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O. H. LOYNES

RADIO RINGING SYSTEM

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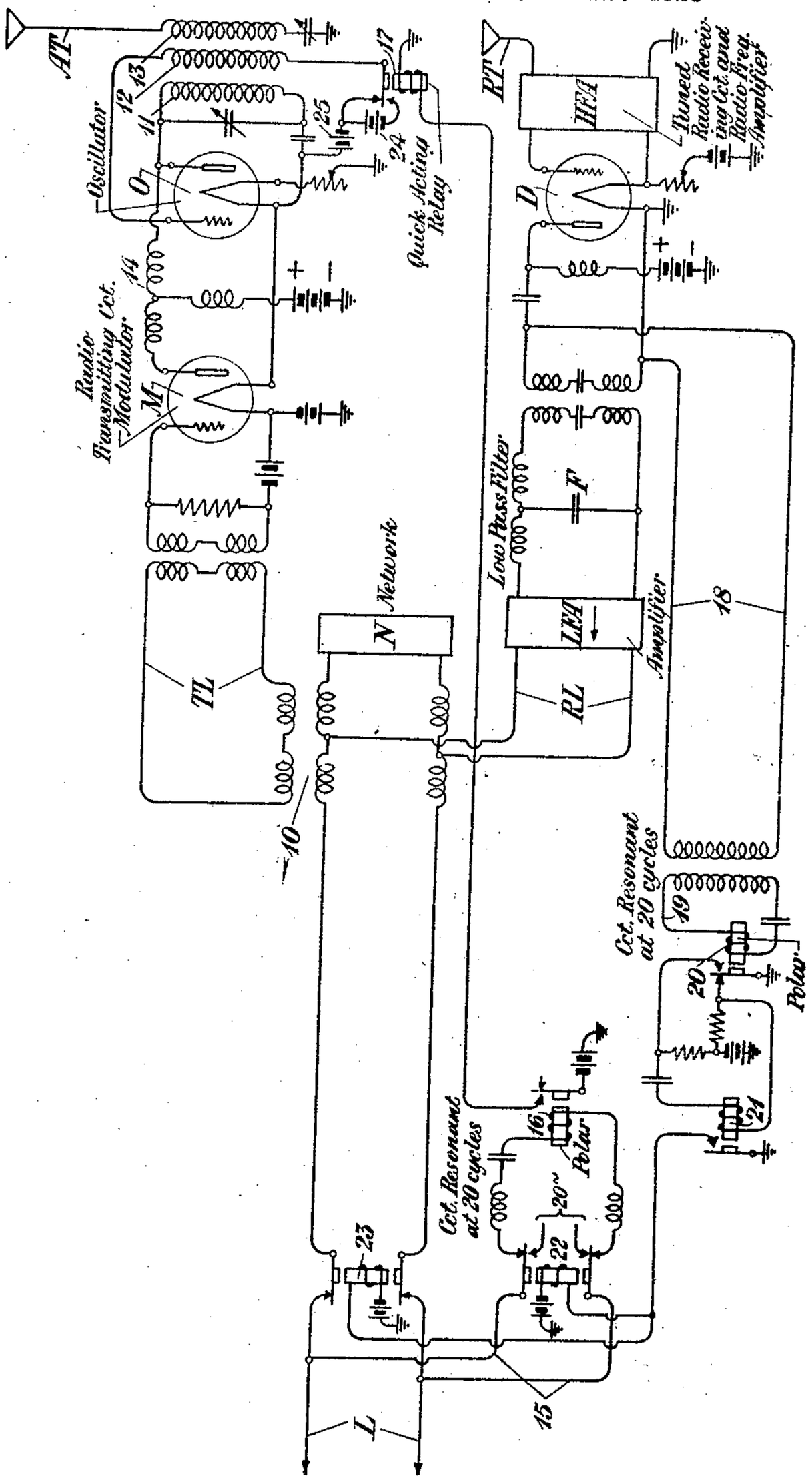

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RADIO RINGING SYSTEM.

