. By the proper design of the two coils and their adjustment to each other, a maximum voltage or current may be applied to the detector. This is effected partly through their action as a step-up or step-down transformer, and partly through resonance between the two circuits.

The use of this instrument enables the detector to operate under the most advantageous circumstances, and it consequently increases the effectiveness of the entire receiving set, notwithstanding its

*See Cabot on "Antenna Phenomena", MODERN ELECTRICS, November, 1908.

**See article on "The High Tension Transformer", MODERN ELECTRICS, February, 1909.

poor efficiency as a transformer of energy. The removal of the detector from the aerial circuit results also in a considerable increase in the reliability of the receiving instruments by the provision of a direct conducting path to earth through the primary, over which any atmospheric electricity, or the so-called "static", may pass without affecting the detector. It must be borne in mind, however, that the the relation between the primary and secondary voltages is not strictly pro-

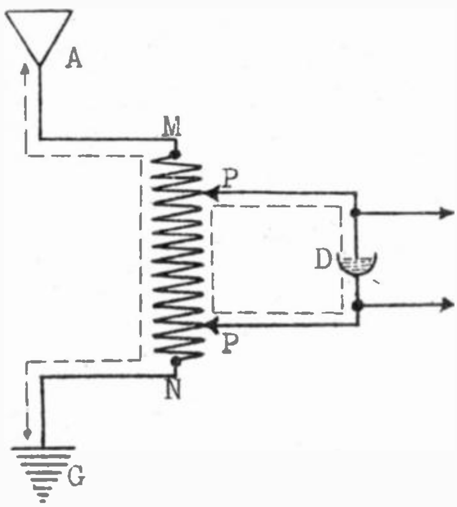


FIG. 2

portional to the number of turns in the respective coils. This is due partly to the excessive magnetic leakage, and to the establishment of stationary waves of current and potential on the coils themselves.

In order to be of any service, the oscillation transformer must be very carefully made, and the parts correctly proportioned. In probably no other piece of wireless apparatus would faulty design prove so serious to the successful operation of a station. In addition, each of the circuits must be provided with such auxiliary apparatus as will enable close resonance to be effected.

Another type of oscillation transformer based upon a somewhat different principle, and one which is not so susceptible to faulty design, is shown in Fig. 2. This type, which produces practically the same results as the one described, makes use of only one coil which is used both as primary and secondary. In this respect it resembles the auto-transformer or "compensator" used on alternating current power circuits. A diagram, illustrating its principle of operation, is shown in Fig. 3.

If a properly designed coil, MN, Fig. 3, threaded by an iron magnetic circuit (not shown), be connected across a source of alternating current G, at a pressure of say 1,000 volts, the voltage will fall uniformly through the length of the coil from one terminal to the other. If we should connect a wire to one terminal of the coil, and another to a tap led out from some intermediate point in the winding, say at the middle point P, the potential between the two wires would be but one-half of that applied to the coil from the generator, or 500 volts. The number of turns included between the two low-potential wires being but one-half of the total number, the resistance will also be one-half of that of the whole coil, and a current twice as great will flow through it as flows through the total winding when connected to a given load. Part of this current is a conduction current from the "primary" and part is the result of induction between the two sections of the winding. In this manner, the energy delivered over the low-pressure wires is equal to that delivered by the generator to the high tension circuit. Of course, this explanation does not consider the loss in transformation, the practical limitations of design, or the nature of the secondary load.

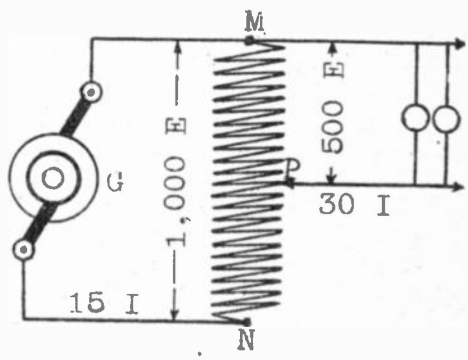


FIG. 3

In effect, the device may be considered an alternating current inductive potentiometer.* By taking out a number of taps from different portions of the winding and connecting them to a multiple-point switch, any desired potential can be obtained. A higher pressure than

*For the principle of the potentiometer, see "The Construction of a Potentiometer", MODERN ELECTRICS, August, 1908, or "How to Make Wireless Instruments", Page 34.

that of the supply circuit can just as easily be secured by connecting one "primary" terminal within those of the "secondary" as shown in Fig. 4. In this case, the current in the secondary is less than that in the primary by an amount

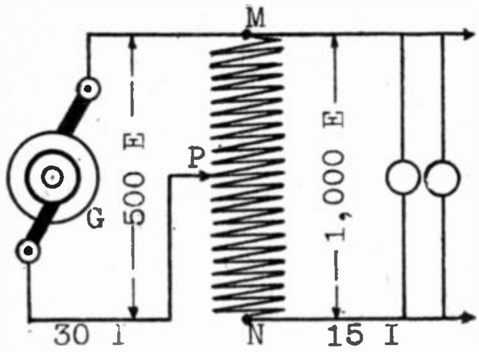


FIG. 4

proportional to the increase in voltage on the secondary side.**

The application of this principle to the oscillation transformer is shown in Fig. 2. Here, MN is a long, fine wire coil having a relatively large inductance. The terminals are connected directly to the aerial and ground wires, while the terminal of the detector leads make contact at the point P and P' through the medium of sliding contacts. The dotted lines show the two circuits through the instrument; the portion of the coil included between P and P' being used simultaneously as primary and secondary. The connection shown in the figure is for reduction of the electro-motive-force on the detector.

In practice, however, the connections given in Fig. 2 could not be used to advantage. The free oscillation period of the aerial could not be adjusted to the length of the incoming waves, and the detector circuit contacts would have but one position on the coil for maximum current or potential. In order to overcome these difficulties we make use of the connections shown in Fig. 5.

To take advantage of the loops and nodes of the stationary waves of current and potential and current established on the coil, and to preserve electrical symmetry between the two circuits, four sliding contacts are necessary. Two of these are connected to the aerial and ground wires respectively, while the detector circuit is completed through the remaining two.

The adjustment for syntony in the aerial circuit is made by means of an auxiliary variable inductance L and a variable capacity C, connected in multiple in the aerial circuit as shown in the figure. The secondary, or detector circuit, is then tuned to resonance with the primary by means of the small variable inductance L' and the capacity C'. The object of the auxiliary inductances L and L' is to effect any necessary changes in the natural periods of the two circuits without disturbing the adjustment of the auto-transformer. For the most satisfactory results, the various condensers

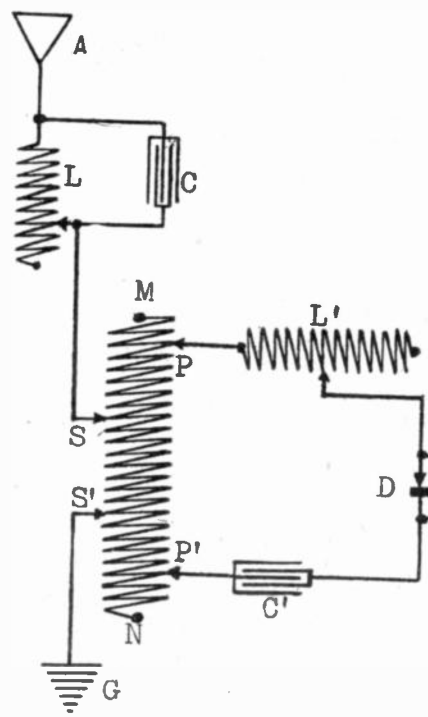


FIG. 5

and inductance coils should be properly proportioned to the size of the auto-transformer. Complete designs for both the transformer and its auxiliary apparatus will be given in a later issue.

**In practical alternating current work, auto-transformers are seldom used where the ratio of transformation is greater than 2 or 3 to 1. They are chiefly used as starters or "compensators" for lowering the line voltage on large induction motors while starting. They are also used on the cars of high tension single-phase railways for lowering the trolley voltage for use at the motors.

Wireless Communication As Applied to Railroad Lines

By Dr. Lee De Forest.

A subject of this type must necessarily deal largely in futures, yet the demonstrated possibilities of the radio telegraph and telephone and the strict requirements of the railway service are to-day so well known by the experts in each separate field, that, by conferring and co-operatively working together, it is reasonable to suppose something tangible, and of real value to both may rapidly result. The possibility of telegraphing wirelessly to moving trains over considerable distances by means of the old fashioned spark telegraph, was, I believe first demonstrated in 1905 over the Chicago and Alton Railroad out of Chicago and St. Louis.

Thanks to the enlightened interest which the officials of that road took in my proposals, I was allowed the privilege of experimenting on the fast daylight express between St. Louis and Chicago. Two horizontal antenna wires were first run on insulators along the top of the train and connected to a receiving instrument installed in the parlor compartment of that coach. Earth connection was made to the trucks, the fifteen kilowatt station at East St. Louis, about two miles from the track side and the ten kilowatt station at Chicago, a quarter mile from the rails were used as transmitters. No attempt was made at that time to trasmit messages from the train. But unfavorably situated as both these stations were, so far from the tracks, messages were clearly received on the flying train when 30 to 35 miles from these stations.

Subsequent experiments at New Haven, Conn., and Toronto, Canada, demonstrated the correctness of my view, that the track rail system, including the mass of telegraph or telephone wires along the right of way served not only as a conducting zone or wave chute along which the electric waves preferred to travel; but also acted as a net to catch waves coming transversely and obliquely towards the right of way, and then distributing in both directions along the track a surprisingly large amount of electric energy.

*A paper read at Los Angeles Convention.

On account of this directive action of the telegraph wires it is easy to pick up strong wireless telegraph signals by a wave detector connected to a short horizontal wire stretched parallel and near to the telegraph wires, and at a surprisingly large distance from the wireless transmitting station.

Now, given this phenomena, it is easy to understand how a track side wireless station, using a horizontal antenna wire say 100 feet long fastened to two or three telegraph poles, can communicate with another trackside station similarly arranged, and distant twenty or even more miles from the first.

Obviously one or both of these stations can be located on board a train, and in such case the horizontal antenna wire can, as I have demonstrated, be run inside the cars, of heavily insulated wire, parallel to the bell cord. This is, of course, providing that the cars are of wood and not of steel. In the latter case wires would need be supported on insulators a few inches above or at one side of the roof of the cars.

By this arrangement it would be a comparatively simple matter to telegraph regularly to and from express trains, over a distance of say forty miles (twenty miles on each side of the track side station). However, the commercial applications of such a wireless telegraph service would be generally confined to a few limited trains, where for the benefit of traveling business men, a news or stock report service could be made a feature. The expense of carrying a telegraph operator on board more than the cost of the equipment entailed, would greatly limit such application.

With the radio (or wireless telephone) however, the case becomes very different, so different in fact that it is my firm belief that ere many years the telephoning to moving trains, and especially to locomotives, will become a very common, or well nigh universal adjunct to our elaborate railroad safety appliances.

For such a purpose long distance of communication will be quite unnecessary, in fact, undesirable. Consider a railroad system equipped with the block system, with signal stations or towers at mile intervals; a small wireless telephone transmitter capable of half mile communication and utilizing the inductive or "wave-chute" action of the existing telegraph wires would cost little to install, little to operate, and be so simple as to add practically nothing to the training of the signal operator. A horizontal antenna wire would be extended to the first or second telegraph pole stretched three feet below the lowest telegraph wire, the earth connections would be direct to the track rails. On the locomotive or over the locomotive and the first coach will extend an insulated wire as easily coupled up when making up the train as is the air brake at present. In the cab a small box is fastened containing a tuning coil and a simple crystal wave detector; connected to this is a single head telephone receiver with head band attached, or a telephone receiver with rubber air pad is fastened to a short arm, at a point where the engineer can easily rest his ear against it. The body of the locomotive, of course, supplies the earth connection.

This system would enable the signal man to talk direct to the engineer for a period of one to four minutes, and add immensely to the probability that he will receive the proper signal, or enable him to receive orders or information which the semaphore cannot possibly communicate. The engineer could not, of course, reply, except to O. K. by whistle.

It would appear that by this appliance it will be generally quite unnecessary for a train to stop merely to receive despatcher's orders. What value this saving of time of hundreds of trains would aggregate to the railroads in a year, I have no means of estimating. Surely it would total very large figures.

Arrangements have already been made with the New York Central for carrying out a series of experiments in telephoning thus to moving trains, from a track side station at Spuyten Duyvil, on the Hudson; and I expect soon to be able to publish some very interesting results.

A short range wireless telephone transmitter for such service as I have just described is operated from a few cells of Edison-Lalande battery, and the entire transmitting outfit will occupy less than three cubic feet of space.

Now consider the application of such wireless telephone instruments to freight train service, on roads like the Santa Fe, for example, without block signal stations at short intervals.

It frequently happens that a train awaits on a siding for long periods the passing of another which has been delayed by accident or other cause and with no means whereby the train crew can be notified to proceed. A portable telephone set installed in the caboose could be quickly brought into action to call up the nearest despatch station.

To facilitate this work a length of flexible antenna wire can be very quickly spiked up on two or three telegraph poles as high as a man can reach, parallel to the telegraph wires or directly connected to a wire through a small condenser, the capacity of which is too small to allow any detrimental grounding of the wires. This "emergency antenna" can be strung up and taken down again in two minutes' time. Such means for getting quick communication with stalled freights will mean an immense saving in costly delays to freight and to all trains affected by the tie up, to say nothing of loss in wages to idle train crews, this latter item where the 16 hour law is operative.

I believe that the railroads will soon see this method demonstrated, and be quick to admit the economy to them of equipping every caboose or a car on every accommodation train with such portable wireless telephone transmitting and receiving sets, whether or not the locomotive carry the receiving apparatus, which I have already described.

Ideas as to the possibilities of overland, wireless telegraph for commercial purposes have been generally founded on the all too plainly demonstrated failures and short comings of the spark systems. Such service is limited to relatively short distances over land by daylight, on account of the sad inefficiency of the spark wireless transmitter. The best of the spark systems can radiate generally less than 10 or 12 per cent. of the energy taken from the dynamo, then the trains of electric waves which the spark transmitter sends out are "strongly damped" as we say—i. e., rapidly tail down to zero. Sharp tuning at the receiving station to cut out interference from other stations or from atmospheric causes is really quite impossible when one has to work with these strongly-damped waves from a spark transmitter.

Hence, in addition to the short ranges necessitated, the spark system is not, and cannot be made reliable and "interference-proof." Such means, therefore, as supplementing the wire service of a railroad at times of emergency as when long stretches of wire are mowed down by sleet and wind storms is quite impracticable because so altogether unreliable.

During the last year, however, a new epoch in wireless telegraphy has been entered, marked by the Radio Telephone Company's new sparkless, wireless telegraph system, this "Radio-tone" transmitter (as it is called) is sparkless and noiseless, in place of the noisy, crude and inefficient old spark gap, it employs a silent discharge from the antenna wires and emits trains of waves which are very little damped, i. e., which tail down to zero slowly.

Moreover, we can now radiate fifty to seventy-five per cent. of the energy derived from the alternating current dynamo instead of the ten to twelve per cent. of the spark system. This means that ranges two or four times greater than those given by the old spark method are possible and that wireless interference from natural or artificial sources can be completely and successfully eliminated.

As proof of my statement note the work daily carried on between our New York and Philadelphia and Washington stations where, in each case, a spark station of the United Wireless Company is operating within one to nine city blocks from our own, yet an hourly commercial wireless service is continually maintained by our Company.

I have here a photograph taken last week in San Francisco of a two kilowatt installation of the sparkless radio tone system on board the United States Army transport "Buford." The first day this apparatus was put in operation the "Buford," lying at her wharf in San Francisco, communicated in bright daylight with a Naval Station at Point Aguillos, nearly 300 miles south, a new daylight record on the coast.

A number of other army transports are now being equipped with this system, replacing the spark apparatus.

The art has now actually reached the stage where we can begin to handle overland business in competition with wire lines.

Therefore, the sparkless, wireless telegraph possesses immediate interest to railroad telegraphers as ready means for communicating over long distances between division headquarters, especially at times of emergency when storms and washouts have cut wide gaps in the wire system.

I foresee this use of the wireless telegraph coupled with short range telephone safety signaling and emergency service as occupying a very extensive field of usefulness to railroads and the traveling public.

BATTERY MOTOR RUN AS INDUCTION MOTOR.

By C. M. Adams.

The interesting behavior of a small battery motor while running on alternating current was noted while a friend and the writer were carrying on some experiments with the same.

The motor used was a Midget dynamo or motor. It was originally a shunt wound machine, but its connections were changed to series to enable it to be run on higher voltage direct current.

The alternating current used was 110 volts sixty cycles stepped down to a convenient voltage by a lamp bank resistance composed of four sixteen c. p. lamps, passing about two amperes.

The plain series motor was first connected to the current supply through this resistance but would not run.

Then the armature was short-circuited by connecting the brush holders by a short piece of wire and the two field terminals were connected to the alternating current supply.

The writer and his friend did not expect the motor to run at all and simply tried it as an experiment.

