N° 11,544 A.D. 1909

Date of Application, 15th May, 1909

Complete Specification Left, 15th Nov., 1909—Accepted, 6th Jan., 1910

PROVISIONAL SPECIFICATION.

"Improvements in Apparatus for Wireless Telegraphy."

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and HENRY JOSEPH ROUND, both of Watergate House, York Buildings, Adelphi, London, Electrical Engineers, do hereby declare the nature of this invention to be as follows:—

The object of this invention is to provide improved apparatus for wireless telegraphy by means of which it may be possible to readily ascertain with great precision the bearing of a station from which the signals are emanating.

It is well known that with certain aerials which will be hereinafter called directional aerials such for instance as those described in Specification No. 14,788 of 1905 the received signals are, other things being equal, of maximum strength when the aerial is situated in the vertical plane passing through the corresponding station, and that the strength of the signals decreases at first gradually but afterwards more rapidly as the aerial moves out of that plane in either direction.

According to this invention we employ at a receiving station two directional aerials set at an angle to one another and we provide a switch or key which can be thrown rapidly backwards and forwards to connect the receiving apparatus to each of the two aerials alternately.

With such an arrangement the signals received in the two positions of the switch will be of unequal strength unless the transmitting station lies in a certain direction and this direction, if the two aerials are similar, will bisect the angle between them. Provided this angle is sufficiently large, the direction of equality may be determined with great precision since the strength of the signals will then change rapidly with the angle.

In the case of a ship fitted with an aerial consisting of a horizontal part stretched between the masts and a vertical part connecting the centre of the horizontal part to the apparatus we find it very convenient to replace such T. shaped aerial by an aerial shaped thus ⊤ that is two directional aerials set at an angle of 180° so that the direction of equality is at right angles to the length of the ship. It will be readily seen that a ship fitted with such aerials will be able to determine with great precision the moment at which a station from which signals are being received is abeam, while by connecting the aerials together at the bottom they become virtually an ordinary T. shaped aerial.

Similarly at a transmitting station we may employ two directional aerials set at an angle to one another with a switch which can be thrown rapidly backwards or forwards to connect the transmitting apparatus to each of the two aerials alternately in which case the signals will be of equal strength in a certain fixed direction and a ship fitted with any aerial can determine with great precision the moment at which it crosses the line of equality.

Moreover, by providing means for weakening the received or transmitted signals in one position of the switch the direction of equality may be changed so that any direction other than that which bisects the angle between the two aerials may be determined, though with loss precision.

For the purpose of determining equality of signals we find it best to employ

[Price 8d.]

some form of telephonic receiver and to change the switch over rapidly and frequently.

Dated this 14th day of May, 1909.

MARCONI'S WIRELESS TELEGRAPH CO. LTD.

H. JAMISON DAVIS,
S. FLOOD PAGE,
Directors.
HENRY W. ALLEN,
Secretary.

H. J. ROUND.

COMPLETE SPECIFICATION.

"Improvements in Apparatus for Wireless Telegraphy."

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and HENRY JOSEPH ROUND, both of Watergate House, York Buildings, Adelphi, London, Electrical Engineers, 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:—

The object of this invention is to provide improved apparatus for wireless telegraphy by means of which it may be possible to readily ascertain with great precision the bearing of a station from which the signals are emanating.

It is well known that with certain aerials which will be hereinafter called directional aerials such for instance as those described in Specification No. 14,788 of 1905 the received signals are, other things being equal, of maximum strength when the aerial is situated in the vertical plane passing through the corresponding station, and that the strength of the signals decreases at first gradually but afterwards more rapidly as the aerial moves out of that plane in either direction.

According to this invention we employ at a receiving station two directional aerials set at an angle to one another and we provide a switch or key which can be thrown rapidly backwards and forwards to connect the receiving apparatus to each of the two aerials alternately.

With such an arrangement the signals received in the two positions of the switch will be of unequal strength unless the transmitting station lies in a certain direction and this direction, if the two aerials are similar, will bisect the angle between them. Provided this angle is sufficiently large, the direction of equality may be determined with great precision since the strength of the signals will then change rapidly with the angle.

In the case of a ship fitted with an aerial consisting of a horizontal part stretched between the masts and a vertical part connecting the centre of the horizontal part to the apparatus we find it very convenient to replace such T shaped aerial by an aerial shaped thus ⅂ ⅃ that is two directional aerials set at an angle of 180° so that the direction of equality is at right angles to the length of the ship. It will be readily seen that a ship fitted with such aerials will be able to determine with great precision the moment at which a station from which signals are being received is abeam, while by connecting the aerials together at the bottom they become virtually an ordinary T shaped aerial.

Similarly at a transmitting station we may employ two directional aerials set at an angle to one another with a switch which can be thrown rapidly backwards or forwards to connect the transmitting apparatus to each of the two aerials alternately in which case the signals will be of equal strength in

a certain fixed direction and a ship fitted with any aerial can determine with great precision the moment at which it crosses the line of equality.

Moreover, by providing means for weakening the received or transmitted signals in one position of the switch the direction of equality may be changed so that any direction other than that which bisects the angle between the two aerials may be determined, though with less precision.

For the purpose of determining equality of signals we find it best to employ some form of telephonic receiver and to change the switch over rapidly and frequently.

Figure 1 is a diagrammatic plan showing the strength of signals with two directional aerials at an angle to each other.

Figure 2 is a diagrammatic elevation of the apparatus having a fixed direction of equality.

Figure 3 is a diagrammatic elevation of one form of the apparatus having a changeable direction of equality, and

Figure 4 is a diagrammatic elevation of another form of the apparatus having a changeable direction of equality.

