H. DUNWOODY.

TUNER FOR WIRELESS TELEGRAPHY.

APPLICATION FILED JULY 5, 1907.

934,296.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

Fig 1.

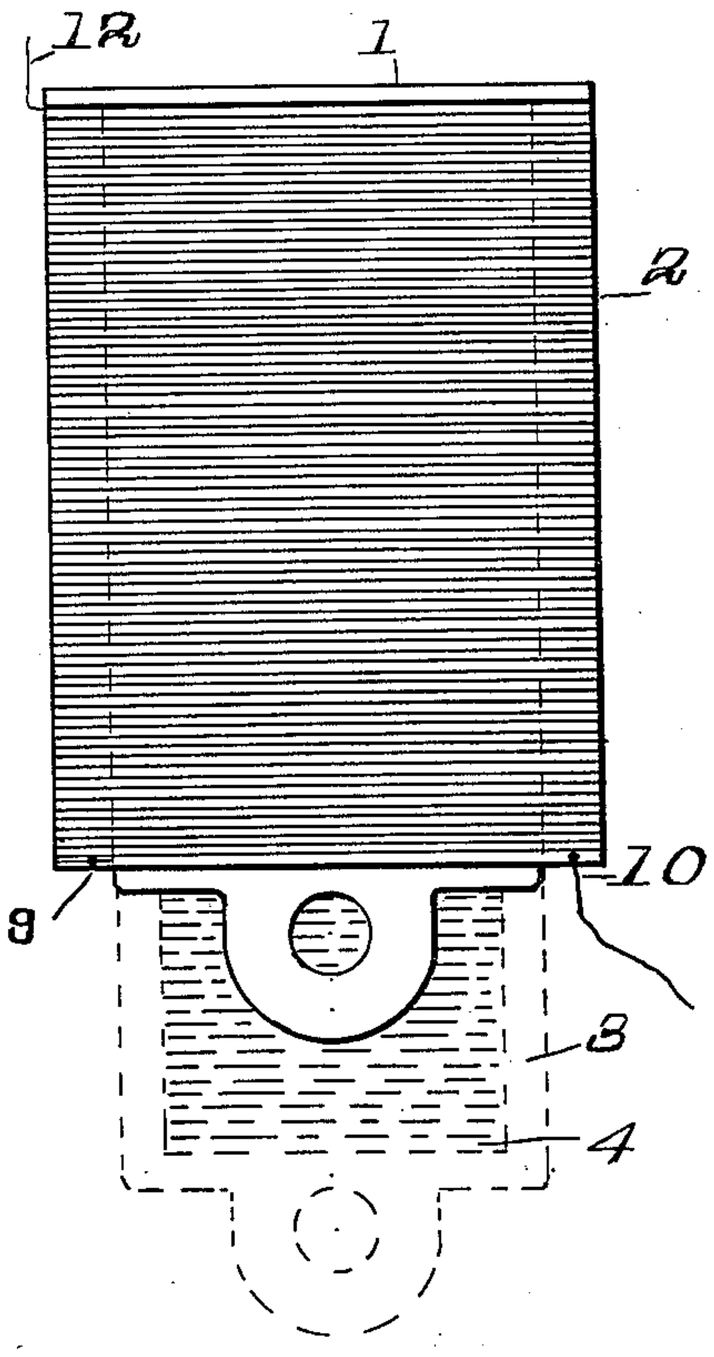


Fig 3.

