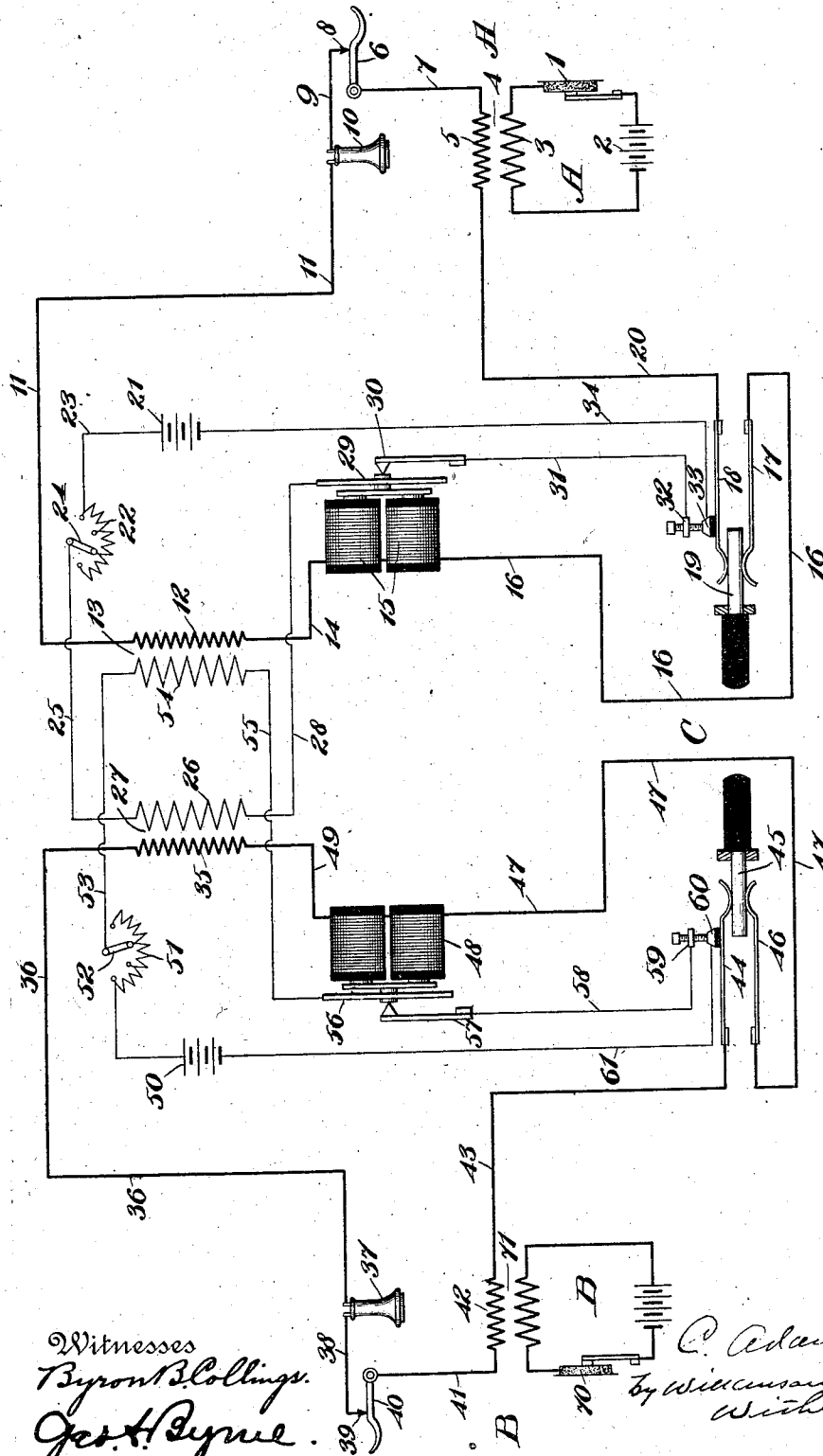


C. ADAMS-RANDALL.
 MULTIPLE REPEATING TELEPHONE SYSTEM.
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1,015,770.

Patented Jan. 30, 1912.



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UNITED STATES PATENT OFFICE.

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MULTIPLE REPEATING TELEPHONE SYSTEM.

1,015,770.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES ADAMS-RANDALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Multiple Repeating Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a telephone system in which a plurality of repeaters are employed and in which the main line circuits are inductively related to the local circuits of said repeaters, and has for its object more particularly to provide a method and means for connecting a plurality of repeaters into their respective independent main line circuits, at the repeater station, telephone exchange, or special switchboard, as the case may be, and intermediate the terminals of the main line circuits through the medium of mechanically and manually operated means, and generally, to improve the efficiency and reliability of speech transmission through the medium of additional energy made available at the intermediate station through the manually operated means.

