

1,295,454.

Patented Feb. 25, 1919.

Fig. 1.

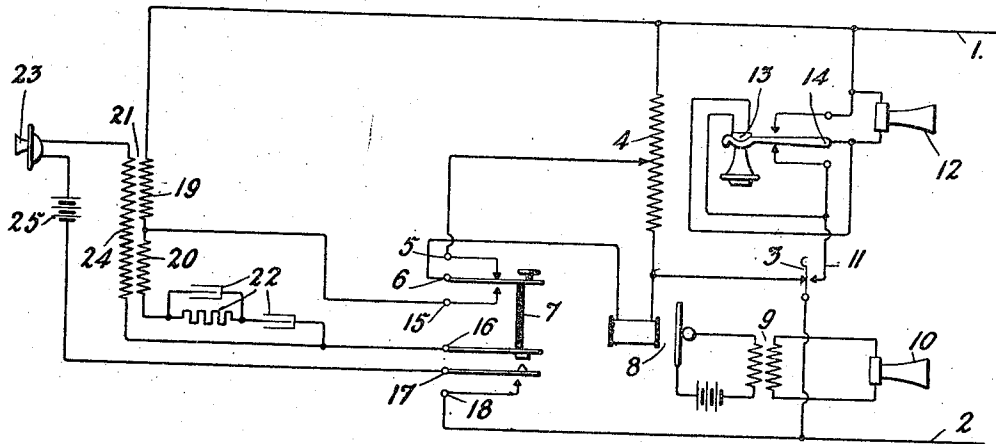


Fig. 2.

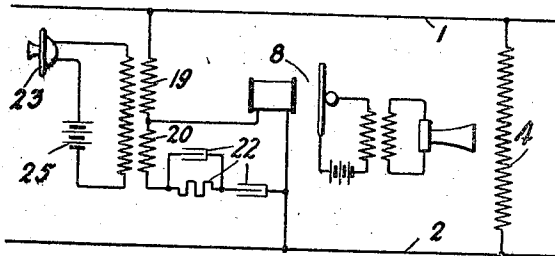


Fig. 3.

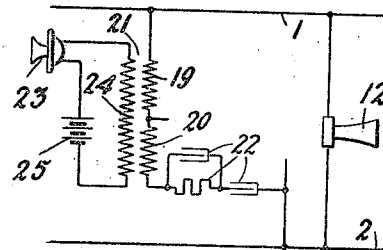


Fig. 4.

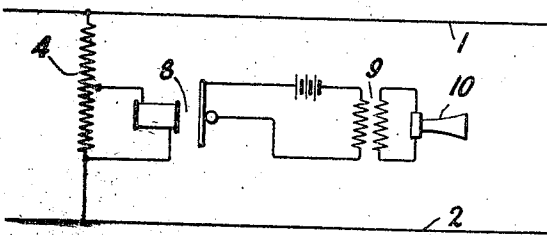
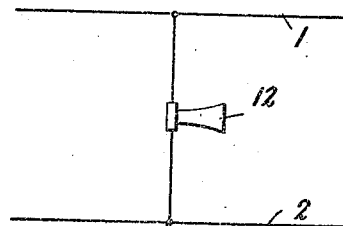


Fig. 5.



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UNITED STATES PATENT OFFICE.

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TRANSMISSION-CIRCUIT.

1,295,454.

Specification of Letters Patent.

Patented Feb. 25, 1919.

Application filed August 30, 1916. Serial No. 117,652.

To all whom it may concern:

Be it known that I, HENRY C. EGERTON, a citizen of the United States, residing at Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Transmission-Circuits, of which the following is a full, clear, concise, and exact description

This invention relates to telephone transmission systems and in particular to a circuit arrangement and organization of apparatus for use at a train dispatcher's station or at similar places where currents of various intensities are received, and where for any reason the use of the ordinary head or hand type of telephone receiver is inconvenient. The object of this invention is to permit the ready reception of messages and the general utilization of the telephone apparatus with a minimum of manipulation.