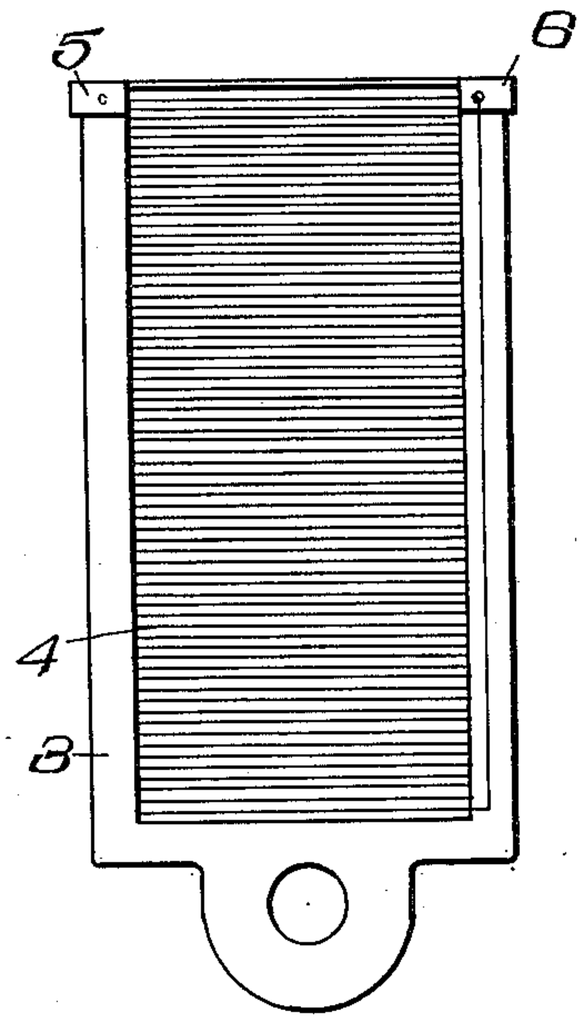


Fig 2.

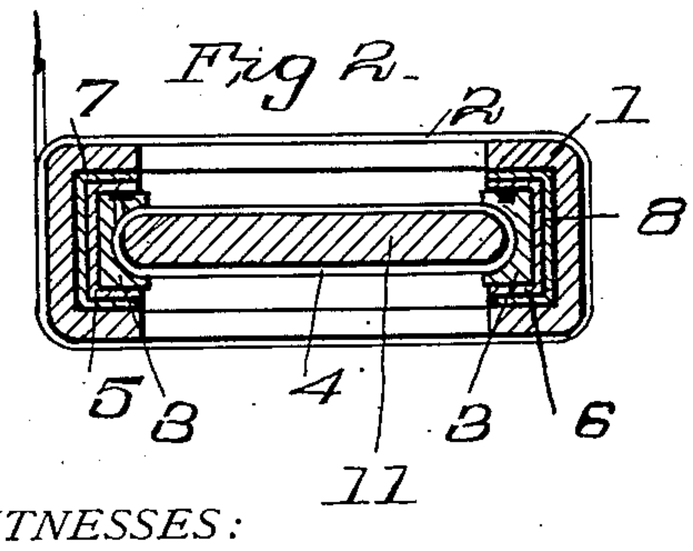
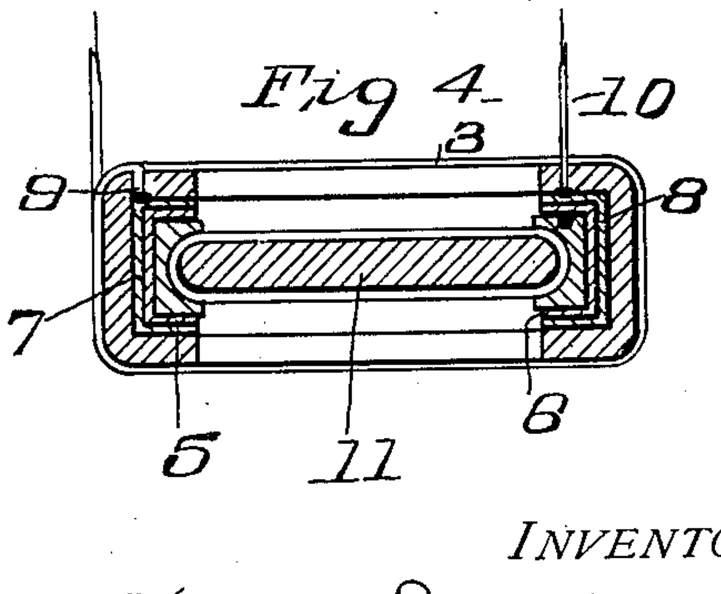


Fig 4.



