W. C. WHITE.

WIRELESS SIGNALING SYSTEM.

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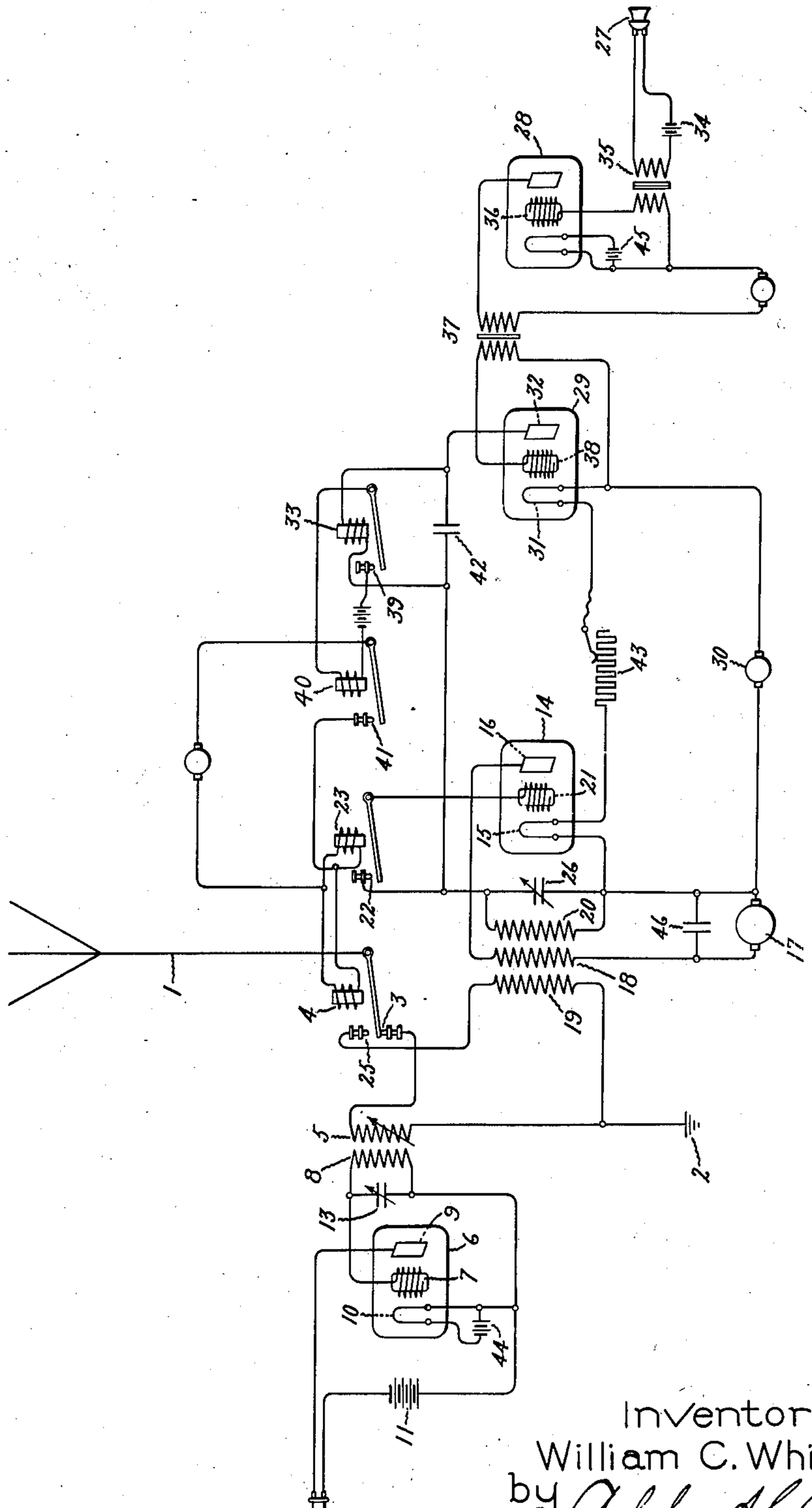

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UNITED STATES PATENT OFFICE.