This invention differs from my co-pending application No. 553,073, filed April 2, 1910, entitled, Telephone repeating system and apparatus, in which the repeating apparatus is automatic in action, in that in this case a plurality of repeaters are employed, the local circuits of each of which are inductively related to one of the main line circuits, and further, in the fact that this system is especially adapted to be used in connection with switchboards.

With the above objects in view, the invention consists in the novel arrangements of parts and in the system of circuits more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification, in which the figure is a diagrammatic illustration of a telephone system constructed in accordance with my invention, 1 represents any suitable transmitter, 2 the local battery associated therewith, 3 the primary of the usual induction coil 4, 5 the secondary of

said coil connected to the hook lever 6 by the wire 7, and said hook lever is associated with the contact 8 connected by the wire 9, to the receiver 10, connected by the wire 11 to one end of the coil 12 of the transformer or induction coil 13. The other end of said coil 12 is connected by the wire 14 to one end of the coils of the repeater 15, the other end of whose coils is connected by the wire 16 to the spring contact member 17, connected to the contact member 18 by the plug 19, and which contact member 18 is connected by the wire 20 to the other end of the secondary 5 to complete the circuit, as shown.

Associated with the repeater 15 is a local battery 21 connected to the rheostat 22 by the wire 23, said rheostat connected by the lever 24 to the wire 25 and to one end of the coil 26 of the transformer or induction coil 27. The other end of said coil 26 is connected by the wire 28 to the contact member 29 of the repeater 15, which member 29 is associated with the member 30 connected by the wire 31 to the contact 32 associated with the contact 33 under the control of the spring member 18, and said contact member 33 is connected by the wire 34 to the other side of the battery 21, as shown.

The coil 26 is inductively associated with the coil 35, one end of which is connected by the wire 36 to the receiver 37, connected by the wire 38 to the contact 39, associated with the hook lever 40, joined by the wire 41 to one end of the secondary 42, whose other end is joined by the wire 43 to the spring contact 44 adapted to be connected by the plug 45 with the spring contact 46, joined by the wire 47 to one end of the coils of the repeater 48. The other end of said coils is connected by the wire 49 to the other end of said coil 35 to complete the circuit, as shown.

Associated with the repeater 48 is the local battery 50 joined from one side to the rheostat 51, connected by the lever 52 to the wire 53, joined to one end of the coil 54 inductively associated with the coil 12, and whose other end is joined by the wire 55 to the contact member 56 of said repeater 48. 57 represents a contact member associated with the contact 56 which is joined by the wire 58 to the contact member 59 associated with the contact 60 under the control of the spring member 44, and joined by the wire 61 to the other side of the local battery 50.

The operation of my invention is as fol-

lows:—Speech being uttered into the transmitter 1 at the station A, currents are caused to leave one end of the secondary 5, to flow along the connection 7, across the contacts 6 and 8, along the wire 9, through the receiver 10, along the wire 11, through the coil 12, along the wire 14, through the coils of the repeater 15, along the wire 16, through the spring contact 17, plug 19 and spring contact 18, along the wire 20 back to the other end of said secondary 5. The passage of current through the coils of the repeater 15 causes the resistance across the contact members 29 and 30 to be varied, and the plug 19 being in the position shown, currents corresponding to the voice caused currents will flow from the local battery 21, through the rheostat 22, lever 24, wire 25, coil 26, wire 28, across the contacts 29 and 30 wire 31, across the contacts 32 and 33 and through the wire 34 back to the battery 21. These currents from the repeater 15 flowing through the coil 26, will induce similar currents in the coil 35, which may be considered as leaving one end of said coil along the wire 36 passing through the receiver 37, traversing the wire 38, the contacts 39 and 40, the wire 41, the secondary 42, the wire 43, the spring contact member 44, plug 45 (assuming said plug to be in the position shown) the spring contact member 46, the wire 47, coils of the repeater 48, and along the wire 49 back to the other end of the coil 35. The passage of these currents similar to the voice caused currents through the receiver 37 will cause the original speech uttered into the transmitter 1 to be reproduced in said receiver 37. The passage of currents, however, through the coils of the receiver 48 will vary the resistance of the contacts 56 and 57, and therefore currents similar to the original voice caused currents will leave one side of the battery 50 traversing the rheostat 51, the lever 52, the wire 53, the coil 54 inductively associated with the coil 12, the wire 55, the contacts 56 and 57, the wire 58, the contacts 59 and 60 and the wire 61, back to the battery. This reaction, however, between the coils 54 and 12 and the coils 26 and 35, I find in practice, does not detrimentally affect the transmission of speech from A to B or from B to A. I also find with this apparatus installed upon telephones the efficiency of transmission is greatly improved. It is further exceedingly convenient to install these repeaters in connection with the switchboard C of an exchange, as is indicated in the drawings, and therefore nothing further need be done to the lines in order to secure a greater clearness in the transmission of speech. Of course the subscribers' stations A and B are each provided with a suitable calling apparatus (not shown) and which may be of any approved construction. It will be

