GEORG GRAF VON ARCO.

RADIOTELEGRAPHIC STATION.

APPLICATION FILED FEB. 7, 1912.

1,082,221

Patented Dec. 23, 1913.

Fig. 1

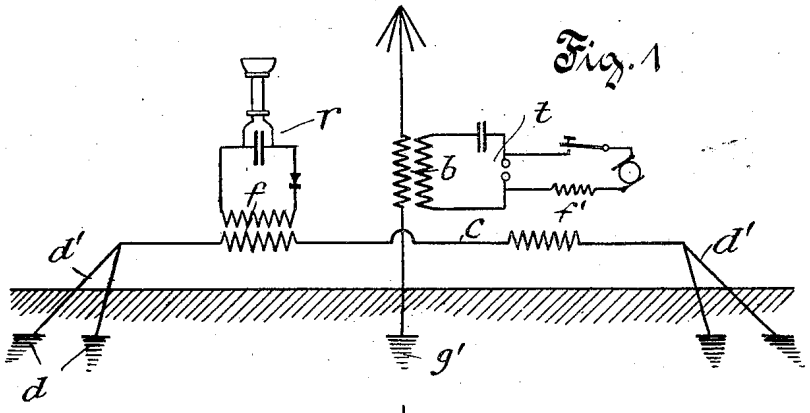


Fig. 2

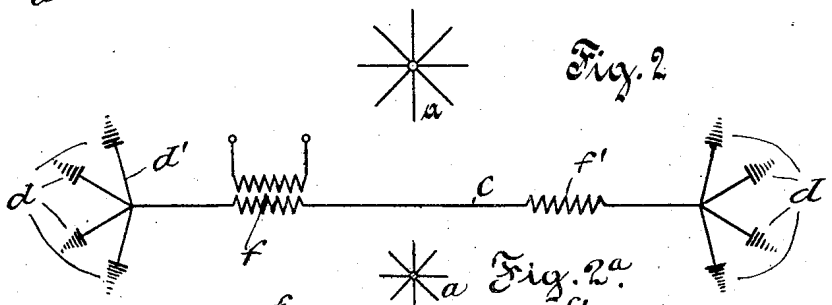


Fig. 2a

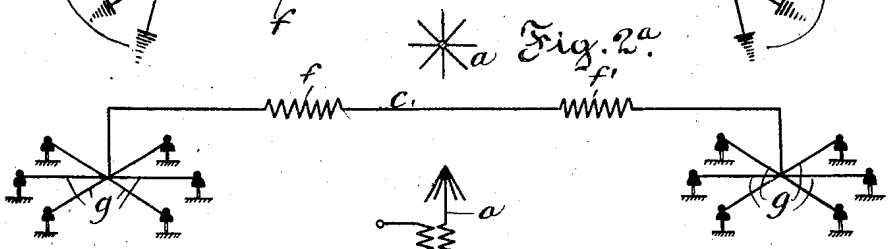


Fig. 3

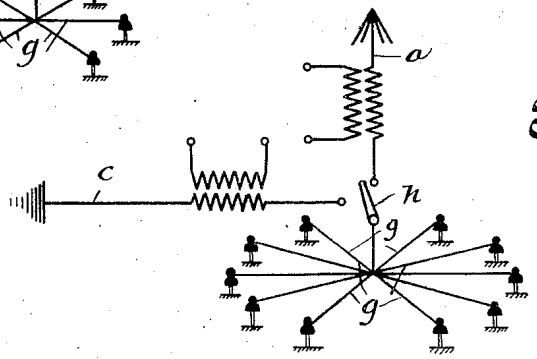
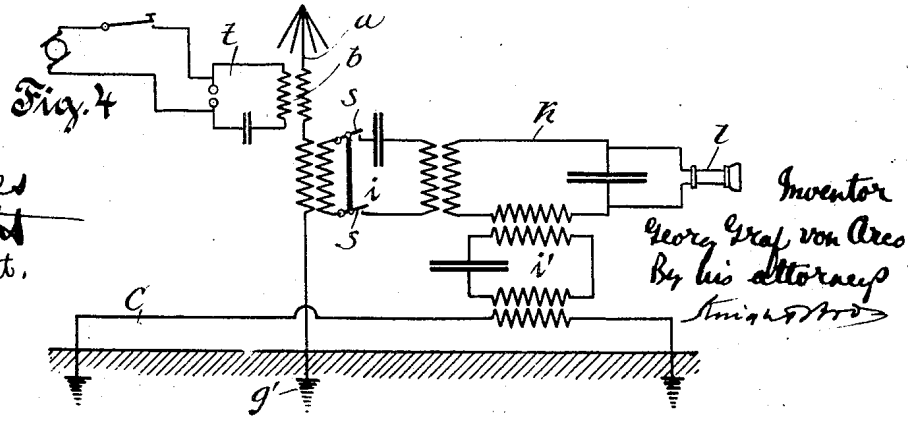


