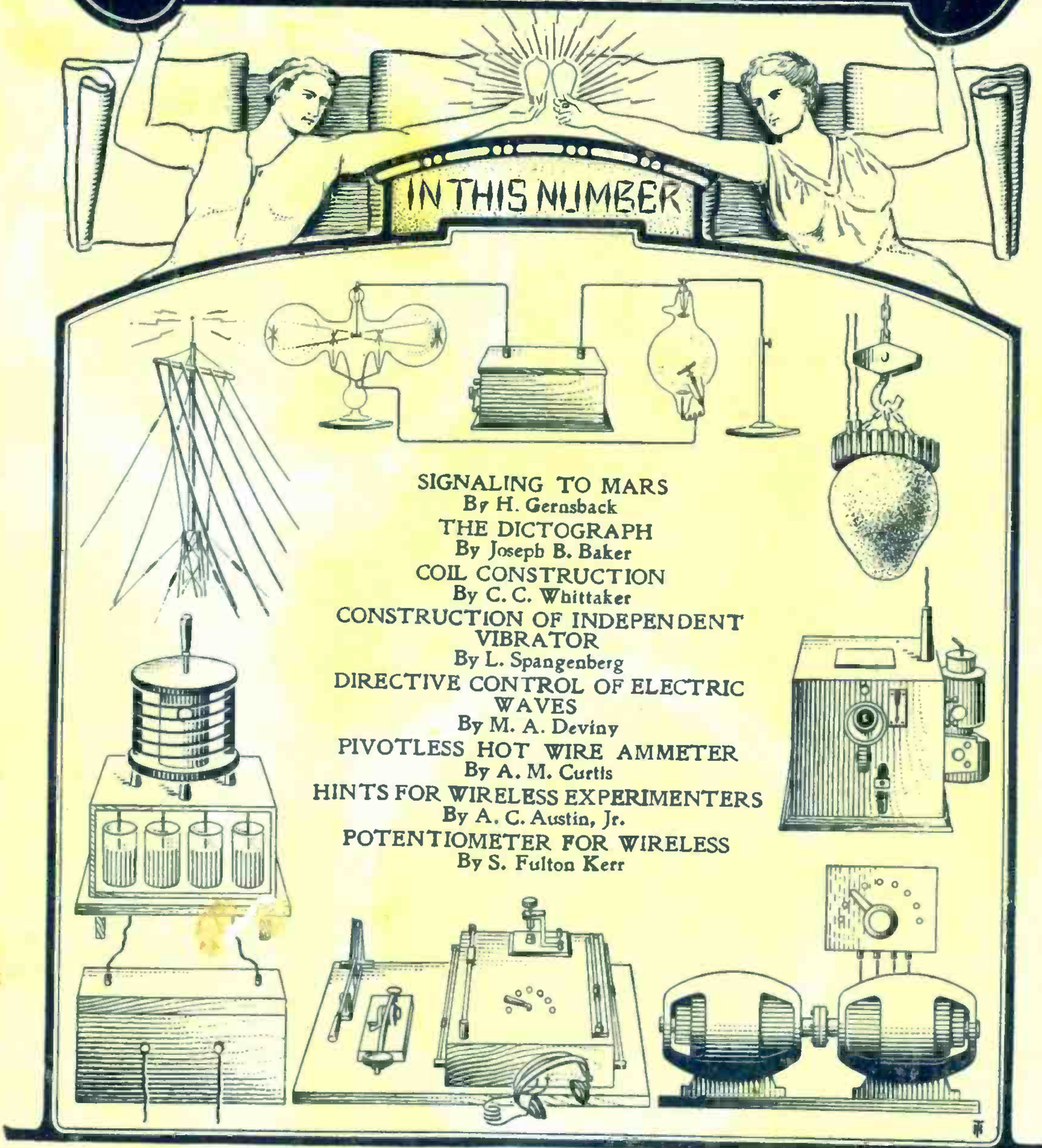
Signaling To Mars
IN THIS ISSUE

PRICE 10 CENTS

MAY, 1909

Vol. II. No. 2

MODERN ELECTRICS



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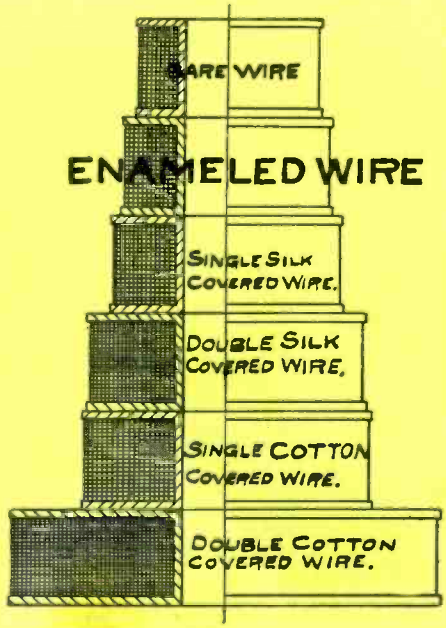

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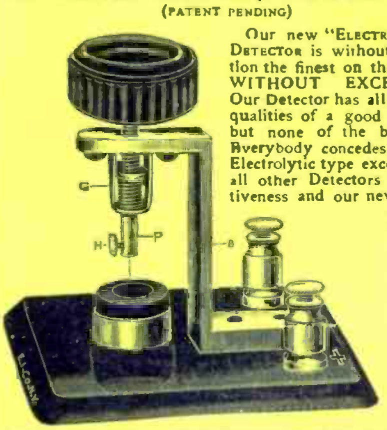

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MODERN ELECTRICS

Vol. II. MAY, 1909. No. 2

Signaling to Mars

By H. Gernsback.

Every time our neighbor Mars comes in opposition to the earth a host of inventors and others begin to turn their attention to the great up-to-date problem, "signaling to Mars."

It is safe to say that all the proposed, possible as well as impossible, projects would fill a good-sized volume, especially the ones invented in this country, which by far leads the world in number of projects and "inventions."

So far only one feasible plan has been worked out. The writer refers to Professor Pickering's mirror arrangement, now being discussed all over the world. But even Professor Pickering is skeptical, as he apparently does not like to take the responsibility of spending ten million dollars on a mere idea which might prove fallacious.

Wireless telegraphy has been talked of much lately as a probable solution of the problem. The writer wishes to show why it is not possible at the present stage of development to use wave telegraphy between the two planets, but at the same time he would like to present a few new ideas how it could be done in the near future.

Take the average present-day wireless station having an output of about 2 K. W. On good nights and under favorable circumstances such a station may cover 1,000 miles. Very frequently, however, only about 800 miles can be spanned.

Next summer for a few days Mars will be nearer to us than for many years to come. The distance between the two planets will then be about 35 million miles.

If we base transmission between the earth and Mars at the same figure as transmission over the earth, a simple calculation will reveal that we must have the enormous power of 70,000 K. W. to our disposition in order to reach Mars.

Now it would be absolutely out of the question to build a single station with that output. Even a station of 700 K. W. would be a monster and a rather dangerous affair to meddle with. This may be understood better when considering that none, even the most powerful stations, to-day have 100 K. W. at their disposal.

A solution, however, presents itself to the writer's mind. As it is impossible and impracticable to build and operate a single station with an output of 70,000 K. W., let us divide the 70,000 K. W. in small stations of, say 2, 10 or 50 K. W. Neither do we have to build these stations for the sole purpose of using them to signal to Mars; they are already being erected by the governments and commercial stations at the rate of about 150 per month.

At the present time of writing the entire output of the U. S. Government, commercial and ship wireless stations combined, is about 2,500 K. W. By adding the stations of private individuals, ranging in power from 1/4 to 2 K. W., the total sum is brought up to about 3,500 K. W., as far as the writer is able to ascertain from the latest reports.

If, however, the art progresses as it has during the past four years, it is safe to predict that in 20 or possibly 15 years the United States, Canada and Mexico will reach the combined output of 70,000 K. W.

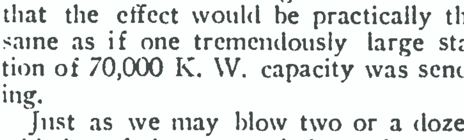
It will then be comparatively easy to seriously undertake to signal to Mars, and the writer proposes the following plan, which has the great advantage that the experiments can be made at practically no cost, against Professor Pickering's project, involving the enormous expense of ten million dollars.

The idea is simple enough. A central point of the continent, such as Lincoln, Nebr., should be selected preferably. By previous arrangement all wireless stations on the continent should be informed that on certain days their stations should be connected with a magnetic key*, which is connected through the already existing wire telegraph lines with the central station at Lincoln. As the wires may be leased from the existing wire telegraph lines, it is of course the simplest thing in the world to connect the key of each wireless station (by wire) with the central station. Each time, therefore, when the operator at Lincoln depresses his key all the keys belonging to the wireless stations connected with his key will be pressed down, and if the combined power of the connected stations is 70,000 K. W., the enormous energy of 70,000 K. W. will be shot out in the ether!

What effect the 70,000 K. W. will have on the weather or climate after they have been radiated for several hours the writer dares not conjecture, but that something will "happen" is almost certain.

Considering the technical side of the project, it is of course feasible. If the necessary amount of power was to be had to-day, there would be no difficulty to try it next summer; as this is not the case, we must be patient and wait; the writer, however, hopes to see the day when the experiment will be tried.

Referring to the technical side, it will be necessary, of course, to tune all the sending apparatus to exactly the same wave length, which, naturally—on account of the great distance to be overcome—should be as long as possible.



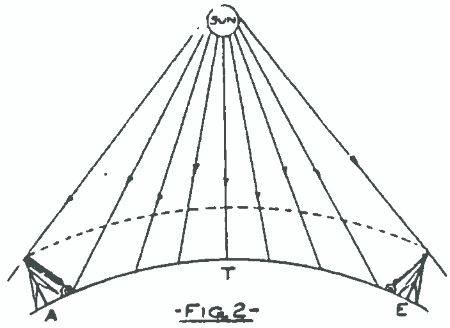
-FIG. 1-

The frequency of the oscillations should be practically the same for all stations. The result of this arrangement would be that the effect would be practically the same as if one tremendously large station of 70,000 K. W. capacity was sending.

Just as we may blow two or a dozen whistles of the same pitch at the same time, in order to carry the sound further, and just as Professor Pickering may use thousands of small mirrors all operated at the same time, as if they were one huge mirror, so it may be possible to unite a great number of different wireless senders and operate them as if they were one, provided of course that, like the whistles, they are tuned to the same "pitch."

There is only one more point to consider.

It has been demonstrated time and again that the action of the sun's rays greatly interfere with wireless telegraphy. In fact, it is possible to send twice



-FIG. 2-

as far over water during the night than during the day. This may be better understood by quoting Mr. Marconi's views:*

"Messages can now be transmitted across the Atlantic by day as well as by night, but there still exists certain periods, fortunately of short duration, when transmission across the Atlantic is difficult and at times ineffective unless an amount of energy greater than that used during what I might call normal conditions is employed.

"Thus in the morning and in the evening when, due to the difference in longitude, daylight extends only part of the way across the Atlantic, the received signals are weak and sometimes cease altogether."

Mr. Marconi's explanation is that illuminated space possesses for electric waves a different refractive index to dark space and that in consequence the electric waves may be refracted and reflected in passing from one medium to another.

The writer wishes to offer a different explanation, which seems far more plausible.

Referring to Fig. 1, let T represent a section of the earth. Let A be a station on the American, E a station of the English coast. As will be seen, the sun is just setting for the point A, while E

* Described in the October, 1908, issue M. E., page 243.

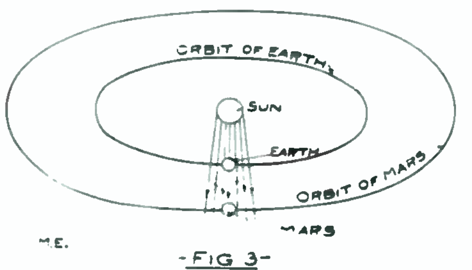
* Article in the May, 1908, issue M. E., page 55.

(as night already (no sun rays reach E).

When A is sending the waves are shot out *parallel* with the sun's rays and *carried with the rays.* The action of the sun's rays is so strong that most of the electric waves are carried along, and therefore never reach E at all. Only by using more powerful waves can this effect be overcome.

This action is not surprising at all. Electromagnetic waves are closely related to light rays. As Svante Arrhenius* has also shown us, the rays of the sun exert a certain amount of pressure on all encountered objects. It is therefore easy to prove that considering the close relationship of light rays and Hertzian waves, the latter *will be carried in the direction away from the sun* under favorable circumstances. Again considering Fig. 1, such favorable circumstances would be reached during sunset or during sunrise.

That this explanation is not a mere theory is best proved by the fact that a point D and C will communicate with each other best during sunrise and sunset, the signals received being then strongest. The electric waves during these two periods *travel parallel with the sun's rays, following the line of least resistance.*



-FIG 3-

During the day (Fig. 2), let A again represent the American, E the English coast station. Now it will be easily understood why messages can be sent almost twice as far during the night as during the day. In this instance the electric waves must *cut directly through the vast field of light*, and are being "held down" to a certain degree by the pressure of the light.

Now let us turn our attention to Fig. 3. This represents the earth and Mars in opposition. It will be seen immediately that the earth has a great advantage over Mars as far as wireless is concerned.

Messages sent from the earth during the opposition will go in the same direction as the sun's rays, and the writer is of the opinion that instead of the theoretical amount of power—that is, 70,000 K. W.—possibly only one-half or one-quarter will be required to signal to Mars, as the electric waves are undoubtedly assisted toward Mars by the rays of the sun.

On the other hand, Mars will find it difficult to signal back, especially during opposition, when his "operators" would have to work directly against the sun's rays.

However, we can only hope that the Martians are further advanced than we and may signal back to us, using a method new to us and possibly long discarded by them, when thousands of years ago they stopped signaling to us, and gave us up, as we did not have intelligence enough to understand.

*"Worlds in the Making." See Panspermie.

ANOTHER NOVEL DETECTOR.

An odd discovery was made by Mr. H. Gernsback the other day.

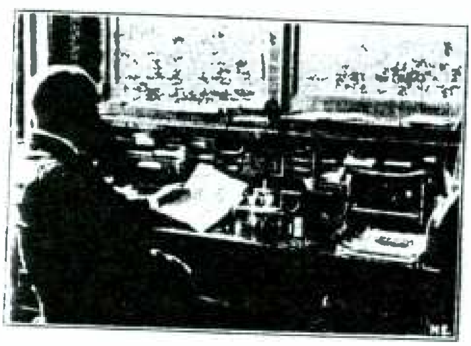
He reasoned that it should be possible to light an ordinary lamp by coherer (imperfect contact) action, and the experiment proved that this was actually the case. A 110 V. 25 C. P. tantalum lamp hanging from a 10 foot ordinary lamp cord was selected. By means of the key of the socket the lamp was lighted in the usual way. The key was left "on," while the lamp bulb itself was screwed out till the lamp extinguished. It was then screwed back till it *almost* made contact again (10 to 15 trials may be necessary to accomplish this and to get the right distance).

