[Second Edition.]

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PROVISIONAL SPECIFICATION.

Improvements in or connected with Aerial Conductors for Wireless Telegraphy.

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and CHARLES SAMUEL FRANKLIN, Electrical Engineers, both of Marconi House, Strand, London, W.C., do hereby declare the nature of this invention to be as follows:—

The object of this invention is to provide an improved wireless aerial system which shall be particularly suitable for a receiving station used in conjunction with but separated from a transmitting station for duplex telegraphy.

It is known that an aerial system consisting of two frames at right angles to each other, used in conjunction with a radiogoniometer can receive best from any two opposite directions and eliminate signals from any two opposite directions at right angles to the first.

According to this invention two similar directional aerial systems are erected at equal distances from a transmitting station and approximately in the line of the desired communication and at a distance apart of preferably a quarter wave length. The moving coil of the radiogoniometer connected to each directional aerial system is connected to a pair of wires leading to the receiving apparatus which is preferably arranged mid-way between them. Condensers are introduced into the circuits comprising the leading wires, the moving coils of the radiogoniometers, and the coils of the receiving apparatus in order to tune them to the desired wave.

As the directional systems are at equal distances from the transmitting station the oscillations produced in them by waves from the transmitting station will be equal and in phase, and, provided the coils of the radiogoniometers are set at equal angles, the effects on the receiving apparatus can be opposed so as to produce no effect.

Waves coming in the line of the directional systems will not produce opposing effects, if the circuits are correctly tuned, as the oscillations are not in phase and the receiving apparatus will be affected.

By setting the coils of the radiogoniometers to any particular angle waves coming from any direction besides that of the transmitting station can be eliminated.

The invention can also be used in another way, *i.e.* supposing the radiogoniometer coils are set to eliminate waves from the adjacent transmitting station and that the two directional systems are a quarter wave length apart, then waves coming in the line of the aerial systems will produce oscillations in the circuits connected to the radiogoniometers which are out of phase 90 degrees. If these circuits are mis-tuned in opposite senses so that the phases of the oscillations in the two circuits are advanced and retarded 45 degrees respectively, then waves coming from one direction will produce in the circuits oscillations which oppose, and waves coming from the other direction will produce oscillations which are in phase.

[*Price* 6*d.*]

By coupling the radiogoniometer circuits, mis-tuned as above described, to two separate receivers and arranging the couplings so that the oscillations in phase with each other in the two circuits oppose as regards one receiver and add as regards the other, waves coming from one direction will actuate only the one receiver, and waves from the opposite direction will actuate only the other receiver.

It is therefore possible to receive from stations in opposite directions on the same wave-length without mutual interference and at the same time to transmit from an adjacent transmitting station.

Though we have described the construction and arrangement only as regards a receiving station, the same construction can be applied to a transmitting station, so as to give a zero effect in two opposite directions and also in any third direction.

Dated the 17th day of April, 1915.

CARPMAEL & Co.,
Agents for Applicants,
24, Southampton Buildings, London, W.C.

COMPLETE SPECIFICATION.

Improvements in or connected with Aerial Conductors for Wireless Telegraphy.

We, Marconi's Wireless Telegraph Company, Limited, and Charles Samuel Franklin, Electrical Engineers, both of Marconi House, Strand, London, W.C., 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 an improved wireless aerial system which shall be particularly suitable for a receiving station used in conjunction with but separated from a transmitting station for duplex telegraphy.

It is known that an aerial system consisting of two frames at right angles to each other, used in conjunction with a radiogoniometer can receive best from any two opposite directions and eliminate signals from any two opposite directions at right angles to the first.

According to this invention two similar directional aerial systems, each consisting of two vertical frames at right angles to one another, are erected at equal distances from a transmitting station and at a distance apart which is a considerable fraction of the wave length it is desired to receive. The moving coil of the radiogoniometer connected to each directional aerial system is connected to a pair of wires leading to the receiving apparatus which is preferably arranged mid-way between them. Condensers are introduced into the circuits comprising the leading wires, the moving coils of the radiogoniometers, and the coils of the receiving apparatus in order to tune them to the desired wave.

Our invention is illustrated by the accompanying diagrams.

In Figure 1, A, *a*, are two aerial systems each consisting of two equal vertical frames at right angles to each other. They are situated at equal distances from an adjacent transmitting station B which may have any type of transmitting aerial, and the distance between them is a considerable fraction of the wave length it is desired to receive.

Presuming the station is arranged so that the direction of the received signals coincides with the line joining A, *a*, then the maximum receiving power of the combination is obtained when A and *a* are placed at a distance equal to one half of the received wave length.

It is, however, generally more useful to place them at a distance apart equal to one quarter of the received wave length.