In certain classes of telephone work and in train despatching by telephone particularly, the so-called loud speaking receiver has assumed considerable importance, in that its use permits the operator to remain in constant touch with the line while attending to other duties and without the necessity of wearing the heretofore customary head receiver

Where an unusually long despatcher's line is involved or where for any reason the attenuation of telephonic currents in the despatcher's line is great, the incoming currents may be of insufficient strength to operate a loud speaking telephone effectively, and it has therefore been proposed to employ a repeater or terminal amplifier between the telephone line and the loud speaking receiver to increase the power in the receiver to a sufficient degree for effective reception.

Unless steps are taken to prevent it, the use of such an amplifier will cause excessively loud side tone when the local transmitting apparatus is used, which by reacting on the local transmitter will set up a local circulation of power and render the line noisy and incapable of use.

This invention, while permitting that the loud speaking receiver and its amplifier be normally associated with the line for maximum receiving efficiency, provides that they will be automatically connected for minimum side tone, when the local transmitting

apparatus is operated. The invention further provides in addition to the high power receiving apparatus which comprises the amplifier-receiver combination above mentioned, a low power receiving apparatus which may be either a hand or head telephone of the usual type or a loud speaking receiver used without an amplifier, which may at will be inserted in place of the high power apparatus. The invention still further provides that regardless of whether the high power or low power apparatus is momentarily in use, such apparatus will be included in proper circuit relation with respect to the transmitting apparatus when the latter is thrown into circuit for transmitting purposes. In other words, the high power receiving apparatus will be included in non-side tone relation, whereas the low power receiving apparatus will not be so included.

The invention will be more clearly understood by reference to the accompanying drawings, in which Figure 1 illustrates the circuit and switching arrangement of this invention. Fig. 2 represents the condition of this circuit for transmitting and with the high power receiving apparatus arranged in non-side tone relation. Fig. 3 represents the circuit condition arranged for transmitting with the low power receiving apparatus in circuit. Fig. 4 represents the normal receiving condition of the circuit with the high power receiving apparatus in circuit; and Fig. 5 represents the receiving arrangement with the low power receiving apparatus in circuit.

Referring to Fig. 1, 1 and 2 are the line conductors of a train despatching or similar circuit. Bridged across these conductors through one contact of the switch 3 is an auto-transformer 4. In parallel with one portion of the auto-transformer 4, through contacts 5, 6 of the key 7 is the receiving element or input circuit of a telephone amplifier 8, here shown in conventional form, it being understood that any suitable type of telephone repeater may be used. The output circuit of the repeater 8 is connected through the transformer 9 to a loud speaking receiver 10. In this, the normal arrangement of the circuit, the circuit condition is that illustrated in the simplified diagram of Fig. 4; and it will be noted that the high

power receiving apparatus, comprising the repeater 8 and the loud speaking receiver 10, is associated directly with the line conductors through the medium of the auto-transformer 4, whose function it is to accommodate the repeater impedance to that of the telephone line. Where the volume of transmission arriving over the conductors 1 and 2 is great, the employment of the amplifier 8 may be found to cause an uncomfortably large volume of sound, in which case the switch 3 may be operated closing contact with point 11 and bringing the loud speaking receiver 12 into circuit across the line.

This circuit arrangement is illustrated in simplified form in Fig. 5. In this lower power receiving circuit, there may be included instead of the loud speaking receiver 12, a hand or a head receiver 13, which, upon its removal from the switchhook 14, is placed in circuit across the line, a short circuit being established across the receiver 12. On the return of the receiver 13 to the switchhook 14, the short circuit is removed from receiver 12 and a short circuit established for the receiver 13. Receiver 13 is of occasional use in case secrecy of communication is desired or if for any reason the noise conditions in the despatcher's office make the use of a loud speaking telephone difficult.