WITNESSES:

H. George Hemingway.

W. W. Neale Jr.

INVENTOR

Valory Dunwoody

BY Wickinson Fisher

Ed Wickinson

Attorney

H. DUNWOODY.

TUNER FOR WIRELESS TELEGRAPHY.

APPLICATION FILED JULY 5, 1907.

934,296.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 2.

Fig 8.

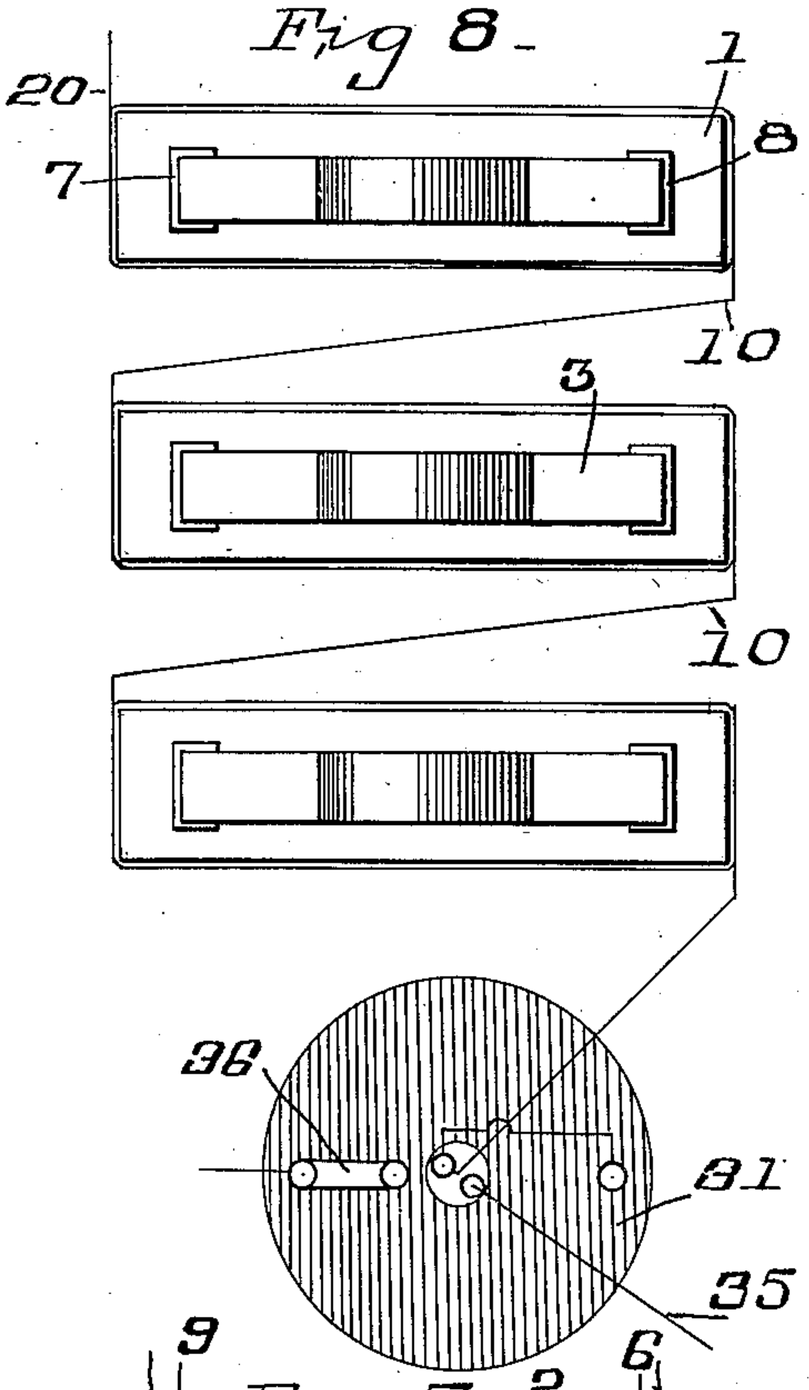


Fig 9.