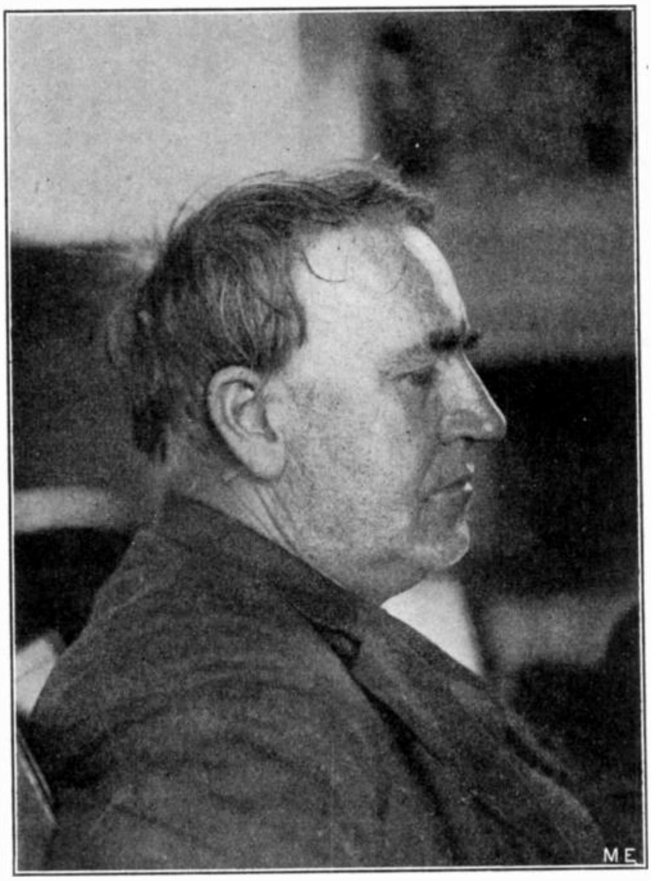
To their great surprise, when the current was switched on the motor started off at a terrific speed and continued to run so.

When connected thus it ran as an alternating current induction motor of the repulsion type. It developed as much power as if it had been run on direct current and was really quite efficient.

If it is allowed to run for some time the yoke and pole pieces will heat up, owing to the eddy currents, but will soon cool off if let idle.

A current of two or two and a half amperes will run it at very high speed if the brushes are adjusted properly which should not be neglected.

Thomas Alva Edison



Character Study of America's Famous Inventor. His Latest Photograph
As He Looks Today

RESTRICTIONS ON WIRELESS.

A bill has been introduced in Congress by Senator Depew, and has passed the Senate, which aims to restrict the use of wireless telegraph apparatus, and which is intended to eliminate interference by amateurs, especially ambitious young experimenters, who are said to interfere with the transmission of business messages through the air, or the ether, as the case may be.

The constitutionality of such an act will be questioned, in view of the fact that there is, as yet, no monopoly of the air or the ether; and there are no exact precedents. Broadly, it would seem that the bill now before Congress would practically establish such a monopoly, and confine the industry to companies which have first entered the field.

The possible interference with official government messages is also assigned as a reason for shutting out messages by unlicensed operators. This feature cannot and should not be overlooked. At the same time, steps which give to the government a monopoly of a great prospective industry, and practically halt experimentation, should be taken cautiously, and with due regard to the rights of all.

One feature must not be ignored. Wireless telegraphy is far from perfect, as shown by the ease with which signals can be made the subject of interference. It is only through stimulating inventive genius that this handicap can be overcome. The Depew act would stifle invention, and retard the advance of the art of wireless telegraphy. It is ques-

(*Continued on page 253.*)

Measuring Box For Condenser Capacities

By A. C. Marlowe.

Paris correspondent Modern Electrics.

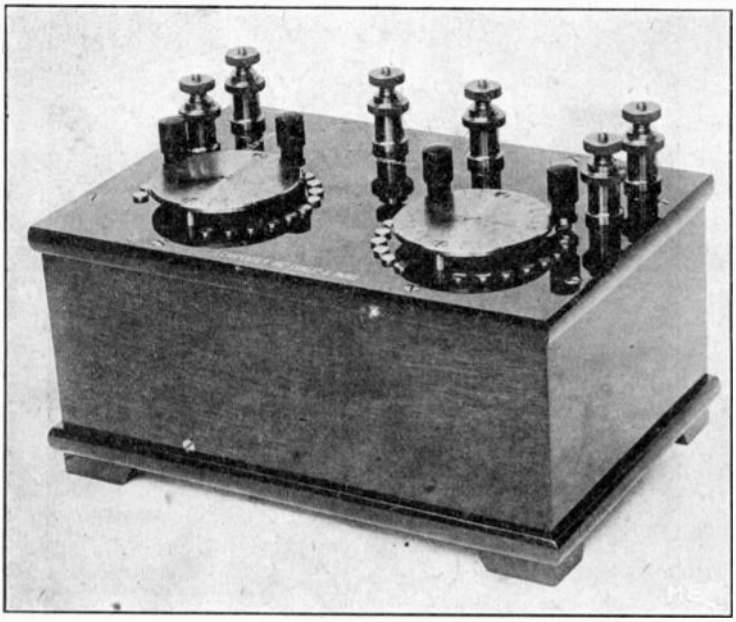


FIG. 1

The Carpentier firm of Paris have brought out a convenient box for measuring the capacity of condensers. It is based upon what is known as the De Sauty bridge method. X is the capacity to be measured and C the standard ca-

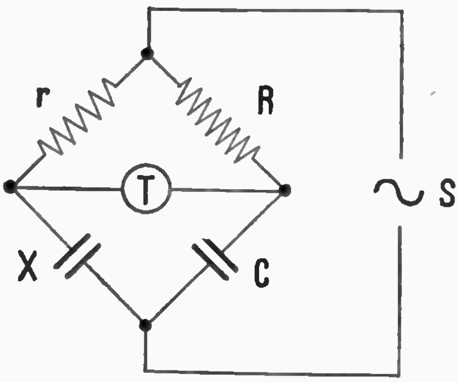


FIG. 2

pacity represented by a small condenser, while r is a standard resistance of 10 100 or 1000 ohms according to the case. R is a resistance which can be varied in steps of 10 ohms and it ranges from 10 to 11,100 ohms. Using this latter resistance we make the balance of the bridge which takes place when the sound is almost stopped in the telephone T. At S is a source of varying current which may be alternating current from the 100 volt mains or a current from an induction coil. In the box there are two series of resistance coils with sliding contacts and also a standard condenser of 0.01 microfarad. Fig. 3 shows the connections of the box. There are six main binding posts which are connected as observed

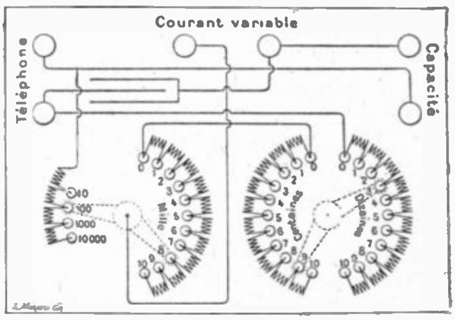


FIG. 3

to the telephone, the source of current and the condenser to be measured. To obtain the balance of the bridge, we find what is the position of the handles corresponding to the four points 10, 100, 1000 and 10,000 and then the position of the three handles of the variable resistances which allow of obtaining the least amount of sound in the telephone. Supposing this to have occurred in the case which the figure shows, with the left handle on the point 100 (100 ohms) and the three others on the resistance points 8000, 900 and 30 (total 8930 ohms), we have X or the capacity to be measured, to be 0.01 (standard capacity) $\times \frac{8930}{100}$ equals 0.893 microfarad. This method has the advantage of making the measurements very easily, quickly and at the same time throughout a wide range.

EINTHOVEN GALVANOMETER.

In a preceding article we gave an account of the wireless station erected in France at Boulogne, on the Channel

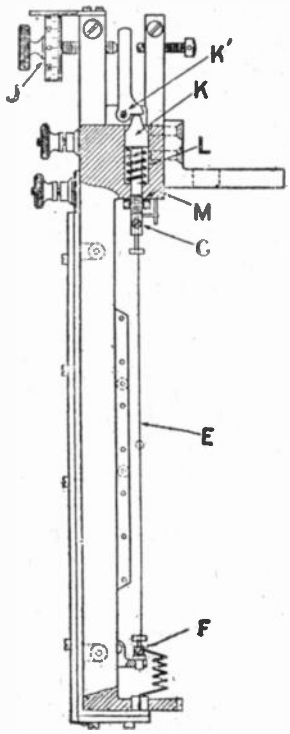


FIG. 1

coast, which is the first to be designed on the Bellini-Tosi directive system. In the experiments which were carried out in order to show the performance of the station, one of the most interesting points was the series of measurements which they made as to the amount of energy radiated by the directive aerial combination, comparing this with what the straight aerial would give. They found that the directive system gave in fact much more energy than the latter, even regardless of the question of directing the waves. It will thus be seen that the question of measurements is likely to become a prominent if not indeed an es-

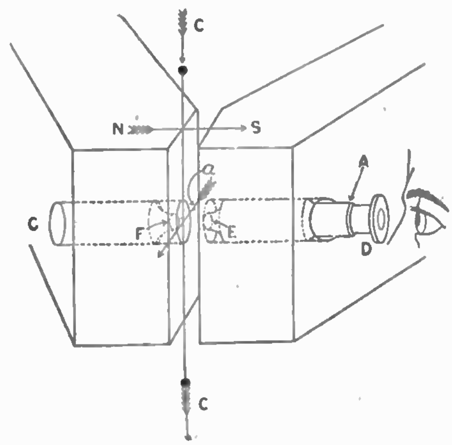


FIG. 2

sential feature in all tests where we wish to compare the performance of different methods. The Einthoven galvanometer, as modified by Mr. Duddell, was used here, and it is also employed by the Marconi company. It consists of a single wire which is suspended between the poles of a powerful electro-magnet. A sidewise displacement is given when even a very slight current flows in the wire. A similar galvanometer but with double parallel wire, is used by Dr. Korn for the receiver of his tele-photographic apparatus, as was recently mentioned.

As constructed for wireless work, the Einthoven galvanometer uses a very powerful magnetic field which is produced by an electro-magnet having heavy iron pole-pieces. In the gap between the pole-pieces. is stretched the fine wire The method of mounting the wire is shown here. For the wire, which must be as fine as possible, platinum, silver or aluminum can be used, but it is found that even smaller diameter can be obtained by using quartz or glass fibres, these being platinized or silvered. The ends of the wire are soldered to T-shaped pieces which are held by the set-screws C and F at the ends. Adjusting the tension of the wire is a close operation and it is carried out by mounting the upper wire-carrier upon a rod having the cam

K on the upper end, the rod being normally pushed up by a spring, L. The lever, K', presses the rod down, this lever being operated by the micrometer screw J. In this way a very fine adjustment of the wire is secured.

The second figure shows the method of observing the displacement of the wire. An eyepiece, AE, is inserted in a hole in one of the magnet poles and the light is projected by the tube C, and the lens F. The wire, stretched between the points CC, and having the current flowing in the direction of the arrows, has a deflection as shown by the horizontal arrow. For projecting on a screen, the eyepiece is removed and by sending a powerful light at C we see the image of the middle part of the wire on the screen, this latter being placed at a few inches away. The amount of deflection can thus be read off, and we thus find the amount of energy which any given aerial will radiate. In the experiments made by Bellini and Tosi at Boulogne, the galvanometer was mounted at a mile or two from the station, using a short aerial in order to take the waves. Comparison could thus be readily made between the values for the directive and the ordinary aerial, and this was much in favor of the former, as was already mentioned.

A photographic record is easily made with the above apparatus, and all that is needed is a suitable device for moving the photographic plate in the vertical sense in front of the image. The plate-holder works upon pulleys and its movement is slackened by a piston which works in an oil dash-pot. The piston is hollow and by regulating the diameter of a hole in the bottom by means of an adjustment screw we can secure the desired speed for dropping the plate. A very small current can thus be read, and this is stated to be as low as 10^{-12} amperes.

NOTES ON WIRELESS INTERFERENCE.

By Bernadotte Anderson.

In the editorial section of a recent issue of this magazine it was suggested that the amateur use a separate aerial for transmitting and receiving, by providing a very small aerial for transmitting, so as to eliminate too long a wave length and that he use his own discretion regarding the height of his antenna for receiving, when it was desired to take in the long distance stations, which is hardly possible without high aerials. This is indeed an excellent suggestion, but it is to be doubted whether the average amateur possesses enough integrity to overcome the temptation of using the better aerial for transmitting and add more fuel to the fire, to this highly agitated wireless legislation.

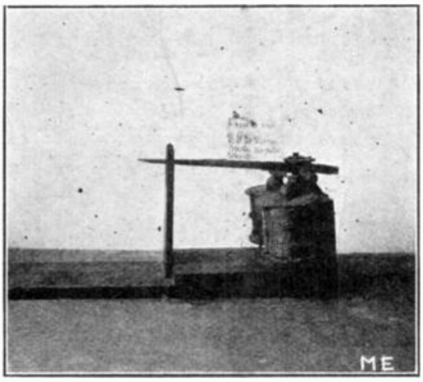
It is indeed to be regretted that the amateur's side of this wonderful and mystic art has reached such a stage where it has been found necessary to secure a compromise to prohibit the experimenter from producing his electric waves in the all pervading ether. However, it is hoped that the remains of the "screenings" of this proposed wireless legislation will at least leave some good things for the amateur. One bill, which carries a clause pertaining to the transmission of prescribed wave lengths, if adopted, will probably open a new field in the wireless supply business for furnishing delicate measuring instruments, and further necessitate an up-to-date knowledge of mathematics, which probably the average amateur of immature age has not been able to get within his scope.

While the majority of the apocryphal statements made by the inventors of these numerous wireless bills are unfounded, yet we have to admit there are quite a number of instances where the amateur has deliberately or innocently interfered with commercial and government stations. However, these instances are rare compared with the flock of amateur experimental stations in certain localities, the majority of whom are always willing to let commercial and government business take precedence over their own private communications, and it is these amateurs who will eventually bring forth the "long felt wants." There is absolutely nothing to be gained by any station, amateur or otherwise, to deliberately "butt in" as soon as any other unfavored stations start sending, as it is only a waste of valuable time, and let us bear the popular "golden rule" in mind, in this respect. On this particular point the writer recalls two rival commercial stations on the Great Lakes who were not friendly disposed towards each other, who made a practice of drowning each other out, until they both realized their fate, and finally agreed to let each other work peacefully. It was one of these same stations who responded to a danger signal from a steamer in distress, and as the responding station was owned by a competing company to the one operating on the steamer, the operator on the steamer would not reply, and according to my understanding several lives were lost owing to assistance not being available in time, on account of this prejudiced act. Discrimination of this sort should be severely dealt with and not permit such unjustified prejudice predominate when life is at stake. This is a case where there should be some law providing severe punishment for such unjust acts.

Considerable mention has been made in the various electrical periodicals devoted to wireless regarding the successful method employed by a Chicago wireless club composed of amateurs, where it is agreed that during the first fifteen minutes of the hour each evening and the whole of Sundays, the members of that club are at liberty to carry on their communications, and during the last forty-five minutes of the hour the commercial companies have that time entirely to themselves. During the day (except Sundays) no restrictions are placed on either the amateur, commercial or government stations. This appears to be a feasible method and can be successfully carried out by other wireless clubs in large localities, and render considerable relief to the congested wireless situation. Wireless clubs should be organized in every locality where there are sufficient members to justify a successful organization, and small initiation fees and dues charged to enable the clubs to promote their interests intelligently. However, there are those who will not associate with organizations of this kind, and it is these selfish amateurs who persist in causing intentional interference. The case of one little amateur in Massachusetts in this respect has become so severe that it has been made a specific point of contention by one of the Representatives introducing a wireless bill. It is also claimed that this particular amateur's language is also very displeasing, which makes it only natural that this should be cited as a specific case in judicial determination of the proposed wireless bills. Other irrepressible amateurs go so far as to maliciously and deliberately "butt in" simply to endeavor to show how much stronger their spark is than others, and don't stop for a moment to realize their insignificance; further, when it comes to their defense in the wireless legislation, they make their childish plea that the commercial and government stations' apparatus is antiquated, not stopping to peruse their own case of their inefficient transmitting apparatus.

In conclusion, the writer wants to thank the editor of this magazine, and knows that every amateur experimenter will join him in this respect, for the good work he has executed in our behalf.

THE FIRST TELEGRAPH



Our illustration shows S. F. B. Morse's first telegraph model, now on exhibition in the Patent Office at Washington. The number of the patent is No. 4453. The model is still in good working order.

RESTRICTIONS ON WIRELESS

(Continued from page 249.)

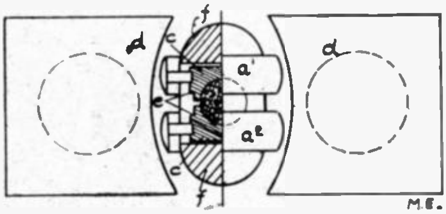
tionable whether it would be wise policy to forbid a young electrical student from experimenting with his crude and simple outfit. For the boy who is ambitious enough to equip a wireless telegraph plant, and is intelligent enough to seek to perfect it, is an electrician in the making.

By common consent of experts, it is considered that we are entering upon an electric age. The experimenting boy of to-day will be the electrician of to-morrow, and the justice of limiting his sphere of experiment is at least open to question.—*Editorial Rochester Democratic-Chronicle.*

Paris Letter.

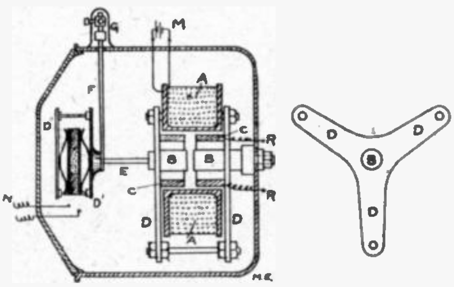
NEW TELEPHONE RELAYS.

