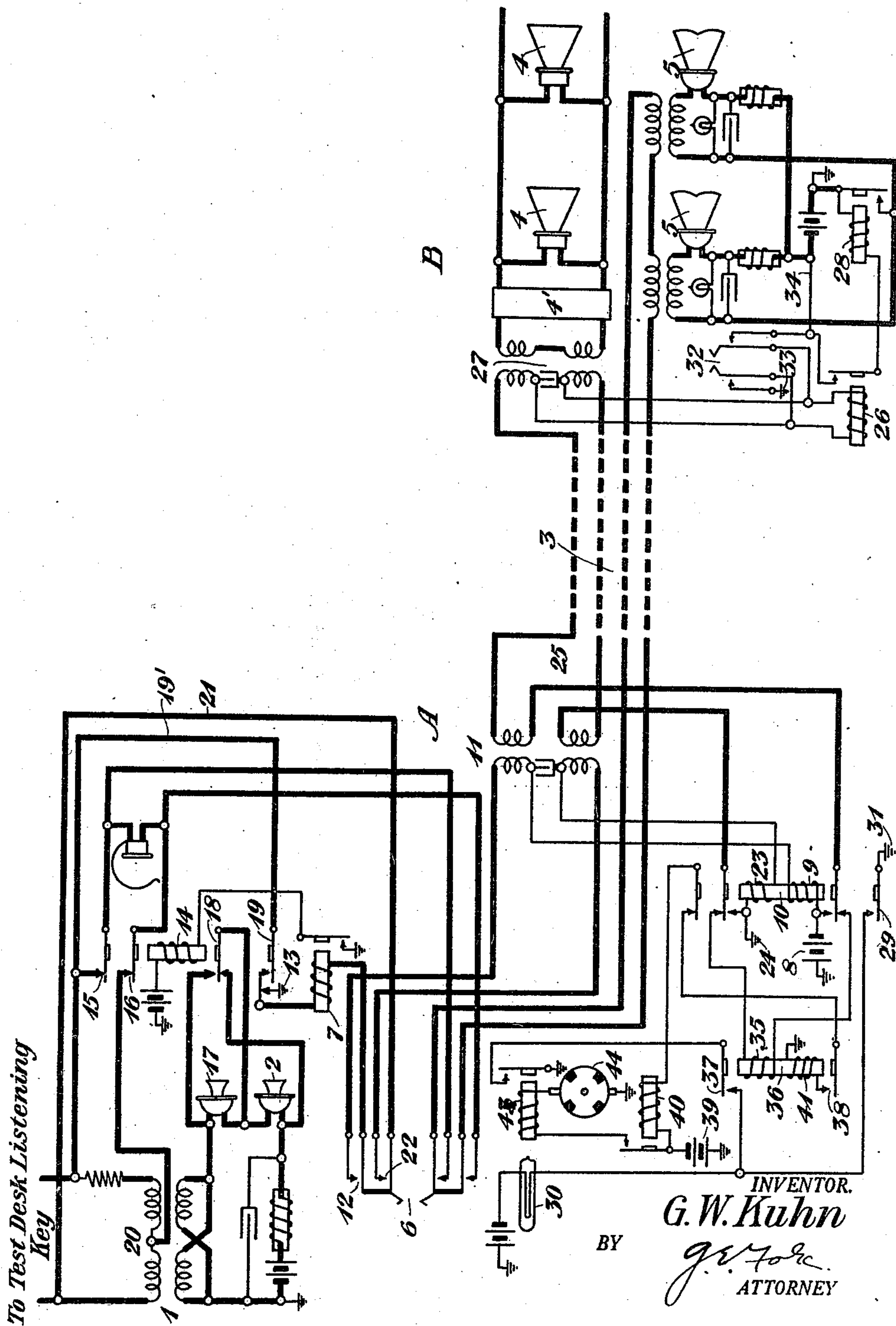


1,416,724.

G. W. KUHN.
TELEPHONE CIRCUITS.
APPLICATION FILED MAR. 16, 1918.

Patented May 23, 1922.



UNITED STATES PATENT OFFICE.

GEORGE W. KUHN, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

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Specification of Letters Patent. Patented May 23, 1922.

Application filed March 16, 1918. Serial No. 222,865.

To all whom it may concern:

Be it known that I, GEORGE W. KUHN, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Telephone Circuits, of which the following is a specification.

This invention relates to telephone circuits intended especially for use in connection with central office testing apparatus but capable of employment in a variety of situations. It is here illustrated in connection with loud-speaking apparatus adapted for use with a central test desk located at one of a number of associated central offices from which the testing is done for all the offices. When the testman desires to test a given line at a certain station, he communicates with an attendant at that station who makes the necessary connections. It is the object of the present invention to provide circuits for facilitating the communication between two stations for this or similar purposes and to so arrange a circuit of this character that either station may initiate the call to the other in a convenient and efficient manner. By the employment of the loud-speaking receivers and transmitters distributed around the room, as for instance, at different points along the main distributing frame when used with testing circuits, the attendant is able, without stopping his work to receive his instructions and to notify the testman that the desired connection has been put up or give him other necessary information.