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WIRELESS SIGNALING SYSTEM.

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Application filed April 23, 1915. Serial No. 23,352.

To all whom it may concern:

Be it known that I, WILLIAM C. WHITE, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Wireless Signaling Systems, of which the following is a specification.

My present invention relates to wireless signaling systems and more especially to those adapted to transmit sound by means of electromagnetic waves set up in the ether.

The object of my invention is to provide such a system in which either receiving apparatus or transmitting apparatus is automatically connected to an antenna when desired.

In carrying my invention into effect I provide suitable receiving apparatus which is normally connected to the antenna. I also provide a system of relays in connection with the transmitting apparatus which is automatically set into operation, as soon as the transmitter is influenced by sound waves, to disconnect the receiving apparatus from the antenna and connect the transmitting apparatus thereto. When the transmitter is no longer influenced by sound waves the transmitting apparatus is automatically disconnected and the receiving apparatus connected again to the antenna.

The features of my invention which I consider novel are pointed out with particularity in the appended claims. My invention itself, however, with further objects and advantages thereof will be best understood by reference to the following description taken in connection with the accompanying drawing in which I have illustrated diagrammatically a single embodiment thereof.

As indicated in the drawing, the antenna 1 is normally connected to ground at 2 through the lower contact 3 of relay 4 and the usual variable inductance 5. The receiving apparatus may be of any desired form. As here indicated it comprises an electron discharge device 6 having a controlling grid 7 which is inductively connected to the antenna by means of the coil 8. The circuit of the electrodes 9 and 10 of the electron discharge device 6, which for convenience of description I term the plate circuit, includes a battery 11 or other source of energy and a telephone receiver 12. A variable condenser 13 is employed in the circuit of the grid 7 and cathode 10 for tuning. The operating of receiving apparatus of this nature is too well known to require further description.

The transmitting apparatus which I employ in the present case comprises an electron discharge device 14 which may be so connected that it will produce continuous electrical waves of high frequency but which is normally inoperative. The plate circuit of this device includes between cathode 15 and anode 16 a source of energy 17 and a coil 18 inductively related to the coil 19 and also to the coil 20 which is connected to the controlling grid 21 when contact 22 of relay 23 is closed. While the three coils 18, 19 and 20 may be inductively related to each other as indicated other arrangements may equally well be used as, for example, a second coil may be employed in the antenna and coil 20 inductively related to this second coil. When relay 4 operates it breaks contact at 3 and makes a second contact at 25, thus connecting coil 19 between the antenna and ground and disconnecting the receiving apparatus from the antenna. With the transmitting apparatus connected to the antenna as described, and contact 22 closed, when current starts to flow in the plate circuit energy is transferred to the coil 20 and oscillations are set up in the grid circuit which includes the coil 20, grid 21, cathode 15 and variable condenser 26. These oscillations cause the potential of the grid 21 to vary. This variation in the grid potential in turn produces a variation in the current in the plate circuit. When the potential of the grid varies in a negative direction the current flowing in the plate circuit decreases and when it varies in a positive direction the current flow in the plate circuit increases. These variations in the current in the plate circuit produce an alternating current in the antenna and by varying the natural frequency of the grid circuit by varying the condenser 26 the frequency of the alternating current thus produced may be varied at will. When contact 22 is open the grid 21 being disconnected from the rest of the device, no oscillations will be produced and but little current will flow through device 14 by reason of the tendency of the grid 21 to become negatively charged.

In order to transmit sound by means of such waves it is necessary to vary the amplitude of the waves transmitted in accordance with variations in the sound waves which are to be transmitted. This may be done by varying the amplitude of the oscillations produced in the grid circuit of device 14 in accordance with the variations in the sound waves. The apparatus which I employ for this purpose comprises a telephone transmitter 27, an electron discharge device 28 which serves as an amplifier, and another electron discharge device 29 which serves to control the amplitude of the oscillations in the grid circuit of device 14.