When the key of a 1 1/2 inch spark coil, with spark gap, connected to a 20 foot aerial, was operated, the lamp would light every time the key was depressed. As soon as the spark coil stopped working, the lamp extinguished. The lamp therefore proved to be auto-decohering. This "detector" is not very reliable, as it will not always respond. Sometimes also the lamp will not decohere of its own accord.

The Dictograph

By Joseph B. Baker.

The busiest business man in the world has no more hours in his day than the idlest. Ahead of every specific business problem that confronts the executive is the problem of extending his personality to the subordinates through whom his work must be done. He knows his own mind, but how shall he communicate it? There are two ways of doing so: Speech and writing. The busy man has not time to write, so that speech—direct, dictated or telephoned—is for him the only way. The problem, therefore, reduces to this: How can he achieve the most direct oral contact with his stenographer and his other subordinates? How much time can be saved in summoning them, how far



can he guard the conveyance of his thought from being hampered and diverted by the machinery of communication?

Ordinarily, the busy executive has three channels for delivering his thought orally: Calling in a stenographer, dictating to a phonograph, and using the telephone. Each of these is a time-saver, yet each falls short of ideal simplicity. Each involves a waste of seconds or minutes, and more than that, the frittering of attention on details utterly trivial in themselves, yet inseparable from these modes of communication.

Press a button to summon your stenographer from the next room. You want her on the instant, while you are under full headway. But you wait a minute or two minutes before she appears, and the momentary check has clouded the current of your thought, like a stone dropped into a clear stream. Yet, she came fairly promptly: a sheet had first to be taken from the machine, a sentence finished or the note book and pencil gathered up. If an hour's dictation follows, you do not mind the trifling delay at the beginning. But suppose you wanted only to ask her a question, or give her a direction consuming ten seconds of your time? And suppose there are a score of such incidental communications in the course of the morning? How many neglected details might you have attended to in the time thus wasted? And, what is far more important—how much would that time and mental energy be worth if you could keep them unbroken and steer them into effective channels?

The phonograph, under some conditions, is an admirable time-saver, and it renders the dictator independent of the presence or convenience of the stenographer, but, after all, the time chiefly saved by the phonograph is the transcriber's, which is not valuable; and to use this machine successfully, the dictator has as much to learn as the transcriber herself. Talking into a mouthpiece, and the mechanical processes of starting, stopping, and changing the cylinders, are distracting, and tend to fetter creative thought. In practice the phonograph is most successful in certain occupations calling for a large volume of dictation, more or less routine in character.

The intercommunicating telephone system saves time, but has no application to dictation. It has the serious objection, to the busy man, of holding him up pretty completely from other activities for the time being. It requires practically his entire time and attention, largely for the purely physical reason that one hand is "tied up," by having to hold the receiver to the ear and talk directly into the transmitter.

The systems and devices that we have described seem modern and time-saving, and they are; but is not something better possible? For example, suppose that instead of having to call your stenographer in, you were able to dictate to her in the next room, just as though she were close at hand, by simply talking out into the air.

Picture yourself sitting at ease with no transmitter or mouthpiece to talk into, no receiver to hold to your ear, no mechanical contrivance whatever to manipulate—with literally nothing to do but talk. You touch a button, and your stenographer's voice answers

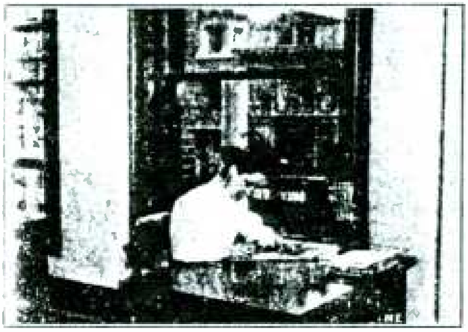
out of the air. You address her in the same fashion, getting up and walking about if you wish, or turning to the files or books at your elbow, dictating steadily the while exactly if she were at the adjoining desk. Can you imagine the unfettering of ideas, the gaining in orderly and effective thought, the heightening concentration that would result from this perfect physical freedom?

The dictograph, shown in the annexed illustrations, achieves this perfect emancipation of mental activity.

This marvelous apparatus is simply a small box tucked away unobtrusively in the back of your desk. The "master station," as it is called, contains in small compass an extraordinarily sensitive transmitter and a loud-speaking receiver. Hanging at the side of the box is an ear-piece receiver also, and on the front are mounted a number of simple electric switches and signals, the terminals of concealed wires running to the desks of the different members of your staff. The "sub-stations" on each of these desks consists only of a transmitter and an ear-piece receiver. At the stenographer's stations the ear-piece may be held against the ear by a head-band, like that used by telephone operators, so as to leave both hands free to manage note-book and pencil.

In using the dictograph, all you have to do is to "call" the assistant needed. A simple movement, which requires no more conscious attention than picking up a lead-pencil, brings the subordinate's voice and ear, instantly reporting for duty and ready to take your instructions. To dictate a letter, for example, you touch one of the little levers on the dictograph box. The stenographer's reply emanates from the little box, though she is sitting at her own desk in another room. You then proceed with the dictation, speaking right out into the air in the customary way, every word being heard and taken down at the other end of the wire. If you wish you may get up from your chair, turn your back, and walk about the room; yet every sound reaches your stenographer through the sensitive electric ear. Should a caller enter while you are dictating, and you desire to have your letter repeated back, or obtain other private information while he is present, you may silence the loudspeaking receiver and use the ear-piece instead.

These things are only indications of the way the dictograph revolutionizes office methods. With the absolutely unhampered freedom of the dictograph you may keep your work stead-



ily moving forward, putting things through without the little hindrances and delays that ordinarily cramp your abilities. You have only to think aloud; the little box is always ready to listen, and through it there may pass a rapid fire of telegrams, letters and memoranda for stenographers to write, orders for department heads to carry out, questions and suggestions to and from colleagues—short-cut communications of all kinds that result in getting things done.

The secrecy attained is an important feature. The physical presence of a stenographer or other persons in the private office has a dampening effect under some circumstances. Many a business deal has gone awry because the principals felt unable to talk freely. With this apparatus, assistants can be called in and dismissed instantly, and "interviews" accorded to callers, without time-consuming ceremony. By utilizing the ear-piece receiver, warnings or advice may be received from the credit man or general counsel during a business call without being overheard by the third party sitting beside your desk.

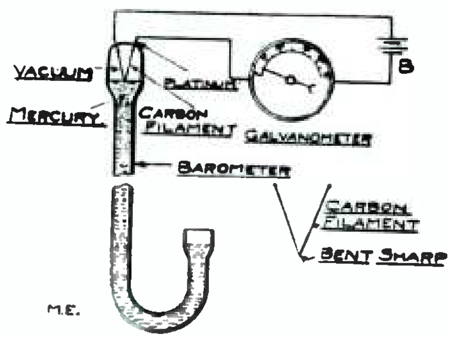
Conferences may be held over the wire without any of the conferees leaving their desks. You may speak to your manager, book-keeper, or other employee without wasting an instant of either his time or your own. You do not distract his attention from his work any more than you would by coming up to his desk for a moment to ask a question. The system lends itself no less admirably to more formal conferences. A master station on a board-room table at a Directors' Meeting enables any of the directors to speak with any one in the establishment—to obtain needed information, receive messages, etc.—without leaving his associates, or losing touch with the proceedings.

The business man who observes a demonstration of the dictograph realizes vividly the possibilities of its application in his own office. He realizes what hitherto unattained freshness and vigor his letters would have, what satisfaction he would obtain in being able to pick up details in their most efficient order and dispose of them finally, in many instances in less time than it now takes him to begin to get in touch with the assistant to whom he delegates them—in short, what "freedom" this wonderful apparatus confers. Every business man who tries it sees unique advantages for his particular problems. Is it any wonder that progressive concerns are taking up the system? The apparatus has already been installed in several prominent banks and trust companies, as well as other commercial houses. Humanly speaking, the system is certain of widespread utilization, and in anticipation of this the company which controls it has made ample preparations to manufacture the apparatus on a large scale.

ELECTRIC BAROMETER.

By Our Brussels Correspondent.

Mr. P. B. Goldschmidt, in a paper read before the Royal Medical Society of Brussels, describes a novel barometer, with which readings are taken direct from a galvanometer. Our illustration shows the arrangement clearly. In the vacuum at the top of the barometer a V shaped carbon filament of minute size is sealed. Platinum wires lead to the filament, the same as in an electric lamp. The filament is in series with a sensitive galvanometer and a few batteries, giving a constant current.



As the mercury rises in the upper part of the tube it submerges the filament more or less and consequently cuts out resistance. These changes are registered on the scale of the galvanometer, and the instrument is so sensitive that it will record pressures of less than one-tenth millimeter. The scale of the galvanometer is graduated so that the usual barometric pressures, in millimeters are to be read off without calculation of any kind.

An interesting discovery was made with the electric barometer. Mr. Goldschmidt found that the atmospheric pressure does not remain constant, not even for seconds. The pointer of the galvanometer moves continually. This had not been known heretofore, as the regular barometer is not a very sensitive instrument as far as direct readings are concerned.

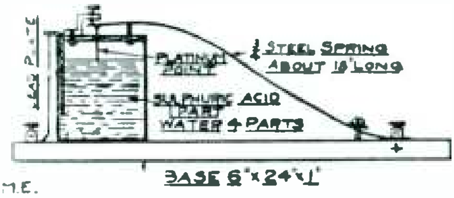
AN AUTOMATIC WIRELESS TRANSMITTER.

KENNETH RICHARDSON.

The purpose of this short article is to outdo the one in the January number describing an "automatic transmitter."

I made the following apparatus a short time ago and found it works very steady. It is to be used on voltages above forty or fifty.

Make an ordinary electrolytic interrupter with a lead plate and a platinum



point, dipping in a solution of sulphuric acid and water. Mount the jar holding the solution on the end of a board 6 inches wide by about 2 feet long. Attach the platinum point to the end of a 3/4 inch steel clock spring about 18 inches long. Fasten the other end of the spring near the end of the board farthest from the jar, and connect it to a binding post screwed on the board. Have the spring bent so that the platinum point just barely touches the solution. Put stops on the cover of the jar to limit the movement of the spring. A regulating screw is attached to the end of the spring farthest from the platinum point. A piece of glass rod may be put through the cover of the jar and down into the solution to regulate the depth of same.

When this apparatus is connected to the 110 or 220-volt circuit through the primary of the induction coil, steam forms around the platinum point, forcing it upward and out of the solution. No waves are then sent from the aerial. The power of the spring brings the point back into the solution and a buzzing sound occurs. When the momentum of the down-coming spring is overcome, the steam again forces the point out of the solution, etc.

The speed of the signals may be varied by moving the regulating screw

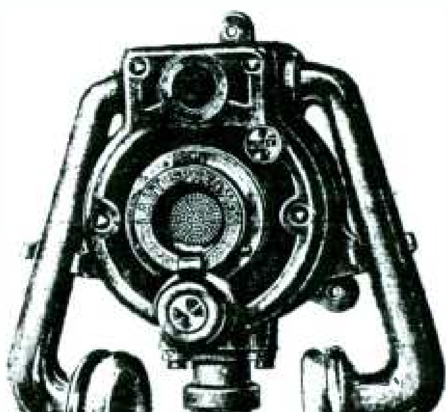
FREAK TELEPHONE.

BY OUR BERLIN CORRESPONDENT.

The accompanying illustration represents a gas and water-tight telephone station as manufactured by a leading German concern. This telephone is used in mines and in chemical factories, great attention having been paid that explosive gases or fumes cannot enter the telephone.

The Transmitter (inscribed "Laut Sprechen," ("talk loud") can be closed hermetically by means of an iron hinged cover, provided with a soft rubber basket. The two receivers are raised up when calling. When down the line is cut off. These receivers are also provided with soft rubber ear cushions to facilitate listening.

The little disc at the upper right, inscribed "Rufen" (call) is the call push button.



The casing of the telephone is entirely of steel.

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 the January issue. *No fees to be paid.*

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MODERN ELECTRICS

A Magazine devoted entirely to the Electrical Arts.

PUBLISHED MONTHLY BY

Modern Electrics Publication

NEW YORK CITY, N. Y.

H. GERNSBACK, EDITOR.

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

New York City and Canada, $1.25.
Foreign Countries, $1.50 in Gold.
Stamps in payment for subscriptions *not accepted.*
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Address all communications to:

MODERN ELECTRICS PUBLICATION
84 West Broadway, New York, N. Y.

European Office:
23 Rue Henri Maus, BRUSSELS

Entered as Second Class matter March 31, 1908, at the New York Post Office, under the Act of Congress of March 3, 1879.

Vol. II. MAY 1909. No. 2

We call our readers' especial attention to the first annual official blue book which we are publishing and which is ready now.

This book contains all the information the student of wireless telegraphy is interested in. It enables him to tell where and from whom a message is sent and thereby increases and stimulates the interest in the art to a great extent.

A contemporary publication a few months ago made the statement that it did not consider it wise to publish a list of Government and commercial stations, with their call letters, etc., as this would only tend to put the experimenter in a position where he could successfully annoy the large stations. This statement is not very flattering to the mentioned publication's readers. It seems to have very little confidence in its own readers and their honesty.

The world has a right to be enlightened. There can be no progress without enlightenment. Any publication keeping valuable and enlightening news from its readers is not working in the readers' interests.

The wireless situation as it stands today, considered from the experimenter's standpoint, may be understood better by an analogy.

Take a blind man who only understands English. Let him walk over a dangerous road full of deep holes. The Italian laborer may vainly shout in Italian: "Look out, you will fall!" but the unfortunate blind man, while he hears the shout, of course, pays no heed—and falls in the first hole he encounters. *He heard, but did not understand.*

The same with the wireless experimenter. The large stations may vainly shout at him to stop sending. He hears, but does not understand. He doesn't even know *who* shouts at him. He is far worse off than the blind man. If he knew *who* was doing the shouting he would more likely pay heed and respect the station whom he disturbed.

And still some people wish to keep the student in the dark, to refrain him from doing mischief! Sancta Simplicitas!

W. A. O. A.

The Wireless Association of America was founded solely to advance wireless. IT IS NOT A MONEY MAKING ORGANIZATION. Congress threatens to pass a law to license all wireless stations. The W. A. O. A. already has over 2,000 members—the largest wireless organization in the world. When the time for action arrives, the thousands of members will exert a powerful pressure to oppose the "wireless license" bill. This is *one* of the purposes of the W. A. O. A. There are more.