The invention will be more fully understood by reference to the accompanying drawing illustrating one embodiment thereof. A represents generally the part of the circuit located at the central test desk and B the part located at a distant central office. The testman's telephone set is indicated at 1 and comprises a well known circuit arrangement, which it is unnecessary to describe here in detail, with the addition of a special transmitter 2 connected in series with the usual transmitter and normally short circuited. A four-wire trunk 3 runs to the distant station where the loud speaking receivers 4 and talk-back transmitters 5 are suitably distributed, the receivers being on one pair and the transmitters on the other pair of the four-wire trunk. An amplifier

may, if desired, be inserted in the circuit of the receivers as at 4'. A key 6 at the testman's desk serves to transfer his telephone set from the testing circuit in which it is normally connected to the four-wire trunk. The key 6 is a locking key and when operated energizes the relays 7 and 10 by closing a circuit from the battery 8 through the lower winding 9 of relay 10, through the upper half of repeating coil 11, contact 12 of switch 6 and to ground at 13. The operation of relay 7 closes the circuit of relay 14 which attracts all four of the armatures thereby opening both sides of the normal circuit of the receiver at 15 and 16 and short-circuiting the standard transmitter 17 while opening the short circuit around the special transmitter 2 by the operation of armature 18. Armature 19 opens the ground connection of the relay 7 but has a make-before-break connection so that the relay circuit is maintained to ground through the following circuit—conductor 19', transformer winding 20, conductor 21, contact 22 of key 6, lower half of repeating coil 11, upper winding 23 of relay 10 (assisting winding 9) and to ground at 24. The energization of relay 10 connects the opposite sides of the circuit 25 of the four-wire trunk to battery and ground, respectively, at 8 and 24 thus energizing relay 26 at the distant station, this relay being connected across the condenser at the center of the repeating coil 27, as will be obvious from the drawing. Relay 26 closes the circuit of relay 28, which in turn closes the local circuits of the talk-back transmitters 5, which are kept normally open because these transmitters consume a considerable amount of current if kept on closed circuit. While only two transmitters are illustrated in the drawing, it will be understood that in practice a larger number than this will ordinarily be used. The lower armature 29 of relay 9 closes the circuit of the signal lamp 30 to ground at 31, so that the lamp will burn steadily as long as the key 6 is left in operated position.

The circuit is now in condition for use. The testman can speak to the frameman at the main distributing frame or wherever the loud speaking instruments are located and direct him to put up the desired connections

and the attendant can reply while moving about the room. These talking circuits will be obvious from the drawing, without being traced in detail.

5 If the frameman at the distant station wishes to call the testman at the central test desk when the circuit is in its normal condition, he closes the switch 32. A non-locking switch is used for this purpose in order that
10 the frameman need not remember to open it when he is through. The operation of this switch connects the opposite sides of the circuit 25 to battery and ground respectively at 33 and 34. Since the contacts of relay 9 are
15 in normal position, this will energize the upper winding 35 of relay 36 which is normally connected across the circuit 25 at the center of the outgoing side of repeating coil 11. Relay 36 thereupon closes both contacts
20 37 and 38. Contact 38 locks the relay in operated position by closing a circuit from battery 39, through the winding of relay 40 back contact of relay 10, contact 38, winding 41 on relay 36 and to ground. Contact 37
25 closes the circuit of the signal lamp 30 through the interrupting contact of relay 43 to ground.

The relay 40 being energized over the circuit heretofore traced, closes the circuit of
30 the interrupter relay 43 through the battery 39 and the constantly running interrupter 44, thus sending an intermittent current through the lamp 30 producing a flashing signal until the call is answered.

35 When the testman answers the call by operating key 6, he energizes relays 10, 7, 14 and 26 over circuits which have already been traced, thereby putting his telephone set in connection with the loud speaking apparatus
40 at the distant station, as above described. The operation of relay 10 also opens the circuit from the signal lamp through the interrupter by unlocking the relay 36 and closes a circuit to ground at 29, so that the lamp will
45 burn steadily instead of flashing, indicating that the call has been answered.