Fig. 4



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RADIOTELEGRAPHIC STATION.

1,082,221. Specification of Letters Patent. Patented Dec. 23, 1913.

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To all whom it may concern:

Be it known that I, GEORG GRAF VON ARCO, a subject of the German Emperor, and residing at Berlin, Germany, have invented certain new and useful Improvements in Radiotelegraphic Stations, of which the following is a specification.

My invention relates to aerials for radiotelegraphic stations.

In radiotelegraphy the dimension and shape of the aerials are of the greatest importance for the range of the stations. The selection of an antenna is connected with certain difficulties, however, because different points of view come into question for transmitting, from those for receiving electric oscillations.

When transmitting, the antenna should take up a predetermined, supplied quantity of energy and emit it with a sufficiently high efficiency. When receiving, on the contrary, as much energy as possible is to be taken up from as large a space as possible. While the first requirement is best fulfilled by a relatively small aerial-capacity of large vertical extent, for receiving, a large aerial-capacity of as large superficial area as possible is desired. A large vertical extent of aerial when receiving is objectionable, when atmospheric and other disturbances should be carefully avoided.

The principal object of my invention is to provide antennæ of various shapes for receiving and for transmitting.

Arrangements have heretofore been proposed which likewise comprise aerials of various shapes for transmitting and receiving. In these known arrangements, however, the aerials were of a form which led in practice to new difficulties which consisted in mutual disturbances occurring both when transmitting and when receiving. These disturbances could be obviated only by separating the two aerials in space some kilometers apart whereby, of course, in practice other disadvantages resulted. Now according to my invention I obviate these defects by employing separate antennæ for transmitting and for receiving, that for transmitting being formed as a standard antenna, while that principally used for receiving is formed as a low horizontal antenna, *i. e.* as an aerial which extends, principally horizontally, in immediate proximity to the ground. When the antennæ used for transmitting and receiving are formed in this manner it is possible to arrange the same directly beside one another without causing mutual reaction of any kind. The directly contiguous arrangement of the two aerials besides has the advantage that not only the antenna specially provided for receiving, but also the vertical antenna can be simultaneously used for receiving the electric oscillations.

One illustrative embodiment of my invention and some modifications thereof are diagrammatically represented in the accompanying drawing, wherein:—

Figures 1 and 2 are elevation and plan view, respectively, showing an arrangement in which the low horizontal antenna is separated from the transmitter antenna and located symmetrically therewith; Fig. 2^a is a modification of the antennæ *c* shown in Fig. 2. Fig. 3 is a diagram showing an arrangement in which the receiving antenna is combined with the transmitting antenna, and Fig. 4 is a diagram showing an arrangement in which the low horizontal antenna and the aerial antenna act on one common receiving apparatus.