Although it is advisable to arrange A, *a* in the line of the desired communication, considerable variation from this can be allowed.

In Figure 2, C, *c* are two radiogoniometers the fixed coils of which are connected in the usual way to the aerial systems A, *a* respectively.

The moving coils D, *d* of the radiogoniometers are connected through tuning condensers E, *e* to coils F, *f* arranged to act upon a common coil G which is connected up to the receiving apparatus H through the necessary tuning appliances.

As the directional systems are at equal distances from the transmitting station B the oscillations produced in them by waves from B will be equal and in phase provided all the circuits are correctly tuned; then if the coils D, *d* are set at equal angles and the couplings between F, G and *f*, G are equal and opposite, no effect will be produced in the receiving apparatus H.

With these adjustments, waves coming from any direction differing appreciably from the direction to or away from B will not produce equal opposing effects as the oscillations resulting in the two systems A, *a* will not be in phase.

To eliminate signals from any desired direction other than that of B, it is only necessary to set the coils D, *d* respectively to the angle at which the oscillations produced in the two frame aerials of each system A, *a* neutralize each other in their effects upon these coils.

The result is that this construction provides a receiving system which will not be affected by waves coming from four different directions, two of which are fixed relatively to the station and two of which are controllable.

The invention can also be used in another way, *i.e.* supposing the radiogoniometer coils are set to eliminate waves from B and that A and *a* are a quarter wave length apart, then waves coming in the line joining A and *a* will produce in the circuits connected to the radiogoniometers oscillations which are out of phase 90 degrees. If these circuits are mis-tuned in opposite senses so that the phase of the oscillations in the two circuits are advanced and retarded 45 degrees respectively, then waves coming from one direction will produce in the circuits oscillations which oppose, and waves coming from the other direction will produce oscillations which are in phase.

By coupling the radiogoniometer circuits, mis-tuned as above described, to two separate receivers and arranging the couplings so that the oscillations in phase with each other in the two circuits oppose as regards one receiver and add as regards the other, waves coming from one direction will actuate only the one receiver, and waves from the opposite direction will actuate only the other receiver.

It is therefore possible to receive from stations in opposite directions on the same wave-length without mutual interference and at the same time to transmit from an adjacent transmitting station.

A similar construction can be applied to a transmitting station. In this case suitable radiogoniometers capable of dealing with the energy are connected to two aerial systems similar to A, *a*, and the moving coils of the radiogoniometers are supplied with high frequency alternating currents from an alternator or other source; then if the adjustments of the radiogoniometers are similar, the system will not radiate waves in the directions at right angles to the line joining the two aerial systems nor in two opposite directions determined by the setting of the moving coils of the radiogoniometers.

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 at a wireless station of two similar aerials, each con-

sisting of two vertical frames at right angles to one another, two radiogoniometers connected thereto and a common receiver or generator, substantially as described.

2. The combination at a wireless station of two similar aerials, each consisting of two vertical frames at right angles to one another, an adjacent transmitting station at equal distances from the two aerials, two radiogoniometers connected to the two aerials, each to each, and a common receiver, substantially as described.

3. Wireless telegraph stations substantially as described and illustrated.

Dated the 16th day of November, 1915.

CARPMAEL & Co.,
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Fig. 1.

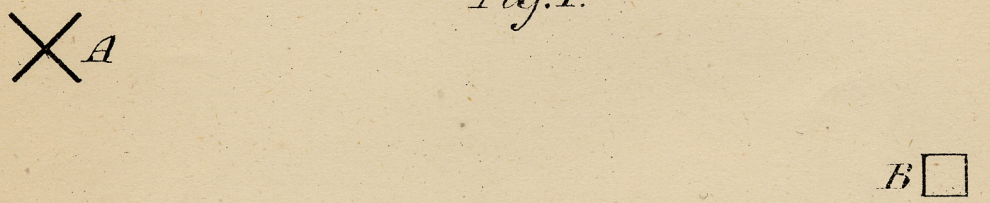
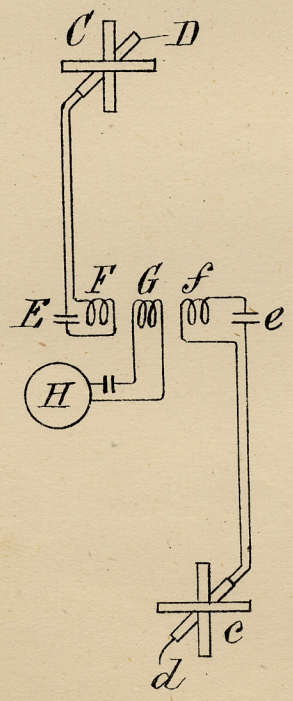


Fig. 2



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

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