In Figure 1 O A^1 represents in plan a directional aerial connected at O through the transmitting or receiving apparatus to earth, O D^1 is the direction of maximum strength of signals, and the pear shaped curve C^1 is that formed by the radius vectors representing strength of signals drawn from the point O. Thus if a line be drawn from the point O in any direction its length from the point O to where it cuts the curve C^1 will represent the strength of signals in that direction. Similarly O A^2 represents another directional aerial, C^2 its corresponding curve under similar conditions, and O D^2 its direction of maximum strength of signals.

O B^1 is the direction of equality bisecting the angle between O D^1 and O D^2 and it will be observed that the rate of change of the strength of signals with the angle is much greater at O B^1 than at O D^1 or O D^2 thus enabling the direction of equality O B^1 to be determined with great precision when the angle between O D^1 and O D^2 is large.

If now the signals transmitted or received by the aerial O A^2 be reduced in strength so that the curve formed by the radius vectors becomes C^3 instead of C^2 the direction of equality will be changed from O B^1 to O B^2.

In Figure 2 a^1 and a^2 are two similar directional aerials placed at an angle to one another, and s is a switch enabling either aerial to be connected to the earth e through the transmitter or receiver r. If the switch s be thrown rapidly backwards and forwards the two sets of transmitted signals will be of equal strength in the direction bisecting the angle between the aerials, while when signals are being received from this direction they will produce an equal effect upon the receiver.

In Figure 3 a^1 and a^2 are two similar directional aerials placed at an angle to one another and connected either directly or indirectly through an ordinary transmitting or receiving apparatus to the inductances i^1 and i^2 respectively, and to the earth e through the switch s. i is an inductance connected to the transmitter or receiver r and capable of movement so as to vary the couplings with the inductances i^1 and i^2. If now the switch s be thrown rapidly backwards and forwards the direction of equality for transmitted or received signals can be changed by the movement of the inductance i.

In Figure 4 a^1 and a^2 are two similar directional aerials placed at an angle to one another and connected to the inductances i^1 and i^2 respectively and to the earth e. j^1 and j^2 form inductive couplings with i^1 and i^2 respectively, s is the switch and r the transmitter or receiver. d is a resistance by means of which the direction of equality can be changed.

It will be understood that although we only show two methods of changing the direction of equality any method which reduces the strength of the signals in one position of the switch more than in the other may be employed.

Furthermore, when receiving, the equality of the two sets of signals may be ascertained either by comparison with a rapidly moving switch or by annulment without a switch if the two receivers are connected in opposition.

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

1. The combination of two directional aerials at an angle to each other and means for alternately connecting a transmitter or receiver to them substantially as described.

2. The combination with apparatus such as referred to in Claim 1, of means for varying the strength of one set of signals for the purpose of changing the direction of the line of equality substantially as described.

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

Dated this 15th day of November, 1909.

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MARCONI'S WIRELESS TELEGRAPH CO. & *another's* COMPLETE SPECIFICATION. *(1 SHEET)*

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

Fig. 1.

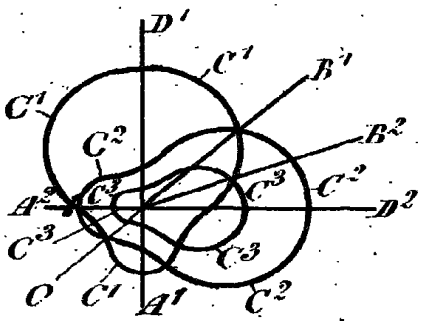


Fig. 2.

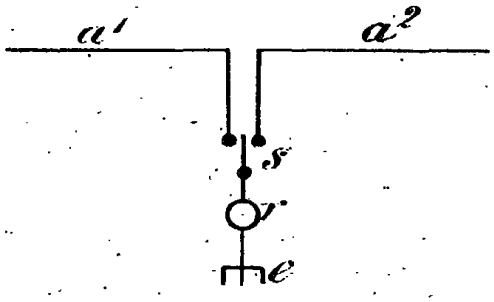


Fig. 3.

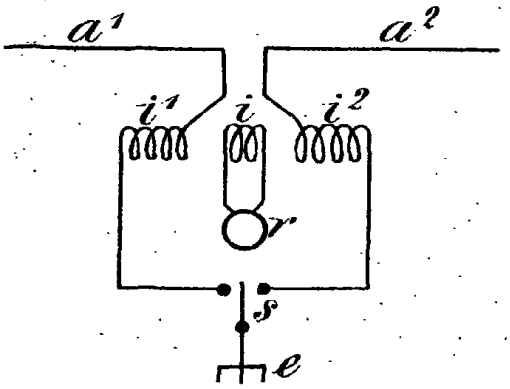
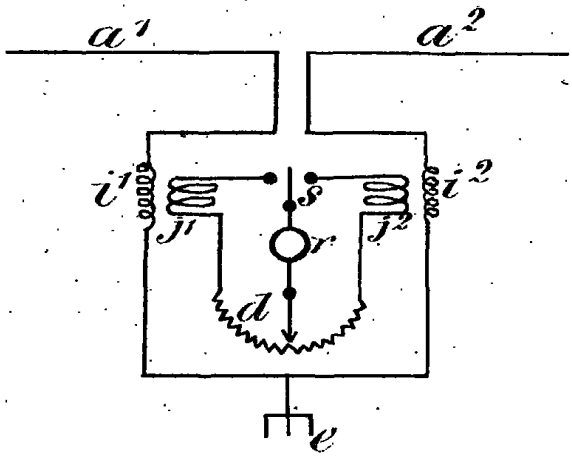


Fig. 4.



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