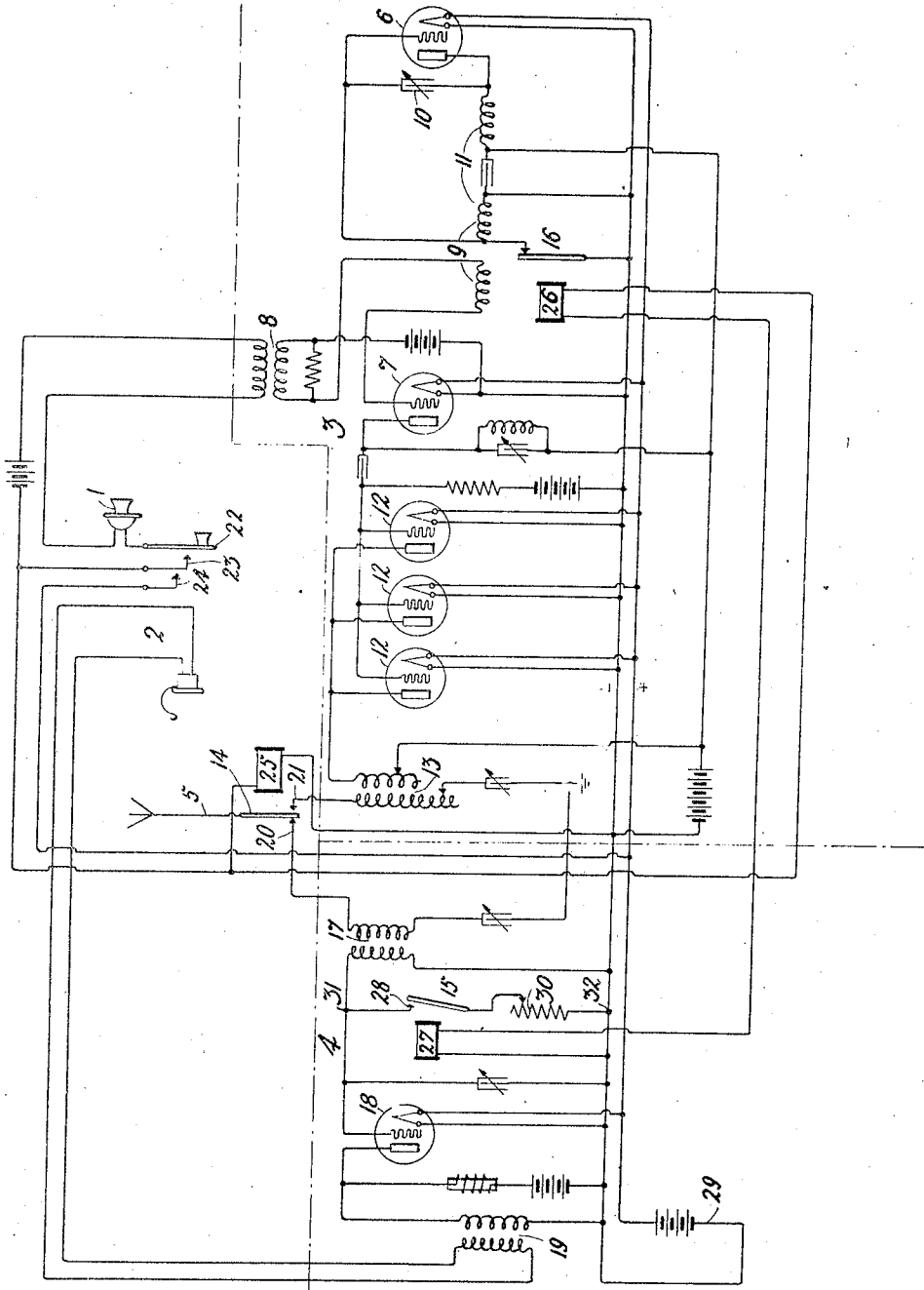


R. A. HEISING.
WIRELESS SIGNALING.
APPLICATION FILED OCT. 26, 1916.

1,406,857.

Patented Feb. 14, 1922.



Inventor:
Raymond A. Heising
by *L. C. Tanner*, Att'y.

UNITED STATES PATENT OFFICE.

RAYMOND A. HEISING, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO WESTERN
ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION
OF NEW YORK.

WIRELESS SIGNALING.

1,406,857.

Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed October 26, 1916. Serial No. 127,922.

To all whom it may concern:

Be it known that I, RAYMOND A. HEISING, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Wireless Signaling, of which the following is a full, clear, concise, and exact description.

