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A.D. 1910



Date of Application, 1st Sept., 1910—Accepted, 31st Aug., 1911

## COMPLETE SPECIFICATION,

**Improvements in Receiving Apparatus for Wireless Telegraphy.**

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and HENRY JOSEPH ROUND, Electrical Engineer, both of Watergate House, York Buildings, Adelphi, in the City of Westminster, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in receiving apparatus for wireless telegraphy whereby the effects produced by powerful atmospheric discharges are reduced or eliminated.

For this purpose we provide in the receiving circuit a path which is normally a bad conductor but which when acted upon by powerful oscillations becomes a relatively good conductor, such path being so arranged that it annuls the effect of the current in the receiver circuit when it is a good conductor but does not materially affect the signals when it is a bad conductor.

We employ for this purpose unidirectional conductors of the type specified and we have found that mercury vapour valves, crystal detectors and Fleming valves are suitable.

In Figure 1 the aerial A is connected to the earth E through the primary P of an oscillation transformer or jigger. The secondary S of the jigger is connected through the condenser C to the receiver D. The variable conductor V is connected across the secondary S of the jigger. When the circuits are in tune signals can be received if they are not sufficiently strong to affect the variable conductor V, but if a powerful atmospheric discharge occurs the variable conductor V will become a shunt to the secondary S of the jigger and very little effect will be produced in the receiver.

The variable conductor V is of the unidirectional type and two such conductors are employed connected in parallel and in opposition as shunts across the secondary of the jigger. We have, however, found that we may very advantageously employ one such conductor and a receiver which is also of the unidirectional type.

Figure 2 shows such an arrangement. The aerial A is connected to the earth E through the condenser C<sup>1</sup>, inductance L, and primary P of the jigger. The secondary S of the jigger is connected to the condenser C<sup>2</sup> and across this are the valve receiver D and telephone T, the latter being connected either direct to the circuit as shown or through a transformer in the well known manner. The variable conductor V is connected in parallel with the receiver D which in this case is a similar Fleming valve connected in opposition. The filaments of the valves D and V are rendered incandescent by the current from the batteries B<sup>1</sup> and B<sup>2</sup> passing through the adjustable resistances r<sup>1</sup> and r<sup>2</sup> respectively, and R<sup>1</sup> and R<sup>2</sup> are potentiometers for varying the voltages across the valves. When the circuits are in tune signals can be received in the telephone T if they are not sufficiently strong to affect the variable conductor V, but if a powerful atmospheric discharge occurs the valves D and V become almost equally operative and being in opposition no rectification takes place and no sound is produced in the telephone T.

[Price 6d.]



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It will be seen that the variable conductor V must not be sufficiently sensitive to be affected by the received signals, and as the strength of the received signals may vary considerably it is necessary either to adjust their effect upon the variable conductor V or to vary the sensitiveness of the latter. For example if the signals are so strong as to effect the variable conductor V 5 the coupling between the primary P and secondary S of the jigger may be weakened by moving them apart until the variable conductor V is no longer affected by the signals. But we prefer to adjust the sensitiveness of the variable conductor and since its resistance varies with the voltage across it, this can conveniently be done by applying an adjustable voltage 10 to the variable conductor. Thus in Figure 2 the potentiometers R<sup>1</sup> and R<sup>2</sup> may be adjusted to give such a voltage across the valves D and V that the additional voltage due to the signals is sufficient to render the valve D operative but insufficient to appreciably affect the valve V, while the additional voltage due to a powerful atmospheric discharge is sufficient to render both valves 15 operative.