In transmitting from the station, herein shown, the key 7 is depressed, thus closing the contacts 6—15 and 16—17—18. The operation of this key by closing contacts 16—17—18 completes the circuit across the line conductors through the secondaries 19 and 20 of the induction coil 21 in series with the artificial line 22 which is designed to simulate the impedance of the despatcher's line. At the same time the closure of contact 16—17 completes the primary circuit of the induction coil 21, including the transmitter 23 and the primary winding 24 and battery 25. The opening of the contacts 5—6 removes the repeater 8 from connection with the auto-transformer 4 and connects it to the junction of the secondary windings 19 and 20.

In this condition the amount of the local currents generated by the transmitter 23 which will flow through the repeater 8, will depend upon the degree to which the artificial line 22 is a true copy of the real line impedance. While in practice the condition of silence in the receiver 10, that is the condition of non-side tone is not to be desired, and in fact will never be reached, owing to the difficulty of designing an artificial line 22 which will at all times be a true copy of the line impedance, it will readily be seen that a satisfactory minimum of side tone can be realized by this arrangement, that is a condition in which the side tone generated

is sufficient to cause the reaction on the transmitter 23 and thereby set up a local circulation of power.

The circuit arrangement just described is shown in simplified form in Fig. 2. When the switch 3 is thrown into contact with point 11, the circuit condition will be as illustrated in simplified form in Fig. 3. In this condition, it will be noted that the low power receiver 12 is bridged directly across the line conductors 1 and 2 in parallel with the secondary circuit of the induction coil 21. This arrangement is desirable inasmuch as, if the receiver 12 were included in the non-side tone relation with respect to the induction coil 21, the volume of side tone would be insufficient to enable the operator to determine whether his transmitter apparatus was working properly or not.

The circuit arrangement herein described is therefore seen to provide that while receiving devices of various degrees of sensitivity are available, the closure of the transmitting key 7 at any time insures that the particular receiving device then in circuit shall be associated with the transmitting induction coil in the most suitable side tone relation.

What is claimed is:

1. In a transmission system, the combination with line conductors of a local station comprising transmitting and receiving means, means intermediate said line conductors and said receiving means for amplifying the received currents, artificial line means for rendering said amplifying means insensitive to currents transmitted from said local station, and means for operatively controlling said artificial line.
2. In a transmission system, a pair of line conductors, an amplifier, a bridge across said line conductors normally including said amplifier, a transmitting induction coil, and switching means for removing said amplifier from said bridge and placing it in non-side tone relation with respect to said induction coil.
3. In a transmission system, a pair of line conductors, an amplifier, a bridge across said line conductors normally including said amplifier, a transmitting induction coil having a primary circuit and a secondary circuit, and switching means for simultaneously removing said amplifier from said bridge, closing said primary circuit, bringing said amplifier into non-side tone relation with respect to said secondary circuit and bridging said secondary circuit across said line conductors.
4. In a transmission system, a pair of line conductors, a transmitting induction coil, switching means for placing said induction coil in circuit with said line conductors, a high power receiving means and a low power receiving means, and means for at

will placing either said low power receiving means in shunt of said induction coil or said high power receiving means in non-side tone relation thereto.

5 5. In a transmission system, the combination with line conductors, of a local station comprising an induction coil having a primary winding and two secondary windings, a transmitter in circuit with said primary
10 winding, a bridge across said line including said secondary windings and an artificial line in series, an amplifier having an input circuit and an output circuit, switching means for simultaneously closing said primary
15 circuit and said bridge circuit and for connecting said input circuit across one of said secondary windings and said artificial line, and a loud speaking receiver connected to said output circuit.

6. In a transmission circuit, the combination with a pair of line conductors, of a local station comprising an induction coil having a primary winding and two secondary windings, an artificial line in series with said secondary winding, a bridge across
20 said line, a high power receiving means normally in circuit with said bridge, and a switching means for simultaneously closing said primary circuit, connecting said secondary windings and said artificial line in
25 series across said line conductors, removing said receiving means from said bridge and connecting it in shunt of one of said secondary windings and said artificial line.

In witness whereof, I hereunto subscribe
30 my name this 29th day of August, A. D., 1916.

HENRY C. EGERTON.