Dec. 1, 1931. C. S. FRANKLIN 1,834,394

DIRECTIONAL AERIAL SYSTEM

Filed July 2, 1926

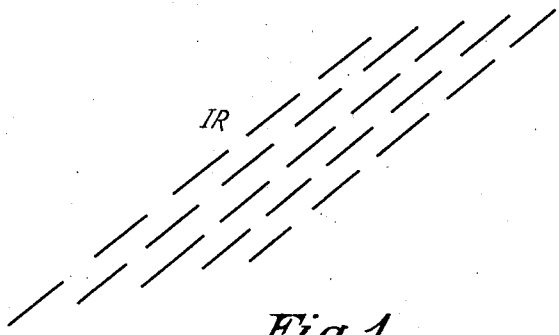
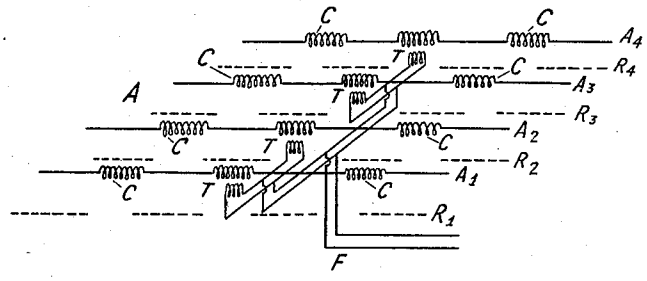


Fig. 1



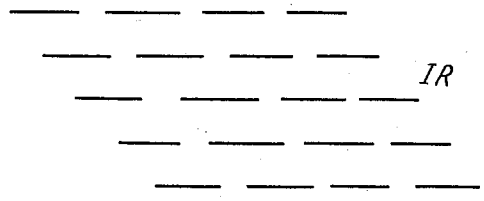
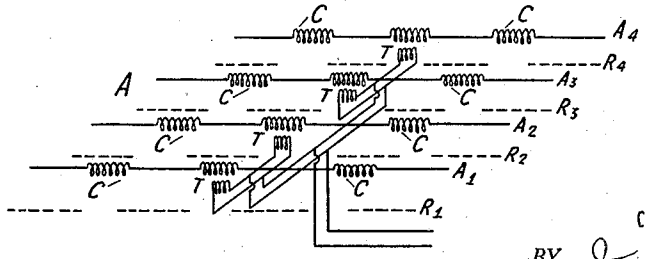


Fig. 2



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UNITED STATES PATENT OFFICE

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DIRECTIONAL AERIAL SYSTEM

Application filed July 2, 1926, Serial No. 120,170, and in Great Britain July 6, 1925.

This invention relates to directional aerial systems, for use in wireless telegraphy and telephony, and has for its object the provision of a directional aerial system especially applicable to short wave wireless telegraphy and telephony.

According to this invention, I provide a uni-directional aerial of any type, so arranged that it sends or receives a beam in or from a substantially vertical direction, and I provide in combination therewith a reflector arranged at any height above the said aerial and placed at an angle so as to send or receive the beam in or from any direction required.

In many cases it will be desired that the reflected beam be substantially horizontal. In such cases the aerial may conveniently be arranged horizontally and the reflector directly above it. This arrangement is, however, not essential, it being necessary only that the aerial be arranged to concentrate the radiation upon the reflector or vice versa.

Such an arrangement possesses two marked advantages:—

Firstly, the feeding arrangements required for the uni-directional aerial are simplified since all parts of the said aerial may be arranged nearer to the ground than would be possible if the aerial were erected vertically.

Secondly, since the inclined reflector is energized wholly by radiation, it requires no connecting feeders and can, therefore, be erected at any desired height. This is of advantage in short wave telegraphy and telephony, since, as is well known, a considerable improvement results if a short wave radiating or receiving aerial be placed well above the ground.

The invention is illustrated in the accompanying drawings, in which Figure 1 shows schematically one arrangement in which the reflected wave is vertically polarized, and Figure 2 shows schematically another arrangement in which the reflected wave is horizontally polarized.

Referring to Figure 1, A is an aerial arranged horizontally, comprising a plurality of aerial units A1, A2, A3, A4, and having a reflecting system R1, R2, R3, R4, which serves to concentrate radiation in a vertical direction. This aerial may be of any known type, and may be supplied with energy in any known way. As shown, the aerial is of the type described in the specification of British Patent No. 242,342, and comprises a plurality of aerial units, each composed of sections separated by phasing coils C and fed from a transmitter (not shown), through a feeding system F and transformers T.

