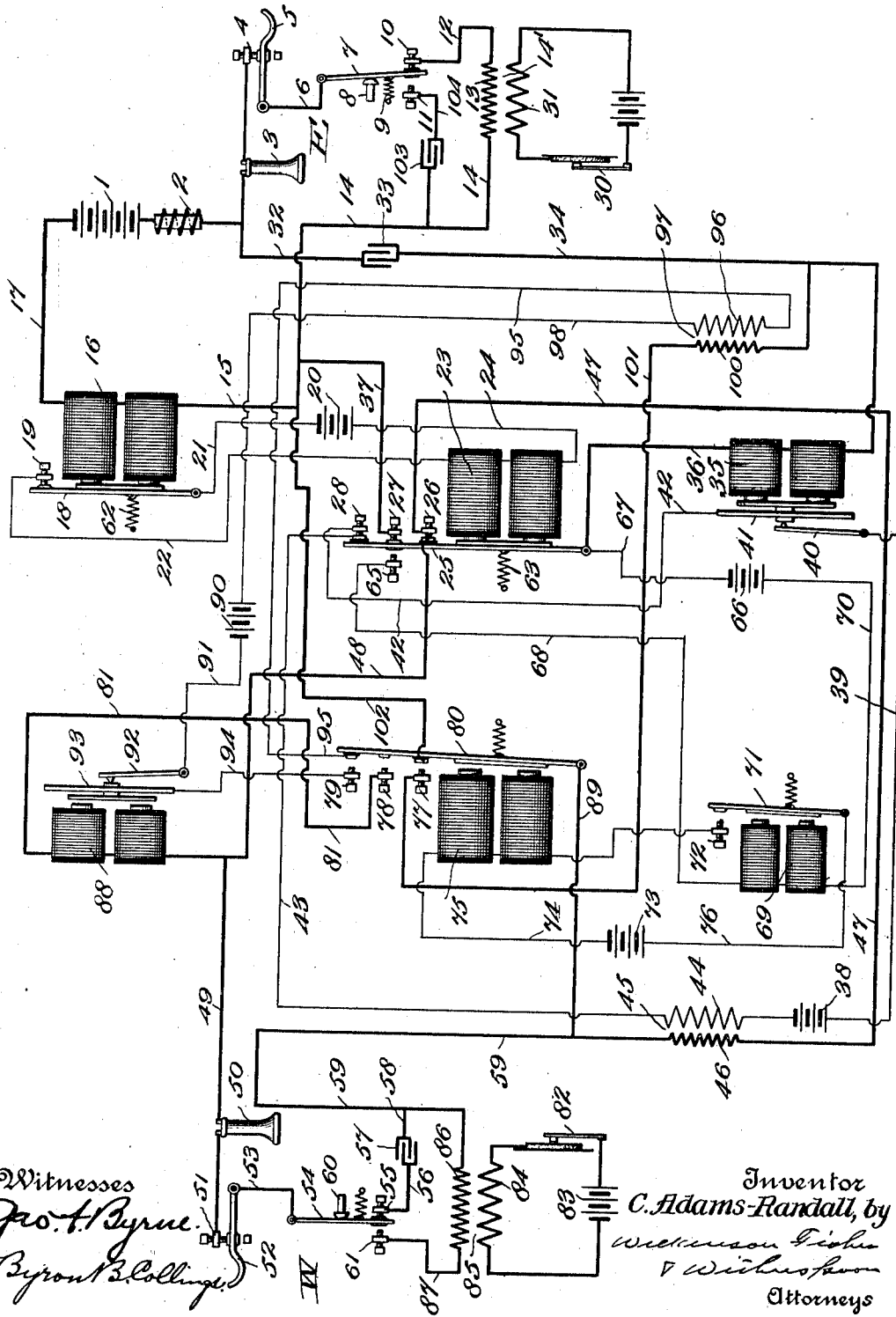


C. ADAMS-RANDALL.
TELEPHONE REPEATING CIRCUITS.
APPLICATION FILED DEC. 20, 1910.

1,008,880.

Patented Nov. 14, 1911.



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UNITED STATES PATENT OFFICE.

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TELEPHONE REPEATING CIRCUITS.

1,008,880.

Specification of Letters Patent.

Patented Nov. 14, 1911.

Application filed December 20, 1910. Serial No. 598,344.

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 Telephone Repeating Circuits; 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 telephone repeating systems, and has for its object to produce an apparatus of this nature which will be more efficient in action and which will transmit speech to a greater distance than those which have been heretofore proposed.