A new form of telephone relay has been brought out by the German inventor Stille. Between the pole-pieces D of a strong magnet are mounted the movable coils A^1 A^2 which are like the usual fine wire galvanometer coils and work upon pivots or a wire suspension. As the coils are oppositely wound they tend to approach each other on the side marked E when a current is passed in them, such coils being connected in series. Inside



the coils are placed carbon blocks CC and the carbons are hollowed out so as to form together a cylindrical chamber in which are placed small spheres of carbon or else any of the usual kinds of granulated microphone carbon. To prevent the carbon from falling, the blocks are wrapped around with a small band, preferably of glass wool. The coils are brought into the zero position by tension on the suspending wire or thread or by using a spring. This latter is employed when the coils are mounted on jewel pivots. Using a strong magnetic field in the main magnets, we send a weak current such as a telephone current, into the movable coils. Such current causes the coils to swing together and this compresses the carbon more or less according to the strength of the current. A strong local current is sent through the variable contact formed by the carbons, and this current will thus follow all the variations of the weak current, so that we have thus a telephone relay by connecting a local telephone on the strong current circuit. In practice an iron core, F, is put inside the moving coils as is usual in galvanometer and this core is somewhat cut out at the top and bottom so as to allow of inserting the carbon blocks.

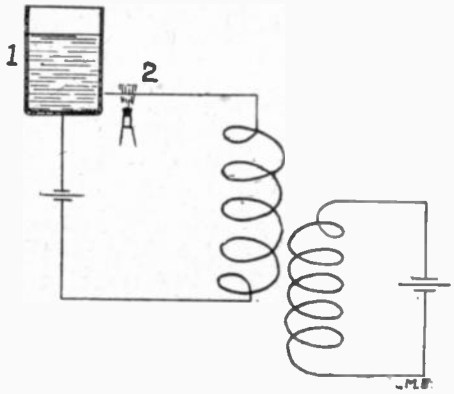
Another telephone relay has been invented in Russia by M. Nikiforoff. The two iron cores, BB, are permanently magnetized by the coil A. Upon these cores there are placed the windings CC which receive the telephone current coming from RR. The cores are mounted each in a star-shaped spring piece, D, which is shown in detail on the left. When variable currents are sent into the coils CC, the iron cores are attracted and repelled, and this movement is transmitted to the left by means of the rod E which is fixed to the spring piece. The second part of the apparatus is held in place by an adjustable arm F. Through an opening in the side the rod E passes, and it works against a microphone contact. This latter is formed of carbon grains contained between two pressure plates, each plate



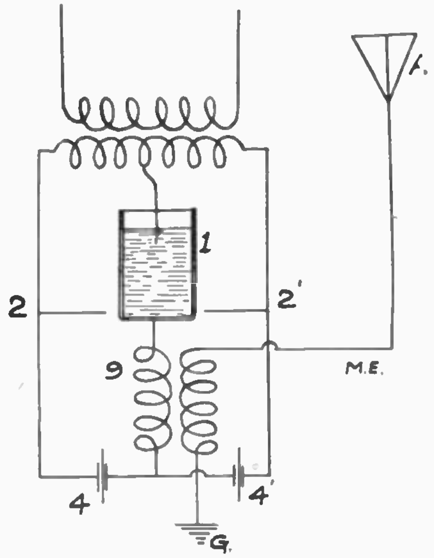
being mounted on a star-shaped spring piece somewhat as we have just seen. When the rod E moves back and forth, it gives a variable pressure on the carbon grains and a strong current, N, is sent through these. Variations in the telephone circuit are thus translated into like variations in the strong current circuit.

HIGH FREQUENCY WAVE APPARATUS.

The following is a new method for producing high frequency waves, in which a sparkless oscillation circuit is made to oscillate by impulses having but one direction. These impulses consist of the first half wave coming from a condenser circuit having a spark gap, and the subsequent oscillations are prevented by including a valve rectifier. As will be noticed, the combined rectifier and spark gap has two electrodes which are kept at different temperatures. One electrode (1) is cooled and the other (2) is heated by a flame or a spark discharge. The electrode (1) is a vessel of good heat conducting quality and it is cooled by the liquid which it holds. Electrode



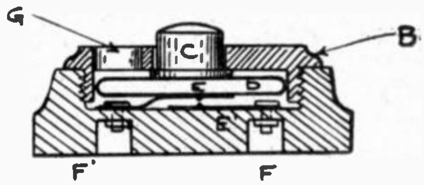
(2) is heated by the flame of a spirit lamp or by a small extra spark gap. When a strong supply current is used, a special means of heating is not needed. When using high tension direct current, we adjust the spark frequency and capacity so that a musical note is produced at the receiver, and this allows of receiving messages in spite of atmospheric



disturbances. The second figure shows a double valve connection. The cooled electrode (1) is connected at the middle point of the transformer secondary, with the other electrodes (2) (2^1) in separate circuit with the condensers (4) (4^1) and a common induction coil (9) so that first one and then the other oscillation is used, according to the momentary direction of the alternating current.

INGENIOUS PUSH BUTTON.

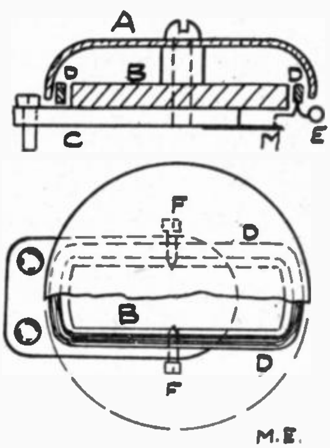
A new form of combined push-button and fire alarm contact is shown here. The fire alarm circuit is put on by the expansion of a liquid contained in a capsule of flexible metal D, and the capsule is placed between the button C and the contact spring piece E. This latter piece makes contact with a lower plate, E^1, when the button is pushed or when the capsule expands by heat. The button C is made in two parts so as to be conveniently mounted with the capsule. The lower part is a threaded socket which is soldered to the capsule and it has an opening so as to allow of filling the capsule with the volatile liquid. This open-



ing can then be closed or sealed by putting on the upper part of the button. In the top cover is the opening G.

A NEW BELL.

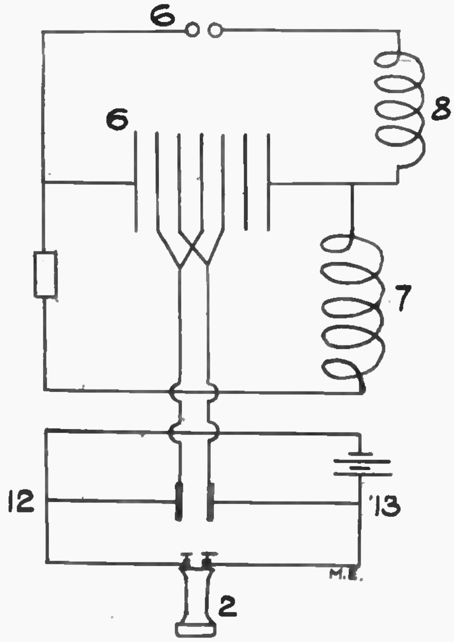
Electric bells have been designed so as to work both on direct and alternating current circuits. In the one which we show here, the coil is movable and it car-



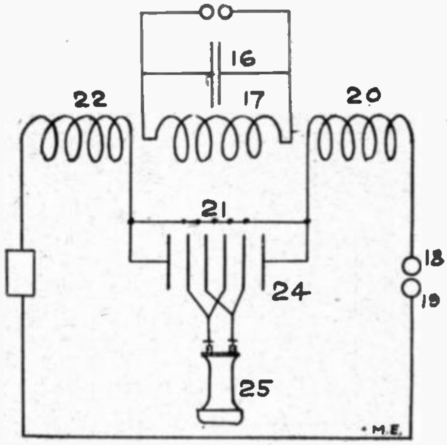
ries the tapper for the bell. On the base plate, C, is mounted an iron piece, B, which serves as a core for the movable coil and the magnetic circuit is completed by the iron bell A. The coil, D, surrounds the core and it works upon a pair of pivots, F, carrying at one end the tapper, E, which comes under the rim of the gong. By adjusting the position of the pivots or otherwise, we make the coil to take the off (or on) position by its own weight, so that a spring is not needed. A suitable contact is placed at M and this is used for direct current. For alternating current the bell works by the impulses of the current.

NEW WIRELESS TELEPHONE.

A new method for wireless telephony consists in the use of incandescent resistances in the circuit. The transmitting telephone, 2, is mounted in the circuit



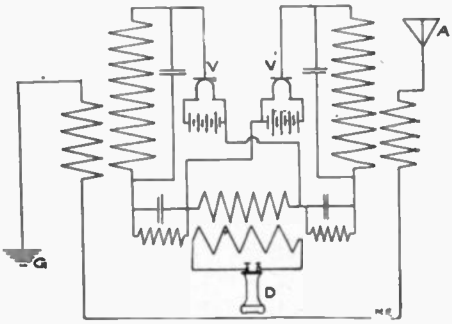
12, 13, and the fluctuating current which it produces is sent to the inner plates of the condenser, 6. This latter works in a strong current circuit having the incandescent resistance, 7, and the conical solenoid, 8, which give current fluctuations in the main oscillating circuit. Using the incandescent resistance we have an increase in the variations of the current. For the receiving system there is used the condenser, 16, and the double cone-shaped solenoid, 17, mounted between two incandescent resistances, 20, 22. These latter are made in the shape of conical solenoids and are connected to the condenser, 24, and the direct current terminals, 18, 19. The receiving telephone, 25, is joined to the inner plates of the condenser, 24, which is shunted by the resistance, 21. For the incandescent



resistances, lamps can be used which have their filaments wound as solenoids.

NEW MARCONI CONNECTION.

The British Marconi Company use the following method for obviating disturbances in a wireless system which are caused by atmospheric influences or by waves for which the receiver is not tuned. There are mounted two rectifying detectors V V' which are connected in two oscillating circuits coupled to the aerial.



One of the circuits is in resonance with the waves to be received, while the natural period of the other circuit is made slightly different. The detectors are connected so that when the capacities and couplings are well adjusted, the currents which they supply to the common telephone receiver, D, due to the disturbing influences, will oppose and neutralize each other.

New York By Night

Broadway at Twenty-third Street and Fifth Avenue. The tall structure is the Flatiron Building

RETURNS FROM FIGHT SENT BY WIRELESS.

By Ellery W. Stone.

Amateur and professional operators along the Pacific Coast near San Francisco received returns by wireless by rounds from the Jeffries-Johnson fight, which was fought at Reno, Nevada, on July Fourth, at the same time that the bulletins were being posted in front of the large newspaper offices.

The returns were flashed from TG, a large wireless station in San Francisco at the offices of the Western Wireless Equipment Company.

The returns were also received by several ships out at sea, among them being the Oceanic Steamship Company's liner "Sierra" on her way to San Francisco from Honolulu, whose operator gave out the fight bulletins to the passengers as soon as they were received.

At 3.39 P. M. TG was sending out returns from the twelfth round when he suddenly started on the fifteenth, saying that Jeff was getting wobbly and that Johnson had knocked him out.

The news was posted on the bulletins at 3.41. Later Hillcrest, the U. W. Co's. big 15 K. W. station at San Francisco, sent out the news of Johnson's victory as did also the government station at the Farallon Islands.

WIRELESS OUSTS TELEGRAPH.

Buenos Ayres, Argentina.—The Postmaster-General has submitted to the government a scheme to replace the telegraph system of the country by wireless telegraphy, declaring that atmospheric conditions in Argentina are more favorable to wireless telegraphy than in any other country and that messages are transmitted to distances never reached in Europe.

The largest wireless station in Europe, that on the Adriatic Sea at Pola, Austria-Hungary, includes a 300-foot tower built on a foundation of glass.

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EDITORIAL

It again becomes necessary for the Editor to take up the matter of wireless legislation.

Although he pointed out a few months ago that there is no immediate danger of the several wireless bills passing Congress, thereby becoming law, dozens of letters are pouring in daily, besieging the Editor for information as to just what can be expected.

Most of the letters come from people who have receiving stations only and who are afraid to invest their money in sending instruments because they are afraid that there is, or soon will be, a law prohibiting the use of sending apparatus.

To these, and all other inquiries, the Editor wishes to make the following statement:

At the present time there is NO law interfering in any respect whatsoever with the transmission or reception of wireless messages except the new law which makes it necessary that all vessels carrying over fifty passengers MUST be equipped with wireless apparatus.

The Depew Wireless Bill passed the Senate some time ago, but this of course does not make it a law as some of our correspondents think. Any bill must pass the Senate, the House of Representatives, and then be signed by the President before it becomes a law.

The Editor is of the firm opinion that none of the wireless bills at present under consideration will be approved by the House of Representatives, at least not in their present form, as public sentiment is very much against these bills, and if any one of them became a law, they would seriously retard the progress of the new art.

In this issue we reprint two editorials from two well-known daily papers which clearly express the Editor's ideas on the subject.

Nevertheless, if all of the wireless bills now pending should become law, there would be little damage done to the amateur's experiments except that he would be restricted in sending messages from one state to another without a license, and messages sent within the borders of the state will not be affected by any of the wireless measures.

A REMARKABLE LETTER.

Editor Modern Electrics,
New York:

Dear Sir—I am sorry to state that my opinion and belief is that you have not answered any one question out of the four questions that I sent you, on the return sheet that you have sent me correctly. I am going to tell you right now, that a person's thoughts is and can be read up all over the city of Philadelphia, whether he or she is on foot or riding on a trolley car, and everything seems to point to it, that the electric waves emanate from a high powered central station; and as the tower there at City Hall is about 525 feet high, it is the most likely and most suitable place for such high-powered electric waves to emanate from, either in Philadelphia or the surrounding country. I know that my thoughts are read up and given out to other people from my home right along, and I know that it is done from a distance and by a high-powered machine by the severe way in which it vibrates on my brains and the deadly shocks that I have received on my person, and the manner in which I have received them. Here the other night, while I was laying in my bed, I felt the sensation of a hand giving me the death grip on one side of me, and one likewise on the other side of me, then a message said into my brains, "I want that $3,000!" My belief is strong that that deathly grip came from City Hall. If not, where did it come from? Surely, no amateur could operate on a person in such a deadly manner as that. My mother is kept sick by wireless waves, and I know it, just for the purpose of making trouble for me and trying to run me out of my home. I suppose they think that if they can murder her by inches by wireless, which they are doing, until she is murdered, that then I would get out, or else keep her sick for the purpose of keeping me out of work; and it seems like that they are to blame for my not being able to get or keep any help about our house, so as to keep me from making a living, so that they can rob me and tie me up complete, and then turn me out a beggar. That's the game of conspiracy that has been in operation on me for months.

This game of wireless as operated in Philadelphia by directive effect amounts to nothing more than murder, robbery, arson, making people sick, running people out of their homes by putting the machine on them so strong as to make life unbearable—some nights making it almost impossible to get any sleep.

Our present Mayor is a Congressman from Washington, D. C. Was this game concocted in Washington, D. C., and sprung on us from there? Now, if we get another Congressman from Washington, D. C., to be Governor of our State, which seems to be the plan, both being Republicans, who will venture to say what will become of the citizens of our State and cities? I say this from the experience of the conditions I have had to contend with for the last two years in Philadelphia, Pa. It looks as if they are trying to work the same game on New York State and city, and if they do, and they mete out upon the people there such unbearable conditions as they have meted out upon the people of Philadelphia, it will be a case of God help the people of New York.

Look at the number of people committing suicide in our city. Philadelphia life has simply become unbearable under conditions as they are in our city. It is bad enough to try and stand the heat some of these hot days, without having a machine vibrating on the peoples' brains, setting them mad. I see in one of our Philadelphia papers that Theodore Roosevelt has already threatened to wield the big stick in New York State on account of his displeasure at the Legislators at Albany not passing the Primary Bill according to his liking. Well, "me thinks good people look out" up in New York. One of those deadly machines or lots of them, must be about ready to spring on the people up there already. We have been smote and yoked down here; now the predicament is to get loose. We should have been more alert and had the saying in our minds: "An ounce of prevention is worth a ton of cure."

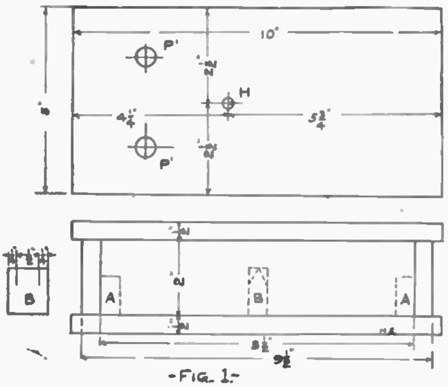
I believe that there ought to be a law passed, making it hanging to extract the thoughts from a person's brains. It is fraud and robbery, and the ruination of our people. Does the deadly machine control the Supreme Court of our State? It looks very much like it to me, when it allows our city to borrow any more millions. It has borrowed millions upon millions already, during this administration.

Your respectfully,
E. F. KEEMLE,
Philadelphia, Pa.

An Automatic Key and Aerial Switch

By J. P. Davenport.

The instrument described here will be found to give excellent results as a key and aerial switch, and is recommended to amateurs for two reasons: First, it saves the operator the time and trouble of throwing over a large switch every time he wants to change from sending to receiving; and second, it enables the operator to tell whether anyone else is sending at the same time that he is, which



-Fig. 1-

will go a great way toward keeping him out of trouble with government and commercial operators. Suppose, for instance, that you start sending a long message to some friend, and at the same time the commercial operator near you is trying to take a long distance message, you would naturally interfere with him, unless your instruments are tuned to send a much longer or shorter wave than the station he is receiving from. And he must wait until you get through before he lets out some of his pent up anger on the unknowing cause of all the trouble. It is easily seen that it need never happen with an arrangement like the following.