further observed that the repeating apparatus is entirely automatic after the operator in the exchange has inserted the proper plugs 19 and 45 in order to connect the circuits between the contacts 32 and 33 and 59 and 60, as well as between the contacts 17, 18 and 44, 46.

When it is desired to talk from the station B to the station A, speech that may be uttered into the transmitter 70 will generate voice caused currents in the secondary 42 of the induction coil 71, which currents may be supposed to leave one end of said secondary along the wire 43, to traverse the spring contact 44, the plug 45, the spring contact 46, the wire 47, the coils of the repeater 48, the coil 35, the wire 36, the receiver 37, wire 38, contacts 39 and 40 and wire 41 back to the other end of said secondary 42. In like manner, the passage of currents through the repeater 48 will vary the resistance across the contacts 56 and 57, and cause currents similar to the voice caused currents to traverse the coil 54, which currents will induce similar currents in the coil 12, which latter currents will traverse the coils of the repeater 15, the contacts 17, 19 and 18, the wire 20, the secondary 5, the receiver 10 and the wire 11 back to the said coil 12. These latter currents traversing the receiver 10, of course, will reproduce the original speech in said receiver which was uttered in the transmitter 70 at the station B. It will thus be seen that I provide what may really be termed electro-magnetically operated transmitters 15 and 48 located in independent local circuits, which are inductively related to independent main line circuits. Further, it will be seen that at the repeater station C I provide manually operated means such as 19 and 45 for simultaneously closing the main line and the local circuits.

It is a well known fact in practice that with telephone repeating systems in which two or more transmitters are operative at the same time, as is here the case, their local batteries being simultaneously closed, and especially when main lines of different lengths are used, that a howling a humming, or a singing noise occurs. Sometimes a continuous note of certain pitch is observed and differing under different conditions, passes over the main line circuit, probably by reason of an inductive effect through the coils 13 and 27. These disturbances greatly interfere with the voice transmission and reproduction, and therefore are found very detrimental. I have, however, discovered that by the simple expedient of introducing rheostats such as 22 and 51 in the local circuits, that these disturbances may be wholly or largely prevented upon a change of the resistance in the transmitter circuits. I have also found that by suitably adjusting the contacts such as

29 and 30 or 56 and 57, such disturbances are largely overcome. Further, I have found by increasing or decreasing the number of cells of battery used in the local circuits, that such disturbances are greatly obviated. But, readjusting the transmitter contact or changing the battery is not convenient and is scarcely practical commercially. I, therefore, find the rheostats much more satisfactory.

It is obvious that those skilled in the art may vary the arrangement of parts as well as the character of the parts themselves, without departing from the spirit of my invention, and therefore I do not wish to be limited to the disclosure above, except as may be required by the claims.

What I claim is:—

1. In a telephone system, the combination of independent main line circuits, means for causing currents corresponding to sound waves to traverse one of said circuits; means comprising an electro-magnetically operated transmitter and a local circuit for causing each of said currents to generate a corresponding current in another of said circuits; means for simultaneously mechanically and manually closing said first men-

tioned main line and local circuits; and means comprising an electro-magnetically operated transmitter and local circuit containing an adjustable resistance for causing each of said generated currents to generate a similar current in said first mentioned circuit, substantially as described.

2. In a telephone system, the combination of a plurality of transmitters and receivers located at different stations; a plurality of independent main line circuits connecting said stations; a plurality of local circuits, one for each main line circuit inductively associated with said main line circuits; switchboards provided with means comprising a spring jack and an associated contact for simultaneously mechanically and manually connecting each of said main line and its associated local circuits; and an electro-magnetic repeater associated with each of said main line and local circuits so connected, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

CHARLES ADAMS-RANDALL.

Witnesses:

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