The exact voltages which are suitable depends on the nature of the variable conductor employed as is shown by the following illustration:—Let us assume that the curve A B C D E F Figure 3 represents the relation of resistance and 20 voltage in a variable conductor, the ordinates being resistances and the abscissæ voltages. If now we take two such variable conductors and apply to them the voltages V<sup>1</sup> and V<sup>2</sup> respectively they will have such large resistances A A<sup>1</sup> and C C<sup>1</sup> as to render both of them inoperative. If now we add the voltage S of the signals to both they will have the resistances D D<sup>1</sup> and B B<sup>1</sup>, that is to say one will be operative and the other inoperative. When 25 an atmospheric discharge occurs there is a large additional voltage such as X, and the voltages V<sup>1</sup> + X and V<sup>2</sup> + X reduce the resistances of the valves to F F<sup>1</sup> and E E<sup>1</sup> respectively, that is to say both valves become operative.

In the arrangements so far described the variable conductors are placed in the receiver circuits but we prefer when possible to place the variable conductor 30 in an intermediate circuit to which both the aerial circuit and the receiver circuit are coupled.

One such arrangement is shown in Figure 4 in which the aerial A is connected to the earth E through the condenser C, inductance L and primary P 35 of the jigger. The secondary S of the jigger is connected to the condenser C<sup>2</sup> and primary P<sup>2</sup> of an oscillation transformer and across these are the variable conductors consisting of Fleming valves V<sup>1</sup> and V<sup>2</sup> connected in opposition. The secondary S<sup>2</sup> of the oscillation transformer is connected to the condenser C<sup>3</sup> and across these are the Fleming valve receiver D and transformer F connected to the telephone T. When the circuits are in tune signals can be received in 40 the telephone T if they are not sufficiently strong to affect the variable conductors V<sup>1</sup> and V<sup>2</sup> but if a powerful atmospheric discharge occurs the valves V<sup>1</sup> and V<sup>2</sup> will become shunts to the intermediate circuit and only very weak oscillations will be induced in the receiver circuit.

Having now particularly described and ascertained the nature of our said 45 invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Receiving apparatus for wireless telegraphy containing a path which is normally a bad conductor but which when acted upon by powerful oscillations becomes a relatively good conductor, such path consisting of two unidirectional 50 variable conductors connected in parallel and in opposition substantially as described.

2. Receiving apparatus for wireless telegraphy containing a path which is normally a bad conductor but which when acted upon by powerful oscillations becomes a relatively good conductor, such path consisting of a unidirectional 55



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variable conductor connected in parallel with and in opposition to a receiver of the unidirectional type substantially as described.