Wireless Association of America

Wireless Registry

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

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

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

NAME AND ADDRESS OF OWNER.	CALL LETTER.	APPROXIMATE WAVE LENGTH IN METERS.	SPARK LENGTH OF INDUCTION COIL.
Ralph Damon, Whitman, Mass.,	R.D.M.	175	2 ins.
George and Fred Taylor, Susanville, Cal.,	G.F.T.	61	1 "
Karl F. Spark, S. Butte, Mont.,	K.S.M.	400	3 "
J. A. Marriott, Seattle, Wash.,	J.A.M.	120	1½ "
Thos. Appleby, W. Phila., Pa.,	H.N.M.	360	1½ "
H. M. Atwater, Kentfield, Cal.,	K.N.M.		1 "
J. Winne, Jr., New York City,	J.W.M	150	2 "
Earl C. Hawkins, Minneapolis, Minn.,	H.A.M.	62	1½ "
Charles J. Meyers, Albany, N. Y.,	C.J.M.	175	1 "
Harry Butts, Mazomaine, Wis.,	H.B.M.	170	1¼ "
S. W. Case, Marcellus, N. Y.,	S.W.C.	335	2 K W
Geo. H. Nixon, Hackettstown, N.J.,	G.H.N.	365	1 ins.
Walter E. Haaren, New York City,	W.E.M.	135	2 "
Alvah Ritterhouse, Philadelphia, Pa.,	F.R.M.	80	3 "
G. S. Vernam, Brooklyn, N. Y.,	G.S.W.	215	1½ "
Meade N. Powell, St. Louis, Mo.,	M.P.M	135	2 "
Rochester Wireless Tele. Co., Rochester, N. Y.,	H.	125	2 "
Allen Lee Whitman, Cambridge, Mass.,	A.L.W.	110	¼ "
Max Wells, Riverside, Cal.,	M.W.N.	85	3 "
Frank McGram, Jersey City, N. J.,	F.M.N.	61	
Edwin R. Willard, Chicago, Ill.,	E.R.W.	110	½ K W
F. J. Rodrick, Avery, Boston,	R.V.M.	35	2½ ins.
Geo. Burrell, Avon, Ohio,	G.B.A.	125	[illegible] "
J. C. Randall, Albany, N. Y.,	S—1	130	1 "
Chas. E. Spirrey, Sanford, Me.,	C.E.S.	135	2 "
R. S. Burtt, N. Paterson, N. J.,	R.B.M.	210	
Earle L. M. Coolidge, Everett, Mass.,	E.M.C.	70	1½ "
F. Wommer, Minneapolis, Minn.,	F.W.M.	74	1½ "
Ray Newby, San Jose, Cal.,	E.Z.M.	235	3 "
E. D. Porter, Lewistown, Mont.,	P.O.M.	950	2 K W
Paul J. Hackett, Walla Walla, Wash.,	P.J.H.	165	3 K W
Thos. J. P. Shannon, Los Angeles, Cal.,	S.I.M.	160	2 K W
B. F. Rittenhouse, N. Woodbury, N. J.,	A.R.M.	105	
A. G. Raycraft, Manhattan, Nev.,	A.R.M.	260	12 "
A. G. Raycraft, Tonopah, Nev.,	N.H.M.	260	12 "
A. P. Morgan, U. Montclair, N. J.,	M.M.U.	350	3 K W
E. H. Guilford, Winchester, Mass.,	H.H.G.	350	3 K W
Harry Brandt, Govans, Md.,	S.S.S.	52	1 in.
C. A. Stone, New Haven, Conn.,	G.K.S.	35	1 "
Ralph T. Morse, Indianapolis, Ind.,	R.T.M.	145	2 "
Mervyn Sullivan, San Francisco, Cal.,	M.X.M.	110	1 "
Kendrick Noble, Yonkers, N. Y.,	K.N.Y.	85	¼ "
J. L. Douglas, E. Orange, N. J.,	J.L.D.	210	1 "
John Christianson, Chicago, Ill.,	J.C.C.	45	2 "
Branson M. DeCou, Blairstown, N. J.,	B.M.D.	180	6 "
A. Inderbitzen, New York City,	A—1	200	2 "
Malcolm H. Smith, Gloucester, Mass.,	M.S.M	170	¼ K W
E. L. Showers, Los Angeles, Cal.,	E.L.S.	270	2 ins.
Wm. Kuhn, Los Angeles, Cal.,	W.E.K.	270	2 "
F. W. Harris, Renton, Wash.,	3—B.	235	5½ "

Receiving stations only.

Above stations will be found in the official Blue Book just issued. Subsequent stations will be registered in next year's Blue book.

Coil Construction

By C. C. Whittaker.

On account of recent developments in wireless telegraphy and X-ray work, the induction coil, or inductorium, as it was first called, is now no longer confined to the laboratory as an interesting piece of apparatus; but, by its application to these comparatively newly discovered branches of science, has advanced till it is now almost a necessity in the electrical arts.

The proportions of the coil depend in a large measure upon the use to which the coil is to be put. In a long coil of small diameter, the secondary winding would, of course, be nearer the primary than that of a short thick coil; however, the former would be relatively slow in its action. The latter possesses the quality of quick action, but the outer turns of the secondary are so far removed from the most intense part of the field that its efficiency is seriously impaired. As a result of this, a compromise must be decided upon. Modern practice makes the length of the coil about twice as great as its diameter.

The proportions for the core follow the same general argument. The core must always have sufficient diameter so as not to strangle the magnetic flux, which flow through it. It is poor economy to make the core of small diameter for the purpose of saving wire. Good proportions for the core are given in the table at the end of this article.

The size wire to be used is another varying factor depending on the nature of the spark desired. Number 36 to 40 gives a long thin spark; number 30 to 34 gives a shorter and fatter one. Larger wire than number 30 is seldom used. Modern wireless coils are now being built with number 30 wire on account of the greater efficiency. For the primary there is an advantage in using large wire. This allows plenty of current to flow, does not heat up readily, and enables the coil to demagnetize quicker than if it was wound with more turns of finer wire on account of the inductive effect which the latter would have.

Number 20 to 22 soft iron wire seems to be about the best for core construction. If this cannot be procured in the soft form, it may be softened in the following manner:

After the wires have been cut the proper length and straightened, the whole bundle should be bound tightly in four or five places with wire so as to bind the whole firmly together. This bundle is now laid in a coal fire, where it is heated till nearly red hot, after which it is taken out and covered thoroughly with ashes. The object of this is to afford the bundle a chance to cool slowly. In all, it should take about two hours for this to cool sufficiently. If the bundle is heated too hot it will oxidize and thereby lessen the quantity of iron in the core. This cooling process having been completed, the ends of the core can now be squared off and the whole bound with one layer of fine, strong cord. Greater firmness will be secured if the core is now soaked in melted paraffine, or, better still, thick shellac.

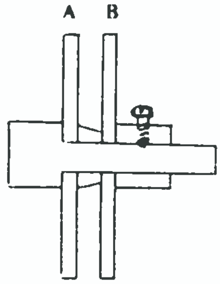


Fig. 1

The primary is now ready for winding. Usually two layers of wire are enough. This brings the two ends out at the same end of the core.

The next subject under consideration regards the insulation which is to separate the primary and secondary windings. The best material for this is of course hard rubber, but this may prove expensive, especially if the coil is large. Compressed fibre can be obtained either black or red in color at a nominal price and forms a fairly good substitute. This fibre can be procured in any size, and the maker will do well to make his core and wind his primary before buying this tube. He will then be able to obtain an insulating tube that will tightly cover the primary.

We are now ready to construct the secondary. All coils giving longer than a one-half inch spark should be built up in sections. These are made by winding the wire on a bobbin, one end of which can be readily slipped off. Fig. 1 gives a good idea of this arrangement, as shown by a cross section. The two large discs A and B should be faced on the inside with metal to prevent warping from the hot paraffine. Discs of thin hard cardboard, or, better still, of compressed fibre, are cut so as to have a hole in their center the diameter of which is to be equal to that of the tube cov-

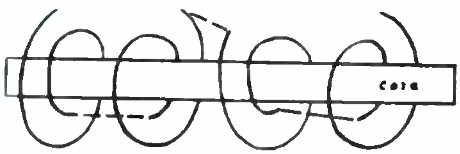


Fig. 2

ering the primary. The outer circumference has a diameter a little larger than that of the secondary winding. These are placed between each adjacent section. The sections should not exceed 1/4 inch in thickness; for coils giving longer than a three-inch spark they should be even thinner. Every other section is wound in the opposite direction. The wire should be run through melted paraffine, as it is wound onto the sections. This treatment cements the whole section together, increases insulation, and facilitates the handling of the section. The sections are connected by solder, as shown in Fig. 2.

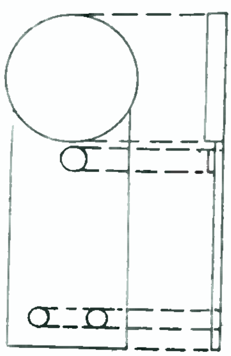


Fig 3.

The vibrator claims our attention next, the speed of vibration of which depends upon its size and weight. If a very rapid vibration is desired, the vibrator is made comparatively short; the soft iron head is made fairly light, a heavy head giving rise to slow vibrations. The full vibration is checked if the contact screw is placed so as to make contact near this head. Fig. 3 shows a good form of vibrator. The contacts should be of sufficient size to carry all the current that is needed and should have their faces truly parallel. Negligence of this will result in nothing but inefficiency in the coil.

The contact screw must be provided with a check-nut, or other arrangement to maintain the adjustment.

The condenser is perhaps the most interesting adjunct of the coil. Its function is to "absorb" the extra induced current in the primary and, by its oscillatory nature of its discharge, to increase the output of the secondary. It is made of alternate pieces of tin foil and paper. The shape of these is immaterial as far as results are concerned. For convenience, however, the condenser should, when completed, have the same proportions as the coil, so that it will fit nicely underneath the coil base. The paper used for this work should be entirely free from holes and should combine the qualities of thinness and strength. The paper which is used by grocers for wrapping fatty material in is good for this purpose; indeed, in some small coils bought ready made the condenser is made from old note-book paper or newspaper; but this is not reliable on account of the presence of a corroded metal in the ink whereby an arc or a short circuit is formed. The ends of the sheets of foil are most conveniently soldered to small brass strips, to which are soldered copper wire terminals. When completed the whole condenser should be thoroughly boiled in paraffine and then pressed firmly together until cold. A book press is excellent for this purpose. If a variable capacity is desired, the condensers are connected in parallel by a switch. Condenser data will be found in the table at the end of this article.

	½ in. Spark	1 in.	2 in.	6 in.	12 in.
Core length	5 in.	7 in.	9 in	12 in.	19 in.
" diam.	⅝ in.	¾ in.	1 in.	1⅛ in.	1½ in.
Area of foil in sq. in.	900	1000	2000	3000	5800
Margin of paper about foil.	½ in.	⅝ in.	¾ in.	1 in.	1½ in.

Construction of An Independent Vibrator

L. Spangenberg.

Perhaps some readers of Modern Electrics will be interested in an instrument of this kind to replace the ordinary core type of vibrator, which gives the operator so much trouble while sending by sticking and producing a lagging

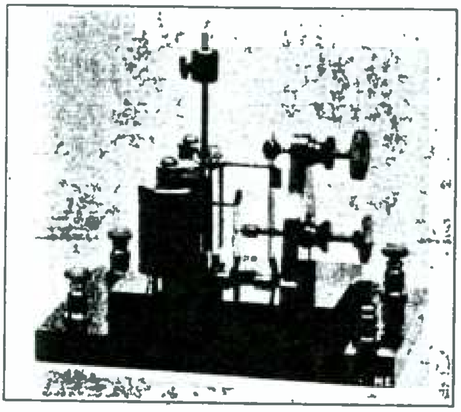
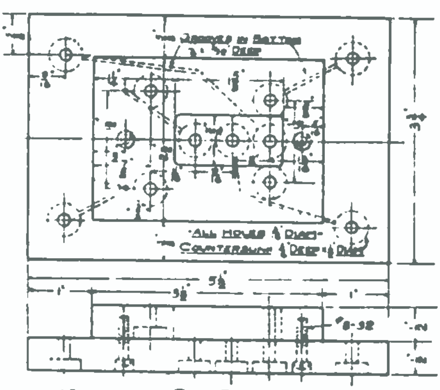


Fig. 1

spark. The difference, however, is not noticeable until after having used an independent vibrator. It will be found that this instrument will give much better results, for when the primary circuit is closed, your vibrator is ready to do its work. Below I will endeavor to instruct the experimenter how to make this instrument, and, if constructed as directed, it will be found to give very good satisfaction.

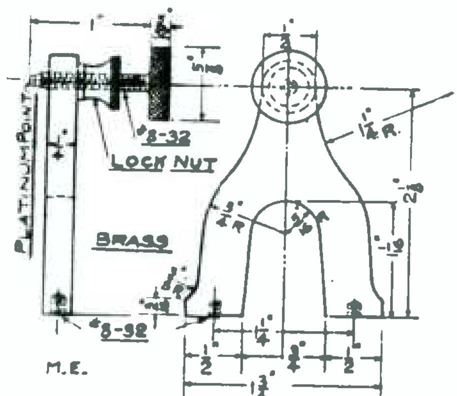


-FIG 2-

Obtain enough hard rubber 1/2 inch thick to make a base and sub-base, as shown in Fig. 2, which shows them held together by two No. 8/32 screws screwed into the top base. Hard wood may be substituted, but hard rubber makes a much better base and gives a neater appearance. Four binding posts should be placed, one in each corner of the base.

The two uprights shown in Fig. 3 and Fig. 4 are made of 1/4 inch brass. The screws in the top of each upright holding the platinum points are made of brass, having threads cut on each as shown. These platinum points are soldered into place, the point shown in Fig. 3 being about 3/32 inch diameter, while that in Fig. 4 may be much smaller.

The armature and springs complete are shown in Fig. 5, the construction of which will be plainly understood by referring to drawing. The springs are made of spring steel, and the bottom bracket of brass. A small platinum rivet or point should be inserted in the small spring, as shown.

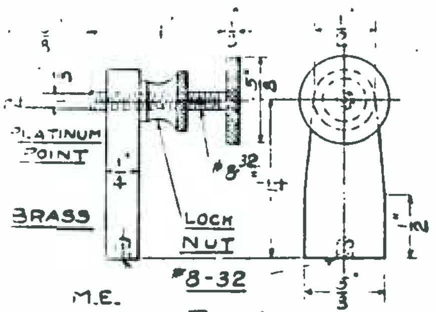


-FIG 3-

The primary circuit spring is shown in Fig. 6, and is made of spring steel, with the bottom bracket of brass. When drilling and filing holes in spring, as shown, care must be taken that the holes are the right size and in the right place. The platinum point in the top of this spring is held in place by soldering it in a brass cup, bolted to spring as shown.