Referring firstly to Figs. 1 and 2, *a* designates a standard transmitter antenna, *e. g.* an umbrella-shaped antenna energized in known manner over the transformer *b*, which forms part of the transmitter circuit *t*. It is used for emitting the signals, while the latter are received by the low horizontal antenna *c* which is connected to the grounded plates *d*, *d*, and transmits the energy by means of the transformer *f* in known manner to the receiving apparatus *r*. The transmitter antenna *a* is arranged laterally of and symmetrically to the receiving antenna, as clearly shown in Fig. 2. While the transmitter acts equally strongly in all directions, the receiver prefers the signals from that direction in which the low horizontal antenna extends. As Fig. 2 shows, the low horizontal antenna is arranged laterally of and symmetrically to the antenna *a* and connected on both sides by wires *d'* proceeding radially from their ends with a plurality of grounded plates *d*. Instead of the plurality of grounded plates one single plate may, of course, be used at each end. Furthermore, the grounded plates may be replaced by the full equivalent of horizontal nets or wires in the form of counterweights

arranged close above the ground and insulated therefrom as shown in Fig. 2ª. The distance between the grounded plates or the length of the low horizontal antenna is preferably approximately equal to half a wave-length.

In consequence of the symmetrical arrangement of the low horizontal antenna relatively to the transmitter antenna no reaction of the high frequency of the transmitter antenna takes place on the receiver. The waves proceeding from the transmitter antenna impact, on the contrary, in Fig. 2 for example, both ends of the low horizontal antenna perfectly uniformly, so that disturbing potential differences do not occur in the antenna and consequently duplex operation with a second station is possible.

It is preferable to utilize the means for grounding or balancing the transmitter antenna for grounding or balancing the low horizontal antenna. Fig. 3 shows an arrangement for using the same counterweight. The counterweight g which serves for balancing the antenna a when transmitting can be connected by the switch h with the low horizontal antenna and thus be used for forming the low horizontal antenna. Instead of the counterweight, however, the equivalent grounding arrangement g' used for the transmitter antenna a in Fig. 1 can likewise be used for the low horizontal antenna in the manner shown in Fig. 3 without departing from the spirit of the invention.

While the aerial antenna solely serves for transmitting it is preferable to use both antennæ for receiving which is readily possible in consequence of their being arranged close together. Fig. 4 shows such an arrangement. The transmitting antenna a besides being coupled with the transmitter circuit t, is also coupled with an intermediate circuit i, and the receiving antenna c is coupled with the intermediate circuit i'. Both circuits i and i' are coupled with one common detector circuit k. Antenna a is disconnected from the receiving system by means of double switch s—s, located in circuit i. In this case the energy taken up by the two antennæ is added together by the two intermediate circuits i,—i', in the common detector-circuit k and the strengthened signals can be perceived in the telephone l. The symmetrical arrangement of the two antennæ in proximity to each other is advantageous also in this case.

I claim:—

1. In a radiotelegraphic station, the combination with a vertical antenna for transmitting, of a low horizontal antenna for receiving, said horizontal antenna being symmetrically disposed adjacent to the vertical antenna and in operative relation therewith to avoid mutual disturbance.

2. In a radiotelegraphic station, the combination with a vertical antenna for transmitting, of a low horizontal antenna for receiving, said horizontal antenna being symmetrically disposed adjacent to the vertical antenna and in operative relation therewith to avoid mutual disturbance and means adapted to ground both the vertical and the horizontal antenna.

3. In a radiotelegraphic station, the combination with a vertical antenna normally for transmitting, of a low horizontal antenna for receiving, said horizontal antenna being symmetrically disposed adjacent to the vertical antenna and in operative relation therewith to avoid mutual disturbance and a receiving apparatus operatively connected with the vertical and with the horizontal antenna, for the purpose specified.

4. In a station for wireless telegraphy, a vertical antenna, a low horizontal antenna, a transmitting device connected with said vertical antenna, a receiving device connected with said horizontal antenna, means for coupling the receiving device of the horizontal antenna with the vertical antenna and for uncoupling it therefrom to permit the receiving device to receive energy from both antennæ at will.

5. In a station for wireless telegraphy, a vertical antenna, a low horizontal antenna, a transmitting device connected with said vertical antenna, and a receiving device connected with said horizontal antenna, means for coupling with the vertical antenna and for uncoupling therefrom the receiving device of the horizontal antenna, the horizontal antenna being symmetrically arranged relatively to the vertical antenna.

In testimony whereof, I affix my signature in the presence of two witnesses.

GEORG GRAF VON ARCO.

Witnesses:
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HENRY HASPER.