The controlling device 29 has a source of energy 30 connected to its electrodes 31 and 32 and the plate circuit of this device also includes the winding of relay 33. When the transmitting apparatus is not in operation the current which flows through this relay winding is insufficient to operate the relay. As soon, however, as the transmitter 27 is influenced by sound waves current variations are produced in its local circuit which includes the battery 34 and the primary of transformer 35. These current variations produce potential variations in the grid 36 of the amplifier 28 and thereby corresponding current variations of greater amplitude are produced in the plate circuit of the amplifier. The variable current thus produced flows through transformer 37 and produces corresponding potential variations in the grid 38 of the controlling device 29, thereby reproducing in the plate circuit of the controlling device current variations corresponding to those produced by the transmitter 27. The current thus produced will of course be a pulsating current but the average value of it will be much greater than the normal current in the plate circuit of the controlling device and will be sufficient to operate the relay 33. When relay 33 operates it makes contact at 39 and closes the local circuit of relay 40. Relay 40 then operates and makes contact at 41 closing the local circuit of relays 4 and 23, thereby disconnecting the receiving apparatus and connecting the transmitting apparatus to the antenna. Relays 33 and 40 should be quick acting relays and relays 4 and 23 should be quick to close but should have an appreciable time lag in opening to prevent the transmitting apparatus from being disconnected during a momentary cessation of the sound waves acting upon transmitter 27. This time lag is preferably greater for relay 4 than for relay 23 in order that relay 23 may open and thus stop the production of oscillations before the antenna circuit is broken at 25. While I have indicated the telephone transmitter as being located close to the other apparatus it will be evident that it may equally well be connected thereto by a wire line of any length desired.

In the system I have described if the device 29 is not connected to the grid circuit of device 14 this grid circuit will oscillate freely and the oscillations therein will have a substantially constant amplitude. When, however, device 29 is connected as indicated to the grid circuit of device 14 some of the energy of the high frequency oscillations will be diverted from the grid circuit through the controlling device and as a result the oscillations set up therein will be damped, the amount of the damping of the oscillations of course depending upon the amount of energy diverted. The amount of energy thus diverted will vary in accordance with the variations in the potential of the controlling grid 38. As soon as energy is diverted from the grid circuit of device 14 and the oscillations therein are accordingly damped the current variations in the plate circuit of device 14 are correspondingly reduced and the high frequency current set up in the antenna is reduced. This in turn causes a further reduction in the amplitude of the oscillations in the grid circuit.

The winding of relay 33 is preferably shunted by a condenser 42 so that the alternating component of the current flowing in the plate circuit of the controlling device 29 will not have to pass through this winding. The source of energy 30 may conveniently be employed for heating the cathodes 15 and 31 of electron discharge devices 14 and 29 as indicated, the temperature of these being adjusted by the variable resistance 43. If desired the same source may be used for heating the cathodes of devices 6 and 28, although to avoid complications in the diagram I have shown separate batteries 44 and 45 for this purpose. I also find it desirable to employ a condenser 46 in shunt to the source of supply 17 in order that the high frequency component of the current in the plate circuit of device 14 will not be required to pass through the supply source.

While I have illustrated a single embodiment of my invention I do not wish to be limited to the precise form described as it will be apparent to one skilled in the art that many modifications thereof may be made without departing from the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination in a wireless signaling system, of an antenna, receiving apparatus normally connected to said antenna, transmitting apparatus which is normally inoperative, and means whereby sound waves render said transmitting apparatus operative, automatically connect it to the antenna and disconnect the receiving apparatus.

2. The combination in a wireless signaling system, of an antenna, receiving apparatus normally connected to said antenna, trans-

mitting apparatus which is normally inoperative, a telephone transmitter, and means whereby the action of sound waves upon said transmitter render said transmitting apparatus operative, automatically connect it to the antenna and disconnect the receiving apparatus.