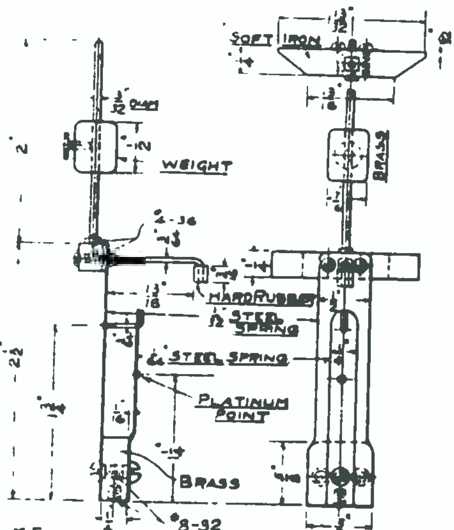
The electro magnets can be purchased from any electrical supply house cheaper than they can be made. The figures in this article are to suit a pair of 4 ohm electromagnets purchased from a supply house. Tap a No. 8/32 hole in the top of each magnet core and make two mag-

...et ends of soft iron, as shown in Fig. ..., which may be fastened to each electromagnet by a No. 8/32 screw. The mag-



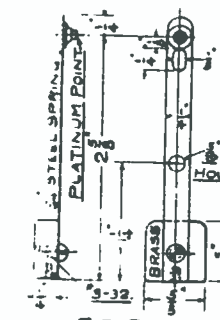
-FIG 4-

nets are spaced 1 1/2 inches apart, and fastened to a piece of soft iron, such as shown in Fig. 8.

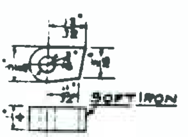


-FIG 5-

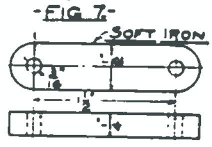
For the erection of this vibrator refer to Fig. 1 and connect up the instrument to correspond with grooves in the bot-



-FIG 6-



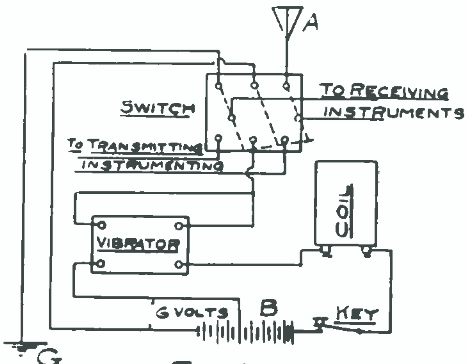
-FIG 7-



-FIG 8-

tom base (Fig. 2), using No. 14 copper wire in connecting up the primary circuit.

If constructed as directed this vibrator will operate any coil up to 12 inches. Six volts will be enough to operate a pair of 4 ohm magnets, and if used in connection with a coil having a core type of vibrator, screw up the vibrator screw so that it will not work, and wire



-FIG 9-

as shown in Fig. 9, using an aerial switch such as shown on page 402 of the February number of MODERN ELECTRICS.

A NOVEL "WIRELESS DETECTOR."

The writer was once looking over a building in the course of construction in Boston, and happened to put his hand against the hook and chain at the bottom of a tall derrick. Small, bright sparks, about an eighth of an inch long, jumped to the fingers. This appeared very puzzling, since the derrick was run by steam and there were no wires rubbing against the cable. More puzzling than this was the rhythmical way the sparks came. The writer was just realizing that they seemed a great deal like the Morse alphabet, when they ceased with a BX, BX, and the finish signal used in wireless.

The explanation was simple enough. In the very neighborhood was the ten K. W. DeForest station. The long wire rope cable of the derrick acted as an aerial, which discharged to the ground through the fingers.

ROBERT E. BRADLEY.

WIRELESS ON CANAL ZONE.

Washington.—Finding that a wireless telegraph service would be cheaper than a telephone or a cable service, the Isthmian Canal Commission has decided to erect a station at Porto Bello, a port on the Caribbean Sea, eighteen miles east of Colon, to communicate with Colon.

Wireless Department

The Directive Control of Electric Waves

By M. A. Deviny.

Ever since the possibility of utilizing electric waves as a medium for the transmission of intelligence first began to be appreciated, there have been continual attempts on the part of those identified with the progress of the art to devise some practical method whereby directive control of the radiations might be effected. The tremendous advantages that would result if such directive control could be secured were realized from the beginning, and, next to the problem of securing selective communication, this subject has probably received the largest share of attention on the part of the investigators. It has only been recently,

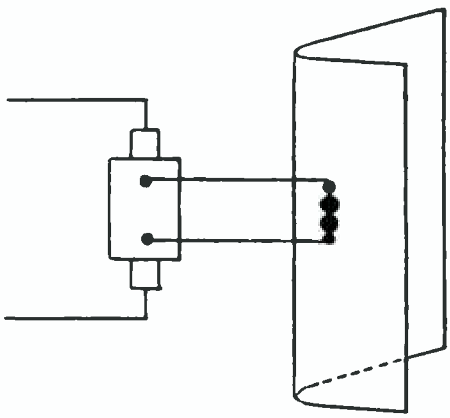


Fig. 1

however, that the results obtained in this direction have proved of sufficient importance to render the apparatus employed of any true value in the field of practical wireless telegraphy. Like all other valuable improvements, the problem has been attacked from many standpoints and as a result several more or less successful systems are now in the course of development.

When it was first proven experimentally by Hertz, in his classic researches, that electric waves were identical in all of their physical characteristics with the radiations causing the sensation of light, and after Marconi's triumphs had become fairly well known, there were several methods devised by his colleagues for obtaining directive radiation by employing the property of reflection. One of the most notable of these was that of Dr. Righi, of the University of Bologna. He proposed to obtain control of the radiations produced by an especially designed oscillator by reflecting them from a parabolic mirror, somewhat after the manner shown in Fig. 1. The oscillator, which closely resembles the well-known type designed by Sir Oliver Lodge, consisted of two small metallic balls which were connected by wires to the high tension source of supply. Between these balls were placed two larger ones which were very carefully insulated and served the purpose of breaking the spark discharge into three distinct parts. This oscillator was placed at the focus of a huge parabolic "mirror" made from sheet metal, and when the discharge was allowed to take place the radiations produced were resolved by the mirror into a single beam and concentrated in a direction along the axis of the parabola.

This was probably the most effectual and simple method yet devised for the purpose, but it was soon found that in order to secure satisfactory operation the wave length employed, even with the largest mirror that had been constructed, was of necessity so short as to render it of very little practical value. In fact, the experiments in which they were used were made over distances not exceeding two miles. The system was also applicable to directive receiving, in which case the coherer employed was placed at the focus of a similar mirror which was so arranged that it might be turned as to face in any desired direction. The incoming radiations were thus caused to converge at the focus of the mirror and produce oscillations which affected the coherer, while those coming from any other direction were screened and produced no effect upon the receiving instruments.

Many attempts have since been made to improve this system, but owing to its inherent defects, which cannot be overcome, they have never proved of any real practical value. This can be readily appreciated from the fact that in order to reflect radiant energy as a beam it is necessary that the ratio existing between the length of the wave employed and the diameter of the mirror must be exceedingly large. For example, we find that in reflecting light from a concave mirror, the ratio between the length of the light waves and the size of even the smallest mirror it is possible to construct, is still of such tremendous magnitude that we find no difficulty in securing the desired reflection. The length of wave employed in wireless telegraphy is relatively so great, however, that in order to employ the method of reflection it would be necessary to use mirrors so large as to render its practical application almost impossible.

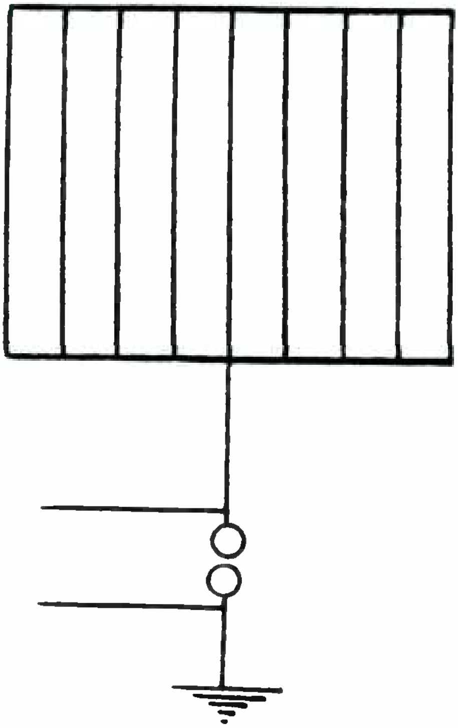


Fig. 2

After wireless telegraphy first began to be introduced commercially, and after a considerable number of installations had been made which afforded facility for the observation of the phenomena of transmitting and receiving over considerable distances, it was found that the various forms of aerials then in use possessed marked individual characteristics as regards to their direction of maximum propagation. It was observed that aerials consisting of a single earthed wire slightly inclined to the horizontal possessed the property of radiating more strongly in the direction away from which the wire pointed, and that the effective radiation might be controlled by altering the degree of inclination and the direction of the aerial. Dr. DeForest took up the subject in 1904 and obtained two patents for effecting the directive control of the radiations by the use of aerials of special design. One of these consisted of a series of vertical wires which were connected so as to form a sort of a grid after the manner shown in Fig. 2. This grid was connected by a leading-in wire to the transmitting or receiving apparatus and was so constructed mechanically as to be capable of being rotated about a vertical axis in order that it might be made to face any desired direction. The effective radiations from this type of aerial were found to be more pronounced in a direction perpendicular to the plane of the grid, and that the oscillations produced in it when used for receiving were most powerful when the grid faced in the direction from which the radiations were proceeding. This method, although not securing absolute control of the radiations, nevertheless showed itself to be of some practical value in determining, with more or less accuracy, the direction in which the source of radiation was located.

Another form of semi-directive aerial also designed by Dr. DeForest for obtaining the same results, and shown in Fig. 3, consisted of a single vertical wire of comparatively short length to the up-

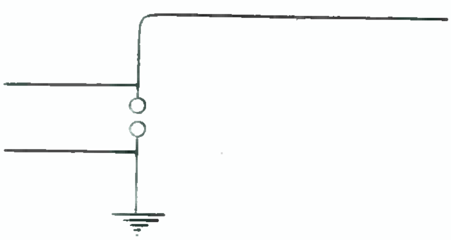


Fig. 3

per end of which was fastened a longer horizontal section. When the oscillations were set up in this type of aerial the radiations produced were found to be a maximum in a direction away from which the horizontal wire pointed, and it was thus possible (although somewhat inconvenient) to control the principal direction of the waves by altering the position of the horizontal section. For use in receiving from a desired direction a similar operation was necessary, and the oscillations induced by the waves were a maximum when the horizontal section pointed away from the direction of propagation. This form is the prototype of the now familiar "flat-top" aerial which is so extensively used by the Government stations, the latter being a combination of the "grid" and the horizontal semi-directive aerials and radiates and responds more strongly when the horizontal section is directed away from the position desired. It is on account of these

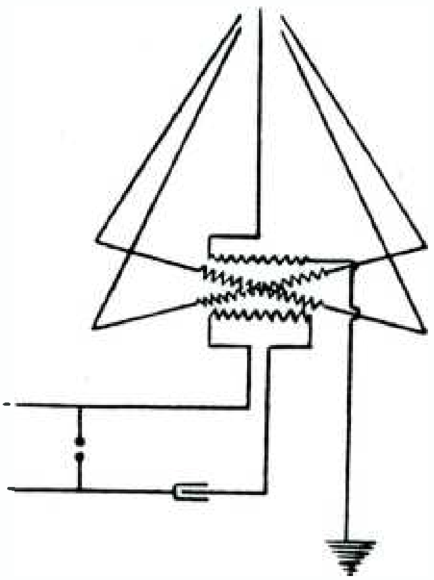


Fig. 4

desirable properties and other valuable features possessed by the "flat-top" aerial that it has become the most popular and widely used type at the present time; its merits having caused it to be recently introduced into some of the large trans-Atlantic stations.

The theory of the semi-directive action of the inclined and "flat-top" forms of aerials seems to be rather meagerly understood. Perhaps the most widely accepted explanation is that evolved by Professor Zenneck, who maintains that the waves, in passing over the earth, become inclined forward from the perpendicular, there seeming to be a sort of dragging action on the surface due to the electrical characteristics of the earth as a conductor. Hence an aerial which is inclined forward or of the horizontal type is in reality more nearly parallel to the wave front and is therefore in the most advantageous position for the induction of the oscillations.

In transmitting with this class of aerials, the radiations are thrown out into space in the direction away from which the top is pointed, while those in the opposite direction are thrown more toward the earth and are suppressed to a greater or less extent.

Attempts have also been made to effect directive control by employing two aerials placed half a wave length apart and exciting them by oscillations in the same phase. It was thus expected that the interference of the waves might neutralize all radiation in a vertical plane through the two wires and increase the effectiveness of those in a plane perpendicular to the line connecting the aerials. The practical limitations of this method, however, due to the constantly changing wave length employed and the great difficulty of installing it on board ship have to a considerable extent prevented its more extended introduction.

The more recently designed systems which have lately been introduced in some of the European stations seem to have solved the problem in a most satisfactory manner. The two most notable of these are those designed by Count Alessandro Artom and Messrs. Bellini and Tosi.

Count Artom has succeeded, after long and careful research upon the subject in producing polarized electric waves of considerable length and has perfected a system of applying these to long distance wireless telegraphy. In his system two aerial wires are used which are placed at right angles to each other; these being excited from the secondary of an oscillation transformer used in conjunction with two additional transformers of special design. By this arrangement one of the aerials is excited electromagnetically while the other receives its energy by electrostatic induction from a special type of condenser, and he is thus able to produce oscillations in each of the aerials which are equal in magnitude but differing in phase by an amount slightly greater than a quarter of a period. The resultant waves emitted by the two aerials are thus elliptically polarized and can be sent in any desired direction by merely turning the aerial tructure so that the line of propagation is perpendicular to the plane of the aerials. Several long distance tests were made on this system and the results obtained appear to be very satisfactory.

Probably the most interesting as well as one of the most ingenious systems now in use is that of Messrs. Bellini and Tosi, one type of which is shown diagrammatically in Fig. 4. In their method two triangular aerials are employed which are open a short distance from the top and which are placed in a fixed position at right angles to each other. These aerials are excited from the secondaries of an oscillation transformer of special design known as the "radiogoniometer."* This instrument employs two entirely separate secondaries which are placed at right angles to each other so as to form a cross, their terminals being connected directly to the aerials in the manner indicated in the figure. A single primary, which is capable of being rotated on a vertical axis through any desired angle, is placed within the secondaries and is excited in the usual manner by means of an induction coil or a high tension transformer. By this arrangement the relative values of the strength of the oscillations induced in the fixed secondaries is made dependent upon the position of the primary, and the radiations from the two aerials are governed accordingly. The interaction of the waves of different intensities emitted from the triangular aerials combine according to the parallelogram law and form a resultant radiation which will have a direction in a line through the primary coil. Hence by turning the primary so as to point in the direction in which it is desired to send, the waves may be transmitted in that direction only. A similar operation is performed in receiving from a desired direction: the radiations being resolved into two components by the fixed coils (which in this case become primaries) and affect the secondary only when it is in such a position as to point in the direction of the transmitting station.