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To all whom it may concern:

Be it known that I, OWEN H. LOYNES, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Radio Ringing Systems, of which the following is a specification.

This invention relates to radio transmission and more particularly to calling arrangements for a radio telephone system.

It is one of the objects of the present invention to provide a calling arrangement for a radio telephone system which shall be simple and economical and at the same time dependable in its operation. This object, as well as other objects of the invention, is attained by providing means whereby in response to pulses of ringing current, the grid potential of the oscillator supplying the carrier current is periodically changed to transmit a pulsatingly interrupted carrier. At the receiving station the pulses are detected and operate a vibrating relay which supplies alternating current to a relay continuously operated while a ringing signal is maintained, said relay applying a ringing frequency in the transmission line.

The invention may now be understood from the following description when read in connection with the accompanying drawing, the figure of which shows a circuit diagram illustrating one embodiment of the invention.

Referring to the drawing, L designates a transmission line, such as a telephone line, which terminates at a radio station in a hybrid coil 10 and is balanced by means of an artificial line N, so that a transmitting radio channel TL and a receiving radio channel RL may be rendered substantially conjugate. The radio transmitting channel TL includes a vacuum tube modulator M and a high power vacuum tube oscillator O. The latter tube has its output and input circuits connected together through windings 11 and 12 in a well-known manner and is coupled to the transmitting antenna AT through a winding 13. The output circuit of the oscillator O is also connected to the output circuit of the modulator M through a choke coil 14, so that the modulation is of the well-known constant current type.

The receiving portion of the system comprises a receiving antenna RT, which is connected to suitable tuned circuits and radio frequency amplifying apparatus schematically indicated at HFA. On the output side of the amplifier a detecting tube D is provided for the purpose of detecting the signaling currents modulated upon the radio frequency transmitted from the distant station. Low frequency amplifying apparatus LFA is also schematically indicated for the purpose of amplifying the detected voice frequencies and a low pass filter F is interposed between the detector A and the amplifier LFA for restricting the currents to be amplified to the voice frequency currents.

The ringing apparatus comprises a high impedance circuit 15 bridged across the telephone line L, said bridge being tuned to the ringing frequency, which may be, for example, 20 cycles per second. A vibrating polar relay 16 is included in this bridge and in response to received ringing current vibrates its armature to intermittently open and close the circuit of the quick acting relay 17. The latter relay is arranged to increase the negative potential upon the grid of the oscillator so that the oscillations which are normally transmitted by the oscillator O will be interrupted each time the relay 17 is energized. This results in the transmission of a radio carrier frequency which is interrupted at the ringing frequency.

The receiving portion of the calling apparatus comprises a circuit 18 bridged across the output of the detector D, this circuit being coupled to a circuit 19 which is tuned to the ringing frequency and which includes a vibrating polar relay 20, the armature of which vibrates at the detected ringing frequency. The armature of the polar relay 20, upon vibrating, alternately connects the winding of an alternating current relay 21 to the positive and negative pole of a battery so that, in effect, an alternating current of ringing frequency is caused to flow through the winding of the relay 21 in response to the ringing signal. The relay 21, upon being operated, closes a circuit of a relay 22 for applying a 20-cycle ringing source to the line L and also closes a circuit of relay 23, which disconnects the line L from the transmitting channel TL to prevent the ringing current from being transmitted to the modulator.

The operation is as follows: ringing currents incoming from the line L cause the polar vibrating relay 16 to vibrate at the

ringing frequency of 20 cycles per second, thereby intermittently energizing the quick acting relay 17. The latter relay each time it is energized attracts its armature and connects a supplemental C battery 24 in series with the normal C battery 25, thereby increasing the negative potential upon the grid of the power oscillator so as to interrupt the normally transmitted carrier frequency generated by the oscillator. At the distant receiving radio station apparatus will be provided similar to that shown in the diagram and the interrupted carrier will produce a ringing signal in a manner similar to that which will now be described in connection with the receiving apparatus of the diagram illustrated.