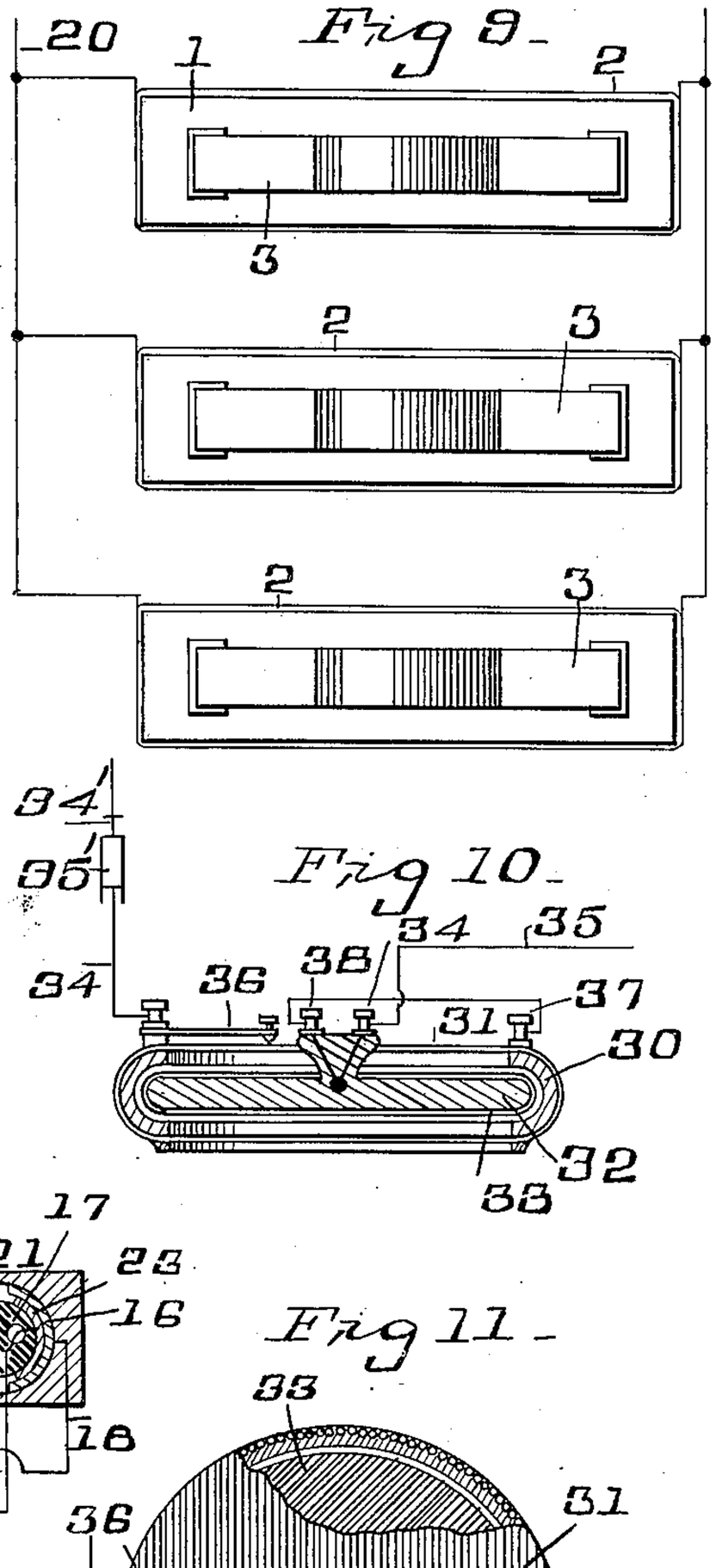


Fig 5.