In order to check all backward radiation or that in the opposite direction from that desired, a vertical wire is placed between the two triangular aerials and connected as shown. The radiations produced by this wire are in phase with the resultant forward radiations from the main aerials, which are thereby strengthened, while the backward radiations which are of opposite phase are completely neutralized. This system has shown itself to be practical and comparatively simple, and on tests made with it in France it was found capable of determining the direction of a transmitting station nearly two hundred miles distant within one degree of arc.

Directive systems, although possessing several marked advantages, are nevertheless not very applicable to the general field of wireless telegraphy and for this reason their use seems limited to certain special conditions. For example, highly directive systems such as those of reflection and the more recently introduced methods would seem impracticable on board ship and under other conditions where the position of the station is constantly changing, as it would be next to impossible to so control the beam of radiation as to cause it to continually strike the receiving station. Their chief field of application will no doubt lie in special shore installations at certain fixed points such as light houses and similar places where they might be of considerable value to mariners in determining their bearings at sea without the necessity of taking the customary observations. In fact, the entire art is in such an embryonic condition that it is almost impossible to predict what its possibilities are, and as new developments are continually being made and more efficient apparatus and systems devised, there is but little doubt but that the near future will see a chain of directive transmitting stations installed along our coasts with apparatus of such high efficiency as to greatly reduce the ever-menacing perils of the sea.

TO GET RID OF STATICS.

When using a silicon or a perikon detector, much of the trouble from noise from statics can be stopped by increasing the battery current sent through the detector. This decreases its sensitiveness more or less, but shuts out other noises. It is usually easier to read weak signals when all else is quiet than it is to read moderately strong signals amidst a loud roar from statics.

Contributed by R. E. Bradley.

* See March issue, this magazine.—Ed.

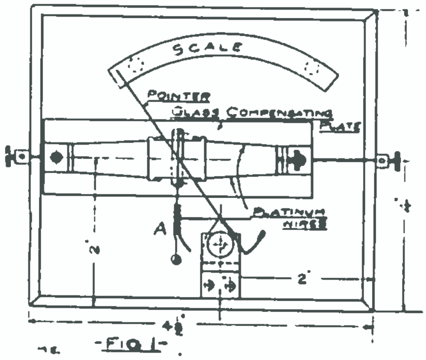
Pivotless Hot Wire Ammeter

By A. M. Curtis.

Following is the description of a hot wire ammeter designed for use in tuning wireless telegraph transmitters, but which may be used for any kind of current, direct or alternating.

The baseboard is of mahogany or other hard wood, 4 x 4 1/2 x 1/2 inches.

To compensate for external changes



-FIG 1-

of temperature and to prevent them from changing the position of the pointer, the wires which carry the current are mounted on a strip of ordinary window glass, 3 1/2 inches long by 1 inch wide. As glass and platinum expand at very nearly the same rate, the tension on the wires is thus kept constant.

Drill four 1/8 inch holes in the glass strip (Fig. 5), using a twist drill which is hardened by heating red hot and cooling in ice water. Lubricate the drill with turpentine. At one end of the glass plate screw on angle piece, of 1/16 soft brass 3/4 inch high by 3/8 inch wide, to the bottom of which is soldered a short piece of the stranded conductor taken from a piece of lamp cord (A, Fig. 2). Use a 6/32 machine screw and nut with a couple of paper washers to prevent cracking the glass.

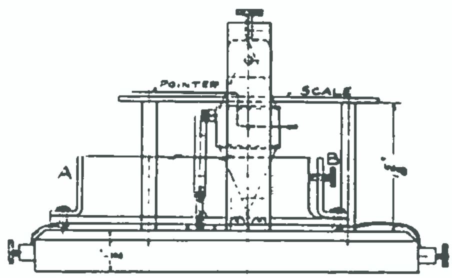
At the other end of the glass fasten a brass piece of the same dimensions, tapped for an 8/32 thumb screw (B, Fig. 2). Clamped by the same screw which holds the upright to the glass base is a spring of 1/64 inch brass, 3/4 inch high by 3/8 inch wide, also notched at the top. A piece of the same conductor as is attached to A is also soldered to the heavier angle piece of B.

For a scale reading to 3 amperes, which is high enough for a 1 K. W. transmitter, 6 strands of .002 platinum wire should be used, three on a side. For a smaller scale, only one wire may be used on each side.

Screw the thumbscrew at B in, so as to push out the spring somewhat. Tie a loop of the wire around the upright A, then wind it between A and the spring at B till there are 3 strands on each side, taking care that each wire is drawn taut and all are of equal length. Tie the loose end at B, and then with a small soldering iron solder the wires at the back of A and B with as little solder as possible.

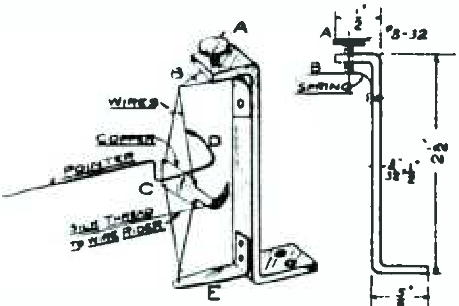
Screw the glass plate with the wires to the middle of the baseboard (Fig. 1), and fasten each of the copper wires to a binding post, which is screwed into the edges of the base opposite to where the ends of the glass plate come.

The part shown in Fig. 4 is made of very thin sheet copper. Cut a rectangular piece (Fig. 4) 3/4 inch by 1/2 inch with projecting lugs at the corners, 1/16 by 1/8 inch. Slit these lugs with a pair of scissors and bend half of each in opposite directions, so as to make a small groove in which the platinum wire rests and supports the rider. Cut a 1/8 inch slit in the middle of the rider with a penknife and insert in it a strip of



-FIG 2-

the same copper 1/8 inch by 2 inches so that 1 inch projects on each side of the rider. Solder it at right angles to the rider with a trace of solder, then with a pair of round nose plyers, bend the ends of this strip into sextants in opposite directions, leaving 1/2 inch of each part of the strip straight (A, Fig. 4). Next attach two fine silk threads to the sextants, tieing them in holes punched into the copper with a needle. The thread at the top, which goes to the pointer sextant, is attached to the free end of the sextant, while the bottom thread is attached at the angle. Attach to the bottom thread a spiral spring wound of No. 28 German silver or brass wire, about 1/8 inch in diameter. Next place the rider between the platinum

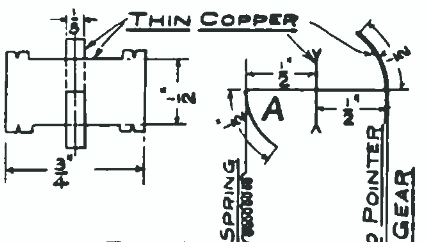


M.E. -FIG. 3-

wires (see Fig. 1), and attach the spring, held clear of the baseboard, to a small screw (A, Fig. 1).

The upright shown in Fig. 3 is made of 3/32 inch soft brass, 1/2 inch wide, bent as shown. The top part of it is drilled and tapped for an 8/32 thumb screw (A, Fig. 3). E is a strip of 1/16 inch brass which projects from the upright 1 1/8 inches. A small hook made of part of a pin is soldered to it 1 inch from the upright. B is a brass spring 1/64 inch thick by 1 1/2 inches long, cut as shown and screwed to the upright. Its tension is adjusted by the thumb screw A.

The moving part C, which carries the

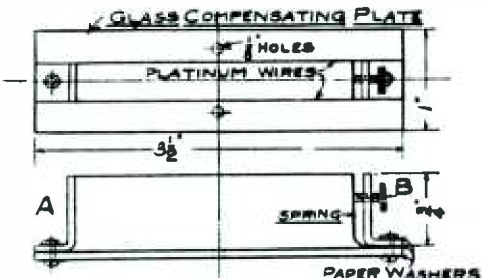


M.E. -FIG. 4-

pointer, is made of the same copper as the rider in Fig. 4. A projecting arm carries a sextant similar to those in Fig. 4. to a hole, in the free end of which the thread from the rider on the wire couple is to be attached. The pointer fastened to C is of No. 24 aluminum wire, held by being passed through a hole, around the top of C, and again through the same hole, and being clinched with a pair of pincers. The back end of the pointer D is bent in a segment of a circle. A few turns of No. 24 copper wire, wound on D so as to be movable with considerable friction, serves to balance the pointer.

The wires which support C are of phosphor bronze, .003 inch in diameter, or if phosphor bronze cannot be gotten, No. 36 bare copper wire will answer. Two loops of this wire 2 inches long are tied to the four corners of C through small holes and fastened by a trace of solder. The loops are then hooked over the end of the spring B and the hook on E adjusted so that the pointer moves horizontally. The tension of the spring B is adjusted by the thumb screw so that the pointer returns quickly to its normal position when moved.

When the pointer movement is assembled, as shown in Fig. 3, it may be screwed in position on the baseboard and the free end of the thread coming from the upper sextant on the wires attached to the free end of the sextant of C and



M.E. -FIG. 5-

drawn taut. Considerable care must be taken that neither of the two sets of fine wire are broken.

The scale is a piece of brass (Fig. 1), to the top of which a piece of white paper is glued. It is supported by two brass rods, which are bolted to the base.

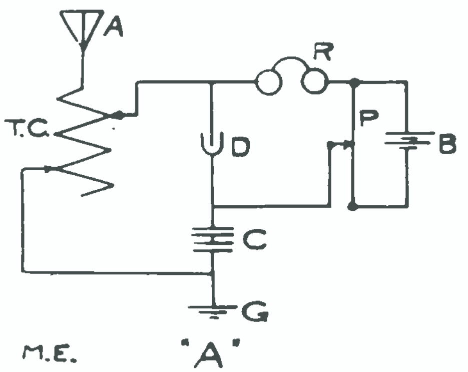
The case of the meter is a wooden frame 4 x 4 1/2 x 3 inches, the top of which is a glass plate which may be fastened by a wooden moulding or more conveniently by passe-partout binding paper. It should be attached by hinges and two hooks so that it may be easily raised.

To calibrate the meter it should be put in series with a direct current ammeter, a rheostat and a source of direct current and the scale marked with the various values of current as shown by the D C meter. Its readings will then show the R M S value of an alternating or oscillating current.

Hints for the Wireless Experimenter

A. C. Austin, Jr.

Since becoming interested in wireless telegraphy I have tried many different circuits, both transmitting and receiving, which have been more or less successful, and of which a record has been kept, embracing both the diagrams of the circuits tested and the results obtained during



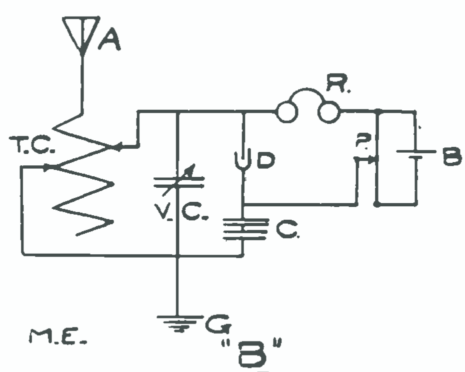
"A"

the varying conditions of the atmosphere. The record of these results day by day as the weather changed has proven surprisingly interesting and instructive. Sometimes on a rainy day or night the signals came in extremely clear and sharp, and distant stations were heard with ease. In fact, I have found it not uncommon to hear stations from 500 to 800 miles away, with a compromise antenna 100 feet long and only elevated 35 feet at the highest point, and a carborundum detector. Again, under the same conditions, practically nothing could be heard except a few commercial stations near by.

One of the first things an experimenter should do is to get a book and start such a record as I have mentioned, keeping under the diagram of each circuit that is tried the daily record of the results and the condition of the weather during such time as the operator is "listening in."

Too many of the wireless experimenters are content to use any circuit that will give a result, relying upon blue prints of "tuned circuits" or an "operator friend" for their connections, and when the instruments are once "hooked up" they stay that way, until some friend says he has a better connection, or until the experimenter's interest dies out and he either sells his apparatus or consigns it to the junk heap. This is entirely wrong and I do not think my interest in wireless would last very long if I only sat down to the instruments and listened to private messages or to reports from ships giving location, etc. I must admit that there is some interest in copying the messages that are being flashed through the ether at all times of the day and night, but for real downright, and above all lasting, interest you must learn to "putter round" your instruments, as the Yankees term it.

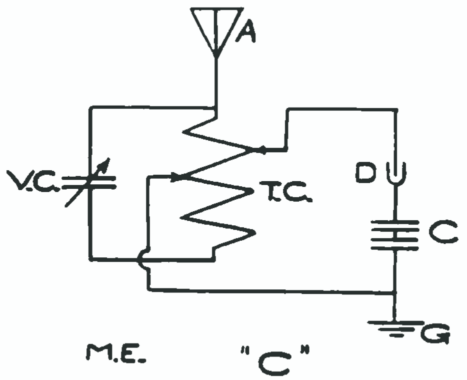
For instance, I sit down to the instrument table, throw the switch in, and listen for some message to come in. As soon as I find that the station sending is apt to keep on sending for a few moments, I take a condenser, or some other piece of apparatus, and connect it up some place in the circuit and note the result, whether better or worse. In this way I have discovered many new circuits, some very good and many only ordinary, and in fact have, to some degree, achieved selectivity, being able to talk with friends without noticing any interference, even when high-powered stations near by were operating, and to tune out any unwanted station and listen to another. My instruments are connected all above board, that is to say the



"B"

wiring is all open, and may be altered very easily, thus facilitating quick changes, though not conducive to good appearance; in fact, a photograph and description of my instruments would never take a prize, and I doubt if it would even receive "Honorable Mention" in the "Monthly Contest" carried on by MODERN ELECTRICS, but in point of workability I believe they are on a par with any in the country.

The above will serve to illustrate my meaning, but to make it a little clearer, a few diagrams are given, showing the difference a condenser or slight change in connections will make. For instance, while signals may be received quite clearly with instruments connected as in diagram A, the addition of a variable condenser, as in diagram B or C, or the extra connection from the tuner to the fixed condenser, as in diagram D, will enable the operator either to hear the signals from 25 per cent. to 50 per cent.



"C"

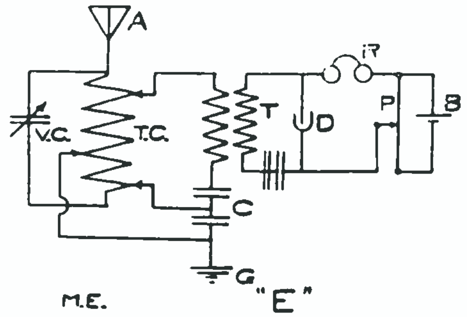
louder or to tune out the signals entirely simply by a variation of the condenser or the third contact on the tuner.

As will be seen in diagrams C and E, the variable condenser is in shunt with the winding of the tuner. This arrangement has been worked out by Mr. H. Gernsback, and to my knowledge has not been used previously. Diagram E shows a connection with which I have had a great deal of success, this being a combination close and loose coupled system.

As soon as a book of diagrams and results is started there is bound to be an improvement in the working of the station, for it is so interesting to compare the results from one circuit with those from another that you keep on trying something new, and thus increase your knowledge.

