

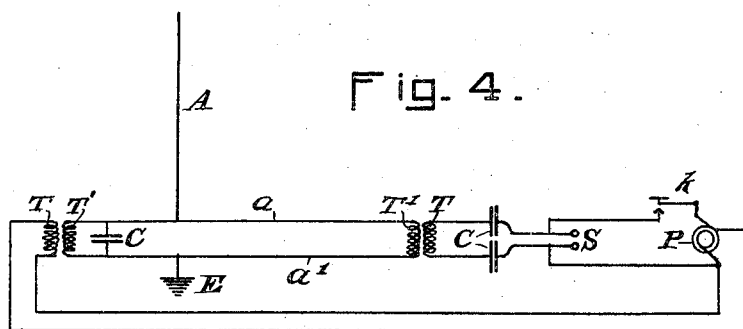
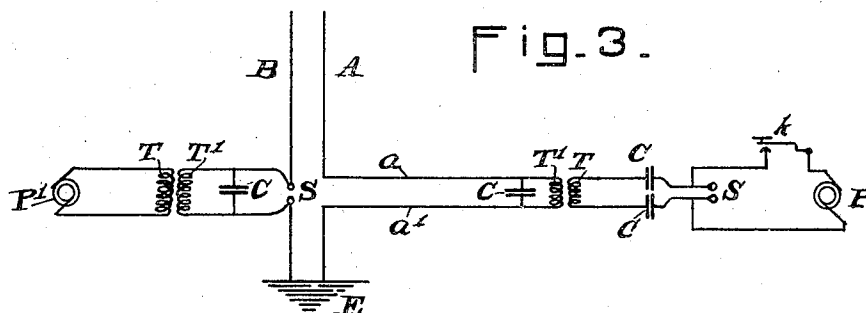
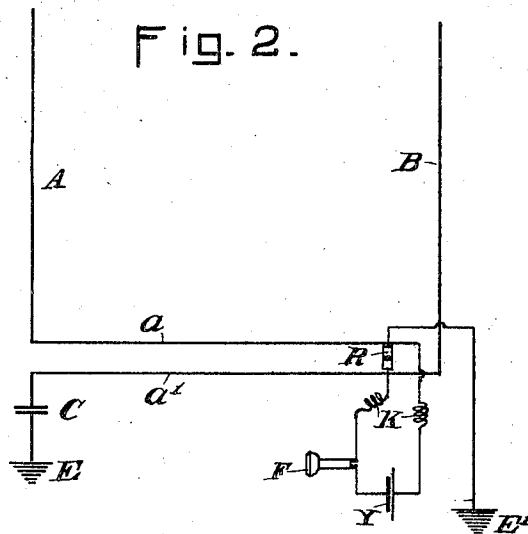
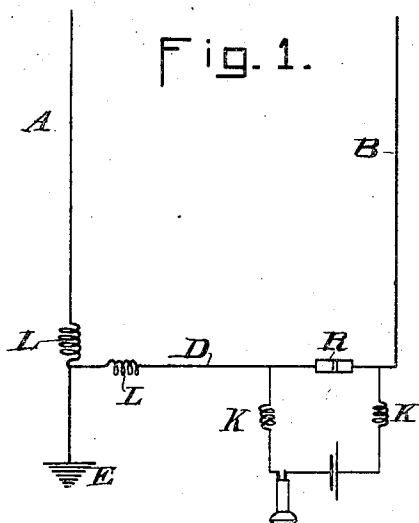
No. 770,229.

PATENTED SEPT. 13, 1904.

L. DE FOREST.
WIRELESS SIGNALING APPARATUS.

APPLICATION FILED MAR. 14, 1903.

NO MODEL.



WITNESSES:

J. Hauck
J. H. Reynolds.

INVENTOR

Lee de Forest

BY

Henry L. Reynolds
his ATTORNEY

UNITED STATES PATENT OFFICE.

LEE DE FOREST, OF NEW YORK, N. Y., ASSIGNOR TO THE GREATER NEW YORK SECURITY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WIRELESS SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 770,229, dated September 13, 1904.

Original application filed May 14, 1902, Serial No. 107,273. Divided and this application filed March 14, 1903. Serial No. 147,749. (No model.)

