E. BELLINI & A. TOSI.

SYSTEM OF DIRECTED WIRELESS TELEGRAPHY.

APPLICATION FILED OCT. 1, 1907.

943,960. Patented Dec. 21, 1909.

FIG_1_

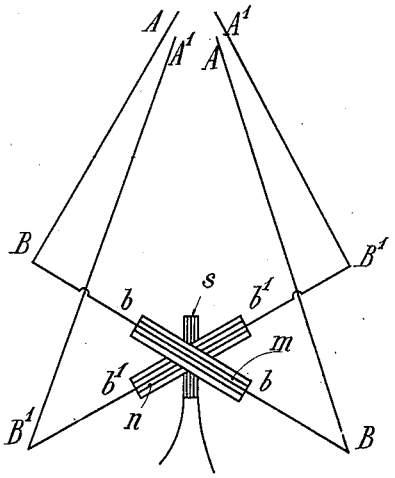


FIG_2_

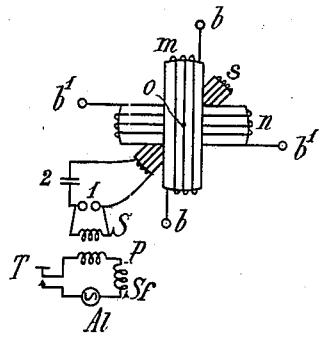
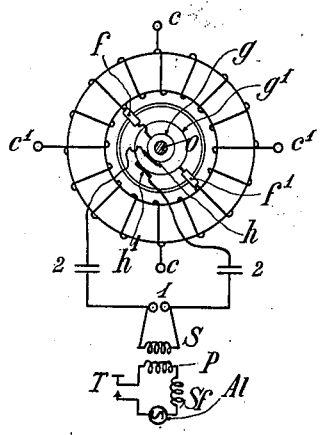


FIG_3_



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SYSTEM OF DIRECTED WIRELESS TELEGRAPHY.

943,960. Specification of Letters Patent. Patented Dec. 21, 1909.

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To all whom it may concern:

Be it known that we, ETTORE BELLINI and ALESSANDRO TOSI, civil engineers, subjects of Italy, residing at 4 Rue du 29 Juillet, Paris, France, have invented new and useful Improvements in Systems of Directed Wireless Telegraphy, of which the following is a specification.

Our invention relates to a system of wireless telegraphy or system employing the energy under the form of electromagnetic waves which permits a receiving station provided with two or several "dirigible aerials" to radiate mainly in any given direction without it being necessary either to turn the dirigible aerials, which is not applicable in practice, or to employ a great number of dirigible aerials, which is very complicated and has besides inconveniences as regards the working.

By the term "dirigible aerial" we mean any aerial conductor having the property of radiating or receiving waves with different intensities according to the different directions. A closed oscillation circuit or a pair of antennæ connected together by a conductor constitutes respectively a dirigible aerial.

To describe the parts of our invention, we have supposed that it is applied to the case in which the dirigible aerials are closed oscillation circuits, but of course all the parts of the installation are applicable in the same manner, to the other dirigible aerials.

In the annexed drawing, Figure 1 represents a diagrammatic perspective partial view of a transmitting station according to our invention comprising two dirigible aerials. Figs. 2 and 3 are diagrammatic plan views showing the devices enabling radiation in any given direction, without causing the dirigible aerials to turn.

As is well known, a directed wireless telegraphy station must generally be capable of radiating in any given direction. Up to now, it has been necessary for this purpose either to turn the dirigible aerial according to the direction of the receiving station, or to arrange a great number of dirigible aerials in the different directions. According to our invention, it is on the contrary possible to radiate in any given direction with a very small number of dirigible aerials (two for instance) and without causing the aerials to turn. We employ for this purpose two or more dirigible aerials in a fixed position, which are excited at the same time and in such a manner that the partial electromagnetic fields (produced by each circuit) superpose themselves and determine a resulting field which is directed in the required direction. As it is possibly to vary the excitation of the aerials, the direction of the resulting field may thus be varied, that is to say the direction of the transmission.

We have shown in the drawing two different arrangements which we may employ to realize the purpose set forth. In both cases, we have supposed that the dirigible aerials consist of two closed oscillation circuits of triangular shape A B B A and A′ B′ B′ A′ arranged respectively in two perpendicular planes.

According to the first arrangement (Figs. 1 and 2) we employ in combination with said dirigible aerials an apparatus of the inductive excitation type composed of two fixed coils *m* and *n* perpendicular one to each other. Each coil is connected respectively to one of the dirigible aerials through terminals *b b* and *b′ b′*. A third coil *s* is placed within the free space between the coils *m* and *n* and is capable of rotating about the axis *o* or intersection of the median planes of the coils *m* and *n*. It is traversed by the oscillating currents which may be produced by any suitable means.

2 indicates the condenser of the exciting circuit; 1 the spark-gap; P and S the primary and secondary winding of a transformer; T the manipulator; S*f* a self induction coil; A*l* the energy generator (alternator).

When the coil *s* is traversed by an oscillating current, electro-motive force will take place in both coils *m* and *n*, the values and phases of said E. M. F. depending on the position of the coil *s* with relation to the two fixed coils *m* and *n*. As these coils are connected to the two closed oscillation circuits, each of these will thus produce in the space an electro-magnetic field. The field produced by one of the circuits, by combining with that produced by the other circuit, will determine a resulting electro-magnetic field having a certain intensity and a certain direction, depending on the intensities and phases of the component fields. By rotating the movable coil *s*, the intensity and phase of the component fields may be varied at will

and consequently the direction of the resulting field, that is to say, the direction of the waves radiated.

In the second arrangement illustrated in Fig. 3, the apparatus employed is of the direct excitation type. It consists of a continuous spiral wound on a torus. The points b b and b' b' of the aerial circuits, instead of being connected to the coils m and n of the foregoing apparatus, are connected to the points c c and c' c'' of the torus at the ends of two perpendicular diameters. Two brushes f f' insulated one from the other and invariably fixed at 180° may rotate in continuous contact with the torus, about the axis o. The brushes are connected by means of rings g g' and contact pieces h h' to the oscillation source which may be of any kind and which in the drawing is shown diagrammatically as being of the same kind as that of Fig. 2. The aerials are in this case excited by the oscillation circuit of direct excitation, which, as is known, may be considered as a double excitation, viz.: magnetic and galvanic, the magnetic excitation being far superior to the galvanic. By causing the position of the brushes f f' to be varied, the degrees of connection between the primary excitation circuit and each aerial circuit are varied. When the brushes f f' are arranged according to c c, the degree of connection is maximum for the aerial connected to the points c c and null for the other. The latter does not work therefore and the transmission takes place through the aerial connected to the points c c. A reverse analogous action takes place when the brushes are arranged according to c' c'.

When the brushes are arranged in any intermediate position, as shown in Fig. 3, the degrees of connection have values different from zero. Consequently the two aerials are excited at the same time and the transmission thus takes place according to an intermediate direction which has a determined relation with the direction of the diameter f f'.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

A system of directed transmission for wireless telegraphy stations, comprising for the aerial part of the transmitting station several dirigible aerials in a fixed position, combined with fixed windings inserted in the conducting part of the aerials, a wave generator and a rotary device which is connected to the wave generator and which excites the fixed windings, substantially as described and for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ETTORE BELLINI.
ALESSANDRO TOSI.

Witnesses:
ANTOINE LAVOIX,
LOUIS MOSES.