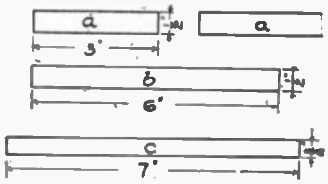
In making the instrument care should be taken to balance the working part as nearly perfect as possible or the key will work stiff.

First, make the box, the size and dimensions of which are shown in Fig. 1. It can be made of almost any hard wood, but mahogany makes a neater appearance when finished nicely. All the wood used is ½ inch thick. The inside measurements of the box are: 8½ x 3½ x 2 inches, and the top and bottom are made 5 x 10 inches so they will protrude ¼ inch all around. The pieces A'A' Fig. 1 are ½ inch thick, 1 inch high, and 3½ inches long, and are fastened to the ends of the box inside, as shown.

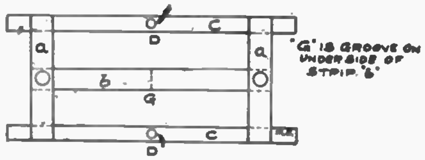
The piece B is ½ inch thick, 1 inch wide and 1¼ inch high, with the ½ inch in the center of the top filed from both sides to a sharp edge. This piece is fastened to the exact center of the box in an upright position.

Next, obtain some ⅛ inch fibre and cut three pieces of the size shown in Fig. 2, a a and b. In the exact center of the piece b cut a groove crosswise about half way through with a three cornered file. This is to set on the pivot B, Fig. 1. From a piece of No. 28 spring brass cut two pieces like c, Fig. 2.

Fasten the two pieces a a, Fig. 2 to each end of the piece b on the upper side. This can best be done by drilling a hole through both pieces and fastening with an 8-32 machine screw and nut. Next, take the two brass strips c c, and

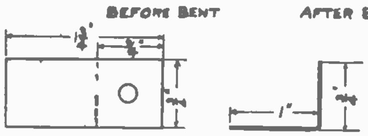


-Fig. 2-

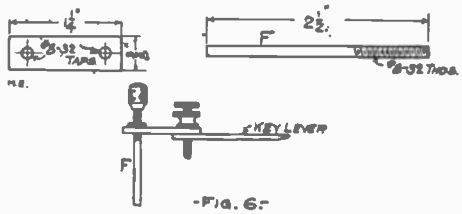


-Fig. 3-

fasten them on the under side of the pieces a a, as shown in Fig. 3, and then solder a short piece of flexible cord to the center of each at D D, Fig. 3, which go to binding posts 1 and 2, Fig. 5, for the aerial and ground. This entire framework sets on the pivot B, Fig. 1. From a piece of No. 26 or No. 28 spring brass cut out four pieces like Fig. 4, and after making the holes, bend at right angles on the dotted lines. Two of these pieces go on each end of the box and are fastened ¼ inch from each side by the binding posts 3' 3' and 4' 4', as will be more clearly understood by referring to Fig. 5, which shows the framework resting inside the box. They should be fastened



-FIG. 4-

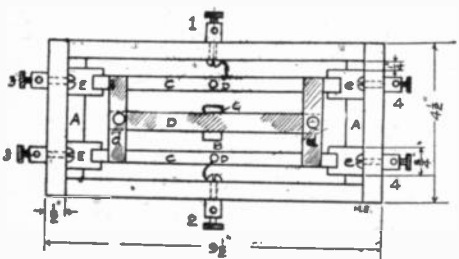


-FIG. 6-

with the longer side resting on the pieces A A, Fig. 1.

Next, take a piece of 5-32 inch round brass rod, 2½ inches long and thread it on one end for ¾ inch with an 8-32 thread, F, Fig. 6. Then take another piece of fibre and cut to the shape shown in Fig. 6 and tapped as shown.

The threaded end of the rod F is screwed into one of the holes in the fibre and fastened with hexagon nuts, and the fibre and rod is then fastened on the end of the key as shown in Fig. 6. The key may be either the leg or legless type, but the latter is preferable as it can be screwed right on top of the box, while with the leg type it is necessary to drill holes in the top and, after fastening the key, cut the rest of the legs off. Whichever type is used should be fastened to the top in such a way that

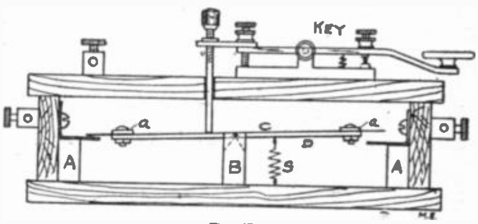


-FIG. 5-

the brass rod, F, goes through a ¼ inch hole drilled in the top as shown in Fig. 1 at H. We are now ready to assemble the instrument. First, place the framework, Fig. 3, on the pivot B. If it is made properly it should have a swing of a little over ¼ inch at the ends, and a little over a 1-16 inch at the place where the rod F will press on the fibre, and it should be very nearly balanced. After setting the framework in, connect the two flexible leads to binding posts 1 and 2 as in Fig. 5.

Next, connect the leads from the key to two suitable binding posts on top of case at P' P', Fig. 1, and we are ready to screw on the cover.

After putting on the top the rod F should press on the fibre strip, B, ¾ of an inch from the pivot B and should be adjusted so that the two brass strips cc press on the pieces EE when the key is normal, and on the pieces E'E' when it is pressed, being pulled down by the spring S, Fig. 7, which should be slightly weaker than the spring on the key, Fig. 7 shows a side elevation of the in-



-FIG. 7-

strument and should make the working of the same clear.

In setting up the instrument, connect post 1 to the aerial and post 2 to the ground. The receiving instruments are connected to posts 3 3 and the transmitter to posts 4 4, the same as would be done in connecting to a D. P. D. T. switch. The working of the instrument is very simple and can easily be understood by looking at the diagrams.

The key must be allowed quite a large play.

W. A. O. A.

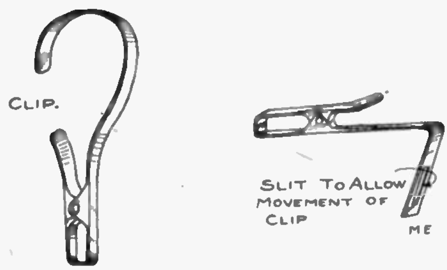
The Wireless Association of America, headed by America's foremost wireless men, has only one purpose: the advancement of "wireless." If you are not a member as yet, do not fail to read the announcement in this issue. *No fees to be paid.*

Send today for free membership card. Join the Association. It is the most powerful wireless organization in the U. S. It will guard your interest when occasion arises.

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

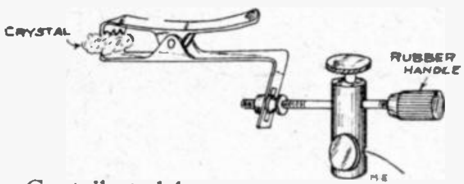
CRYSTAL CLIP.

A clip for holding crystals may be made by procuring some clips from a



stationery store and proceeding as per drawings.

Clamp clip on end of a bar and insert bar in binding post.

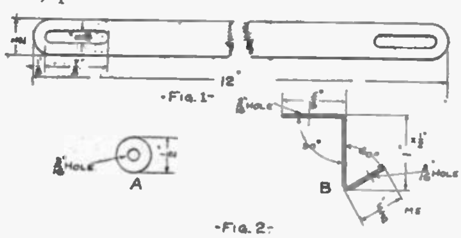


Contributed by

A. TODD.

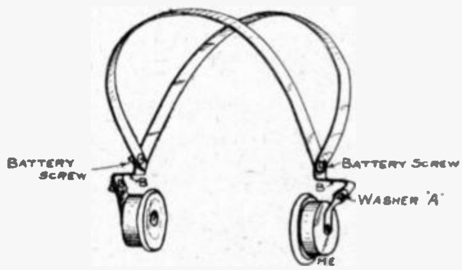
AN IMPROVED HEADBAND.

To make a better fitting and more business-like headband than the one described in the July issue of this magazine, proceed as follows:



Get two pieces of ½-inch ribbon brass each 12 inches long, and slot them as in Fig. 1. To do this, first drill several 3/16-inch holes and finish with a file. Then bend them into a half oval shape to fit the head. From some softer brass ½ inch wide and about 3/64 inch thick make two washers, A, Fig. 2, and two pieces, B, Fig. 2.

File all pieces smooth so as not to catch your hair. Assemble as in Fig. 3.



· FIG. 3·

You can then easily adjust it to fit your head.

Contributed by

PHILIP EDELMAN.

CAN YOU BEAT IT?

While I do not intend entering any "Who can beat it" controversy, I will, purely in the interest of science relate my latest experiment conducted while sitting on a bench in Fairmount Park reading Mr. Wilde's letter in my favorite electrical publication.

The thought occurred to me could I not construct a receiving set from materials at hand. Finding a piece of iron wire under the bench I carefully scraped and cut enough filings to make a short train over half of one of my spectacle glasses.

Bringing the ear piece down to the lens and into contact at one end of the train the hinge being in contact with the other end, I held this to the grounded part of the Park bench. Flushed with nervous excitement my trembling hand acted as a perfect decoherer.

Carefully insulating my body I then for an aerial grasped with my right hand an insulated section of a guy wire which was just in reach back of the bench. By carefully watching the motion of the filings I could plainly read A. R. calling L. I.

Very truly,

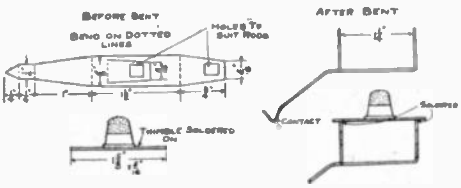
B. C. HILLIARD.

N. B. Wow! Wasn't it A. R. calling L. I. A. R?

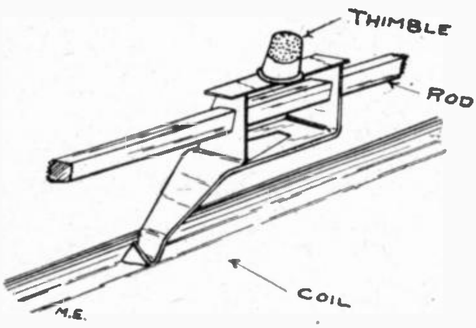
"FIPS!!

SIMPLE SLIDER.

Enclosed find drawings for a slider I made and which proved to be successful.



Most experimenters can get square brass rods in their home town and find it sometimes troublesome to make a



slider that works good on a square rod. The diagrams explain themselves therefore a description is not necessary.

Paint the thimble with melted sealing wax and it will insulate as well as add to the appearance.

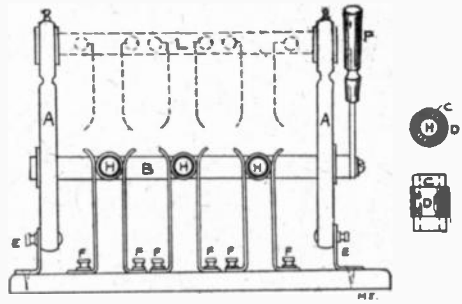
Contributed by

CHAS. E. KECK.

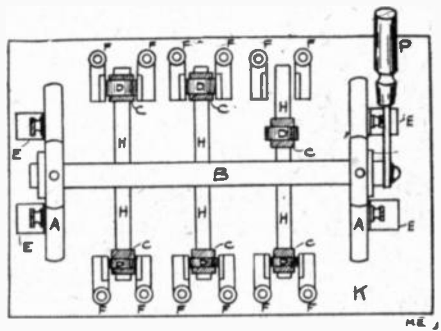
ROTARY SWITCH.

By LYNN OLSON.

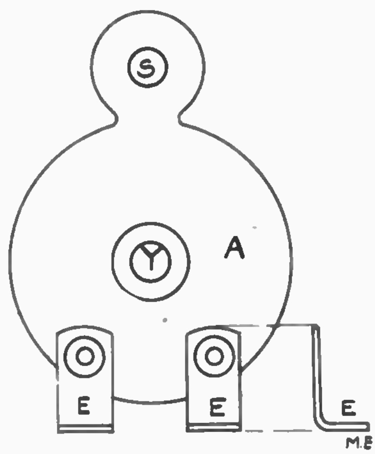
Find enclosed a drawing of a switch I made which I find to work all right. It may be of some benefit to the amateur. The end pieces (A) are from an old magneto. (B) is of hard wood turned down at ends to fit the holes (Y). Three holes are drilled in (B) and hard wood pins (H) are driven through. Some small hard rubber tubes (C) slide up and down arms (H) so you can cut out any circuit you wish. (C) has a copper band soldered around it to make connections between springs (F). Then by pushing



or pulling handle (P) you can operate switches on either side. (E) is brass strips bent in L-shape and fastened to



(A) with battery screws and screwed to board (K) with small wood-screws. If a lot of connections are to be made, the



rigging (L) may be placed in upper holes (S), but stationary.

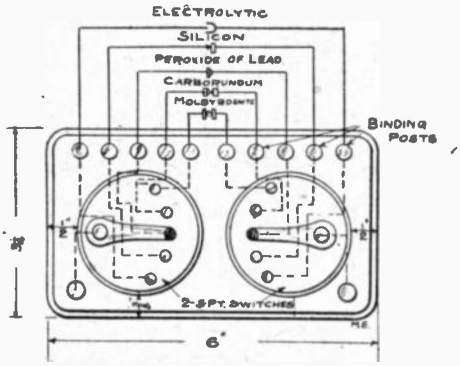
A SIMPLE DETECTOR SWITCH.

Many experimenters wish to test and find the efficiency of the detector used.

It is very unhandy to change the wiring while listening to a message. A single-pole switch is not very good because it leaves the detectors all connected on one side.

This can be overcome by using a switch described in this article.

First, secure two 5-point battery circuit switches. Then make a base 3¼ inches by 6 inches of wood or fibre, the latter preferred. Then put the switches on the base with the points facing each other, have the switches about ⅜ of an inch from the bottom and ½ inch from each side.



Having screwed them to the base, get 12 binding posts off of dead dry batteries, put 2 at the bottom with one on each side. These are to lead to the instruments. Then put the other 10 at the top. Starting in the middle, space them according to the number to be used. The dotted lines shown in the drawing show where the wires run under the base. The wires are led to the detectors as shown.

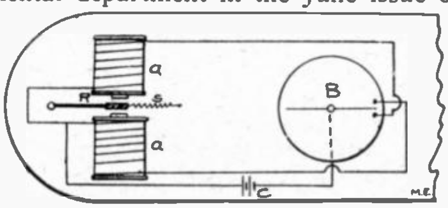
The experimenter will have a switch which will cut in any detectors.

Contributed by

CARROLL M. PFLEEGOR.

ELECTRIC BOAT STEERING.

While looking through the experimental department in the June issue of



a-a'-MAGNETS C-BATTERIES
B-COMPASS R-RUDDER SHAFT
S-SPRING.

your fine magazine, MODERN ELECTRICS, I saw an article on an automatic rudder for model boats.

Having a large model boat operated by electricity, I tried the rudder on it. At first it did not work, but after experimenting for a short time I changed the wiring as in the enclosed diagram. After that the boat steered very nicely.

When the wiring was connected according to the original diagram the magnets only helped to pull the boat in a circular course, as can be seen by following the diagram.

In my model I have eliminated this by changing the wires.

Contributed by

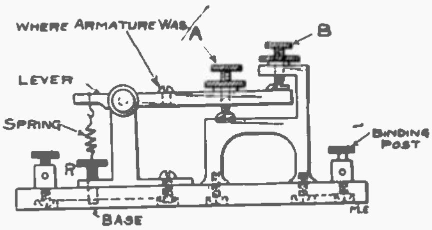
RAYMOND GREENWOOD.

DOUBLE DETECTOR.

A detector for using two minerals is a fairly sensitive one, and you can easily construct it so that it will give excellent results for long distance work.

Get an old telegraph sounder, and take out the magnets and the armature. File down the adjusting screws A and B to a sharp point. Now you may mount the detector on a base or on your receiving set board.

You can choose your own minerals, but for fairly good results, molybdenite can be placed in the lower adjustment, G, or silicon in the top, K. Very fine



adjustment can be accomplished by the thumb screw and spring, R, and the other two points A and B. Of course only one detector should be used at a time.

Contributed by

EDWARD B. DUVALL.

DUPLEX DETECTOR.

Take the graphite or carbon cup out of an "Electrolytic" detector and put a brass cup off the end of a round battery carbon in its place. Fill the cup with melted solder and insert a small piece of fused silicon. For a point use a piece of a brass pin inserted in the holder.

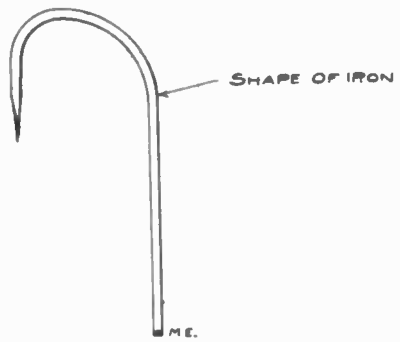
Connect in the usual way.

Contributed by

J. RALPH JONES.

NOVEL METHOD TO CUT GLASS.

As a great many amateurs desire a cheap and sure way to cut glass, I submit the following which was shown to me by Dr. Thomas, Dean of Wabash College, Indiana. First, take a three-cornered pointed file and etch or scratch out the desired shape and figure on the glass. Next, take a piece of half-round iron about two feet long by ½ inch wide, put a point on one end and bend into shape in diagram.