To all whom it may concern:

Be it known that I, LEE DE FOREST, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented certain new and useful Improvements in Wireless Signaling Apparatus, of which the following is a specification.

My invention relates to improvements in wireless signaling apparatus whereby the disturbing effect of aperiodic waves upon periodic receiving devices may be avoided.

My invention consists of the novel parts and combinations thereof hereinafter described, and particularly pointed out in the claims.

The drawings accompanying herewith and forming a part of this application illustrate my invention in forms now preferred by me and in sufficient variety to make clear the principles thereof and the manner of carrying them out.

Figures 1 and 2 represent slightly-different forms of receiving devices embodying my invention. Figs. 3 and 4 represent slightly-different forms of transmitting devices which may be used in carrying out my invention.

This application is a division of my application, Serial No. 107,273, filed May 14, 1902.

In the use of syntonic signaling devices it has been found that a violent aperiodic wave-train by the force of its impact is able to force vibrations in any receiving system whatever may be its period and that the working of such systems is therefore liable to be seriously interrupted by such aperiodic wave-trains. I have discovered means, herein set forth, whereby the disturbing effect of such aperiodic wave-trains may be neutralized. This, broadly stated, consists in conveying such aperiodic impulses in equal amounts to both ends of a wave-responsive device. As the operation of the indicating devices employed depends upon differences in potential at opposite ends of the wave-responsive device and by my invention the variations in potential caused by aperiodic wave-trains are alike at both ends thereof, no difference in

potential is thereby caused, and hence no effect capable of operating the indicating device is produced.

In the receiving apparatus shown in Fig. 1 two antennæ A and B are shown, the antenna A being tuned to a given periodicity by means of a coil or coils L. The conductor D, connecting the antenna with the wave-responsive device, is also provided with a tuning-coil L. Any other means for obtaining the tuning effect may be employed—as, for instance, the parallel Lecher conductors *a a'* of Fig. 2. The action of these Lecher conductors has been fully described in my application, Serial No. 97,239, filed March 8, 1902, and hence will not be herein set forth. They form a highly-resonant system which may be readily and exactly adjusted to the desired period.

Stationary static waves will be formed in the conductors *a* and *a'*, with a node at the point of insertion of the wave-responsive device R. The connection for the aperiodic antenna with the ground *E'* being at such a nodal point will not affect impulses received from the antenna A. The condenser C will also prevent the impulses received through antenna B from grounding at E; but said impulses will choose the path of least resistance to earth *E'*. The aperiodic antenna B is in both cases directly connected with the wave-responsive device R, but to the opposite end from that to which the antenna A is connected.

A local indicating-circuit is employed which may be of any desired or usual character and is connected with the wave-responsive device in the usual way. This circuit, as shown, contains choke-coils K, battery Y, and telephone-receiver F. Any other form of circuit or devices suitable for such purposes may be employed instead of those shown.

A periodic wave-train of the same period as the antenna A and its connected system will produce vibrations of some intensity in such system, while they will produce little or no vibrations in the antenna B. This will result in differences of potential at opposite ends of the wave-responsive device which will be

sufficient to operate the indicating device in the usual manner. If, however, an aperiodic wave-train should reach the receiving apparatus, it will equally affect both antennæ, thus producing two sets of waves, which are conveyed to opposite ends of the wave-responsive device simultaneously, thus causing equal and similar variations of potential at both ends. As a difference of potential between the two ends of the wave-responsive device is essential to operate the indicating device, such equal and similar variations will produce no result. Such a receiving device may be used in conjunction with a syntonizing transmitting device of any character. If desired, however, an aperiodic transmitting device may be combined with such periodic device, and this aperiodic device may be operated simultaneously with the periodic transmitter or in any other order not in tune with the periodic transmitter—as, for instance, continuously. Such devices are shown in Figs. 3 and 4. That shown in Fig. 3 has the aperiodic and the periodic transmitters entirely distinct, while that shown in Fig. 4 has the two partially combined.