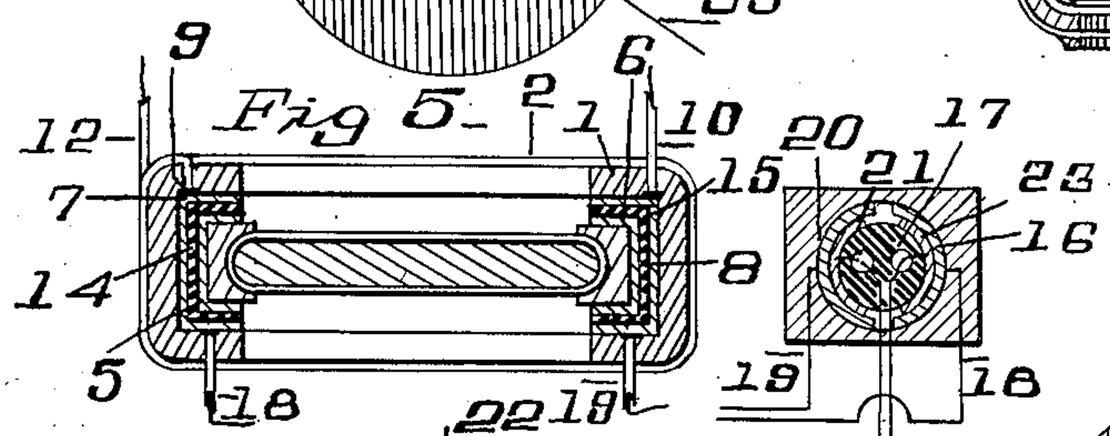


Fig 6

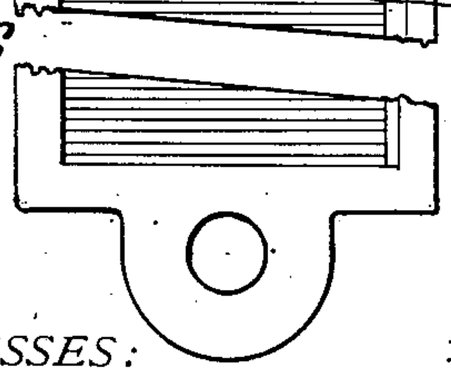
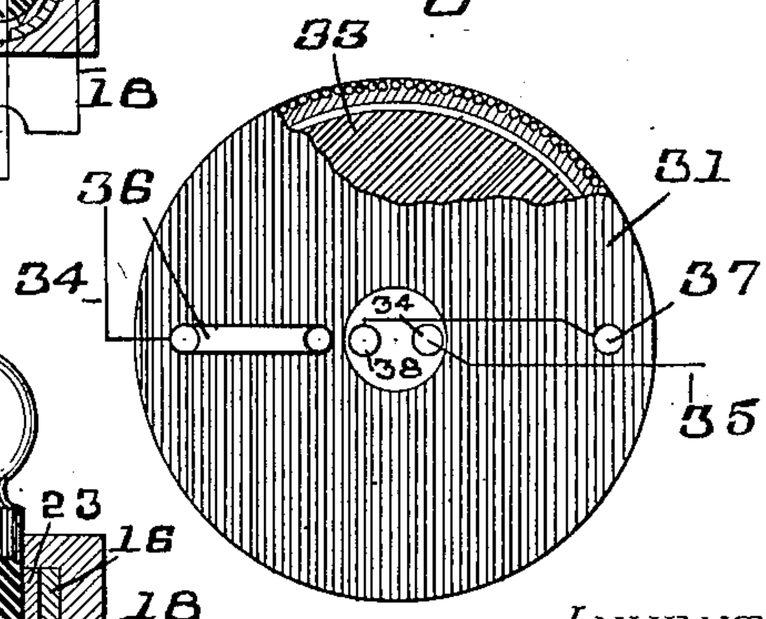


Fig 11.