This invention relates to the transmission of intelligence, and more particularly to a combined transmitting and receiving station having one or more receiving or transmitting terminals, which may be connected to either the transmitting or the receiving system of the station.

Other features of the invention relate to certain combinations and arrangements of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be apparent to those skilled in the art.

In such an apparatus it is necessary to have some means for readily connecting the antenna to one system or the other, depending on whether it is desired to transmit or receive signals. In order to eliminate the side-tone in the receiver when the transmitting system is being operated, that is, to prevent signals sent out by the transmitting system from actuating the receiving system at the same station, it is convenient to have some means for temporarily shunting or disconnecting the receiving apparatus. For economical working, the oscillating system used as the source of high-frequency oscillations should operate only when signals are desired to be transmitted, so that the oscillator shall be oscillating only when the antenna is connected to the transmitting system, and shall be inoperative when the antenna is receiving signals from an outside source. The purpose of this invention is to afford a ready means whereby these ends may be realized.

For the accomplishment of the above purpose, this invention embodies a key or push-button that operates three relays, controlling the three features above mentioned. The invention is shown in connection with a wireless telephone station, the principal features of which are covered in the United States patent to Van der Bijl, No. 1,350,752, patented Aug. 24, 1920, Hartley, No. 1,356,763,

patented October 26, 1920, and Colpitts and Arnold, No. 1,388,450, patented August 23, 1921.

This invention may be better understood by reference to the following specification and accompanying drawing in which the figure represents one embodiment of this invention.

The signaling set, consisting of a transmitter 1 and a receiver 2, is shown connected to a transmitting system 3 and a receiving system 4, the antenna 5 being adapted to be connected to the one or the other. The transmitting system consists of an oscillation generator, a modulating device, and amplifying means. The oscillation generator comprises a vacuum tube 6 and an oscillating circuit containing the inductance 11 and capacity 10 connected to the input and output electrodes of the tube. Such a generator is of the type described in the Hartley patent previously mentioned. The modulating device 7 is preferably of the audion type on whose input terminals are impressed both the signal wave oscillations by means of transformer 8 from the transmitter 1 and carrier wave oscillations from the oscillation generator by means of transformer 9. The output circuit of the modulator contains the high-frequency oscillations modulated in amplitude in accordance with the low-frequency form. This modulator is of the type described in the Van der Bijl Patent No. 1,350,752, wherein its operation is explained in detail. These modulated oscillations are impressed on the input circuit of a system of amplifiers 12, which give the required amplification of the modulated carrier wave for proper transmission. The output circuit of the amplifying system may be inductively connected to the antenna 5 by means of a transformer 13.

The receiving system 4 is inductively related to the antenna 5 by means of a repeating coil 17. The received carrier waves are detected by the detector 18, which is preferably of the audion type. The detected signals are impressed on the receiver 2 by means of a repeating coil 19. These signals may, however, be amplified to any desired degree in the usual manner, before being impressed on the receiver 2.

Associated with the signaling set is a key

22 and two key contacts 23 and 24. In circuits with contact 24 are a source of current 29 and three relays, 25, 26 and 27. The first of these circuits may be traced from negative pole of battery 29, by way of relay 27, relay 26, contact 24, to the positive pole of battery 29, thus connecting relays 26 and 27 in series. The second circuit may be traced from negative pole of battery 29, relay 25, contact 24, to positive pole of battery 29. For convenience, these two circuits have been traced in the reverse direction from the negative pole to the positive pole of battery. In close proximity to relay 25 is a switch 14, which normally is in contact with terminal 20, thereby serving to connect the antenna to the receiving system 4. Adjacent to relay 26 is a switch 16 which is normally closed, thereby short-circuiting a part of inductance 11 and connecting the grid of tube 6 directly to the cathode, so that the high-frequency oscillations from the oscillator 6 are suppressed. Near relay 27 is a switch 15 which is normally open, thus allowing the received signals to pass on to the detector 18, instead of being shunted. The switches 14, 15 and 16 will in general constitute the armatures of the relays 25, 26 and 27. Consequently, with the three switches or armatures in their normal positions, the apparatus is temporarily adapted for the reception of signals.

If it is now desired to disconnect the receiving system and connect the antenna to the transmitting system, it will be necessary to start the oscillator 6 and shunt the receiving system to eliminate the side-tone. These objects are attained by the use of key 22 and the three relays, for when the key 22 is pressed down, so as to make an electrical connection between the contacts 23 and 24, the circuit containing the relays and the battery 29 is closed so that the relays become energized. Switch 14 is then pulled over to contact 21, thereby connecting the transmitting system to the antenna; the switch 16 is opened, thereby breaking the shunt around part of inductance 11, thus allowing the oscillator to oscillate and to impress its oscillations on the input circuit of the modulator by means of the inductive relation between the primary and secondary of coil 9; and the switch 15 is pulled over to contact 28, thereby shunting the detector 18 so that no energy will go through to the receiver 2.