Never discard a circuit until you have tried several different detectors with it, for some circuits that will work very good with an electrolytic detector only give fair results with the carborundum, and vice versa.

Try new materials for detectors, and don't forget to try with and without battery. Generally I use a buzzer tester first and then switch in the aerial, using

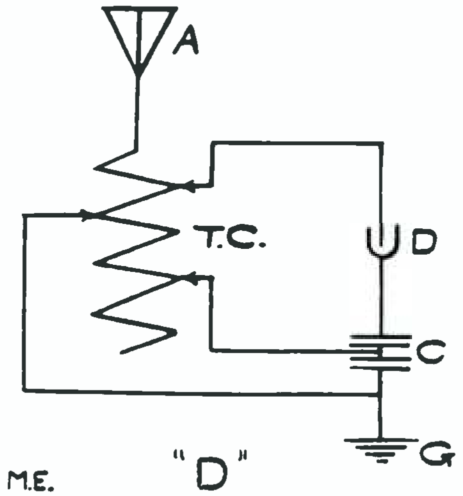


"E"

some standard detector, and when some station starts sending, switch over and compare results on the new material. In this way I have found many minerals which may be used as detectors more or less successfully.

You will note that only one aerial lead is shown in diagrams, and in defense of this I would say that I believe the double slide tuner is better in every way than two tuning coils on two separate aerial leads, the second slide on the tuner taking the place of the static coil in the loop system.

The greatest advantage, however, in the use of the one aerial lead to the receiving instruments lies in the fact that it is not necessary to use an anchor gap, wherein much energy is lost, and which I believe materially cuts down the sending radius of a station. In fact, to my knowledge some of the commercial companies have apparently waked up to this



"D"

and are now experimenting, with a view to discarding this gap. It is the use of

(Continued on Page 78)

A Potentiometer for Wireless Telegraphy

By S. Fulton Kerr.

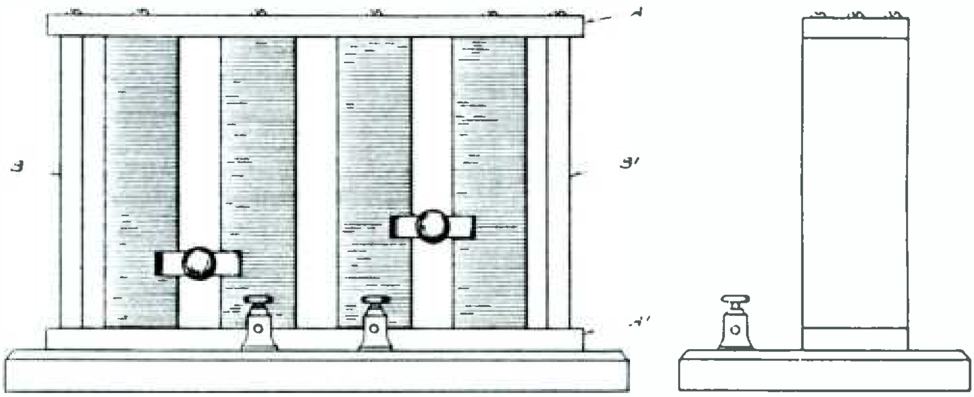


Fig. 1

In long distance wireless telegraph experimenting the variable resistance or potentiometer plays a more important part than many experimenters realize. In fact, for the successful operation of a receiving station, it is as essential as the tuning coil, especially so when an Electrolytic detector is used as this type of detector requires very accurate adjustment.

There have been more or less articles in electrical publications lately dealing on the construction of wireless apparatus, but they have failed to give the potentiometer much consideration, and this fact has led many experimenters to believe to some extent, that the potentiometer does not necessarily have to be employed. Of course, in some cases this may be true enough, as for instance, when one lives near a large government or commercial station, and wishes to receive messages from the same as the waves emitted by these are so strong that they may be received with very simple apparatus.

To obtain the best results, however, the potentiometer must be so constructed that a very gradual increase or decrease of resistance can be introduced into the circuit, and it is the purpose of this article to describe the construction of one that fulfils these requirements.

The two pieces A, A1, are made from oak or other hard wood, 12 1/2 inches long, 2 1/2 inches wide and 1/2 inch thick. The pieces B, B1, are made from the same kind of wood, the dimensions being 7 inches long, 2 1/2 inches wide and 1/2 inch thick. These strips are then screwed together to make the frame as shown in Fig. 1.

Now, turn down on a lathe or otherwise procure four cylinders of wood 1 3/4 inches in diameter and 7 inches long. After thoroughly drying them in an oven they should be wound with No. 26 B. & S. gauge, (.0159 inch) bare German silver wire allowing the same distance between the turns as the thickness of the wire. This can easily be done by screwing in a small brass wood screw, wrap the wire around the screw a few times and proceed to wind. Another screw should be screwed in at the finishing point, and the end of the wire wrapped around it. This prevents the wire from coming loose and unwinding. When the cylinders are all wound they should be given a double coat of shellac and allowed to dry.

Then screw the cylinders into the frame as shown with a distance of one inch between each one. The shellac should then be scraped off the part of the wire where the sliders will make contact with it.

The sliders are made from a strip of phosphor bronze 1/2 inch wide and about 1/32 inch thick. The shape should be like that shown in Fig. 2. The curve in the slider will of course have to have the same radius as the cylinders so that it may slide easily between them. Phosphor bronze is used to make the sliders as it is very springy and does not easily lose its stiffness, but if it cannot be obtained, stiff copper or brass will answer the purpose. Two sliders are required.

To give the instrument a neat appearance the frame should be screwed down to a base made of the same kind of wood as the frame and being 15 inches long, 7 inches wide and 1 inch thick. The edges of the base are beveled and the two binding posts are mounted on it.

The connections are made as shown in the diagram in Fig. 3. The two middle coils are connected together at the bottom, and the two end coils are each connected to a binding post.

This potentiometer if wound with the size wire specified will have a resistance of approximately 300 ohms. That is if the German silver wire is 18 per cent. alloy, but if it is a 30 per cent. alloy the resistance will be about 500 ohms. As 300 ohms will be sufficient resistance with two dry cells, the 18 per cent. alloy should be used. One pound of the wire will be sufficient.

Of course, this instrument may be made on a smaller scale, but to obtain the same resistance of 300 ohms, it would be necessary to wind it with smaller wire, and this would not permit the very gradual increase or decrease of resistance as can be obtained

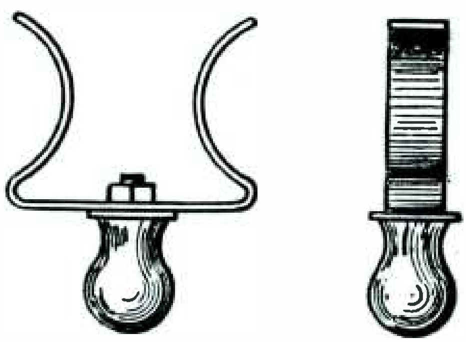


FIG. 2.

when the instrument is made larger and heavier wire is used.

By referring to Fig. 3 it can be seen that when both sliders are at the bottom of the coils, there is no resistance in the circuit as the current goes right through the sliders.

To introduce resistance into the circuit, raise the left hand slider and the higher up it is raised the more resistance there will be in the circuit. When the slider is raised as far as it will go the total resistance of the two left hand coils will be in the circuit.

If more resistance is wanted raise the right hand slider, leaving the left hand one still at the top, and when the

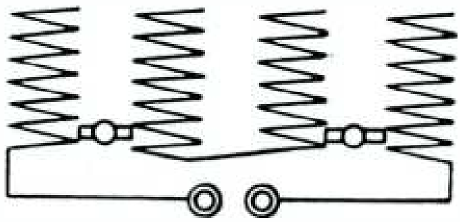


FIG. 3.

right hand slider is up at the top the total resistance of all the coils will be in the circuit.

There have been so many articles published from time to time on the method of adjusting this instrument when it is connected up with the other instruments that it will not be necessary to explain that here, and in conclusion, it may be added that if this instrument is properly constructed, it will make a valuable addition to the experimenter's station.

This instrument, as will be seen, is of the inductive type, and while not as efficient as a non-inductive potentiometer it will do good service in the hands of the experimenter who does not require absolutely exact balanced circuits.

PARAFFINE TAPE.

The ordinary insulating tape is much too heavy to be used on very fine wires, and in applying it there is danger of breaking the wire. For all such work paraffine tape is much better, and may easily be prepared as follows:

Get a roll of taffeta silk seam binding, which may be bought at any dry goods store for a few cents. This is a thin silk tape and should be about a quarter of an inch wide.

Prepare the paraffine by heating it to nearly the boiling point; then run the tape through it, being careful not to get the paraffine on too thick, and wind on a spool.

In using the tape, the heat of the fingers is sufficient to soften the paraffine so that it will adhere readily.

Contributed by J. CARLTON PAULMIER.

Wireless Telegraph Contest

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

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.

Please find enclosed a picture of my wireless station. I am 15 years old and have been experimenting with wireless six months. On the right are the sending instruments. I use a one inch induction coil, and run my coil from the 110 volt alternating current here. I use a

water rheostat in connection with same; this gives very good results. You can see rheostat just back of coil.

I use two 3 quart Leyden jars for sending condenser, one on each side of spark gap. On this side of coil is my sending helix, which I made from 10

feet of No. 8 brass wire. The spark gap is on top of coil. I use an ordinary strap key for sending. With these instruments I can easily get a station 5 miles from here. For receiving I use 3 complete outfits; one is a 75 ohm relay with a coherer and decoherer, which signals me.

Another is a 1,000 ohm receiver which I made from a 75 ohm one, and an "auto" coherer with a rheostat regulator. The last one is a 1,000 ohm receiver in connection with an electrolytic detector, tuning coil, condenser, and a potentiometer made of German silver wire. With the above instruments at night I can hear the Galveston and Dallas stations. I use the "auto" coherer to communicate with my friends that have stations here.

Just to the right above coil is my D. P. D. T. switch, used to connect the sending and receiving with ground and aerial. My aerial is suspended from two 50 foot poles and is composed of 2 No. 14 B. S. copper wires 50 feet long and 2 feet apart.

MODERN ELECTRICS is a fine magazine, especially for wireless experimenters, and is a great help to me.

Abilene, Texas. EARNEST CARTER.

HONORABLE MENTION.

Enclosed please find 2 photos of my wireless station.

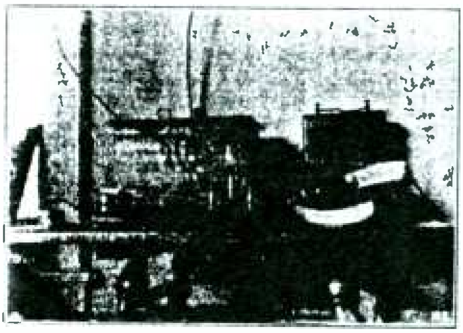
No. 1 is the receiver. Against the wall, on the left of the table is the tuning coil, with two sliding contacts. To the right of this is the adjustable condenser, made of four small condensers arranged with plugs like a resistance box. Just to the right of the phones is a silicon detector. In front of the tuning coil are an electrolytic and a silicon with finer adjustments than the other one. It is made of a telegraph sounder, the top of the anvil being cut off and the magnets taken out. The lever is turned around in the frame and the frame unscrewed and then screwed down so that the lever is over the anvil. The silicon is put between the lever and the anvil and the adjustment is obtained with the regular spring and thumb-screw. I made everything on the table, except of course, the phones.

No. 2 is the transmitter. It is of

ranged in portable form, in a box 12x 12x13 inches.

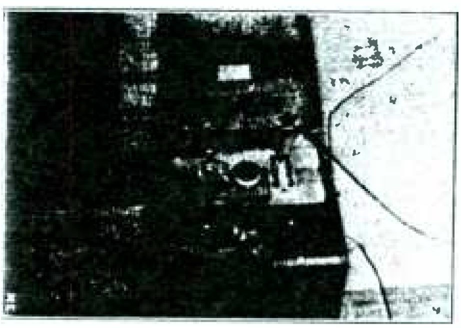
On the right is the top of the coil, on the left is the discharger, a brass mushroom and a zinc rod, at the back of the box, under the shelf, are the Leyden jars. The tuning coil is in the front, near the bottom, and does not show.

On the shelf are the key, battery switch and a D. P. D. T. switch for



the aerial. The receiver shown fits in a box of the same size. It has two binding posts on the outside which lead by a flexible cord to two on the outside of the transmitter box, two more on the transmitter box go to the batteries or dynamo, and two to the aerial and ground.

All the wiring is done in silk flexible cord—high-tension in green, battery wiring in red.



The binding posts are labeled with red or green plates such as you get from slot machines. The instruments are finished in green "Jap-a-lac."

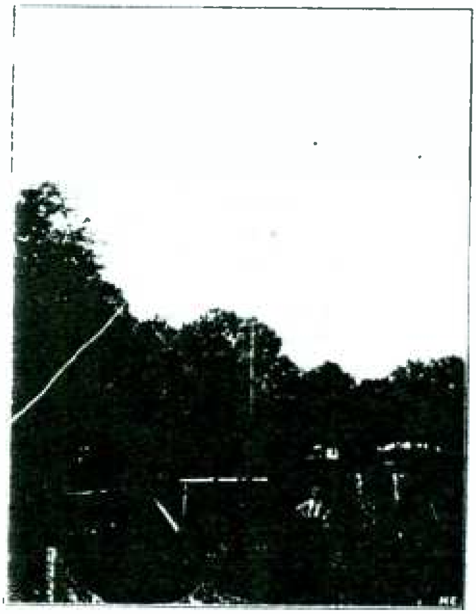
My aerial contains some 450 feet of wire and is raised by a 35 foot pole on the roof. I have had very good results with this set, and have heard B. G. quite clearly.

MODERN ELECTRICS is the best magazine I have ever seen for the amateur. Its articles are clear and concise, without being too detailed.

New York BOWDEN WASHINGTON.

HONORABLE MENTION.

My station is located at Baldwinsville, N. Y. The pole I made of iron pipe, and is 72 feet high; length of aerial, 85 feet. My transmitter consists of sending inductance, spark gap, muffler type; series.



multiple condensers, key, and spark coil, which will give a 4 inch spark, which I run from a transformer giving 10 volts, connected with 110 volt 60 cycle lighting circuit. I use tuned circuit receiving apparatus, which includes tuning coil, dou-

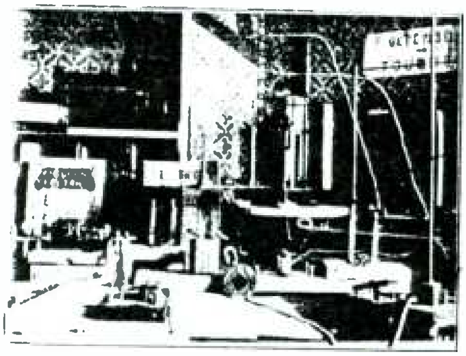
ble slide, potentiometer, variable condenser, rotary type; electrolytic detector, and telephone receivers wound to 1,200 ohms each. I think MODERN ELECTRICS a fine book on everything in the wireless question.