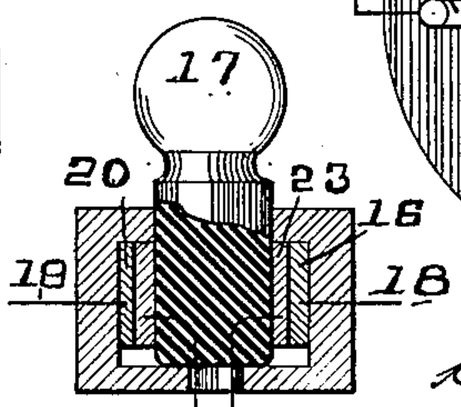


Fig 7.

22 24

WITNESSES:

H. George Hemingway.

A. W. Neale, Jr.

INVENTOR

Valery Dunwoody

BY Wickinson Fisher and Wilkinson

Attorney

UNITED STATES PATENT OFFICE.

HALSEY DUNWOODY, OF THE UNITED STATES ARMY.

TUNER FOR WIRELESS TELEGRAPHY.

934,296. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed July 5, 1907. Serial No. 382,212.

To all whom it may concern:

Be it known that I, HALSEY DUNWOODY, a lieutenant in the U. S. Army, and a citizen of the United States, residing at Fortress Monroe, in the county of Elizabeth City and State of Virginia, have invented certain new and useful Improvements in Tuners for Wireless Telegraphy; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a method of and an apparatus for rendering the messages received in wireless telegraphy more distinct than heretofore. That is to say, with a given set of receiving instruments and a given amount of energy delivered to the same, my method and apparatus causes the incoming message to be more distinct than heretofore, and, also, permits the message to be read with a lesser amount of energy received than has been heretofore possible.

The object of my invention is to do away with the uncertainty and indistinctness that, at present, frequently accompanies the reception of incoming messages, and to these ends my invention consists in a novel method of, and apparatus for, causing the received energy to more suddenly vary in value than heretofore, while passing through a telephone, or like receiver, and to thereby cause a more distinct signal to be delivered by said receiver.

Referring to the accompanying drawings, forming a part of this specification;—Figure 1 is a plan view of one form of my apparatus showing the inner coil in dotted lines partly withdrawn from the outer coil. Fig. 2, a cross section of the two coils taken through the terminals of the inner coil. Fig. 3, a plan view of the inner coil removed from the outer. Fig. 4 a like section to that of Fig. 3, but taken through the opposite terminal of the outer coil. Fig. 5 is a cross sectional view of a pair of coils having a modified connection between the same. Fig. 6 is a detail of the connections employed in Fig. 5, showing the reversing plug in cross section, and Fig. 7 is a longitudinal section of the reversing plug shown in Fig. 6. Fig. 8 is an end elevation of a plurality of pairs of coils joined to the modified form of coil shown in Figs. 10 and 11, so as to make one complete apparatus. Fig. 9 is a like view of a plurality of coils joined in parallel. Fig. 10 is a cross sectional view of a modified form of coil, and Fig. 11, a plan view, partly in section, showing the same coil as in Fig. 10.

Like numerals indicate like parts in all the views.

1 represents a casing of any suitable material, preferably of hard wood or rubber, around which is wound the coil 2; 3 represents a U-shaped frame of like material, into which is slipped the coil 4.

5 and 6 represent suitable U-shaped metallic terminals to which are secured the ends of coil 4, and which slide respectively in similar shaped terminal strips 7 and 8 inside the casing 1, as shown, and form electrical contacts therewith. The end 9 of coil 2 is electrically connected with strip 7 and the wire 10 is likewise connected to strip 8, as shown in Fig. 4.

11 represents a core of any suitable material around which coil 4 is wound.