To these ends the invention consists broadly stated, in independent main line circuits inductively related through local relay circuits, in controllers located in local circuits, and in relays governed by local as well as by the main line circuits, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification and in which the figure is a diagrammatic illustration of a system arranged in accordance with my invention:—1 indicates a main line battery, 2 an impedance coil, 3 a receiver at the station E, 4 a contact, 5 the usual receiver lever, 6 a connection between said lever and the spring lever 7, 8 a push pin governing said lever 7, 9 a spring normally holding said lever 7 from the contact 10 and against the contact 11, 12 a connection between the contact 10 and the secondary 13. The said secondary 13 is also connected by the eastern main line 14 to the main line 15 connected to the relay 16, joined by the wire 17 to the battery 1. Hence, should a person at the eastern station E desire to talk to the western station W, upon pressing the button 8 he would cause current to flow over the relay main line circuit just described and therefore would energize said relay causing the armature 18 to contact with the pin 19, and current to flow from the local battery 20 along the wire 21, through said armature 18, contact 19, wire 22, coils of the east controller 23 and wire 24 back to battery 20. Current over this local circuit accordingly energizes said east controller 23, and causes

the same to close through its armature 25, the contacts 26, 27 and 28. The operator now talks into the transmitter 30 at the sending station E, which causes currents to flow through the primary 31 of the induction coil 14, and these currents induce similar ones which may be supposed to leave one end of the secondary coil 13, pass along the wire 12, over the contacts 10 and 7, wire 6, contacts 5 and 4, receiver 3, wire 32 and into the condenser 33. A portion of these currents will also pass through the impedance coil 2, but the constants of this coil are so chosen that only a small fraction of the energy passes therethrough. The voice-caused current entering the condenser 33 charges said condenser, and causes a similar current to flow along the main line wire 34, through the coils of the eastern repeater 35, wire 36, armature 25, contact 27, main line wire 37, and main line wire 14, back to the other end of the secondary 13. The passage of current through the eastern repeater 35 causes current from the local battery 38 to flow along the local conductor 39, across the contacts 40 and 41 of said repeater 35, along the local wire 42, across the contact 28 of the eastern controller, along the local wire 43, and through the primary 44 of the eastern induction coil 45, back to the battery 38. Currents passing through the primary 44 of the induction coil 45 will cause induced currents to leave one end of the secondary 46 of said coil and to flow along the western main line wire 47, through the contact 26, along the wire 48, along the wire 49, through the western receiver 50, contact 51, hook lever 52, wire 53, spring contact lever 54, contact 55, wire 56, and into the condenser 57. The charging of the condenser 57 causes a similar current to pass out by the wire 58, along the western main line wire 59, and back to the other end of the secondary coil 46. The passage of currents through the western receiver 50 of course reproduces the speech originally spoken into the eastern transmitter 30.

It will be seen from the above that the relay 16 is in a circuit to itself, which constitutes a portion of the eastern main line circuit, and that the eastern controller 23, is in a local circuit entirely independent of the eastern main line circuit, while the eastern main line sending circuit passes through the coils of the eastern repeater 35 and i.

only connected to the western receiving circuit through the medium of the local circuit fed from the battery 38 and controlled by the eastern repeater 35. In other words, it will be observed that the only coils included in the eastern sending circuit are those of the eastern repeater, of the receiver 3, and the secondary 13 of the transmitter coil 14. It will likewise be seen that the only coils included in the western receiving circuit are the secondary 46 of the western induction coil 45, and the coil of the western receiver 50. Should now it be desired to speak from the western station W to the eastern station E, of course the push button 60 will be pressed in to make contact with the pin 61, and the push button 8 will be released permitting the lever 7 to make contact with the pin 11, and to break the circuit of the battery 1 through the contact 10. The breaking of the circuit at the contact 10 will cause the spring 62 governing the armature 18 of the relay 16 to break the local circuit at the contact 19, and therefore the spring 63 associated with the eastern controller 23 will likewise break the contacts 26, 27 and 28. The breaking of these latter contacts, however, will cause the armature 25 to make contact with the pin 65, permitting current to flow from the local battery 66, over the wire 67, armature 25, contact 65, wire 68, coils of the local relay 69, and wire 70 back to battery 66. The said relay 69 will accordingly be energized, and contact will be made between its armature 71 and the pin 72, whereupon current will flow from the local battery 73, over the wire 74, through coils of the western controller 75, through said contacts 72 and 71 and over the local wire 76, back to the battery 73. The passage of current through the coils of the western controller 75 will make the contacts 77, 78 and 79, thereby connecting armature 80 with the western main line wire 81. The operator having pushed in the pin 60, at the western station W, as above described, now talks into the transmitter 82 which causes currents to flow from the battery 83, through the primary 84 of the induction coil 85, associated with said transmitter, and back to the battery 83. The varying current through the primary 84 will induce currents in the secondary 86, which may be supposed to leave one end of said secondary over the wire 87, the contacts 61, spring lever 54, wire 53, hook 52, contact 51, receiver 50, main line wire 49, coils of the western repeater 88, western main line wire 81, contact 78, armature 80 of the western controller 75, western main line wire 89, wire 59, back to the other end of the secondary 86. The passage of current through the coils of the western repeater 88, permits current to flow from the local battery 90, over the local wire 91, across the contacts 92 and 93, of the said repeater 88, along the

wire 94, across the contact 79, wire 95, through the primary 96 of the western induction coil 97, and along the wire 98 back to the battery 90. The currents passing through the primary 96 of the coil 97, will induce similar currents in the secondary 100 of said coil which may be supposed to leave one end of said coil along the eastern main line receiving circuit 101, across the contact 77, eastern main line wire 102, eastern main line wire 14, and into the condenser 103. A similar current passes out of said condenser 103 along the wire 104, across the contact 11 and lever 7, and over the connections 6, 5 and 4, through the receiver 3 and wire 32 into the condenser 33. Similar currents will leave said condenser 33 by way of the eastern main line wire 34 and back to the other end of the secondary 100 of the western induction coil 97. The passage of these currents through the receiver 3 at the eastern station E, of course, reproduces the speech originally sent out from the western station W.