New York. C. R. MILLER.

Laboratory Contest

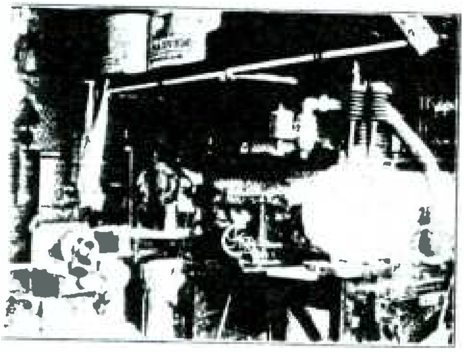
FIRST PRIZE, THREE DOLLARS.

Being an acute reader of your up-to-

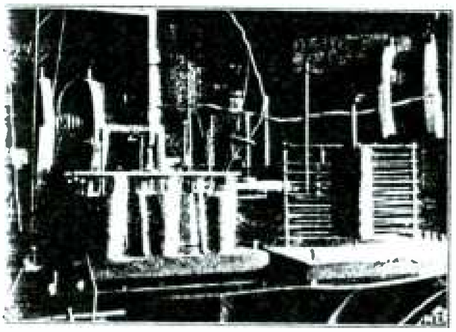


date magazine, I am sending you these photos for the laboratory contest.

They were taken by myself with a 9 x 12 folding camera. To the right is an electrolytic detector, U form, with two resistance coils and telephone.



Higher is my D'Arsonval galvanometer with glass case. The magnet is one taken off a magneto, the armature is a coil of cardboard upon which I rolled



50 meters of 0.2 millimeter insulated copper wire.

Higher to the left is my 3 centimeters induction spark coil, and in front of your magazine a 200 ohm Radiguet (Paris) relay. In front is a mercury-carbon coherer, but the electrolytic type works very much better with the telephone. My aerial has 3 parallel wires on top of the house. I work only with accumulators because it is the only available source of energy for an electrical laboratory. I also enclose another photo of my laboratory showing my lathe, 3 H. P. Minerva motor, steam engine, and projection apparatus for 8 1/2 x 10 plates.

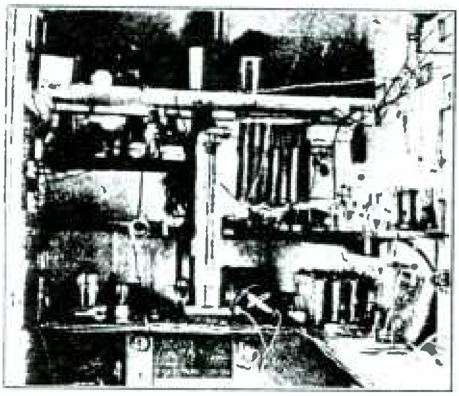
Another photo shows my recent high frequency apparatus constructed by me for wireless work.

The battery of Leyden jars which are in front work very well.

Brussels, Belgium. RENE BEYAERT.

HONORABLE MENTION.

I enclose a photo of my laboratory and wireless sets. I own one sending set and four different receiving sets. I use the electrolytic detector most of the time. My tuning coil I made myself, and it has 182 feet of wire on it. I have an aerial 60 feet high, eight wires of No. 18 bare copper from the instruments to top of mast. The photo which I enclose was taken last December; the room has been



changed a great deal since then. The reason for so many bottles is that I do a great deal of experimenting in chemistry.

New York. ROBERT L. STEELE.

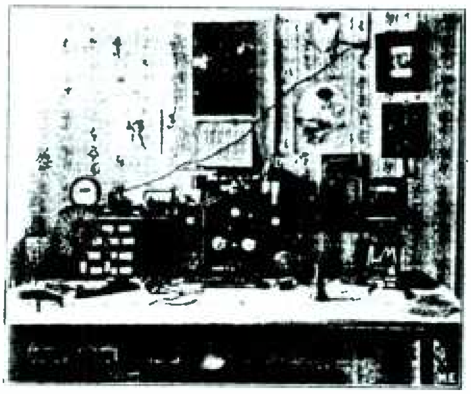
HONORABLE MENTION.

I herewith enclose a photograph of my electrical laboratory.

The switchboard, which controls nine batteries, can be seen in the center of the table. A current may be had from one, two, three, four or nine batteries, as desired. This arrangement is controlled by two two-point switches and one lever switch. The two knife switches control two miniature lamps.

To the right and left of the switchboard and on the shelf are two telegraph sounders and a relay. The telegraph lines lead to the home of my friend, and the receivers, which are seen in the foreground, may be switched in to the circuit and used in place of the sounder.

The rheostat under the shelf to the left of switchboard regulates the miniature lamps, while the one to the right is used to regulate the speed of motors or the current of other instruments. Both rheostats are made of field coils from an electric fan.



An 8 inch plate E. I. Co. static machine is at the left of table, and it will give a 2 1/2 inch spark at all times.

Leyden jars of my own make may be seen directly above the switchboard.

My laboratory contains many other electrical instruments which can be seen in the photo.

Modern Electrics is a splendid magazine for electrical experimenters.

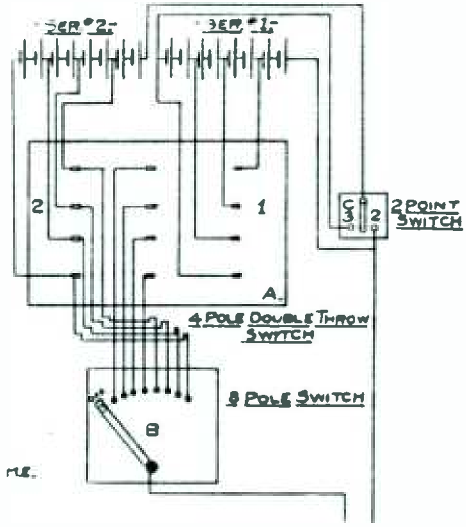
Indiana. L. S. Musser.

BATTERY SWITCH.

Some time ago I worked out the following circuit for controlling a battery of dry cells, which is very satisfactory, allowing the battery to be used in two sets, one recuperating when the other is in use or allowing all to be used in series.

The parts are: A, a four-pole double throw knife switch, which can be made up of the parts of 2 double-pole double throw switches. B is an eight-point switch for cutting in the batteries.

C is a two-point switch for governing the sets. To use set No. 1, A is thrown over to 1 and B advanced until the current is right.



To use set No. 2, A is thrown over to 2, C is turned to 2, and B advanced for right amount of current. To use all cells in series, A is put to 1, C put on 3, and B advanced for current.

The diagram shows 16 cells or two sets of 8. The arrangement will be found very handy for experiments.

Contributed by Frank J. Harris.

HINTS FOR THE WIRELESS EXPERIMENTER.

(Continued from Page 67)

the anchor gap which, to my mind, prevents the average amateur from communicating with friends except over short distances, as when the power of a station is low the anchor gap takes the greatest part of it, and consequently the aerial radiates but feebly.

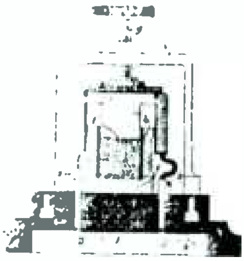
Apparently the Government experts have appreciated this fact, for they are now using a form of relay which closes the gap when sending, and opens it when receiving, the object of this being to disconnect the transmitter from the receptor, thus avoiding any possibility of unbalancing the receiving circuit with the capacity and inductance of the sending circuit. However, I accomplish this end all at the switch, and I believe in a much simpler way.

These few hints if remembered I hope will prove of benefit to many experimenters in wireless telegraphy and I trust may lead to some future discovery of importance.

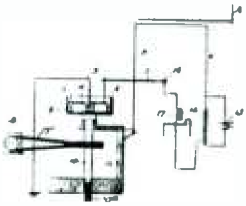
Electrical Patents for the Month

[illegible] ELECTRICAL RESISTANCE DEVICE. [illegible] Dearin, Liverpool, England. Filed [illegible]. Serial No. [illegible].

1. An electrical resistance device comprising a resistance [illegible] in which are intimately mixed together a material [illegible] the form of [illegible] of flakes and a material in form of grains.

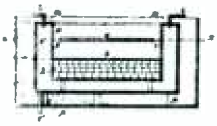


[illegible] DETECTING DEVICE FOR WIRELESS TELEGRAPHY. Reginald A. Fessenden, Brant Rock, [illegible]. Filed Mar. [illegible], 1907. Serial No. [illegible]. Renewed Feb. [illegible], 1908. Serial No. [illegible].



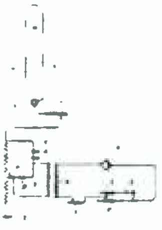
1. A receiver for electro magnetic waves comprising a conducting liquid and a conducting body projecting thereinto, the two having relative motion, means for movably supporting said body so as to balance it against the frictional stress of the liquid, and means for indicating its movements due to alterations in said stress by the waves.

[illegible] CARBON-CONSUMING GALVANIC CELL. [illegible] W. Jungner, Kneippbaden, Norrköping, Sweden. Filed June 27, 1906. Serial No. [illegible].



1. In a primary galvanic element, an anode of amorphous carbon, an electrolyte of concentrated sulfuric acid and a cathode insoluble in the electrolyte and a depolarizer of atmospheric air.

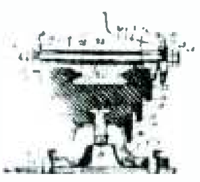
[illegible] TRANSMITTING APPARATUS. [illegible], Jersey City, N. J., assignor to International Telegraph Construction Company, a Corporation of New York. Filed Dec. 23, 1906. Serial No. [illegible].



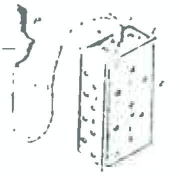
[illegible] In a signaling system, means for producing high frequency oscillations, a signaling circuit for supplying energy thereto, a source of electrical energy in said circuit, inductive resistances of different magnitudes serially connected in said circuit, and an inductive resistance and a key adapted to close a circuit in parallel to one of said resistances, whereby signals are transmitted.

[illegible] THIRD-RAIL INSULATOR. Louis [illegible], New York, N. Y. Filed June 6, 1907. Serial No. 377,444.

1. A device of the character described, comprising a [illegible] portion, a metallic plate mounted thereupon, a bolt extending across the top of said metallic plate and supported thereby, a roller mounted upon said bolt, clamps [illegible] portions of said bolt and adapted to [illegible] said bolt to move in a definite plane from said plate, and a rail engaging said roller and provided with portions [illegible] engaging portions of said clamps.

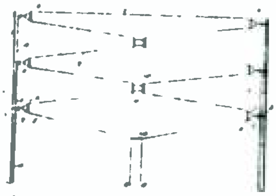


[illegible] ELECTRIC HEATING DEVICE. [illegible] Filed July [illegible], 1908. Serial No. [illegible].



1. An electric water heater adapted to be submerged in a liquid and comprising a perforated body, a plurality of [illegible] carrying plates of non-conducting material arranged in the body in parallel relation and each having its side [illegible] formed with notches, each of said plates also having perforations arranged adjacent the [illegible], wires having their ends passed through the apertures in said carrying plates and their intermediate portions wound or coiled around said plates and engaged with said notches, and [illegible] plates composed of non-conducting material arranged within the body between the carrying plates and apertured to receive certain of said wires, the wires of the [illegible] coils being united and the wires of the [illegible] coils projecting outside of the body.

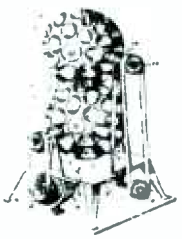
[illegible] ANTENNA FOR WIRELESS TELEGRAPHY. [illegible] E. Arnesen, Brooklyn, N. Y. Filed May 23, 1908. Serial No. [illegible].



1. In wireless telegraph antennae, the combination of suitable supports, and a plurality of wire loops extending horizontally and lying in a vertical plane between said supports, substantially as described.

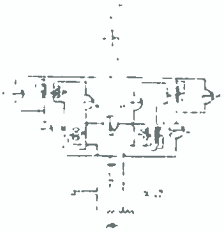
2. In wireless telegraph antennae, the combination of a plurality of masts, and a single wire formed into loops extending horizontally and lying in a vertical plane between and supported by said masts, substantially as described.

[illegible] ILLUMINATING DEVICE. Charles A. [illegible], [illegible]. Filed June 20, 1908. Serial No. [illegible].



In an illuminating device of the character described, comprising spheres adjacent and revoluble at right angles to each other, each of said spheres irregularly studded on the periphery with reflectors carrying electric lamps connected with wires, a hollow axis with each of said spheres mounted thereon with means provided for conducting wires through said axis to said lamps, cog and pulley means of connections with motor driving said axes, insulated interior collars attached to turning shafts carrying wires for said lamps and collars connecting with exterior stationary collars that receive wires conveying electric current, all substantially as set forth.

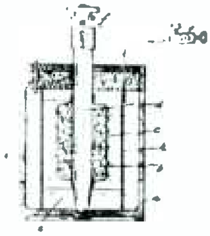
[illegible] METHOD OF WIRELESS SIGNALING. Reginald A. Fessenden, Brant Rock, Mass. Filed July 1, 1907. Serial No. [illegible].



[illegible] art of wireless signaling, the method of eliminating disturbing impulses which comprises generating waves [illegible] a definite frequency, in groups having a [illegible] group frequency above 200 per second but within the limits of audibility, and receiving the same with an indicator [illegible] unresponsive to said group frequency.

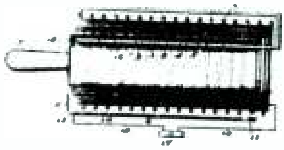
[illegible] GALVANIC CELL. [illegible], Hamburg, Germany. Filed July [illegible]. Serial No. [illegible].

1. In a galvanic cell the combination with a positive electrode and a negative electrode of a depolarizing substance containing chlorid of iron, an electrolyte and an admixture thereto of an acid of the [illegible] group.

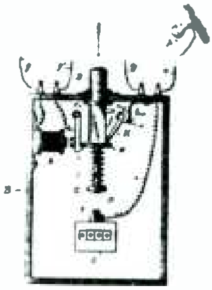


[illegible] HERTZIAN WAVE METER. Clarence D. Ransom, New York, N. Y., assignor to The United Wireless Telegraph Company, a Corporation of Maine. Filed May 27, 1908. Serial No. 435,280.

1. In a Hertzian wave meter the combination of a pair of insulated metallic cylinders constituting a condenser; an inductance coil surrounding said cylinders; a sliding connection between said coil and one of said cylinders; a sliding connection between said latter cylinder and said coil; and a wave indicator connected to both of said cylinders substantially as described.



[illegible] REGISTER FOR TELEPHONES. William O. [illegible], San Francisco, Cal. Filed Dec. 29, 1906. Serial No. [illegible].