The antenna A of Fig. 3 is connected with a resonant system consisting of the parallel Lecher conductors aa' . The sparking-circuit contains the key k and an alternating generator P. The oscillating circuit connected with the spark-gap S contains condensers C and the primary T of a transformer, the secondary T' being in the Lecher circuit. The aperiodic system connected with the antenna B contains the sparking circuit only connected with the alternating generator P' by transformer-coils T T'.

The transmitter shown in Fig. 4 is like that in Fig. 3, except that a single antenna is used which is common to both systems, and both systems are connected with the same generator. In both cases the aperiodic system is connected with the generator, so as to produce a continuous series of wave-trains. The system might be operated in any other manner, as by connecting it with the signal-key k .

With a transmitter containing means for emitting an aperiodic set of wave-trains along with the periodic set of wave-trains it would be impossible for a receiving system not containing the protective feature of my invention to decipher the message, although it might be tuned to the same frequency. The aperiodic impulses received would so confuse the periodic impulses as to make them unintelligible.

It is evident that parts of the apparatus used may be very different from that shown without affecting the character of my invention. The apparatus shown is given only as illustrations of forms of construction which are preferred and which serve to make clear what my invention is and the manner of carrying it out. My invention may be embodied in any form of transmitting or receiving apparatus and is not

limited to those shown. I do not, therefore, wish to be limited in its application to the construction shown and described, but to claim my invention broadly irrespective of the particular apparatus employed.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a receiving apparatus for space signaling, the combination with periodic and aperiodic receiving systems, of a wave-responsive member having its opposite ends respectively connected with said receiving systems.

2. In a receiving apparatus for space signaling, the combination with a periodic and an aperiodic antenna, of a wave-responsive device connected with both of said antennæ to be oppositely affected by waves received from the different antennæ.

3. In a receiving apparatus for space signaling, the combination with a periodic and an aperiodic antenna, of a wave-responsive device having one end connected with one antenna and its other end connected with the other antenna.

4. In a receiving apparatus for space signaling, the combination with a single wave-responsive device, of a tuned and an untuned wave-collecting system oppositely connected with said wave-responsive device.

5. In space signaling, the combination with a tuned or periodic signal-receiving system, of an aperiodic or untuned receiving system connected to the wave-responsive member oppositely to the periodic system, whereby the effects of aperiodic waves thereon is neutralized.

6. In space signaling apparatus, the combination with means for producing and radiating both periodic and aperiodic wave-trains, of receiving apparatus designed for the reception of similar periodic and aperiodic wave-trains, and a wave-responsive member connected to said receiving apparatus to receive the periodic wave-trains at one end and the aperiodic wave-trains at both ends.

7. In a space signaling apparatus, the combination with periodic and aperiodic wave-producers, of a receiving apparatus comprising complementary periodic and aperiodic receiving systems, and a common indicating device oppositely affected by the two receiving systems.

8. In a space signaling apparatus, the combination with periodic and aperiodic wave-producers, and a receiving apparatus comprising complementary periodic and aperiodic receiving systems, of a local indicating-circuit common to both receiving systems and containing a single wave-responsive member having said receiving systems connected respectively with opposite ends thereof.

9. In space signaling, the combination with a radiating-conductor, of two spark-producing devices, one connected with the radiator

directly to produce aperiodic wave-trains, and a tuned or periodic conductor connecting the other spark-producing device with the radiator whereby periodic wave-trains are sent out.

5 10. In space signaling, the combination in a sending apparatus of a periodic and an aperiodic wave-producer.

10 11. In space signaling, the combination with a radiating-conductor, and means for producing and communicating thereto both periodic and aperiodic wave-trains, of means for controlling the periodic wave-trains to produce signals.

15 12. In space signaling, the combination in a sending apparatus of periodic and aperiodic

wave-producers adapted to be both operated at the same time.

13. The means for protecting a syntonizing receiving apparatus from the effects of waves not harmonizing with its period consisting of an aperiodic receiving system connected with the wave-responsive device oppositely to the syntonizing or periodic system.

In testimony whereof I have hereunto affixed my signature, this 25th day of February, 1903, in the presence of two witnesses.

LEE DE FOREST.

Witnesses:

M. W. NOLAN,

J. V. McMANUZ.