It will thus be seen that this system comprises a single main line battery 1, a manually controlled main line relay circuit fed from said battery; and an eastern main line sending circuit including the coil 13, the receiver 3, the condenser 33, the repeater 35, and the contact 27, governed by the controller 23 in a local circuit governed by the relay 16. The system further comprises a western main line receiving circuit independent of the eastern sending circuit except for the inductive relation of the local circuit fed from the battery 73 and controlled by said sending circuit through the agency of the relay 35. It will be further observed when the eastern relay 16 and controller 23 are energized that the western relay 69 and controller 75 are deenergized and vice versa; and it will also be observed that the said eastern controller 23 governs the western relay 69 through the back contact 65 and the local circuit fed from the battery 66.

This case differs from my copending application No. 598,843, filed December 20, 1910, and entitled "Telephone repeating systems" among other things in that this system employs two relays 16 and 69, one is a main line circuit and the other in a local circuit, while said copending application employs a single relay in a local circuit. This system also employs both of its controllers in local circuits while the said copending application employs one of its controllers in a main line circuit.

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

What I claim is:—

1. In a telephone repeating system, the combination of independent main line sending and receiving circuits; a relay and main line relay circuit; a controller and a local controller circuit governed by said main line relay; and connections whereby said main line sending circuit may be governed by said controller, substantially as described.
2. In a telephone repeating system, the combination of a relay and a main line relay circuit; a controller and a local controller circuit governed by said main line relay; a main line sending circuit governed by said controller; and an impedance in series with said relay circuit and said sending circuit, substantially as described.
3. In a telephone repeating system, the combination of a relay and a main line relay circuit, means for manually controlling said circuit; an impedance in said circuit; a controller and a local circuit governed by said relay; and a sending circuit provided with a condenser governed by said controller, substantially as described.
4. In a telephone repeating system, the combination of a relay and a main line relay circuit; means for manually controlling said circuit; an impedance in said circuit; a controller and a local circuit governed by said relay; a sending circuit provided with a condenser governed by said controller; a receiving circuit independent of said sending circuit; and a local circuit governed by said sending circuit in inductive relation with said receiving circuit, substantially as described.
5. In a telephone repeating system, the combination of a main line relay; a main line circuit including said relay; a controller governed by said relay; a sending main line circuit governed by said controller; a receiving main line circuit independent of said sending circuit; a second controller associated with said receiving circuit; and a local circuit in inductive relation to said receiving circuit governed by said sending circuit, substantially as described.
6. In a telephone repeating system, the combination of a main line relay; a main line circuit including said relay; a local circuit and a controller therein governed by said relay; a sending main line circuit governed by said controller; a repeater in said sending circuit; a receiving main line circuit independent of said sending circuit; a second controller associated with said receiving circuit; and a local circuit in inductive relation to said receiving circuit controlled by said repeater and governed by said sending circuit, substantially as described.
7. In a telephone repeating system, the

combination of a main line sending circuit; a main line receiving circuit independent of said sending circuit; local circuits in inductive relation to said main line circuits and adapted at different times to transmit currents from said sending to said receiving and from said receiving to said sending circuits; repeaters in said main line circuits and governing said local circuits; and a relay in a main line circuit adapted to govern one of said controllers, substantially as described.

8. In a telephone repeating system, the combination of a main line sending circuit; a main line receiving circuit independent of said sending circuit; local circuits in inductive relation to said main line circuits and adapted at different times to transmit currents from said sending to said receiving and from said receiving to said sending circuits; repeaters in said main line circuits and governing said local circuits; a relay in a main line circuit adapted to govern one of said controllers; an additional local circuit; and an additional relay in said local circuit adapted to govern another of said controllers, substantially as described.

9. In a telephone repeating system, the combination of independent main line sending and receiving circuits; controllers adapted at different times to govern said circuits; a relay governing one of said controllers; a local circuit governed by said controller; and an additional relay in said local circuit for governing the other controller, substantially as described.

10. In a telephone repeating system the combination of independent main line sending and receiving circuits, independent controllers associated with said circuits; means for automatically repeating messages from one and into another of said circuits, and a main line relay provided with connections adapted to govern one of said circuits, substantially as described.

11. In a telephone repeating system the combination of independent main line sending and receiving circuits; a controller associated with each of said circuits; means for automatically repeating messages from one and into another of said circuits; a main line relay provided with connections adapted to govern one of said circuits, and means comprising a switch for causing a current of greater energy than the voice-caused currents to actuate said relay, substantially as described.

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

CHARLES ADAMS-RANDALL.

Witnesses:

FREDERICK B. BLACKMAN,
JOHN J. CARROLL.