Arranged at a height above the aerial A is an inclined reflector IR, adapted to reflect the vertical beam from the aerial A in the desired direction. The reflector IR is preferably of considerably larger area than the main aerial, and may conveniently comprise a number of insulated tuned units. With the reflector as shown in Figure 1, the reflected beam therefrom will be polarized vertically, the said beam being reflected in a plane substantially horizontal and parallel to the wires of the aerial A.

Figure 2 shows a modification, which differs from the arrangement shown in Figure 1 only in that the reflected beam is polarized horizontally, the said beam being reflected in a plane substantially horizontal and at right angles to the wires of the aerial A.

It will be apparent that polarization of the reflected beam in any direction may be effected by suitably arranging the wires comprised in the reflector IR.

If desired, the directional aerial A and its associated reflector, described with reference to Figures 1 and 2, may be replaced by an aerial arranged at the focus of a large parabolic reflector, or any other convenient direction aerial system.

Again, if desired, more than one reflector may be arranged above or at a higher level than the aerial in order that several reflected beams may be used, and the said reflectors may be adjustable as to direction, concentration of the reflected beam, or polarizing properties.

The invention is also applicable to the reception of wireless telegraphy and telephony.

Having described my invention, I claim:

1. In a directional beam antenna system, in

combination, an aerial comprising a plurality of parallel tuned radiators, a feeding system associated with said radiators, a reflector comprising a plurality of disconnected wires parallel to said radiators and spaced therefrom for directing the energy in a direction different from the desired direction of communication, and a second reflector system adapted to reflect the energy beam from said aerial system and first named reflector system in the desired direction of communication.

2. In a directional antenna system, in combination, an aerial comprising a plurality of parallel tuned radiators, a feeding system for said radiators, a reflector comprising a plurality of disconnected wires symmetrically spaced relative to said radiators for directing energy in a direction different from the desired direction of communication, and a second reflector system adapted to reflect the energy beam from said aerial and first named reflector in the desired direction of communication, said last named reflector comprising a plurality of disconnected wires symmetrically spaced relative to said radiators.

3. In a beam antenna system, in combination, an aerial comprising a plurality of spaced parallel horizontal radiators, a feeding system therefor, reflecting means comprising a plurality of reflectors below said radiators and parallel thereto, and a second reflecting means comprising a plurality of parallel reflectors located in a plane and above the radiators.

4. In a beam antenna system, in combination, an aerial comprising a plurality of spaced parallel radiators, a feeding system therefor, reflecting means comprising a plurality of reflectors below said radiators and parallel thereto, and a second reflecting means comprising a plurality of disconnected parallel reflectors located in a plane above the radiators, said last named reflecting means being of a greater area than the horizontal radiators.

5. In a beam antenna system, in combination, an aerial comprising a plurality of parallel radiators arranged in a plane, a feeder system associated with said radiators, reflecting means comprising a plurality of parallel reflectors located in a plane parallel to and below said radiators, and a second reflecting means located above the radiators and comprising a plurality of parallel reflectors lying in a plane the location of which relative to the location of the aerial depends on the direction in which it is desired to direct the radiated beam.

6. A directional aerial system, a radiating system located in a plane, a reflecting system located in a plane parallel to said first named plane, a deflecting system located in a plane inclined with respect to said first named plane and a feeder system associated with said radiating system.

7. A directional aerial system for transmitting radio signals, comprising in combination a directional radiating system including, a plurality of parallel radiators spaced in a horizontal plane and adapted when energized in phase to radiate a beam of energy substantially vertically, and a reflector comprising conductors arranged in a plane above and at an angle to the plane of the radiators and in the path of the beam of energy radiated from said aerial, and means for energizing said aerial system.

8. A directional aerial system for transmitting radio signals comprising in combination a directional radiating system including, a plurality of parallel radiators spaced in a horizontal plane and adapted when energized in phase to radiate a beam of energy substantially vertically, a reflector comprising a plurality of parallel conductors spaced in a horizontal plane above and at an angle with respect to the plane of said radiators, and means for energizing said aerial system comprising a feeder symmetrically coupled to each conductor in said aerial system.

9. A directional aerial system for transmitting radio signals comprising a plurality of radiators spaced in parallel relation in a horizontal plane and energized in phase to transmit a beam of energy substantially vertically, and means for polarizing the radiated beam and directing it in the desired direction including, a reflector comprising a plurality of spaced radiators arranged in a plane in the path of said beam and at an angle with respect to the plane of said radiators.

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