

UNITED STATES PATENT OFFICE.

GUGLIELMO MARCONI, OF LONDON, ENGLAND, ASSIGNOR TO MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, A CORPORATION OF GREAT BRITAIN.

WIRELESS SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 760,463, dated May 24, 1904.

Application filed September 10, 1903. Serial No. 172,617. (No model.)

To all whom it may concern:

Be it known that I, GUGLIELMO MARCONI, a subject of the King of Italy, residing at London, England, have invented certain new and useful Improvements in Wireless Signaling Systems, of which the following is a full and true description.

My invention has as its object the provision of means whereby etheric vibrations or Hertzian waves or electrical oscillations of high frequency, such as are used in systems of wireless telegraphy or signaling, may be transmitted to greater distances at smaller cost and by means of less expenditure of electrical energy than has been required in systems previously used.

My invention relates particularly to the aerial or elevated conductor used in connection with such systems for radiating or receiving the etheric vibrations or Hertzian waves or electrical oscillations of high frequency. Heretofore it has been the practice to use for this purpose an upright or vertical mast or other support for the aerial conductor with or without a capacity area at the top, from which the waves or vibrations are to be radiated or upon which they are to be received. I have found in the use of such apparatus that the distances to which messages can be sent and detected depends, for one thing, upon the height to which the conductor is carried. It is not practicable, however, to carry such conductor to a height much greater than two hundred feet on account of the mechanical difficulties and the expense involved in erecting and maintaining structures of greater height. I have also found that with an elevated conductor of a given height the distance to which messages may be sent can be increased by increasing the electrical energy by means of which the etheric waves are produced. I find, however, that there is a limit beyond which increased electrical energy does not appreciably increase the distance to which signals may be sent.

According to my present invention I connect to the vertical elevated conductor which, as shown, is in the form of a wire or rod, one or more members consisting of wires or rods

extending therefrom in a lateral or outward direction. The vertical portion of the aerial may then, if desired, be made comparatively short, and the necessary length and capacity secured by lateral extension. The lateral aeri-als may extend either in a horizontal plane or may be inclined either above or below such a plane. These outwardly-extending members, by reason of their rod or wire form, may be carried for a considerable distance from the upright elevated aerial conductor, and thereby greatly extend the distance across which signals may be sent or received without involving serious difficulty in supporting and maintaining the same, and in such case their free ends are preferably supported directly from the ground, but insulated from said support and from the ground.

Reference is hereby made to the accompanying drawings, showing several forms in which my invention may be embodied.

In the drawings, Figures 1, 2, and 3 are views showing in elevation various forms embodying my invention. Fig. 4 is a perspective view showing the form in which my invention is preferably embodied.

In all of the figures, 1 represents the upright elevated conductor, to the lower end of which is electrically connected any suitable form of apparatus for producing or detecting the etheric vibrations or Hertzian waves by means of which the signals are produced and detected. I have indicated diagrammatically apparatus 4 suitable for receiving and detecting the signals; but it will be understood that this may be replaced by sending apparatus.

In Fig. 1 I have shown a single outwardly-extending member 2^a, which is connected to the vertical member 1 at one end and extends therefrom in a horizontal plane, being supported at its free end by the support 3, which rises from the ground, the member 2^a being electrically connected with the member 1 and insulated from the support 3.

In Fig. 2 the outwardly-extending members 2^b are inclined upward from the horizontal. This form is superior to a single vertical conductor which terminates at a point at the same elevation as the free ends of the members 2^b;

but it is obvious that in this construction the outward-extending members cannot be carried to so great a distance on account of mechanical difficulties as that shown in Fig. 1.

5 In the form shown in Fig. 3 the outwardly-extending conductors 2^c are inclined downward from a horizontal plane.

In the preferred form illustrated in Fig. 4 the outwardly-extending members 2^d radiate in all directions from the vertical member 1 in a horizontal plane, their free ends being supported by supports 3 and insulated therefrom, as in the form shown in Fig. 1. I have obtained good results by using eight of the outwardly-extending conductors 2^d, each one forming an angle of forty-five degrees with its neighbor. I have also found that good results may be obtained by making the members 2^d of such a length that the free ends of adjacent members will be supported at a distance of about thirty feet from each other. The members 2^d may be placed at any desired height above the earth, depending upon the distance to which it is desired to transmit or from which it is desired to receive the signals. I have found, however, that with an elevated conductor of this form measuring about twenty-five feet in height I have been able to transmit signals to as great a distance as could be accomplished with a single vertical aerial conductor of six times the height.

A special advantage of a plurality of outwardly-extending aeri-als is that having a common center the oscillations in the several aeri-als concentrate their effect at a common point, and the apparatus is thus more efficient both for transmission and reception.

The whole system of both the vertical and projecting aeri-als should be in tune with the circuits of the transmitter and receiver, as fully explained in my British Patent No. 7,777 of 1900.

I do not limit myself to any specific dimensions or elevations of the members comprising the elevated conductor nor to the number of members which extend outwardly from the vertical member.

It is to be understood that under the term "wire" I include rods or other form of conductor which admits of great extension or length without requiring impracticable forms of support.

What I claim, however, and desire to secure by Letters Patent, is—

55 1. As a means for increasing the effective distance to which intelligible signals may be transmitted by electrical oscillations of high frequency, an elevated conductor, comprising an upright wire or rod, reduced in height

compared with the usual height of elevated conductors heretofore used for a given distance, and a wire or rod extending outwardly therefrom in an elevated position.

2. In a system of signaling by means of electrical oscillations of high frequency, an elevated conductor, comprising an upright wire or rod and a plurality of wires extending outwardly therefrom in elevated positions whereby the distance to which intelligible signals may be transmitted with a given amount of energy is increased, substantially as described.

3. In a system of signaling by means of electrical oscillations of high frequency, an elevated conductor, comprising an upright wire or rod and a wire extending outwardly therefrom in an elevated position, in combination with a support for said outwardly-extending member whereby the distance to which intelligible signals may be transmitted with a given amount of energy is increased, substantially as described.

4. In a system of signaling by means of electrical oscillations of high frequency, an elevated conductor, comprising an upright wire or rod and a plurality of wires extending outwardly therefrom in elevated positions, in combination with supports for the free ends of said outwardly-extending members whereby the distance to which intelligible signals may be transmitted with a given amount of energy is increased, substantially as described.

5. In a system of signaling by means of electrical oscillations of high frequency, an elevated conductor, comprising an upright wire or rod, and a horizontal wire or rod extending outwardly therefrom in an elevated position, and exceeding in length the upright member whereby the distance to which intelligible signals may be transmitted with a given amount of energy is increased, substantially as described.

6. In a system of signaling by means of electrical oscillations of high frequency, an elevated conductor, comprising an upright member and a plurality of outwardly-extending members extending radially from a common center in combination with supports for said outwardly-extending members whereby the distance to which intelligible signals may be transmitted with a given amount of energy is increased, substantially as described.

In witness whereof I have hereunto signed my name this 3d day of September, 1903.

GUGLIELMO MARCONI.

In presence of—

J. BOTTOMLEY,
W. H. BENTLEY.