The operation of the apparatus will, in the main, be clear from the foregoing. Operation of the key 6 by the testman disconnects
50 his receiver from the test circuit and connects it across one pair of conductors in the four-wire trunk; it short circuits the normal transmitter and makes operative the special transmitter at his desk and connects its circuit to
55 the other pair in the four-wire trunk; it closes the local circuits of the talk-back transmitters at the distant station and lights the lamp 30 at his own station through a direct circuit to ground, so that it burns steadily as long as the key 6 remains in operated
60 position. If the call originates from the distant station by the attendant operating key 32, the lamp 30 will be lighted through the circuit of the interrupter giving a flashing
65 signal until the call is answered. It also

momentarily closes the local circuits of the loud speaking transmitters 5, as will be obvious from an inspection of the drawing. These circuits are, however, broken when the switch 32 is released. The signal lamp 30
70 continues to flash because the relay 36 is locked in operated position by the winding 41. When the central test desk answers the call by operating switch 6, the flashing signal is changed to a steady signal which continues as long as the connection remains intact and the talking circuits are established,
75 as above indicated.

The advantages of the circuit herein disclosed, employing the loud speaking apparatus and the signal controlled from either
80 end of the line, will be obvious. It is to be understood that while the invention is illustrated as applied to testing circuits it is equally applicable to communication between
85 stations for a variety of purposes and is, furthermore, not limited to the details of the circuit arrangement herein shown, as various modifications which do not depart from the spirit of the invention, as set forth in the ap-
90 pended claims, will readily suggest themselves to those skilled in the art.

What is claimed is:

1. In a telephone system, a talking circuit extending between two stations, a
95 telephone set and a signal located at one of the stations, a telephone set at the other station including a normally open circuit for the transmitter and a switch at said first mentioned station controlling at that
100 station the connection between the telephone set and the talking circuit, and the operation of said signal and at the other station the continuity of the normally open transmitter circuit.
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2. In a telephone system for connecting a central station with a number of local stations, a telephone set at the central station, a two-wire circuit to which the telephone set is normally connected, loud-
110 speaking receivers and talk-back transmitters at the local station, a four-wire circuit extending between the two stations having its pairs of conductors connected respectively to the loud speaking receivers and
115 the talk-back transmitters at the local station, and means at the central station for shifting the connections of said telephone set to make it available for communication with said loud-speaking receivers and talk-
120 back transmitters.

3. In a system for testing the lines of local offices from a test desk at a central office, a telephone set at the central office normally connected to the testing circuit,
125 loud speaking receivers and transmitters at the local office, two independent circuits extending between the two offices and connected respectively to the loud-speaking receivers and the talk-back transmitters at
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the local office and means at the central office for changing the connections of said telephone set to make it available for communication with the loud-speaking receivers and talk-back transmitters.

4. In a system for testing the lines of local offices from a test desk at a central office, a telephone set at the central office normally connected to the testing circuit, loud speaking receivers and talk-back transmitters at the local office, two independent circuits extending between the two offices and connected respectively to the loud speaking receivers and the talk-back transmitters at the local office, means at the central office for changing the connections of said telephone set to make it available for communication with loud speaking receivers and talk-back transmitters and mechanism for closing the local circuit of the talk-back transmitters upon operation of said means.

5. In a telephone system, a talking circuit consisting of two pairs of wires, one for talking in each direction between two stations, a signal and an operating magnet therefor at one station, a normally open transmitter circuit and a magnet for closing it, at the other station, a winding for each magnet normally connected in circuit across one of the pairs of conductors at opposite ends, respectively, of said circuit and means for connecting the wires of said pair to battery and ground respectively, at either station, for causing operation of the magnet at the other station.

6. In a telephone system, two separate circuits, a telephone set normally connected to one of said circuits and provided with two transmitters one of which is normally so connected as to be inoperative and means for connecting the telephone set with the other circuit and simultaneously shifting the connections of said transmitters to make

said inoperative transmitter operative and the other transmitter inoperative.

7. In a telephone system a circuit extending between two stations, a telephone set at one station normally disconnected from said circuit, a telephone set at the other station having a normally open local circuit for the transmitter and means at said first named station for connecting to said circuit the telephone set there located and for simultaneously causing the transmitter circuit at the other station to be closed.

8. A telephone circuit connecting two stations, a telephone set at each station, the battery circuit for the transmitter at one station being normally open, a magnetic switch for closing said battery circuit, a signal at the other station and means at each station for causing the energization of the magnetic switch and signal.

9. A telephone circuit connecting two stations, a telephone set at each station, the battery circuit for the transmitter at one station being normally open, a magnetic switch for closing said circuit, a signal at the other station, means at the first named station to effect the closing of the energizing circuits, of said switch and said signal and means for holding the latter circuit closed.

10. In a telephone system two independent circuits, a telephone set having two transmitters one designed for use in each of said circuits, means for completing telephonic connections between said set and either of said circuits and means controlled by said connecting means for rendering effective the transmitter corresponding to the circuit to which connection is so completed.

In testimony whereof, I have signed my name to this specification this eighth day of March, 1918.

GEORGE W. KUHN.