BAR OF IRON

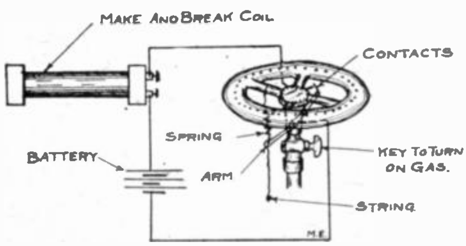
Heat the short pointed end to cherry heat and you can hold the long end in your hand and work all day without burning your hand. Now trace with this iron along the lines made by the file and the glass will break smoothly and evenly. A curious fact about this method of cutting glass is that you can press your finger on glass edges cut in this manner with no harmful result.

Contributed by

PHILLIPS WILDE.

ELECTRIC GAS LIGHTING APPARATUS.

The diagram is complete. Simply turn on the gas and pull the string. The contacts should be immediately over one of



the vent holes to insure quick ignition.

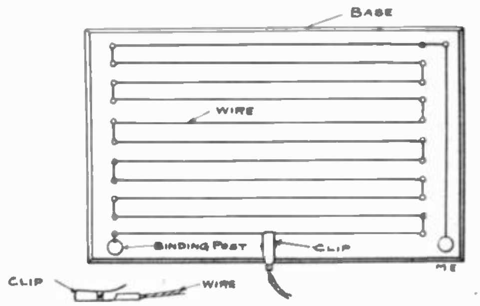
Contributed by

PHILLIPS B. WILDE.

SIMPLE POTENTIOMETER.

A very cheap, non-inductive potentiometer can be made as follows:

Procure a piece of wood 12 x 4 x ½



inches and tack on about 20 small nails about half way in. Now procure some German silver wire about the size of a thread and wind it on the nails, as per sketch, about 10 or 15 feet is sufficient, which can be purchased for 5 cents.

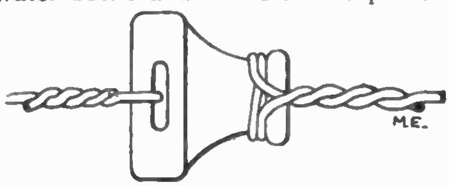
Binding posts can be obtained from the carbon on dry cells. For a clip, use a clip like those used on cuffs or suspenders, and wind tape around it and attach wire.

Contributed by

EUGENE TAILFER.

SIMPLE AERIAL INSULATOR

First procure a large empty distilled water bottle and unfasten the porcelain



top, then put through the hole a piece of wire and fasten to your spreader where the rubber washer was formerly and your aerial wire after the manner shown which makes a very fine small insulator.

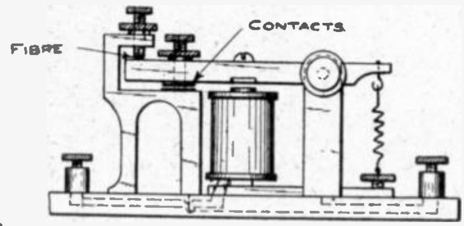
Contributed by

WILLIAM MURPHY.

MAGNET OPERATED KEY.

The growing use of lighting current in connection with transformers necessitates the use of a large contact key. Although an ordinary telegraph key with silver contacts in the shape of dimes, is all right, the danger of disagreeable shock still remains. This is entirely absent in the following magnet operated key, as the only current handled by the operator is the small one from a couple dry cells.

For this key, get a sounder, any make will do as long as it has a wooden base. Take two dimes and file one surface of each flat. Dimes are used for contact because of the high melting point of silver and its very low resistance. Take off the anvil and lever of the sounder and solder one dime on the down ad-



justment screw and the other on the anvil where this screw hits. This will probably be better understood by referring to sketch. The filed surfaces should come together perfectly flat. On the back click screw, glue a little piece of fibre. Then run wires to anvil and lever and key is complete.

If the key is to be used on voltages higher than 110, the wood base should be replaced by one made of fibre, in order to prevent leakage. The contacts might also be made of quarters, if large amounts of current are used.

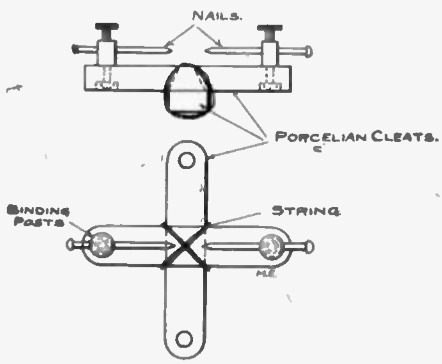
In the diagram given, the key is so connected that it may be used to test detectors, since the 110 V. current circuit is opened when switch is on receiving side, leaving the key to be operated as a sounder.

Contributed by

M. H. Hammerly.

A CHEAP SPARK GAP.

The accompanying drawing shows a cheap and efficient spark gap, which can



-FIG. 1.-

be made from two poreclain cleats, two binding posts, two nails and a little string. Such a gap when finished can be screwed to almost anything and is capable of carrying about one hundred watts with ease, in fact, the writer uses a similar one with a one-quarter kilowatt open core transformer using an electrolytic interrupter.

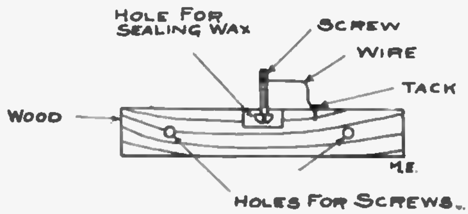
Contributed by

Richard U. Clark.

AN INSULATED ADJUSTING SCREW.

Take a piece of straight grained hard wood about 6 inches long, 2 inches wide and an inch thick. Split this in two and screw it together with two screws as shown. Then take a drill of the proper size and place the point on the split in the wood and drill a hole of the proper depth. Rub some soap or wax around in this hole to fill up the pores.

Now bend a piece of wire as shown and tack it in place and suspend the screw in the center of the hole. Now fill the hole with melted sealing wax. When



the wax is hard take out the screws, carefully pull the mould apart and trim the head with a knife and file.

When the head is smooth it may be polished by putting it in a hand-drill like that shown in the March number of Modern Electrics for winding magnets, and revolving it against a piece of fine sandpaper and then a piece of soft cloth or felt.

I have used this method myself and I find it is excellent.

Contributed by

L. S. Uphoff.

TELEGRAPH KEY.

Materials: Base hard rubber 4 x 6 x ¼ inches.

Lever, 7 x ¼ x ⅛ inches.

Standards (each) 1¾ x ¼ x ⅛ inch.

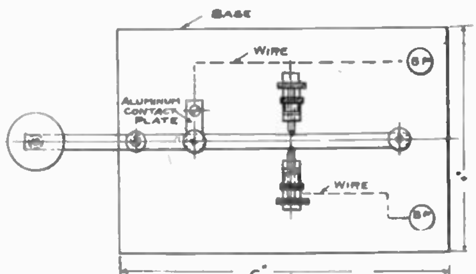
Nine battery binding posts.

Some aluminum (sheet).

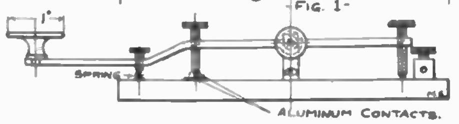
The base is made of hard rubber 4 x 6 x ¼ inch. All holes ⅛ inch.

The lever is of brass 7 x ¼ x ⅛ inch.

Drill a hole (A, Fig. 5) for the handle, a second for the upper contact (C, Fig. 5) a third for a screw to vary the pres-



-FIG. 1-



-FIG. 2-

sure on the spring and one at (D, Fig. 5) to vary the distance the lever has to move.

The two standards (Fig. 3 and 4) are of brass also. Measure 1 inch from one end and bend at 90 degrees. Drill hole at 9/16 in. from bottom (A, Fig. 3) and another at (B, Fig. 3). If one has not the tools to thread them a good plan is to solder a nut on the standard.

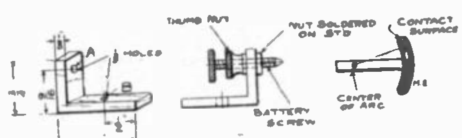


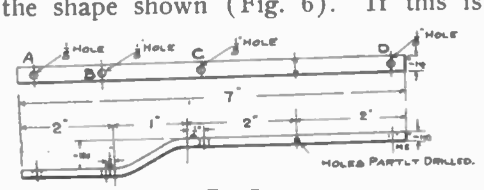
FIG. 3- FIG. 4- FIG. 6-

Sharpen the ends of 2 battery screws (see Fig. 4). These are for the key to move on.

On the lever 2 inches from end (Fig. 5) partially drill a hole to receive the points of the screws in the standards. (See Figs. 1 and 2.)

The handle is made by pouring melted sealing wax into a mould and inserting a battery terminal in the centre, head inwards.

It is a good plan to make contact plate the shape shown (Fig. 6). If this is



- FIG. 5.-

done, when one part gets burned and makes imperfect contact, the plate can be moved. In this way it can also be used as a switch by attaching an insulating handle. Lastly, attach two strips of felt to the bottom of the base.

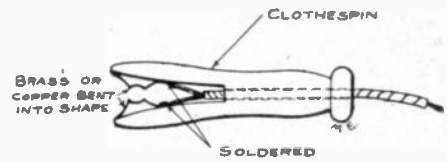
This key if made carefully will give better satisfaction than the strap keys used by many. I have constructed one and find it satisfactory.

Contributed by

A. TODD.

ANOTHER HELIX CLIP.

Noticing a general demand for a good helix clip and the dearth of such articles, I venture to submit the following diagram of one which I have used successfully. A glance at the diagram is sufficient for one to see how it is made and the clothes pin forms a handle of sufficient insulation to insure the holder from shocks while the transmitting set is in operation. It may be more amply



insulated by covering with common tire tape.

Contributed by

PHILIPS B. WILDE.

HIGH AND LOW WATER SIGNAL.

First obtain a piece of wood about 19 inches long and 1 inch thick by 1½ inches wide as shown at A, Fig. 1.

At the bottom of piece A is fastened a piece of wood 3 inches square and 2 inches thick, which is shown at B, Fig. 1.

The wires C and C' (Fig. 1) are made out of telephone wire and are bent into the shape shown in Fig. 2.

These wires should be 3 inches long and the eye (A) is made a little larger in diameter than the wire.

There should be two of these wires and they should be placed thus, C' 3 inches from the bottom of A, (Fig. 1) and C should be placed about 7 inches from C'.

The wire B, (Fig. 1) is 5 inches long and the B in Fig. 3 is about 1½ inches in diameter, and should not make connection with wire D' (Fig. 1) only when in low water position.

The wire D' (Fig. 1) is also a telephone wire and is bent at the top as shown in Fig. 4 at C.

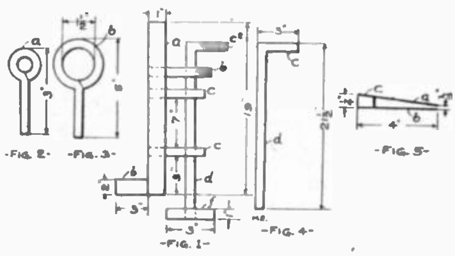
The bend should be at least 1¼ inch so that in case the rod D' should become misplaced it can make contact with the eye B, as shown in Fig. 1.

There should be at least 6 inches of bare copper wire wound on the eye B, (Fig. 3) and also on the bent end of wire D' Fig. 1.

The wire D' should be at least 21½ inches long after the bend is made.

Fig. 5 shows the contact circuit for high water signal.

The thin strips of brass, A and B, are 4 inches long and 1 inch wide and are ¼ inch apart at one end and ⅛ inch at the other.



The block C is a non-conductor.

When fastening these strips of brass onto the wooden post, be sure and insulate the screws from the two strips or otherwise there will be a short circuit.

I used two bells in my diagram in Fig. 6, but one will do just as well and only one strip of brass will then be required.

The wire shown dotted at B, Fig. 6,

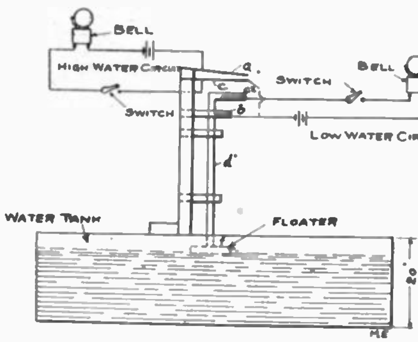


FIG. 6

shows how it should be connected when only one bell is to be used.

The wires from the battery for the high water circuit should be connected to the strips A and B, (Fig. 5) but is shown better at A and C (Fig. 6.)

It is best to have a switch in each circuit in case you do not want the bell to ring, or you want to make repairs or the tank being full or empty.

The floater, F, (Fig. 1) consists of a block of wood 3 inches square and 1 inch thick.

To fasten the wires shown in Figs. 2 and 3, drill a hole in the post, A, (Fig. 1) at places 3 inches and 10 inches from the bottom of the post.

The holes may be a little larger in diameter than the wire and then a tack may be driven in beside the wire to hold it securely in place.

A hole should also be drilled in the center of the floater in the same way as you did for the others.

A low water signal may be made as shown in Fig. 1.

The wires from the battery and bell being connected at C^2 and B (Fig. 1) and this is also shown in Fig. 6.

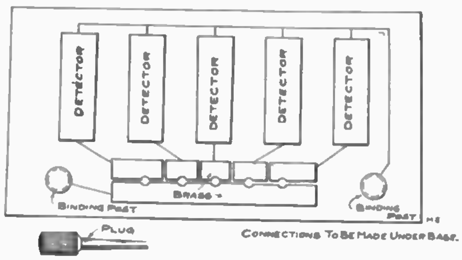
When the tank is full the floater, F, (Fig. 6) pushes the wire D' up until the wire pushes the brass strips together and rings the bell.

Now when the water in the tank is lowered the floater goes down with the water and finally the bent part of the wire, C^2 comes in contact with B, and this completes the circuit to the low water bell.

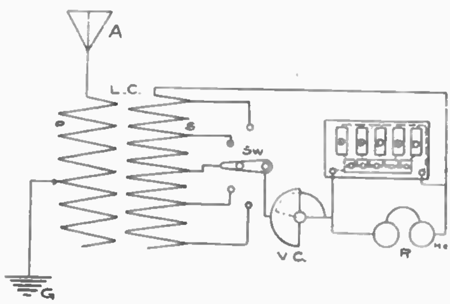
Contributed by DEAN REYNOLDS.

DETECTOR CONDENSER.

Please find enclosed a diagram of a



base for detectors and device for cutting in any number in multiple. There is

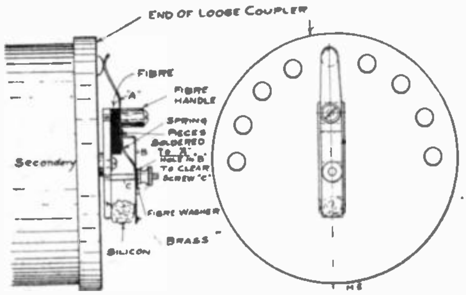


not a diagram of detectors as any kind can be used.

I have 2 silicon, 1 electrolytic, 1 peroxide of lead and 1 mineral detector made on the style of the Ferron detector.

This style of switching is quicker than the rotary switch and I use the 2 silicons in my general work, as it makes the signals louder, is much more sensitive and if one detector breaks down while receiving it does not deaden the circuit.

In trying to reduce the size of my set so as to use it as a portable without reducing the radius, I made a duplicate loose coupler as described in your book, "How to Make Wireless Instruments," but I altered the switch in the secondary and made the handle as follows:



No dimensions because of the various kinds of switches.

Contributed by

EUGENE WULFF.

WIRELESS QUESTIONS.

By

1. What part of a wireless station suggests aviation?

2. In what part of a wireless station would a geologist be especially interested?

3. Name two wireless instruments which suggest something good to eat.

4. What method of tuning would be very disastrous if it happened on a railroad train?

5. What wireless instruments suggest electro chemistry?

6. What two wireless instruments are very important parts of a compound steam engine?

7. What wireless instrument is an atheletic event in almost every track meet?

8. What wireless attachment would be very handy in case your neighborhood had a constantly playing phonograph or piano?

9. What wireless instrument is a kind of wharf and also an important part of a door?

10. What undesirable condition of some instruments is said to exist when a young man talks a great deal to a young lady?

11. What instrument is a part of a lady's false hair outfit?

12. What instrument is a county official?

13. What instrument is very undesirable to have about when one is speaking?

14. What part of a station is always an important part of any high tension transmission line?

15. Change one letter in the name of what transmitting instrument and you will have a characteristic of a fresh kid?

16. What thing used with some detectors would it be dangerous to use against an officer of the law?

17. What lately perfected wireless system would a baseball pitcher like very much to have?

18. What thing much used in some of the late wireless systems is much used in mechanical drawing and in plane geometry?

19. What instrument could a man much intoxicated be said to represent?

20. What essential feature of all tuning apparatus is much spoken of in plane geometry?

21. The plural of what instrument is a disease of chickens?

22. The first name of what instrument is an essential part of a ship?

23. What part of an old fashioned instrument can be found about any blacksmith or machine shop?

24. The name of what part of what instrument if reversed would be very expensive?

25. What instrument would a musician be apt to possess?

26. What part of wireless telegraphy suggests the ocean?

27. Substitute for the last three letters in the name of a county official, two other letters and you will have the name of a modern and very wonderful wireless instrument.

28. What part of an aerial has been the object of many exploring expeditions for many years?

29. What thing used in almost every station is a part of the artillery corps of every army?

30. What substance used in the construction of many instruments is a very undesirable quality of any person?

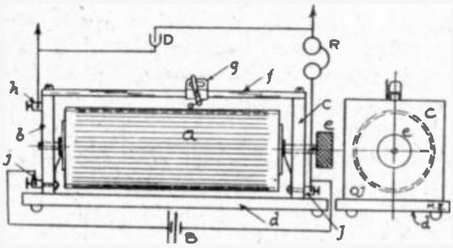
(Answered on page 288)

A Non-Inductive Potentiometer

By H. W. Secor.