In actual practice it is sometimes desirable not to completely eliminate the side-tone but to allow a portion of the energy of the transmitted signals to pass through the detector 18 to the receiver, so that the operator will know when the transmitting apparatus is working satisfactorily. If there is no resistance between points 31 and 32, there will be silence in the receiver. But there will be a desired small side-tone effect if a resistance 30 which may be variable is added to the

circuit, as is shown in the drawing. By varying resistance 30, the side tone may be regulated to any desired intensity, even to the point of complete elimination.

Thus it is seen that when there is no connection between contact 24 and key 22, the receiving system is alone operative at the station, but when contact is made between the points 23 and 24 by means of key 22, the transmitting system is operative, the oscillator is started, the connection with the antenna is properly made, and the shunt is closed, which prevents any energy being fed back into the receiving system.

The key 22 may be of any suitable form for making and breaking the circuit. Devices 25, 26 and 27, while preferably of the relay type, may be of any suitable form for the magnetic control of the switches.

While the features of this invention have been described and illustrated in connection with a radio signalling system, it is to be understood that the invention is not so limited but is equally applicable to systems in which the signal waves are guided by wires or other conductors.

What is claimed is:

1. In a telephone system, the combination of a transmitting device, a receiving device, a key, and a high frequency circuit, said transmitting device including an oscillator, said key having associated therewith means for connecting said transmitting device and said receiving device to said high frequency circuit, means for regulating the side tone in the receiving device, and means for controlling the starting of said oscillator.

2. In a signaling system, a transmitting apparatus, a receiving apparatus, an antenna, and a manually operated key, said transmitting apparatus including an oscillator, and means under the control of said key for simultaneously changing the connections of said transmitting apparatus and said receiving apparatus to said antenna, starting said oscillator, and controlling the side tone in said receiving apparatus.

3. In a telephone system, a transmitting apparatus comprising a generator of high frequency oscillations, a receiving apparatus including a receiver, a transmitting conductor associated with said transmitting apparatus and said receiving apparatus, and means to simultaneously render said generator operative, connect said generator to said transmitting conductor, and to limit to a desired value the side tone in said receiver.

4. In a signaling system, a generator of oscillations, means including a telephone transmitter for controlling the amplitude of the oscillations transmitted from said generator, means to prevent said generator from producing oscillations, a transmitting conductor, and means to simultaneously render said preventing means inoperative, connect

said generator to said transmitting conductor, and close a talking battery circuit through said telephone transmitter.

5 5. In a signaling system, an antenna, a receiver normally connected thereto, and a transmitter, means to disconnect said receiver from and to connect said transmitter to said antenna, and means to regulate the intensity of the side tone in said receiver.

10 6. In a signaling system, an antenna, a receiver normally connected thereto, and a transmitter, means to disconnect said receiver from and to connect said transmitter to said antenna, and means to regulate the intensity of the side tone in said receiver, said last named means comprising a variable impedance in shunt to said receiver.

7. In a signaling system having a transmitting apparatus, a receiving apparatus and an antenna, said transmitting apparatus including an oscillator, the combination with a transmitting and a receiving instrument of three relays and means for controlling the action of said relays, one relay affording a means for controlling the connections of one of said apparatus to the antenna, thereby disconnecting the other apparatus, a second relay serving to control side-tone in the receiving apparatus when the transmitting apparatus is being operated, and a third relay controlling the operation of said oscillator.

8. In a signaling system, a transmitting apparatus including an oscillator, a receiving apparatus, an antenna cooperating with both apparatus, a relay for connecting the antenna to one apparatus and disconnecting it from the other apparatus, a relay for regulating the side tone of the transmitting apparatus in the receiving apparatus, a relay controlling the oscillator, and a key controlling the relays.

9. In a signaling system, a transmitting apparatus, a receiving apparatus, a signaling set and an antenna, said transmitting apparatus having an oscillator, said signaling set consisting of a transmitter, a receiver and a key, a source of current for said transmitter, the combination of three relays, said key serving as a means for controlling said source of current and operating said relays, one relay serving as a means for connecting said antenna to one of said apparatus and disconnecting it from the other apparatus, the second relay serving to control the side-tone in said receiving apparatus when the transmitting apparatus is being operated, and the third relay controlling the operation of the oscillator.

In witness whereof, I hereunto subscribe my name this 25th day of October, A. D., 1916.

RAYMOND A. HEISING.