Assuming that a radio frequency transmitted from the distant station and interrupted at the frequency of the ringing current is received by the receiving antenna RT, the apparatus HFA amplifies the received current and impresses it on the detector D. Pulses are thus produced in the output circuit of the detector D, the frequency of the pulses corresponding to the ringing frequency. These pulses flow into the circuit 18 and operate the vibrating polar relay 20 which is in the tuned circuit 19. The relay 20 thereupon causes its armature to vibrate at the frequency of the ringing signal and alernately connects positive and negative potentials to the winding of the relay 21. An alternating current of ringing frequency is thus, in effect, caused to flow through the winding of the relay 21. This relay, being of the alternating current type, is continuously energized during the interval that the ringing current persists and, upon attracting its armature, closes the circuits of the relays 22 and 23.

Relay 22 disconnects the circuit 15 from the polar relay 16 and applies a ringing source to the circuit 15 so that ringing current is transmitted to the telephone line L. At the same time, the relay 23 disconnects the line L from the hybrid coil 10 to prevent a false signal being transmitted to the modulator.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a radio system, a vacuum tube oscillator for supplying radio oscillations, means to apply voice currents to said oscillator to cause said oscillator to modulate the generated radio oscillations in accordance with said voice currents, means responsive to ringing current for intermittently changing the grid potential of the oscillator to intermittently interrupt the generated radio frequency, and means at a receiving station responsive to the interrupted radio frequency for producing a ringing signal.

2. In a radio system, a vacuum tube oscillator for supplying radio oscillations, means to apply voice currents to said oscillator to cause said oscillator to modulate the generated radio oscillations in accordance with said voice currents, means responsive to ringing current for intermittently changing the grid potential of the oscillator to intermittently interrupt the generated radio frequency, a detector at a receiving station for detecting a ringing frequency current from the interrupted radio frequency, and means responsive to the detected current for transmitting a ringing frequency current.

3. In a radio system, a transmitting channel and a receiving channel, a transmission line associated with said channels, a vacuum tube oscillator in the transmitting channel for supplying a radio carrier frequency, means to apply voice currents to said oscillator to cause said oscillator to modulate the generated radio oscillations in accordance with said voice currents, means responsive to ringing currents transmitted over said signaling line for intermittently changing the grid potential of said oscillator tube so that a radio frequency will be transmitted which is interrupted at the ringing frequency, a detector in said receiving channel for detecting signaling currents from received radio frequency currents, and means associated with said detector for transmitting ringing current to said line in response to a detected ringing current.

4. In a radio system, a transmitting channel and a receiving channel, a transmission line associated with said channels, a vacuum tube oscillator in the transmitting channel for supplying a radio carrier frequency, means responsive to ringing currents transmitted over said signaling line for intermittently changing the grid potential of said oscillator tube so that a radio frequency will be transmitted which is interrupted at the ringing frequency, a detector in said receiving channel for detecting signaling currents from received radio frequency currents, a vibrating polar relay associated with said detector tuned to vibrate at the ringing frequency, an alternating current relay adapted to be energized by alternating current applied to its winding in response to the operation of said vibrating polar relay, and a source of ringing current arranged to be connected with said telephone line in response to the operation of the alternating current relay.

5. In a radio system, a transmitting channel and a receiving channel, a low frequency signaling line associated with said channels, means in connection with said transmitting channel for radiating a radio frequency in-

terrupted at a ringing frequency in response to ringing currents from said low frequency signaling line, a detector associated with said receiving channel, a vibrating polar relay in the output circuit of said detector, said polar relay being tuned to vibrate its armature at the frequency of ringing pulses detected by said detector, an alternating current relay, means to supply an alternating current to said relay in response to vibrations of the armature of said polar relay, said alternating relay operating to connect a ringing source to said telephone line in response to a detected ringing current.

In testimony whereof, I have signed my name to this specification this 20th day of August, 1923.

OWEN H. LOYNES.