The writer will endeavor to show herein how a simple and cheap potentiometer of the non-inductive type may be constructed by any amateur, and at the same time allow as fine, if not finer, regulation than most commercial instruments.

Referring to Fig. 1, A is a cardboard or wood cylinder, revolving between the two uprights B and C. A slider G



-Fig. 1-

moves along the brass bar, F, making contact with the wires on the surface of the cylinder A, which is rotated for adjustment by the insulated handle E. The terminals I and J connect to the battery; terminals H and J to detector and receivers as shown.

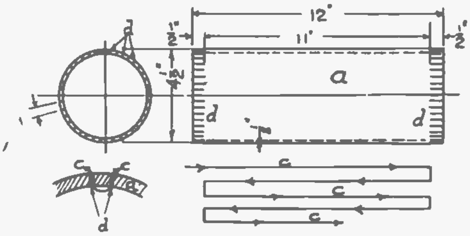
Fig. 2 shows cardboard tube A, and method of winding same. The ends of the tube are slotted ½ inch deep and ⅛ inch apart, all the way around the circumference, The easiest way to lay this out is to take a strip of paper equal to the outer circumference of the tube. Beginning at one end, lay off lines ⅛ in. apart for its entire length. Now wrap this paper strip around the tube and mark off points opposite the lines on the paper, which will give the location of the slots. Needless to say, the slots in the two ends should be directly opposite each other, so that the wires will run parallel to the axis of the cylinder.

Several windings will be given, so that the maker may have an instrument of any resistance he desires. A standard 300 ohm potentiometer may be had by winding on 110 lengths, or 102 feet No. 30 B. & S. Gauge, 30 per cent. Bare German Silver Wire. This will require about ¾ ounce of wire. If wound with the same length of No 32 B. & S. 30 per cent. G. S. Wire the resistance will be 469 ohms. The same length of No. 33 B. & S. 30 per cent. G. S. Wire gives 595 ohms, and if wound with 102 feet No. 35 B & S, 30 per cent. G. S. Wire the resistance resultant will be about 1000 ohms.

Fig, 2 shows the method of winding. The wire C is stretched along the surface of the tube, A; taken down through slot D, drawn across the inside of the tube to the next slot D, passed up through this slot, stretched along the exterior of the tube, etc., until the whole winding is in place. The direction of the winding is shown at B.

After the cylinder has been wound it should be given a good coat of shellac, dried, and then given another coat. This will hold the wire in place and also improve the insulation. Clean off all the wire on top, by scraping off the shellac with a dull knife.

The two terminals of the winding are connected to two brass contact plates

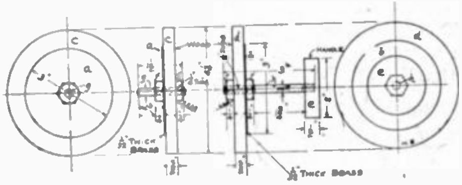


-Fig. 2-

shown at A and B, Fig. 3. In this figure C and D are two wooden disks, slightly tapered so as to fit tightly into the ends of the cardboard tube; G and H are two brass studs acting as journals for the cylinder to revolve on. E is an insulating handle of wood or hard rubber, serving to rotate the cylinder so that any turn of wire may be brought under the slider G.

The base and upright of the instrument may be made of quartered oak or mahogany. The base should be ¾ in. by 16 in. long and 5 ½ in. wide. The uprights are ¾ in. thick, and 5 ½in. square. The holes for the cylinder journals are laid off in the center of the faces of these uprights. The space between them should be 12 ½ inches.

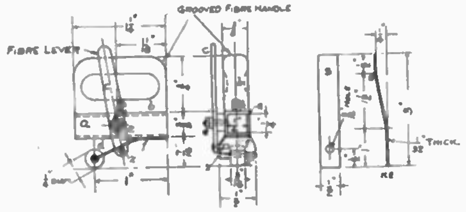
The brass slider rod is 1/4 inch square, and 14 inches long. The slider is of a special design, as seen in Fig. 4. The revolving wheel D of brass, is made with its face slightly convex, to add to its working quality. It is best to remove the contact wheel from the wire when turn-



-Fig. 3-

ing the cylinder, and for this purpose a fibre or hard rubber lever is attached to the side of the slider as shown. This lever carries at its lower end, a pin X which lifts the wheel spring F, when the lever is pulled forward. If the lever pin E, is properly located, the lever when pulled forward will retain its position until pushed backward again.

Contact is made with the cylinder winding terminals, through two brass or phosphor bronze springs, S, Fig. 4, fastened to the inside faces of the uprights and pressing against the brass discs A.



-Fig. 4-

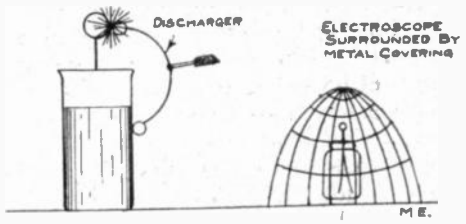
and B. fig. 3. These contact springs are fastened to the binding post I, and J.

To adjust potentiometer revolve cylinder; and then lowering slider contact wheel move the slider along the wire. With a 300 ohm winding, the regulation is .245 ohms per 1 inch of wire hence moving the slider ½ inch will vary the resistance .12 ohm, etc.

LIGHTNING VS. WIRELESS.

By George F. Worts.

The protection of wireless instruments and the buildings that they occupy from lightning, should enter potently in the mind of every owner of a wireless station whether commercial or experimental The fact that a properly grounded aerial is a safeguard to the buildings in its vicinity can be proven by reference

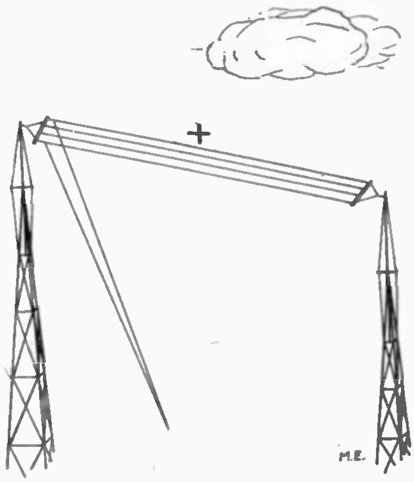


-Fig 1-

to the experiments of Faraday and Franklin.

That the charge on the outside of a conductor always distributes itself in such a way that there is no electric force within the conductor was first proved experimentally by Faraday. He covered a large box with tin foil and went inside with the most delicate electroscopes obtainable. He found that the outside of the box could be charged so strongly that long sparks were flying from it without any electrical effects being observable anywhere inside the box. This proves that the buildings under or near an aerial of comparatively large capacity are safeguarded to a large extent even though not entirely surrounded by the metallic covering.

A simple experiment to prove this statement may be performed as follows: Place an electroscope beneath a bird cage or wire netting, bring charged rods



or heavily charged bodies near the electroscope outside the bird cage. The leaves will be found to remain undisturbed. (Fig. 1.)

We may refer to Franklin's experiment with the lightning which every student is more or less familiar with. In 1752, Benjamin Franklin, during a thunderstorm sent up his historic kite. At the top of this kite was secured a pointed wire. As soon as the kite string became wet he succeeded in drawing ordinary electric sparks from a brass key attached to the lower end. This experiment demonstrated for the first time that thunder clouds carry ordinary electrical charges which may be drawn from them by a method similar to that he used. It showed that lightning is nothing but a huge electric spark. Franklin applied this discovery in the invention of the lightning rod. The way the rod discharges the cloud is as follows: As the charged cloud approaches the building, it induces an opposite charge in the rod or aerial as the case may be. The induced charge escapes rapidly and quietly from the lightning rod and thus neutralizes the charge of the cloud. A wireless aerial will prove a much more efficient lightning protector than the lightning rod, owing to its usually nearer proximity to the cloud, also its greater exposed surface. It will be seen, therefore, that aerials protect buildings, not because they conduct the lightning to the earth, but because they prevent the formation of powerful charges in the neighborhood of the building on which they are placed.

There are certain kinds of discharges, however, from which lightning rods or aerials do not protect a building. In general, however, they do greatly diminish the liability to lightning stroke.

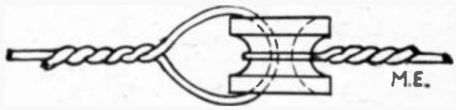
The body of the fire underwriters' rules for protection of wireless instruments from lightning is given below:

1. Aerial conductors shall be permanently and effectively grounded when station is not in operation, by a copper wire, no smaller than No. 4 B & S gauge fastened to a waterpipe at a point on the street side of all plumbing connections or to some other equally satisfactory earth connection.

2. Aerial conductors when grounded as above specified must be efficiently cut off from all apparatus within the building or grounded through low resistance lightning arresters consisting of brass or copper plates (separated no farther apart than .015 of an inch and properly insulated) or by other approved low resistance arresters.

3. If the aerial is grounded through a switch, it shall be of the jack knife type and capable of carrying 100 amperes.

4. The wire leading to the ground shall be insulated from the sides of buildings, etc., by poreclain cleats. It shall lead in as straight a line as possible from the aerial to the ground.



- FIG. 1 -

THE CONSTRUCTION OF AN 80-FOOT MAST.

By L. J. Nadan du Treil.

Many articles have appeared on the construction of wireless outfits, but it is surprising that so little has been written concerning masts to support the aerial. It is the object of this article to describe the construction of a mast which is inexpensive and can easily be erected by three persons.

The articles necessary are the following:

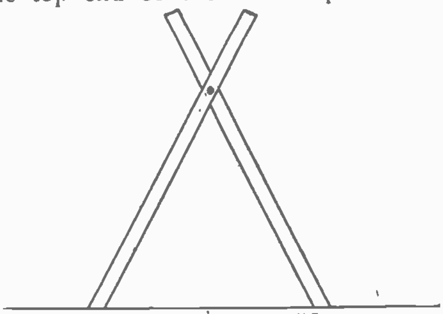
1 piece pine 4 x 4 in. x 30 ft. long.
1 piece pine 3 x 3 in. x 30 ft. long.
1 piece pine 2 x 2½ in. x 30 ft. long.
40 pieces pine or cypress 4 x ⅞ in. x 20 in.
2—8 x ½ in. bolts with washers.
2—6 x ½ in. bolts with washers.
35 lbs. No. 14 galvanized iron wire.
150 ft. ⅜ in. rope.
1 small single block (for ⅜ in. rope).
40 glass or porcelain insulators.

The wood should be free from all large knots. The pieces 4 x ⅞ in. x 20 in. are for steps, and their dimensions can be changed to suit builder. However, they should be strong enough to hold an ordinary person. The mast should be erected at a point from which the guy wires can be run 30 feet or more from its four sides. Two holes ½ in. in diameter and 5 feet apart are bored through one end of the 4 x 4 in. piece, through one end of the 2 x 2½ in. piece, and through both ends of the 3 x 3 in. piece. The first hole can be about 6 inches from the end.

The steps are now nailed on the 4 x 4 in. and 3 x 3 in. pieces about 1½ ft. apart. Four guy wires about 50 feet long are attached to the 4 x 4 in. piece about 6 feet from the end in which the holes were bored. Screw eyes should never be used as they are liable to be pulled out. A good method is to wrap the end of the wire twice around the wood and twist it around the long wire. About 2 feet from this place cut the wire and insert an insulator as shown in Fig. 1.

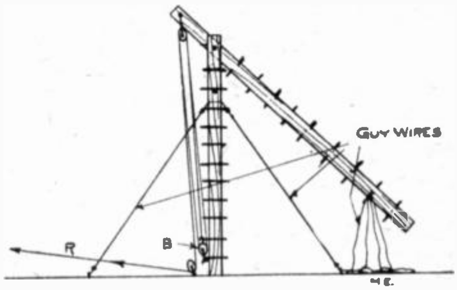
The mast should be bolted to a building or post. Suitable bolts should be provided and holes bored for them beforehand. To raise the 4 x 4 in. piece the end on which there are no guy wires is placed against the building or post. One person should then lift the other end over his head and walk under it toward the base. Two persons should assist him with two crossed pieces as shown in Fig. 2. When the piece is upright and bolted, each guy should be cut and an insulator inserted about 2 feet above the place where it is fastened.

Four guy wires, 90 feet long, are attached to one end of the 3 x 3 in. piece in the same manner, and distance from the end as for the first piece. The other end is hoisted to the top and one of the 8-inch bolts passed through the top hole of the first piece, and the lower hole at the top end of the second piece. See



-FIG. 2.

Fig. 3. It will be seen in Fig. 3 that the steps are on opposite sides of the pieces in order not to interfere with one another. A block and tackle composed of three single blocks and 130 feet of ½-in. rope will be needed. One end is fastened to the top hole of the second piece with a doubled No. 14 wire, the other to the mast about 5 feet above the ground. By hauling on the rope R, the pole gradually swings upwards. The guys are then fastened at the same points where the lower set are fastened.* Insulators should be inserted in the same manner as for the first set. Four guys, 65 feet long, are fastened to the middle of the second piece. Insulators are inserted as in the other sets. The third



-FIG.- 3-

section (the 2 x 2½ in. piece) may be trimmed down toward the end through which there are no holes. This is not absolutely necessary, as it adds only to the appearance of the mast. The small block mentioned in the list is fastened to the end, through which there are no holes with a piece of No. 14 wire doubled. It is best to have the block at least 6 inches away from the mast. The rope is passed through and the two ends tied together. About 1½ feet below this attach a set of four guys each about 100 feet long; and about 12 feet below the pulley another set, each guy being 90 feet long. The end, through which are the holes, is hoisted to the top of the second piece, bolted to it, and the block and tackle attached in the same manner as for the second piece. The second set of guys from the top can be made 12 feet long and the loose ends fastened to the same section near the holes. The other pieces can be tied on after the third section is upright. It will be seen that this simply obviates the necessity of handling 8 guy wires instead of four while the third piece is going up. If the block and tackle rope is not more than 130 feet long, block B in Fig. 3 can be moved to the top of the first piece.

Insulators are inserted in the guys to keep them from absorbing the waves received and sent. When a powerful sending set is used it is better to insert insulators in several places besides at the used for this purpose, as they can stand little strain and when they break the, guy is broken. The advantages of the insulator shown in Fig. 1, is that it will stand much more strain and in case it

(*Continued on page 276*)

*The block and tackle is removed from the hole and the other 8-inch bolt inserted.

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 laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

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

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

FIRST PRIZE THREE DOLLARS.

Enclosed please find photo of our wireless equipment. At the left of the picture is our receiving set. This consists of a double-slide tuning coil (in front) battery (inside of box) two telephone receivers, 1,000 and 75-ohm resistance, and two detectors, namely, silicon and perikon, fixed condenser (in back). These are all mounted on one base; either detector may be thrown in instantly by a two-point switch.

At the right is our sender. In the center of the table is an E. I. Co.'s sending helix, adjustable condenser, key, E. I. Co.'s one inch coil, spark gap, 18 dry cells and D. P. D. T. switch (not seen) in back of the helix to throw in the sending and receiving apparatus.

The aerial is composed of 4 aluminum No. 14 wires, 100 feet long, 3 feet apart and about 70 feet above ground.

On the lead-in of my aerial (outside of window) I have a S. P. D. T. switch, which I ground when not using instruments. Call letter W. A. S. I get good results from this outfit.

WEBER & SEEMAN,

Brooklyn, N. Y.

HONORABLE MENTION.

The Wilson Military Academy of Finderne, N. J., was the first educational institution to adopt "Wireless Telegraphy" as a part of its curriculum and on account of its proximity to New York City, where a large number of high power stations are in operation, is always in touch with some commercial station either afloat or on land. The equipment consists of a Clapp Eastham transmitting outfit of one kilowatt power, while the receiving set is of the composite type. Excellent results are obtained with a four-wire flat-top aerial and quite often it is possible to read distinctly, ships miles below the Delaware Capes that the Waldorf Office of the United Wireless Co. has trouble in copying on account of the amateur interference from Brooklyn and vicinity, the academy station being just out of range of most of these amateurs. The music-like note of the Marconi Station at Cape Cod comes in at the Academy with remarkable distinctness and makes one of the most interesting stations to copy on account of

its clearness. The wireless instruction is in charge of Professor Ronan, an old-time operator and formerly with the United Wireless Telegraph Company. The picture shows Mrs. L. M. Wilson, wife of Lt. Wilson, the principal of the Academy, at the instruments. She is a proficient operator and has a large book of messages she has picked out of the air during her leisure moments. Mrs. Wilson is quite a wireless fiend and not satisfied with copying messages from the instruments in the wireless room, she has extended the detector loop into her living rooms where she sits with the receivers to her ears, while sewing or reading. She is justly proud of her ability as a wireless operator and says it makes one of the most facinating and interesting pastimes any woman could take up.

HONORABLE MENTION.

This photo represents the equipment of the School of Wireless, San Jose, California.

Opr. Newby has on a pair of E. I. Co. 3000 ohm phones with which the school has copied the S. S. Manchuria nearly 2,000 miles out of San Francisco.

In front of Newby is the wonderful little one-inch E. I. Co's. coil with which

he sent the congratulatory message from Major W. G. Hawley, postmaster, San Jose, to Rear Admiral Hugo Osterhaus, Mare Island, a distance of 70 miles overland in broad daylight with same one-inch coil. He also talked to the Farallon Island (Gov. Station) 90 miles (at midday) over half of this distance being overland.