3. Receivers for wireless telegraphy substantially as described and illustrated in the drawings.

5 Dated this 1st day of September, 1910.

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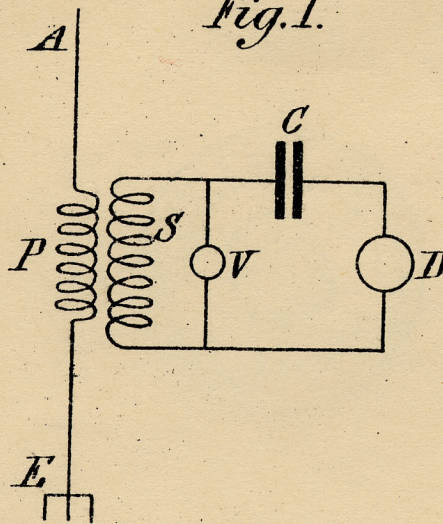
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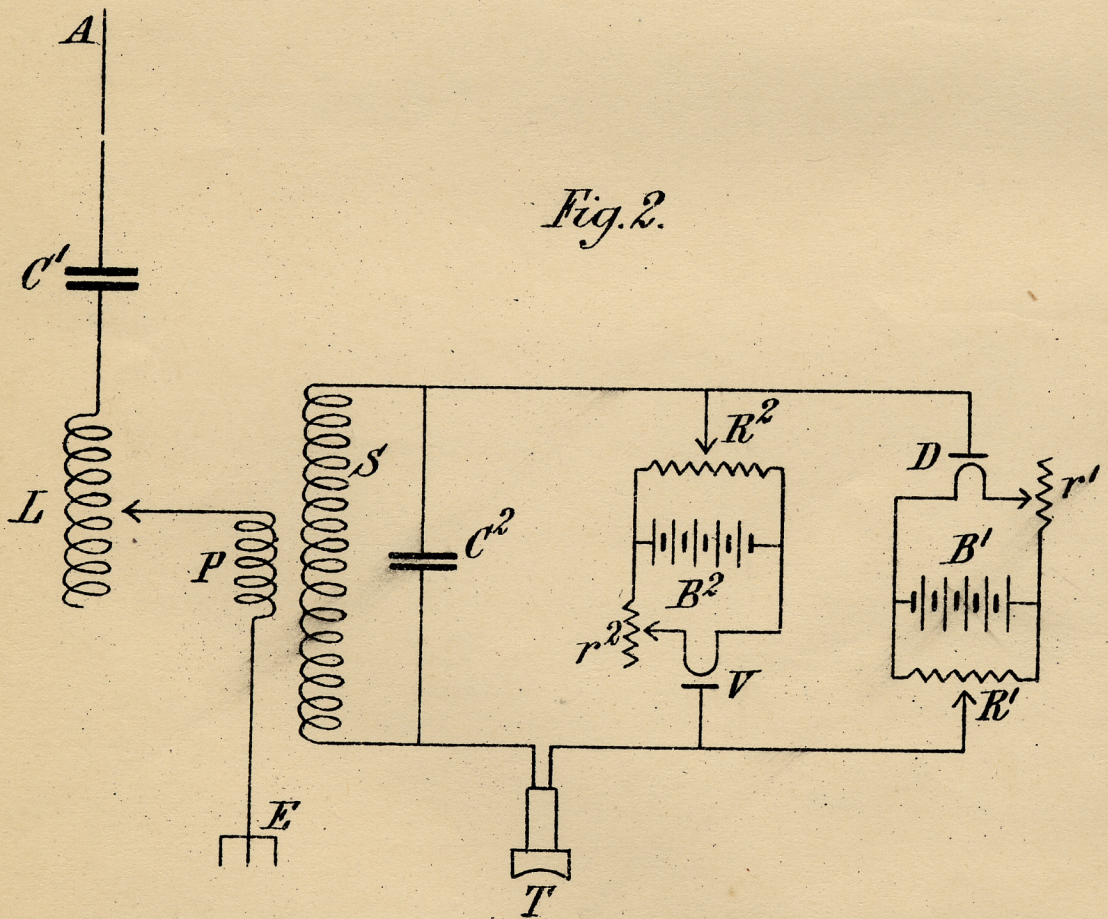
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SHEET 1.

*Fig. 1.*



*Fig. 2.*



[This Drawing is a reproduction of the Original on a reduced scale.]



Fig. 3.

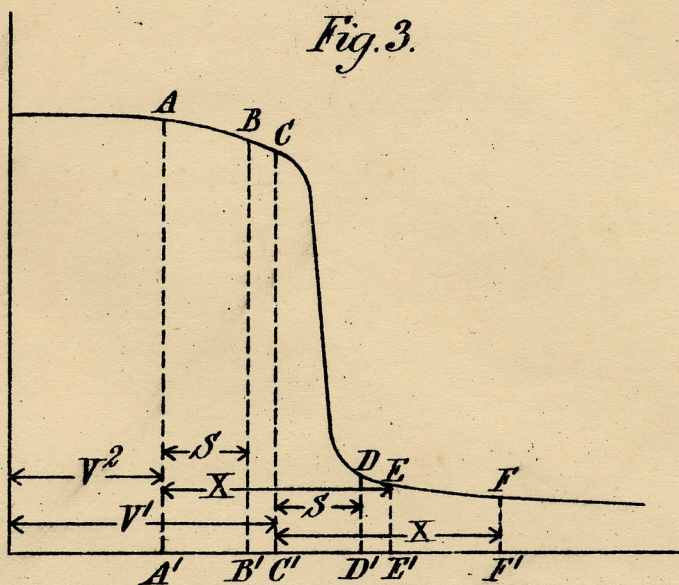


Fig. 4.