So far as now described, if a wave entered on the wire 12, it would traverse the coil 2, to its end 9, enter strip 7, then cross to terminal 5 of said coil 4, traverse said coil to terminal 6, enter strip 8, and finally emerge on wire 10. This would be the circuit whether the coil 4 is pushed all the way into the coil 2, or only occupies a portion of the inside of said coil. Furthermore, if coil 4 is pulled all the way out of coil 2, turned bottom side upward, and then replaced, its terminal 6 would then contact with strip 7, and its terminal 5, with strip 8, so that while the current traversed coil 2 in the same direction as before it would traverse coil 4 in the opposite direction.

In the modified structure shown in Figs. 5, 6 and 7, strips of insulation 14 and 15 are placed inside the strips 7 and 8, and the terminals 5 and 6 slide within the insulating strips 14 and 15, as shown. The terminal 9 of the coil 2 is connected to strip 7 as before, and this strip is connected to one side 16 of a split metallic casing of the reversing plug 17, by means of the wire 18, while the strip 8 is connected by means of the wire 19 to the other side 20 of said split casing. The plug 17 carries the metallic contact 21, which is connected by wire 22 to contact 5, and also carries contact 23 connected by wire 24 with contact 6 on coil 4, as shown. The circuit through these coils, should a wave strike wire 12, would be as follows:—first through coil 2 to terminal 9, thence through strip 7

to wire 18, thence to side 16 of the split casing, thence to contact 23, wire 24, contact 6, through coil 4 to contact 5, wire 22 to contact 21, side 20 of the split casing, wire 19 to strip 8, and thence to wire 10. This reversing plug enables the current to be reversed in the coil 4, in any position it may occupy with reference to coil 2.

In the modified form shown in Figs. 10 and 11, I provide a circular core 30 around which the outer coil 31 is wound, and an inner disk-like core 32, around which the inner coil 33 is wound. 34′ represents the aerial, and 35′ an adjustable capacity therein. 36 represents any suitable contact device, here shown as a pivoted contact point, to make electrical connection between the aerial 34′ and coil 31, and to cut in or out one or more of the turns of said coil at pleasure. The terminal 37 of coil 31, is electrically connected to one terminal 38 of coil 33, 34 being the other terminal thereof which is connected to the wire 35. The inner coil turns inside the outer, so that the turns of the two coils may be angularly displaced, as shown.

It is well known in telephonic and like receivers, when a sine wave traverses the same, that the more sudden the change in the energy the more distinct will be the sound. In other words, a sine wave at the instant of going, say from minus to zero, and then to plus, at which time its energy is experiencing a maximum rate of change, will give a more distinct sound than at the instant it rises to its maximum energy value and then begins to fall, at which instant it experiences its minimum rate of change. And this is the fact, notwithstanding the total energy that passes through the receiver in the first case may be far less than the total energy that passes in the second. So in wireless telegraphy, if a wave be say 200 miles long and only its crest passes through the receiver, it might well happen, that the rate of change in its energy might be too slow to produce distinct signals, although very clear and distinct signals would appear, if one of its nodes were located in, or near, the receiving instrument. In actual practice, my coils serve to greatly increase the distinctness of the signals received; due to, I believe, an increase in this rate of change of energy in or near the receiving instruments, whether the crest, the node or any other portion of a sine wave strikes the antenna. And, whereas, I do not, of course, limit myself to any particular theory, I believe the following explanation will make clear the reason for this marked improvement in the efficiency of my receivers over any others with which I am acquainted. Suppose in Fig. 1, for example, some portion of a wave strikes the wire 12, traverses the coil 2, and then the coil 4, in the manner described above. A choking action is immediately obtained, due to induction, as is well known, and this choking action may be so great as to almost bring the energy that is passing through the receiver from its maximum value down to zero, and to thereby greatly increase its rate of change, and therefore the distinctness of the signal. By adjusting the inner coil in or out of the outer coil, this choking action may be controlled to a nicety, and the most distinct signals are obtained. I have found by turning the inner coil over, so as to reverse the current therethrough, while adjusting it in and out of coil 2, often, very superior results are obtained; and, of course, the same thing may be accomplished with a reversing switch such as that shown. The same distinct signals are, also, obtained by angularly adjusting the coils 31 and 33 relatively to each other, as shown in Fig. 11, and especially distinct signals are obtained when a plurality of pairs of coils are joined in parallel, as shown in Fig. 9, or in series, or when said coils joined in parallel or in series are also joined in series to the angularly adjustable coils, shown in Fig. 8. In all cases, the wire 36 of course is joined to the receiving instrument as heretofore.