He also used the same one-inch coil to talk to the U. W. T. Co's. station at Monterey. This is overland and across a chain of high mountains.

The aerial used consisted of over 7,000 feet of No. 14 bare copper, the arrangement being based on the Letcher System. It is distortionless, the only capacity used being that of the aerial, the decrement of damping .001.

HONORABLE MENTION.

Enclosed please find photo of my wireless.

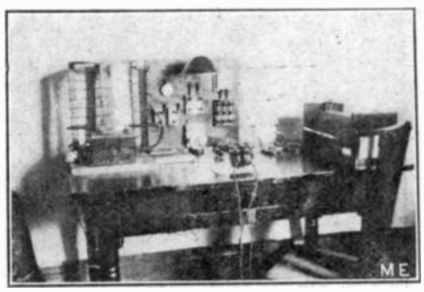
On the left of the photo is the sending apparatus, consisting of a helix, one 1-inch spark coil; 1 pair of spark gaps, and Morse key with silver contacts (sending condensers not shown in photo, transmitting apparatus run by 110 V. AC. lighting current, with electrolytic interrupter in series.

Switchboard in center of photo contains four switches, and fuse block, one triple pole, double throw aerial switch, one double pole single throw 110 V. AC switch for primary circuit, and two single pole single throw switches, one for shunting detector, and one for battery switch on receiving instruments.

On the right, can be seen the receiving instruments, consisting of one double slide tuner, wound with No. 20 B. & S. double cotton covered copper wire, one silicon and one electrolytic detector, which can be seen in between switchboard and tuner, three fixed condensers, one pair 3,000 ohm Murdock am. type phones.

Use loop connections for receiving.

All instruments made by myself with the exception of phones and spark coil. Now building ½ KW, under construction.



Aerial is about 200 feet long and am situated on top of high ground. Sending radius about 15 miles, and receiving radius about 1,000 miles.

I read MODERN ELECTRICS every month, and have gotten many good ideas toward improving my station from it.

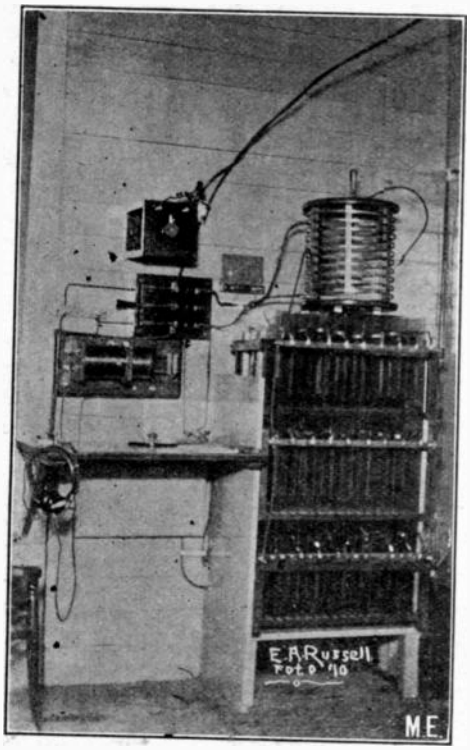
JOS. DAVIS,
San Francisco, Cal.

HONORABLE MENTION.

Enclosed please find photos of my wireless station which I have recently completed.

My aerial is composed of two wires 800 feet long, suspended from a tower 180 feet high.

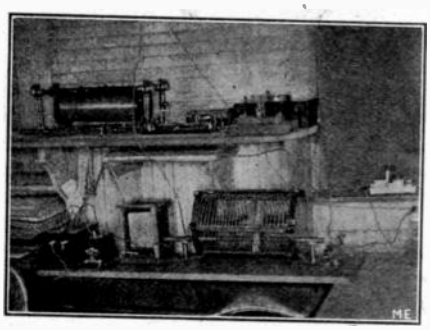
I have obtained excellent results with this outfit, being able at times to copy



Key West, Fla., and Houston, Texas.
Michigan. O. H. STECKER.

HONORABLE MENTION.

On the shelf along the wall is my D.



S. tuner, variable condenser, coherer and de-coherer, and detectors electrolytic and silicon, in front of them are my 'phones, potentiometer, 4 pole switch for transferring the detectors, fixed condenser and oscillaphone; of the above I made tuner, silicon detector stand, fixed and variable condensers and oscillaphone.

On table below from left to right are my ½ and ¼ K. W. coils in parallel, sending condenser, D. S. Helix with spark gap inside of coil, key, switch and interrupter, of these I made condenser, spark gap, helix and key.

My aerial is of the inverted fan type, 35 and 45 feet high, 4 aluminum wires No. 14.

My tuner is 14 inches long by 4½ inches in diameter, wound with No. 18 D. C. C. wire, two slides on rods on top; I find this coil of great value and power, but am making a variable coupling coil.

Sending condenser is of G. P. type, 52 plates, 6 by 8 inches, with foil interposed. I find this type sparks some in service and propose immersing same in paraffine.

Spark gap is made of ⅝ inch brass rods; Helix is made of No. 10 bare copper wire, 9 inch in diameter by 12 inches long, with two slides, on top and side. The key is built up of rubber bushings and tubes, trunnion of ⅝ inch brass.

I use E. I. Co.'s ½ K. W. coil and W. E. Co.'s ¼ K. W. coil in parallel, and find they work admirably well. I use D. C. 100 volts; also use E. I. Co.'s interrupter; it certainly does break the current.

Up to January 1st I knew nothing about the make-up of the above instruments, but having an electrical knowledge could readily understand the excellent description and explanations set forth in MODERN ELECTRICS; consequently had no technical difficulties in making same.

Sending, I use the Fessenden System, and receiving use a compromise Fessenden and Massie. I have no trouble listening in on several stations, but having only ¾ K. W. cannot reach them.

Arkansas. C. C. HUMBER.

THE CONSTRUCTION OF AN 80-FOOT MAST.

(Continued from page 272.)

should break the guy is not broken. Regular wireless insulators may be used with safety.

The aerial should never be pulled within 6 inches of the pulley because rain contracts the rope and if pulled in tight it would break.

If more than one aerial is used and the weight would be too much for the third piece described, a larger piece could be used.

The cost of a mast as described would not be more than $7 or $8.

AMATEUR WIRELESS.

The amateur wireless operators are protesting against a law that only those who have received the Government license may use the atmosphere for the purposes of wireless telegraphy, and that this license shall be granted solely to professionals. This proposed legislation has an extremely modern sound; like the suggested aviation treaty between the United States and Mexico, it involves an issue that is distinctively of the twentieth century, and unimaginable to our forefathers.

The science of wireless telegraphy, like that of aviation, owes much to the enthusiastic experiment of amateurs. When Professor Dolbear, of Tufts College, and Professor Trowbridge, of Harvard, were engaged in their earlier researches, they might fairly have been styled amateurs, and so might Marconi or De Forest. When the Wright Brothers were building their first airship in the much-ridiculed mystery of fenced-in seclusion at Dayton, Ohio, they were amateurs. The more wits there are at work on any inventive problem, the more ingenious improvements are likely to be evolved. Many valuable scientific devices have been the composite product of an era of intellectual ferment rather than the crystallization of the individual concept of a solitary worker.

The rapid increase of wireless telegraphy appears to call for some kind of regulation, for the protection of those who pursue it seriously against irresponsible interruption. Yet it seems almost as unreasonable to issue official licenses for the use of the air by wireless operators as it would be to restrict aeronautical ascents to professional sky-pilots. As the conditions of wireless communication have been made to approximate more and more closely those of an exact science, the introduction of precise methods of measuring wave-lengths and controlling the frequency of vibrations has minimized the serious problem of mid-aerial interference, until now it is possible so to adjust the receiving and the transmitting apparatus that the vibrations need not interfere with those that are sent and taken in accordance with an established official standard.

The wisest scheme of regulating wireless operations will be that which does not penalize ingenuity, but allows the freest possible scope to the amateur inventor, who often has private means to devote to his hobby for experiments for which the professional operator has neither the time nor the money. The Government should establish at once a standard wave-length, instead of enacting into law a measure that will be extremely difficult, if not impossible, of enforcement. — *Editorial Philadelphia Ledger.*

BOOK REVIEW.

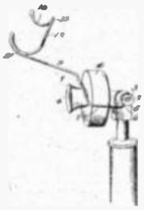
Flying Machine Construction and Operation, by Jackman, Russell and Chanute. Published by The Charles C. Thompson Co., Chicago, Ill., 1910. Profusely illustrated. Price, Cloth bound, $1.00; leather bound, $1.50; 250 pages.

This book written by three recognized authorities, is a timely publication at this epoch, when the aviation craze has spread throughout the world. The first few chapters treat on the theory, construction, and manipulation of gliders. As the glider is only a stepping stone to the motor driven aeroplane, the experimenter will welcome the drawings and the descriptions for full size gliders. The chapter on "Learning to Fly" gives interesting and valuable data on the art of gliding.

A few chapters are entirely devoted to the building and operation of a full size successful aeroplane. Every detail may be mastered through the pages which contain drawings of all the parts. Among the points mentioned are: The kind of materials to use; how to prepare and assemble the parts; how to select, install, and operate the motor; expense of construction; sailing the machine; equilibrium; stability; and many other features of interest to the aviator or layman. The book contains historical notes, photographs, and descriptions of all the types of machines both American and European, theories, comparisons of the birds and aeroplane, figures on flights, winds, engines, planes, etc. A chapter is devoted to a discussion of the Wright patents, describing the meaning and operation of the warping wings, which has been misinterpreted, but vaguely understood by the average layman.

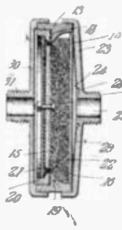
Electrical Patents for the Month.

963,628 TELEPHONE RECEIVER ATTACHMENT George N. McComb, San Francisco, Cal Filed Dec 27, 1909 Serial No 535,192



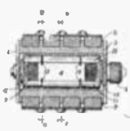
1 The combination in a telephone receiver, of an arm having segmental bearing members at one end, said arm having means at its opposite end to secure it to the transmitter, and an intermediate portion bent substantially at right angles and crossing above the transmitter and adapted to rest and be supported upon the same

963,214 TELEPHONE TRANSMITTER Charles L. Christie, Marysville New Brunswick, Canada Original application filed Jan 20 1909 Serial No 473,171 Divided and this application filed Mar 9 1909 Serial No 482 212



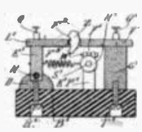
4 A telephone transmitter having a diaphragm for receiving the direct impact of sound waves said diaphragm being peripherally supported without stress, and superficially unobstructed on its sound receiving face and also having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted

964,033 GENERATOR APPARATUS Oscar M Leich, Genoa, Ill, assignor to Cracraft Leich Electric Co, Genoa, Ill Filed June 10 1908 Serial No. 439,305



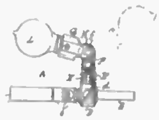
A magneto generator comprising permanent magnets solid pole pieces for said permanent magnets, a solid metallic armature of magnetic material for operation adjacent to said pole pieces, non magnetic metallic end plates provided with shaft extensions secured to overhanging ends of said armature, said shaft extensions not extending through the armature proper, and a plurality of thin transverse slots for subdividing each one of the two opposite halves of said armature into a plurality of substantially independent magnetic portions, provided in each of the opposite halves of said armature to increase the resistance offered to the flow of eddy currents to thereby decrease the effort necessary in the rotation of said armature, a slot being located close to each of the ends of said armature

963,173 OSCILLATION RECEIVER Greenleaf Whittier Pickard Amesbury Mass Original application filed Sept 14, 1907, Serial No 392,894 Divided and this application filed Mar 16 1910 Serial No 549,687



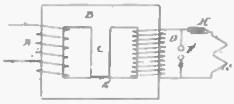
An oscillation receiver, which comprises an electrical conductor in electrical contact with a substantially rough unpolished fracture surface of the electrically conducting solid, the mineral red oxid of zinc, substantially as described

963,647 ELECTRIC LAMP SOCKET SUPPORT Herbert E Plass, Newark, N. J., assignor to Howard Miniature Lamp Company, Inc., Newark, N. J., a Corporation of New Jersey Filed Jan 13, 1910 Serial No 537,910



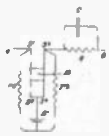
1 The herein described electric lamp socket support, comprising a bracket and means secured thereto to support a lamp socket with an interposed spring with its lower end secured to a part on the bracket and at its upper end to a part on the socket, said spring constituting the mechanical support for the latter, as and for the purpose set forth

965,168 TRANSFORMER Melville Eastham, Boston Mass., assignor to Clapp Eastham Company, Boston, Mass. a Corporation of Massachusetts Filed Sept 3 1909 Serial No 516,007



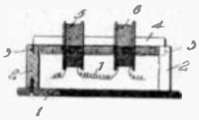
A resonant circuit comprising the secondary of a closed core transformer characterized by large magnetic leakage, a condenser in circuit with the said secondary the secondary having an inductive reactance approximately equal to the capacity reactance of the condenser for the alternation-frequency of the supply current

964,521 HOT WIRE ELECTRICAL MEASURING INSTRUMENT John T Irwin, London England Filed May 25 1907. Serial No 375 580



1 An electrical hot wire measuring instrument comprising two strips or wires connected together at one end, two nearly equal resistances respectively connected to the free ends of the two strips or wires a source of continuous current one pole of which is connected to the united ends of the two strips and the other pole connected to the two nearly equal resistances in parallel, a non inductive resistance in the main circuit and in series with the two strips, a condenser in parallel with this resistance, and means for indicating the difference in expansion of the two strips on the passing of a current through the strips in series.

963,062 CHOKE COIL Harry J. Beck, Philipsburg Pa Filed Sept 2 1909 Serial No 515,802

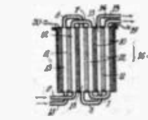


In a device of the class described, a base, standards mounted thereon and provided with sockets therein, an angular core seated in said sockets, coils slidably mounted upon said core, and a flexible connection between said coils which connects the same electrically in series

963,954 TELEPHONE-RECEIVER Sol S Sonneborn, New York, N Y Filed May 18 1906 Serial No. 433,600

1 A telephone receiver comprising a diaphragm, a magnet, a ring supporting said diaphragm, and a casing surrounding said ring and adapted to establish an annular space around the same, said space establishing communication between opposite sides of the diaphragm

963,980. APPARATUS FOR THERMOCHEMICAL GENERATION OF ELECTRICITY. Lucien Paul Basset, Paris, France, assignor to Maurice Basque de Lafarthe, Paris, France. Original application filed Mar. 27, 1906, Serial No. 308,340 Divided and this application filed Feb. 20, 1908, Serial No. 416,932. Renewed Apr 19, 1910 Serial No. 556,398.



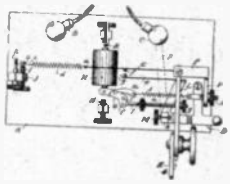
1 A thermo chemical generator of electricity comprising a vessel separated into compartments by walls of carbon and walls of porous material alternately disposed, the compartments forming two groups the elements of which are connected with each other alternately, and means for passing two different electrolytes through these two groups of compartments, the walls of carbon constituting also insoluble electrodes.

963,934. DEVICE TO BE USED AS TELEPHONE RECEIVER Karel Ort, Kostice on Eger, Josef Rihosek, Domoušice, near Louny, and Josef Karel Ort, Kostice on Eger, Austria-Hungary Filed Nov 29, 1907 Serial No 404,464

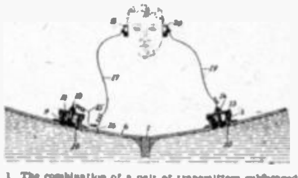
1 A device to be used as a telephone receiver, which consists of superposed diaphragms of conducting material, alternate layers of the same being connected together in one series to form a continuous conductor and connected to the positive pole of an electric circuit, and the remaining alternate layers being connected in a second series and connected to the negative pole of said circuit, a layer of elastic dielectric material interposed between each two conducting diaphragms, and means for elastically suspending the whole

13,130. TELEGRAPHIC TRANSMITTER Paul Dinous, Cleveland, Ohio, assignor of one-half to W. Louis Rose and one-half to Albert Lynn Lawrence, Cleveland, Ohio Filed May 17, 1909 Serial No. 496,679 Original No. 920,034, dated Apr. 27, 1909. Serial No. 385,924.

1. In a telegraphic transmitter, the combination with a vibrator equipped with a fixed weight, of speed and contact regulating means associated therewith, a bell crank lever, a spring connected thereto under tension in such manner as to exert its maximum force in the direction of the vibrator, and a key lever governing said bell crank lever.



964,380 APPARATUS FOR SUBMARINE SIGNALING. Thomas James Bowles, Boston, Mass Filed Mar 26, 1906. Serial No. 423,374.



1 The combination of a pair of transmitters submerged in water and sensitive to sound waves passing through said water, a pair of receivers connected with said transmitters and adapted to be applied to the ears of an operator, and connections from said transmitters to said receivers, said transmitters being spaced apart, by a distance representing the proximate distance apart of said receivers multiplied by the ratio of velocity of sound in water as compared with the velocity of sound in air.

Original Electrical Inventions for which Letters Patent Have Been Granted for Month Ending July 28

Copy of any of the above Patents will be mailed upon 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; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

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

RECEIVING RADII.

(643.) ADOLPH ROSSITER, Penna., writes:

1.—I have silicon detector, small double slide tuning coil, one 1,000-ohm receiver, and fixed condenser, in connection with 40-foot aerial, 46 feet high, (4 wires, 18 inches apart) ground water pipe. I cannot make the apparatus work. I can hear a few clicks and that is all. Have you any idea what is wrong?