3. The combination in a wireless signaling system, of an antenna, receiving apparatus normally connected to said antenna, transmitting apparatus which is normally disconnected from the antenna, a telephone transmitter, a switch for disconnecting said receiving apparatus and connecting the transmitting apparatus to the antenna and means whereby the action of sound waves upon said transmitter causes said switch to operate.

4. The combination in a wireless signaling system, of an antenna, receiving apparatus normally connected to said antenna, transmitting apparatus which is normally disconnected from the antenna, a telephone transmitter, a switch for disconnecting said receiving apparatus and connecting the transmitting apparatus to the antenna, a relay for controlling the operation of said switch and means whereby the action of sound waves upon said transmitter causes said relay to act and operate said switch.

5. The combination in a wireless signaling system, of an antenna, receiving apparatus normally connected to said antenna, transmitting apparatus which is normally inoperative and disconnected from the antenna, a telephone transmitter, a switch for disconnecting said receiving apparatus and connecting the transmitting apparatus to the antenna, a second switch for rendering the transmitting apparatus operative, a relay for controlling the operation of said switches and means whereby the action of sound waves upon said transmitter causes said relay to act and operate said switches.

6. The combination in a wireless signaling system of an apparatus for producing continuous electrical waves which is normally inoperative, a switch for controlling the operation of said wave producing apparatus, and means actuated by sound waves to cause the closing of said switch to render said wave producing apparatus operative.

7. The combination in a wireless signaling system of apparatus for producing continuous electrical waves which is normally inoperative, a switch for controlling the operation of said wave producing apparatus, a telephone transmitter, and means whereby the action of sound waves upon said transmitter will cause said switch to close and render said wave producing apparatus operative.

8. The combination in a wireless signaling system of apparatus for producing continuous electrical waves which is normally inoperative, a switch for rendering said wave producing apparatus operative, a relay for controlling the operation of said switch, a telephone transmitter and means whereby the action of sound waves upon said transmitter will cause said relay to act and operate said switch.

9. The combination in a wireless signaling system of means for producing continuous electrical oscillations comprising an electron discharge device having a cathode, an anode and a discharge controlling grid, a normally open switch in the grid circuit of said device and means actuated by sound waves to cause said switch to close.

10. The combination in a wireless signaling system of means for producing continuous electrical oscillations comprising an electron discharge device having a cathode, an anode and a discharge controlling grid, a normally open switch in the grid circuit of said device, a telephone transmitter and means whereby the action of sound waves upon said transmitter will cause said switch to close.

11. The combination in a wireless signaling system of means for producing continuous electrical oscillations comprising an electron discharge device having a cathode, an anode and discharge controlling grid, a normally open switch in the grid circuit of said device, a relay for controlling the operation of said switch, a telephone transmitter and means whereby the action of sound waves upon said transmitter will cause said relay to act and close said switch.

12. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally inoperative and disconnected from the antenna, a switch for connecting said transmitting apparatus to the antenna, a second switch for rendering the transmitting apparatus operative, relays to close said switches and hold the same closed for an appreciable period after the force actuating the relays is withdrawn, and means rendered operative by sound waves for operating said relays.

13. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally disconnected from the antenna, a switch for connecting said transmitting apparatus to the antenna, a relay to close said switch quickly and hold it closed for an appreciable interval after the force actuating the relay is withdrawn, and means rendered operative by sound waves for actuating said relay.

14. The combination in a wireless signaling system of an antenna, normally inoperative means for producing continuous electrical waves in said antenna, a switch for rendering said wave producing means operative, means controlled by sound waves for closing said switch, and holding the same

closed during the continuance of the sound waves.

15. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally disconnected from the antenna and means actuated by sound waves for connecting said transmitting apparatus to said antenna.

16. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally disconnected from the antenna and means actuated by sound waves for connecting said transmitting apparatus to the antenna and holding it in that relation during the continuance of the sound waves.

17. The combination of normally inoperative means comprising an electron discharge device for producing continuous electrical waves and means comprising a second electron discharge device for rendering the wave producing means operative and varying the amplitude of the waves produced thereby.