My invention should be carefully distinguished from those devices which disclose coils in series and in inductive relationship. In such d vices one continuous circuit is employed, as is the case in mine, and the coils are angularly adjustable with relation to each other. But when it comes to tune a circuit for wireless telegraphy or telephony, a very wide range of waves must be dealt with quickly and with facility. If the coils are angularly adjustable only, they are found to be of an inconvenient size if they are made large enough to control the whole range of waves ordinarily received; and furthermore, although the adjustment of the inductance is exceedingly fine when the coils are in one extreme position, an equal relative angular movement when the coils are in the other extreme position gives quite different quantitative results. Again if the coils are so mounted as to enable them to move relatively to each other while keeping the planes of the individual turns always parallel, although a given relative movement corresponds to a given change of inductance, and although they may control a wide range of waves, yet, so delicate an adjustment of the inductance cannot be obtained, as is the case with the first mentioned coils. Therefore, in practice it is found very desirable to employ both the sliding and the rotating types of coils illustrated, in order that the sliding type may cover a wide range, and the other type may provide an exceedingly fine adjustment of the induction, and yet the whole apparatus may be so light as not to be at all inconvenient in a small portable wireless telegraphic

outfit. In fact, so delicate is this control of such an apparatus over the choking effect on the incoming sine wave, that it is possible in practice to make the system respond exactly to the node of any particular wave length encountered in wireless telegraphy; and I have produced what really constitutes a micrometer tuner for both wireless telegraphy and telephony, which having a single circuit of constant resistance is capable of operation without changing the resistance, or capacity of the receiving circuit at all, and which therefore makes it very easy to keep a delicately balanced system coördinated.

It will thus be seen that by my coils I can cause such sudden changes in small energies that the same will produce audible signals in the receiving apparatus, although they would be incapable of so doing if not passed through my coils.

Having now described my invention, what I claim and desire to secure by Letters Patent, is:—

1. In a tuner for wireless telegraphy, the combination of an aerial, a plurality of pairs of coils; electrical connections between said coils; and means permitting one pair to be slidingly and the other to be angularly adjusted relatively to each other while maintaining constant the number of turns traversed by the current until a maximum distinctness is obtained, substantially as described.

2. In a tuner for wireless telegraphy, the combination of an aerial, a plurality of pairs of inner and outer coils in series with and slidingly adjustable relatively to each other; a pair of coils angularly adjustable relatively to each other; and electrical connections between each of said coils, substantially as described.

3. In a tuner for wireless telegraphy, the combination of an aerial; a plurality of pairs of inner and outer coils connected together in series; means permitting some of said coils to be slidingly displaceable relatively to each other; means permitting others of said coils to be angularly displaceable relatively to each other; and means causing the current to flow in some of the inner coils in a direction opposite to that in the outer coils, substantially as described.

4. A tuner for wireless telegraphy comprising an outer coil having a U-shaped frame on which its turns are wound; and an inner coil slidingly fitted in said frame provided with U-shaped terminals, substantially as described.

5. A tuner for wireless telegraphy comprising an outer coil provided with a frame having a channel; an inner coil slidingly fitted in said channel and provided with terminals, also, fitting said channel; and a reversing plug in circuit between said coils, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

HALSEY DUNWOODY.

Witnesses:
P. H. WORCESTER,
HOUSTON ELDREDGE.