A. 1.—If the connections are right, the trouble may possibly be in the detector. Some silicon will not work, so it is advisable to try several pieces, also you might try a battery on it, connecting the positive pole to the silicon, with a potential of .2 volt.

2.—What will be the receiving range of the above outfit?

A. 2.—200-300 miles.

3.—If I were to use an electrolytic detector, potentiometer, and "Electro" receiving transformer, what would the receiving range be?

A. 3.—300 to 400 miles.

½-K. W. TRANSFORMER.

(644.) ANTONIO CONTI, Yonkers, N. Y.:

1.—How should I connect the following to get best results: Helix, condenser, spark gap, transformer and key?

A. 1.—See diagram on page 580 in March issue.

2.—Kindly let me know the number of pounds and sizes of wire to be used on primary and secondary windings for a ½-K. W. transformer, to be used on 110 volts alternating current?

A. 2.—See answer to query No. 560 in June number.

3.—How many sheets of tinfoil would I need for the above transformer?

A. 3.—Make up 2 units of 17 12 x 14 inch glass plates each. Each plate covered on both sides with tinfoil 8 x 10 inches. Connect both units in series across the secondary.

SPARK LENGTH.

(645.) S. KATZ, N. Y. City, writes:

1.—What will be the spark length of a coil constructed as follows: Core, 1½ inches thick, 20 inches long. Primary, 3 layers of No. 10 B. & S. double cotton covered. Secondary having 16 pounds No. 33 double cotton covered wire wound in 256 sections, each of which have an outside diameter of about 10½ inches, and is wound so that each turn goes over the other, each section is 1-16 of an inch thick.

A. 1.—It should give a 12-inch spark.

2.—Give dimensions for insulating tube and whether rubber or fibre?

A. 2.—Same length as core with ⅜-inch wall; rubber.

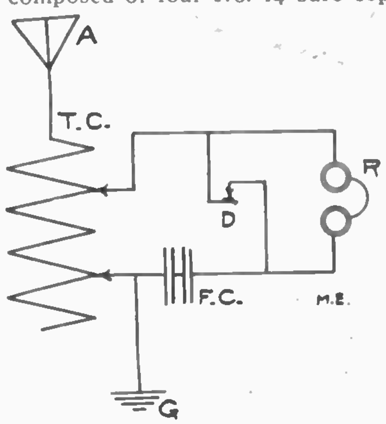
GROUND.

(646.) J. A. R. ROBINSON, Maine, says:

1.—As there are no water-pipes in this part of the town, I have buried about twelve square feet of sheet zinc, two feet deep. Will this do for the ground connection?

A. 1.—Yes, if buried in damp earth.

2.—What is my receiving radius with the following: Aerial, 35 feet high, 75 feet long, composed of four No. 14 bare copper



wires on spreaders eight feet long, insulated by porcelain insulators, molybdenite detector, E. I. Co. 75-ohm telephone receivers, fixed condenser, composed of 21 sheets of tinfoil 1 x 1½ inches, tuning coil 9 inches long, 3 inches in diameter wound with 100 feet No. 18 D. C. C. annunciator wire and above mentioned ground?

A. 2.—60 to 80 miles.

3.—Will you please give diagram for connecting same?

A. 3.—Diagram given below.

1-K. W. OPEN CORE TRANSFORMER.

(647.) D. R. JOHNSON, Minn., says:

1.—Kindly publish specifications for a 1-K. W. open core transformer using No. 30 enameled wire on secondary?

A. 1.—Core 2 x 14 inches; primary 2 layers, No. 12 D. C. C. wire, well shellacked. Primary and secondary insulating tube 14 inches long, with ½-inch wall, made of hard rubber. Secondary No. 30 wire wound 44 sections 6 inches in diameter, ¼ inch thick and separated by mica disks between them.

2.—How far would this transformer send with an aerial 80 feet high?

A. 2.—200 to 250 miles.

TUNED WAVES.

(648.) P. B. WILDE, Woods Hole, Mass., inquires:

1.—What is an untuned wave, and can they be tuned out by the receiving instrument of a station using a tuned wave?

A. 1.—An untuned wave is one such as emitted from a simple aerial and spark gap, having no helix. It has a definite length and can be tuned out by a tuning coil at the receiving station.

2.—What is my receiving and transmitting distance with the instruments named below: Transmitting side, 1-inch spark coil, helix consisting of nine convolutions of No. 4 copper wire, diameter 10 inches, condenser consisting of six photo plates 8 x 10 covered with tinfoil, spark gap, two wet battery zincs, and Western Union telegraph key? Receiving side: Clapp-Eastham loose-coupler, Perikon and silicon detectors, semi-variable condenser, and Murdocks 2,000-ohm head-set, connected to an aerial 45 feet long, and 50 feet high?

A. 2.—Transmitting 3 to 5 miles. Receiving 300 to 400 miles.

3.—How large a coil will a six volt sixty ampere hour storage battery run?

A. 3.—A 1½ inch coil.

SENDING RANGE.

(649.) WALTER R. MAGILL, Illinois, writes:

1.—What is the sending distance of outfit as follows: Four wire loop aerial (aluminum wire) 60 feet long and 40 feet above the ground, with a ¾-inch spark coil, run on 6 dry batteries, helix 12 inches high and 14 inches in diameter, wound with 25 feet of No. 8 copper wire with spark gap in helix?

A. 1.—1 to 3 miles

2.—What will be the receiving distance

with the same aerial, single slide tuner wound with No. 24 copper wire, silicon detector, fixed and variable condensers, 2,000-ohm E. I. Co. phones? What would be the range if my aerial was 60 feet high?

A. 2.—250 to 350 miles: 300 to 500 miles.

2-INCH SPARK VOLTAGE.

(650.) OLAF SHERIDAN, Washington, asks:

1.—Can a 2-inch spark coil and a 1-inch spark coil be connected in series with one vibrator on direct current, or with both vibrators screwed up tight on alternating current, so as to give a 3-inch spark?

A. 1.—Yes, on D. C. but it will be necessary to use an electrolytic interrupter in series with them on A. C.

2.—How many volts does the secondary of a 2-inch spark coil give?

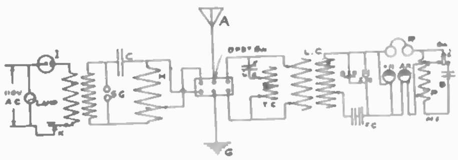
A. 2.—35,000 volts.

CONNECTIONS.

(651.) CHAS. VLIET, Illinois, writes:

1.—Please give diagram how to connect the following instruments: Helix, Leyden jars, interrupter, key, spark coil, spark gap, D. P. D. T. switch, also a loose coupled, double slide tuning coil, silicon detector, electrolytic detector, mil-ammeter and voltmeter, rheostat, phones and batteries, variable condenser, fixed condenser. I use 110 volts A. C.; how could I have a light and also use my coil off the same current?

A. 1.—See diagram below.



WAVE LENGTH.

(652.) R. POLING, Keyport, N. J., writes:

1.—With an aerial having a wave length of 50 meters, could one receive from a station having a wave length of 1,500 meters if he had a tuning coil of 1,450 meters? Or would this be too large a coil for the small aerial?

A. 1.—You can receive all right in this way. Any size tuning coil may be connected to an aerial.

MASSIE SYSTEM.

(653.) WILLIAM KLAUS, New York, inquires:

1.—Please give the Massie transmitting and receiving diagrams?

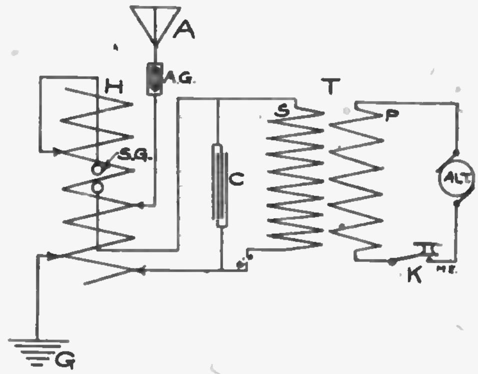
A. 1.—See diagrams below.

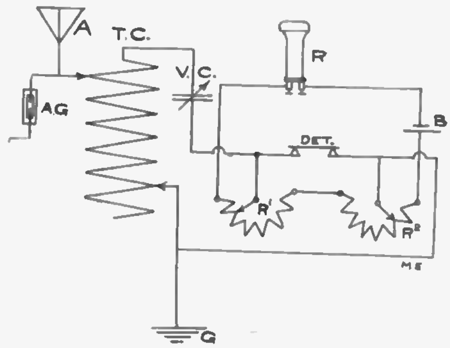
2.—How far will a one half inch coil transmit, using adjustable condensers, helix and aerial 80 feet high; if the receiving station has an aerial 80 feet high and is using single slide tuning coil, perikon and silicon detectors, fixed condenser and two 75-ohm phones?

A. 2.—One to 3 miles.

3.—What is the wave length of a tuning coil wound with 400 feet of No. 24 S. C. C. copper wire?

A. 3.—484 meters.





WIRELESS TELEPHONE.

(654.) H. H. WHEELER, Iowa, asks:

1.—Will you please tell me how I can make a sending variable condenser for a wireless telephone?

A. 1.—Make up a sliding or revolving metal plate type of condenser, spacing the plates ⅛ inch apart.

2.—What is the gauge of the enclosed wire and would it do for the secondary of a loose coupler?

A. 2.—No. 26 S. C. C. copper wire, B. & S. gauge. Best to use No. 28 or 30 S. S. C or bare wire

3.—How could I make a sending loose coupler for a wireless telephone?

A. 3.—Make the primary of: 12 turns No. 6 B. & S. aluminum wire, wound on a drum 14 inches long by 10 inches in diameter, turns spaced 1 inch apart. Secondary of 36 turns. No. 8 aluminum wire wound on a drum 20 inches long by 8 inches in diameter, turns spaced ½ inch apart.

A. C. LINE INDUCTANCE.

(655.) C. F. SMITH, Arkansas, asks:

1.—How is the self-inductance of alternating current transmission lines found?

A. 1.—It may be calculated by the formula:

$$L \text{ equals } .000558 \left[2.303 \log \left(\frac{2A}{d}\right) + .25\right]$$

per mile of circuit.

Where A equals distance between wires in inches.

d equals diameter of conductor in inches.

L equals inductance in henrys.

2.—How is it possible for an A. C. transmission line, having both lines clear and open with no apparatus connected to it, to have a greater voltage, at the distant end of the line than at the generator end.

A. 2.—This is due to the capacity and inductance of the line being in resonance, which sometimes raises the impressed voltage 10% at the distant end.

3.—We have a 3-ring rotary converter (300 K. W.) operating, and would like to know how the A. C. voltage per phase is found?

A. 3.—The voltage per phase (A. C.) is designated by E_3; and the D. C. between the brushes by E. Then:

$$E_3 \text{ equals } \frac{\sqrt{3}}{2} \cdot \frac{E}{\sqrt{2}} \text{ equals } 0.612\ E.$$

$$\text{Hence: } E_3 \text{ equals } \frac{E}{.612}$$

STORAGE BATTERY.

(656.) F. C. Brown, Illinois inquires:

1.—Does the "Exide" storage battery contain more negative than positive plates?

A. 1.—Yes; 5 negative and 4 positive in the standard cell.

2.—What is the usual specific gravity value for the electrolyte; in degrees "Baume"; in per cent. of acid H_2SO_4, to water H_2O?

A. 2.—A specific gravity of 1.2 is generally used as indicated by a hydrometer, which corresponds to 25 degrees "Baume"; or 30% of sulphuric acid in electrolyte; which will require a solution to be made up of 7 parts water and 3 parts sulphuric acid.

3.—What is the specific gravity test for good sulphuric acid for storage battery work?

A. 3.—Usually 1.835 sp. gr. or 66.6 "Baume".

ELECTRO-MAGNET.

(657.) O. M. Prentice, Penna:

1.—Please tell me the formula for calculating the lifting weight of electro-magnets.

A. 1.—The magnetic pull in pounds of an electro-magnet is found by the formula:

$$\frac{B^2 \times A}{72{,}134{,}000}$$

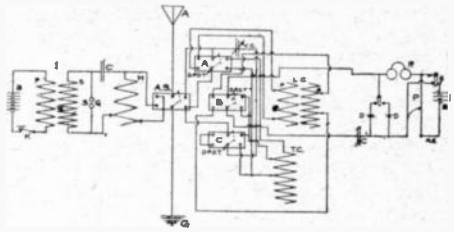
Where B^2 equals the magnetic flux in the core, in lines per square inch; A equals area of pole, at point of contact with armature in square inches.

WIRELESS TROUBLE.

(658.) Wendell Snyder, Des Moines, Ia., writes:

1.—I have a wireless station, most of which I have made. I have had it for about six months and have not had very good results. My receiving set consists of tuning coil, Jr., loose coupler of my own make, variable condenser (tubular), fixed paper condenser, 20 sheets of paraffined paper and tinfoil; paper 4 x 5 inches boiled in paraffine; silicon and molybdenite detector; six Edison primary cells, rheostat and telephone receiver. I am going to get a 1,000-ohm receiver. I have an aerial 40 ft. high and 30 ft. long of four strands of aluminum wire on spreaders one and one-half feet apart. Why can't I receive?

A. 1.—Look over your connections good, and try hook-up given below.



2.—My sending set consists of a 2-inch coil, key, helix made of 30 feet of No. 8 copper wire, wound one inch apart, leyden jar condenser, six Edison primary batteries, and same aerial, water pipe ground, and zinc spark gap. Are my instruments well proportioned?

A. 2.—Yes; very good.

3.—Give a diagram showing how to connect up all my instruments, using as many D. P. D. T. switches as necessary; and arranging it so that I can use my tuning coil separately, loose coupler separately, and both together.

A. 3.—See diagram, answer to question one.

TUNING COIL.

(659.) C. C. Brooks, New Jersey, asks:

1.—How many meters are there on a tuning coil, having a core 5½ inches in diameter, and 11 inches long; wound with 1 lb. No. 24 B. & S. gauge enameled wire?

A. 1.—981 meters wave length.

2.—What is the receiving radius with the above tuner, silicon detector, E. I. Co.'s, fixed condenser, 1,000-ohm 'phones, aerial 30 ft. high, 100 ft. long?

A. 2.—About 150 miles.

CLOSED CORE TRANSFORMER.

(660.) W. G. Brown, Wisconsin, says:

1.—Why are not closed core transformers used in commercial wireless stations? Power and lighting companies seem to use them altogether, proving that they are the best.

A. 1.—Closed core transformers are the most efficient, but cannot be used satisfactorily where very high frequency currents are to be used. There are many of them used, however, in both amateur and commercial stations.

2.—Please give me the name of a good book on transformers.

A. 2.—"The Alternating Current Transformer," by F. G. Baum; covering its theory and design; price, $1.50 net.

D. C. MOTOR.

(661.) V. W. Tarot, Missouri, asks:

1.—What is the reason that when I connect a shunt wound, 110 Vt., 2 H. P., D. C. motor onto the line, by throwing in the switch, that it blows all the fuses?

A. 1.—Because you evidently are not using a rheostat or starting resistance in series with it, to allow of its getting up to speed before putting it direct on the line.

Once it starts to rotate, it begins to generate a back or counter—electromotive—force; which reduces the current passing through the armature, this action increasing with the speed until a certain value is reached; corresponding to the normal speed of the motor.

2.—If a 110 Vt., 16 C. P. incandescent lamp, is shunted or short-circuited by a 15-ampere knife switch, does any current pass through the lamp? How much?

A. 2.—Yes; a small amount of current passes through it. Let c_1 equal the current flowing through lamp; c_2 the current flowing through switch; and C equal current passing through circuit; also, r_1 equal resistance of lamp; and r_2 resistance of switch:

$$\text{Now, } c_1 \text{ equals } \frac{C \times r_2}{r_1 + r_2}$$

$$\text{And, } c_2 \text{ equals } \frac{C \times r_1}{r_1 + r_2}$$

3.—What is the equivalent of 1 K. W. hour, in foot pounds?

A. 3.—2,656,400 foot pounds per hour.

ONE K. W. TRANSFORMER.

(662.) WM. A. ECKART, San Francisco, Cal., requests:

1.—Kindly give me data for a one K. W. open core transformer and condenser to run on 110 volt A. C. 60 cycle.

A. 1.—Core 2 inches in diameter by 14 inches long; primary of 2 layers No. 12 D. C. C. magnet wire. Secondary of 45 sections, 6 inches in diameter by ¼ inch thick, made up of No. 30 S. S. C. wire. Insulating tube, 14 inches long with ½ inch wall. Static condenser, 40 glass plates 16 x 19 inches, covered on both sides with tinfoil 10 x 13 inches, and made up into 2 units of 20 plates each. Connect these in series across the secondary terminals.

WIRELESS BILL.

(663.) RAYMOND CROWDER, N. C., asks:

1.—Will a variometer in connection with a double slide tuning coil, be as sensitive and good for tuning as a loose coupler?

A. 1.—The selectivity will be as great, but this arrangement is not as efficient as the loose coupler.

2.—How far can I receive with the following? A variometer, a double slide tuning coil, a silicon detector, a fixed condenser, a variable condenser, and two "Electro" amateur 1,000-ohm 'phones. An aerial sixty feet above the instruments at one end, and thirty at the other, sixty feet long.

A. 2.—350-400 miles under fair circumstances.

3.—Will there be any fee required to register, now that the wireless bill has been passed?

A. 3.—No bills have been passed as yet.

RECEIVING RANGE.

(664.) A. J. POST, JR., Conn., writes:

1.—How far can I receive with the following instruments: 1,500 meter loose coupler, 1,500 meter double slide tuning coil, rotary variable condenser, fixed con-