18. The combination in a wireless signaling system of normally inoperative means for producing continuous electrical waves comprising an electron discharge device and means comprising a second electron discharge device for rendering said wave producing means operative and varying the amplitude of the waves produced thereby.

19. The combination in a wireless signaling system of an antenna, normally inoperative means comprising an electron discharge device for producing continuous electrical waves in said antenna, and means comprising a second electron device for rendering said wave producing device operative and varying the amplitude of the waves produced thereby in accordance with variations in sound waves.

20. The combination with normally inoperative means comprising an electron discharge device for producing continuous electrical waves, of means for rendering said wave producing means operative and varying the amplitude of the waves produced thereby.

21. The combination in a wireless signaling system of an antenna, means comprising an electron discharge device for producing continuous electrical waves in said antenna, said means being normally disconnected from said antenna and means for connecting said wave producing means to said antenna and varying the amplitude of the waves produced thereby.

22. The combination in a wireless signaling system of an antenna, means comprising an electron discharge device for producing continuous electrical waves in said antenna, said means being normally disconnected from said antenna and means comprising a second electron discharge device for connecting said wave producing means to said antenna and varying the amplitude of the waves produced thereby.

23. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally disconnected from the antenna and means comprising an electron discharge device for automatically connecting said transmitting apparatus to said antenna.

24. The combination in a wireless signaling system of an antenna, transmitting apparatus which is normally disconnected from the antenna and means comprising an electron discharge device for automatically connecting said transmitting apparatus to said antenna and varying the signals transmitted in accordance with variations in sound waves.

25. In a radio telephone system, an antenna, receiving and transmitting circuits, said antenna being normally connected to said receiving circuit, and means controlled by the voice for automatically connecting said transmitting circuit to said antenna when said system is used for transmission.

26. In a radio telephone system, an antenna, receiving and transmitting circuits, and means controlled by the voice for automatically connecting said transmitting circuit to said antenna only when said antenna is used for transmission.

27. In a radio telephone system, an antenna, receiving and transmitting circuits, voice controlled means for automatically connecting said transmitting circuit to said antenna and means for maintaining said connection only as long as transmissions are made.

28. In a radio telephone system, an antenna, receiving and transmitting circuits, voice controlled means for automatically connecting said transmitting circuit to said antenna and means for automatically breaking said connection when transmission ends.

29. In a radio telephone system, an antenna, receiving and transmitting circuits, and voice controlled means to connect said antenna to said transmitting circuit.

30. In a radio telephone system, an antenna normally connected to a receiving circuit, a normally open transmitting circuit, and voice controlled means to automatically open said receiving circuit and close said transmitting circuit.

31. In a radio telephone system, an antenna normally connected to a receiving circuit, a normally open transmitting circuit, and means controlled by sound waves to automatically open said receiving circuit.

32. In a radio telephone system, an antenna normally connected to a receiving circuit, a normally open transmitting circuit, and means controlled by sound waves to automatically close said transmitting circuit.

33. In a radio telephone system, a receiving system, a transmitting system and a common antenna therefor, a switch for connecting said antenna to either of said systems, and automatically operated voice controlled means for actuating said switch.

34. In a radio telephone system, a receiving system, a transmitting system and a common antenna therefor, a switch for connecting said antenna to either of said systems, and voice controlled means for automatically operating said switch.

35. In a radio telephone system, a receiving system, a transmitting system and a common antenna therefor, a switch for connecting said antenna to either of said systems, and voice controlled means for operating said switch, said means being operated by the closing of a normally open circuit.

36. In a radio telephone system, a receiving system, a transmitting system and a common antenna therefor, a switch for connecting said antenna to either of said systems, and means for operating said switch, said means being controlled by a make and break circuit device and voice controlled means for operating said device.

37. In a radio telephone system, a receiving system, a transmitting system and a common antenna therefor, a switch for connecting said antenna to either of said systems, and means for operating said switch, said means being controlled by a make and break circuit device, operated by sound waves.

In witness whereof, I have hereunto set my hand this 22nd day of April 1915.

WILLIAM C. WHITE.