1. A registering attachment for telephones comprising a local registering device, a plunger operated by the subscriber for positively actuating the same, a lock normally preventing any movement whatever of the plunger in a direction to actuate the registering device, and a magnet for releasing said lock, said magnet being in a circuit controlled wholly by the central operator.

[illegible] WIRELESS-TELEGRAPH RECEIVER. [illegible] M. Way, Austin, Tex., assignor to George W. Tremmitts, Galveston, Tex. Filed Mar. 7, 1908. Serial No. [illegible].

1. An electric wave detector comprising a cup or holder for a suitable crystalline mass, said cup being rotatable, a carriage movable about an axis parallel to the axis of rotation of the cup or holder, an arm pivotally connected to the carriage and movable about an axis at right angles to the axis of rotation of the carriage, an adjustable contact screw carried by the arm in position to engage the crystalline mass carried by the holder, and opposing springs connected to the carriage and to the arm on opposite sides of the pivot of the latter.

[illegible] ANTENNA FOR WIRELESS-TELEGRAPH SYSTEMS. Clarence D. Ransom, New York, N. Y. Filed Jan. 24, 1908. Serial No. [illegible].

1. A wireless telegraph antenna comprising an approximately vertical portion and an approximately horizontal portion, said portions being formed by the same continuous wires, and the said horizontal portion consisting of a plurality of parallel conductors disposed in a substantially [illegible] plane substantially as described.

Original Electrical Inventions for Which Letters Patent Have Been Granted for Month Ending April 27th

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

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

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

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

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than three questions answered at one time. No attention paid to letters not observing above rules.

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

CARBON DETECTOR.

(206.) MERLYN DENNIS, Chicago, Ills., asks:

1.—Will two electric light carbons sharpened to an edge, with a steel needle laid across them, act as a detector for a short distance wireless telegraph?

A. 1.—Yes.

2.—With a 1 1-4 inch spark coil, will a 75 ohm telephone receiver, receive messages with the above named detector up to one-half mile?

A. 2.—Yes.

SENDING AND RECEIVING.

(207.) BRANSON M. DECOU, N. J., writes:

1.—What is the maximum sending and receiving range of a wireless set employing for the receiving set, "Electro" Lytic detector, tuning coil, variable condenser, fixed condenser, potentiometer, 2,000 ohm amateur type phones, aerial 75 feet high on both ends, 90 feet in length, composed of two parallel aluminum wires and a lead from this to station in the middle, same on top of a hill in a mountainous district. For sending six-inch Rhumkorff coil, 6-quart Leyden battery, small helix, zinc spark gap, same aerial.

A. 1.—Sending 35 to 50 miles, receiving possibly 700-800 miles.

2.—If a 2-inch coil and small adjustable condenser are substituted in above outfit?

A. 2.—5-10 miles.

3.—Do the letters C. Q. D. stand for the first letters of any particular combination of words, or is the combination simply a conventional signal?

A. 3.—The letters C. Q. D. stand for the phrase, "Come Quick. Danger." We understand that the danger signal has now been changed to S. O. S.

AERIAL AND LIGHTNING.

(208.) GEO. R. VINER, Ills., asks:

1.—What is the greatest possible distance that a message could be sent with a one-inch spark coil, using dry batteries and having an aerial wire about 35 feet high?

A. 1.—3-5 miles.

2.—Is an aerial of 35 feet in height liable or apt to draw lightning?

A. 2.—Yes. Ground switch should be used during storms.

WIRELESS QUERIES.

(209.) J. R. CALDWELL, Brooklyn, N. Y., asks:

1.—What is the greatest possible distance a message can be received with a "Electro-Lytic Detector," using one wet battery. One watch case receiver, and an aerial wire about 40 feet high.

A. 1.—200 to 300 miles.

2.—If I were to use a tuner what would be the greatest possible distance?

A. 2.—300 to 400 miles.

3.—What distance can I send with a 1-4 in. spark coil? A 1-2 in. coil?

A. 3.—One quarter mile. 1-2 to 3-4 mile.

SENDING DISTANCE.

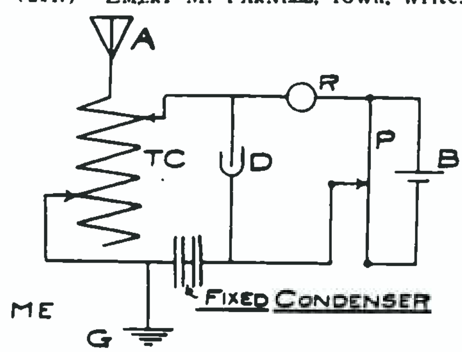
(210.) R. A. MCCLEERY, California, writes:

1.—How far can I send with a one-inch spark coil and a fifty-foot aerial? I am situated in the highest part of the city.

A. 1.—3 to 5 miles.

WIRELESS QUERIES.

(211.) EMERY M. PARNELL, Iowa, writes:



1.—How far can I send messages, under favorable conditions, with an E. I. Co.'s two (2) inch spark coil, and with an "Electro zinc spark gap" in circuit, providing that the receiving station has an "Electro Lytic Detector?"

A. 1.—10 to 15 miles.

2.—Can you please show me by diagram how I can connect the following instruments for receiving for best results: An E. I. Co. tuning coil Electro Lytic Detector, Potentiometer, telephone receiver (75 ohm) and battery?

A. 2.—Diagram shows the addition of a fixed condenser which must be used with the double slide tuning coil.

3.—Can I use a 20 ohm relay in connection with the "Electro Lytic Detector," the relay used in connection with an electric bell for calling.

A. 3.—No.

RECEIVING DISTANCE.

(212.) Henry R. Smith, Ky., writes:

1.—How far can I receive with an aerial composed of 4 wires 8-in. apart strung between two masts 56 feet and 40 feet high? My instruments, consisting of an "Electro"-Lytic Detector, two 1,000 ohm receivers, tuning coil, variable condensers and Potentiometer are within 4 feet of the ground.

A. 1.—Five to eight hundred miles.

POTENTIOMETER.

(213. Richard H. Foster, R. I., writes:

1.—How far can I receive with the following: Electro Lytic Bare-point detector, tuning coil of 246 meters wave length, 75 ohm telephone receiver, choke-coil inserted between battery and detector, aerial, 50 feet long, composed of 4 No. 16 copper wires on spreaders and is about 75 feet high.

A. 1.—Three hundred to five hundred miles.

2.—I use a choke coil to keep down the battery current. Had I better use a potentiometer?

A. 2.—Potentiometer is a great deal better for the purpose you mention.

3.—Will the Electro Imp. Co.'s rheostat-regulator cut down the electric lighting current so as to run a one-inch spark coil?

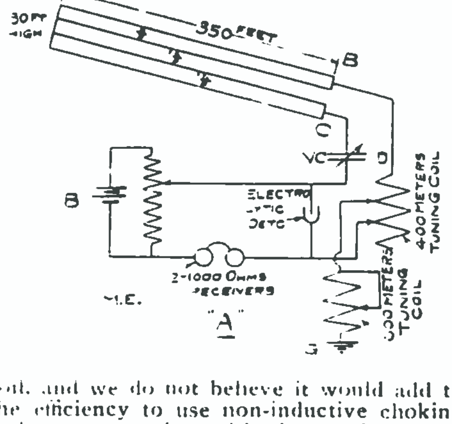
A. 3.—No.

TUNED CIRCUITS.

(214.) L. H. Robinson, California, asks:

1.—Does a high resistance telephone receiver act as a choke coil in a wireless receiving circuit, or would it add efficiency to place one or two non-inductive choking coils in series with receiver to force all oscillations to travel through the detector?

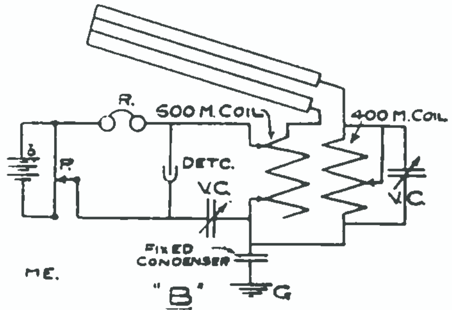
A. 1.—A high resistance telephone receiver acts in a certain way as a choking



coil, and we do not believe it would add to the efficiency to use non-inductive choking coils in connection with the receivers.

2.—Does it make any difference whether the variable condenser is between the detector and aerial, or between detector and ground, when using electrolytic and silicon detectors?

A. 2.—Decidedly. We have found that a condenser in the round circuit is ten per cent better than a condenser in the aerial circuit.



3.—Using tuned system as shown in enclosed diagram, with electrolytic detector fitted with .0002 Wollaston wire, and receivers of 1,000 ohms each, what should my receiving distance be at night over mountainous country?

A. 3.—We would suggest that you use connections as shown in diagram B, with which we think you will get very much better results. You should have little trouble to get messages from distances 1,000 miles away.

VIBRATOR.

(215.) Guy Mead Port, Pa., asks:

1.—Will you please state the size of wire enclosed?

A. 1.—No. 34 B. & S. gauge single silk covered.

2.—Will you please give a diagram showing how to connect a vibrator to a coil for wireless use.

A. 2.—We refer you to query No. 182 in the April issue.

RECEIVING DISTANCE.

(216.)—G. A. Green, Mass., writes:

1.—Please tell me what the receiving radius of my station will be with aerial 40 feet high, using silicon detector, tuning coil, condenser and a 1,000 ohm receiver.

A. 1.—Two to three hundred miles.

TUNER.

(217.) Charles Schilling, Kansas, asks:

1.—Kindly tell me what size wire would be best for a tuning coil.

A. 1.—We consider No. 24 B. & S. Gauge enameled wire the best for this purpose.

2.—How could I take the insulation off of the wire, "for above coil," where contacts are to slide without having frayed ends.

A. 2.—Enamel may be scraped off with a sharp knife.

10-INCH COIL.

(218.) Geo. Clinton, Ills., writes:

1.—Would you please tell me where I can get a list of Government and commercial wireless stations?

A. 1.—We refer you to query No. 218, answer to question three.

2.—Give dimensions of a 10-inch spark coil.

A. 2.—Core 16-inch long, 1 3-8 inches diameter. Primary wound in two layers with 32 ounces of No. 10 wire. Secondary wound in sections with 10 pounds No. 36 B. & S. gauge S. S. C. Condenser 10x6 inches tin foil 60 sheets. Voltage 24. Amperage 10.

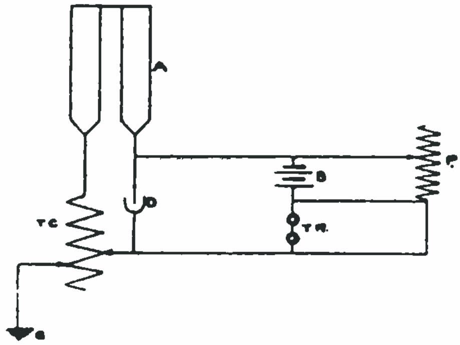
3.—How large a spark coil would I need to send messages 100 miles with a 100-foot aerial and over level country?

A. 3.—10-inch coil would do very well for this purpose.

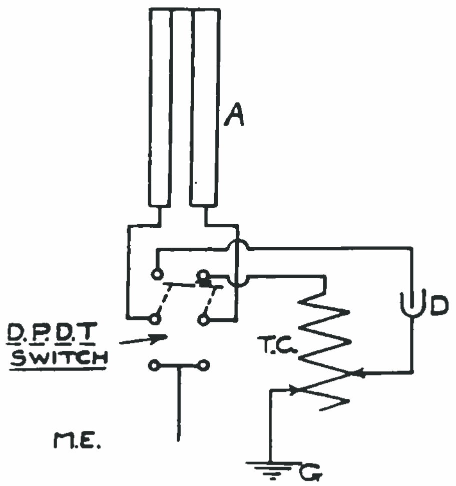
LIGHTNING ARRESTER.

(219.) FRANK W. HARTH, N. Y., writes:

1a.—How would I insert lightning arresters in the following circuit?



A. 1a.—Diagram two is self-explanatory. Ground wires should be run as straight as possible. Throw switch to ground during storms.



1b.—Could I use a vent pipe for a ground?

A. 1b.—No; it is not safe, use gas, or better, water pipe.

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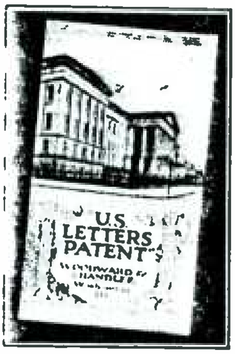

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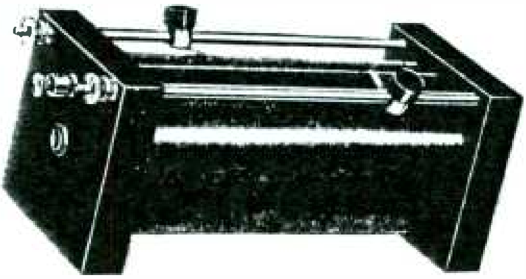

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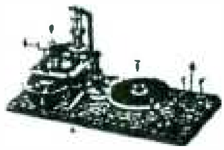

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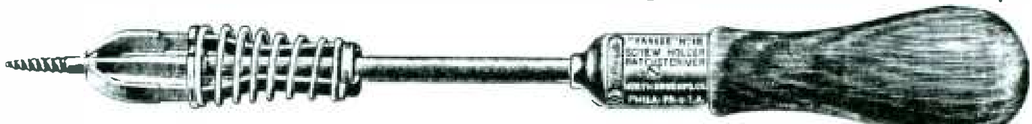

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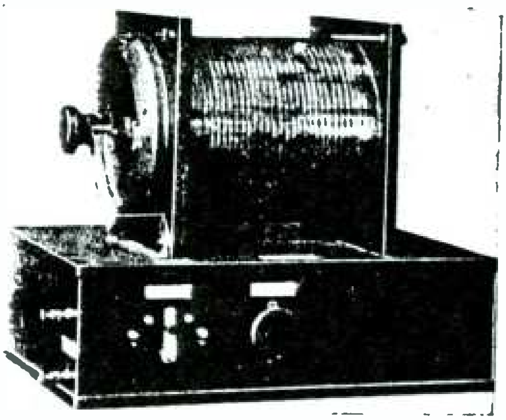

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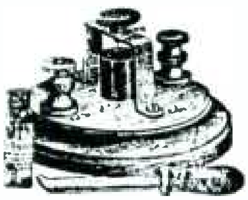

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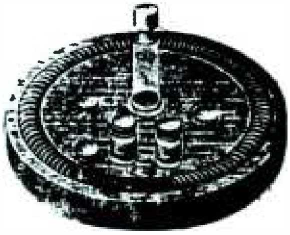

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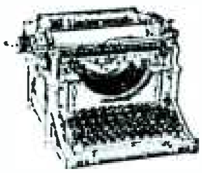

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NO. 8000

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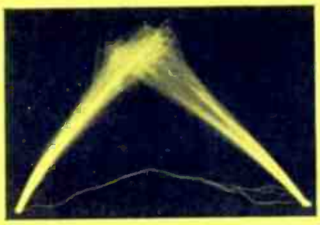

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