

(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,395.

Patented Oct. 26, 1897.

Fig. 1.

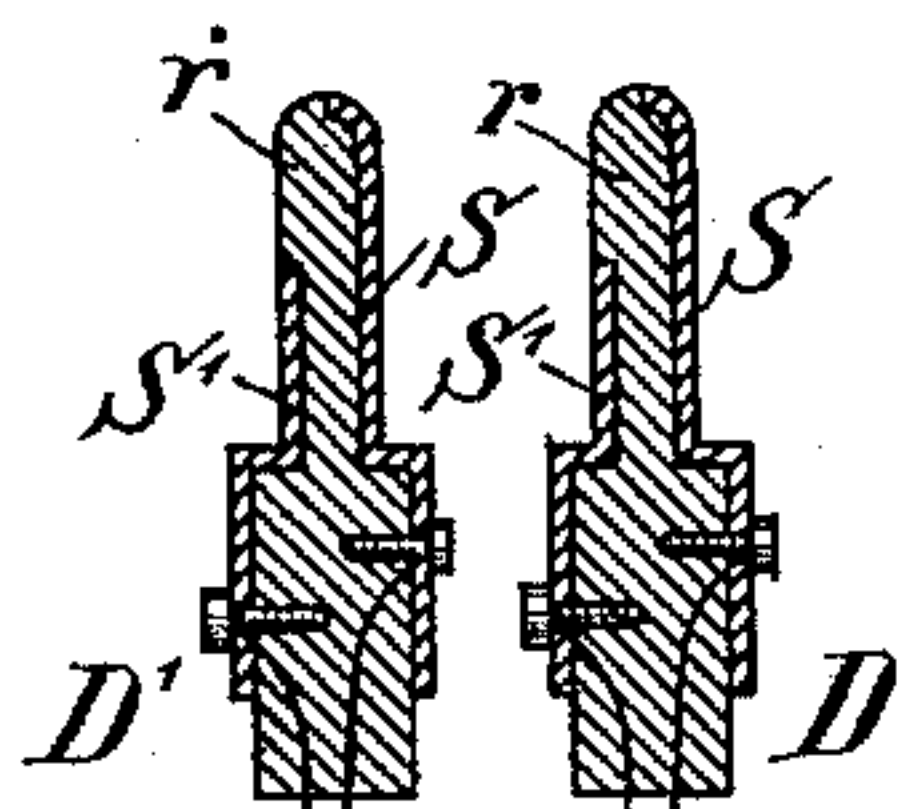
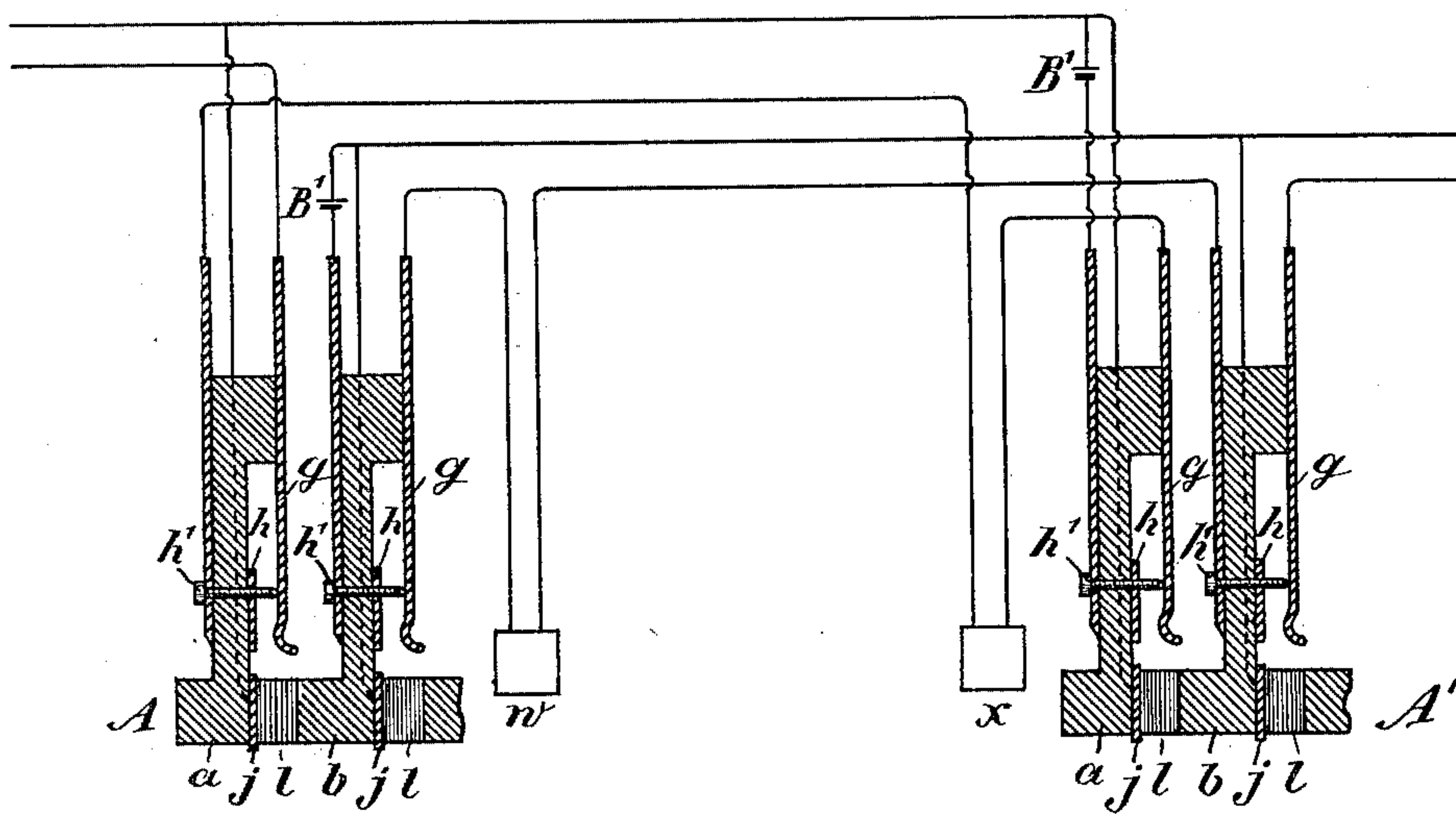


Fig. 2.

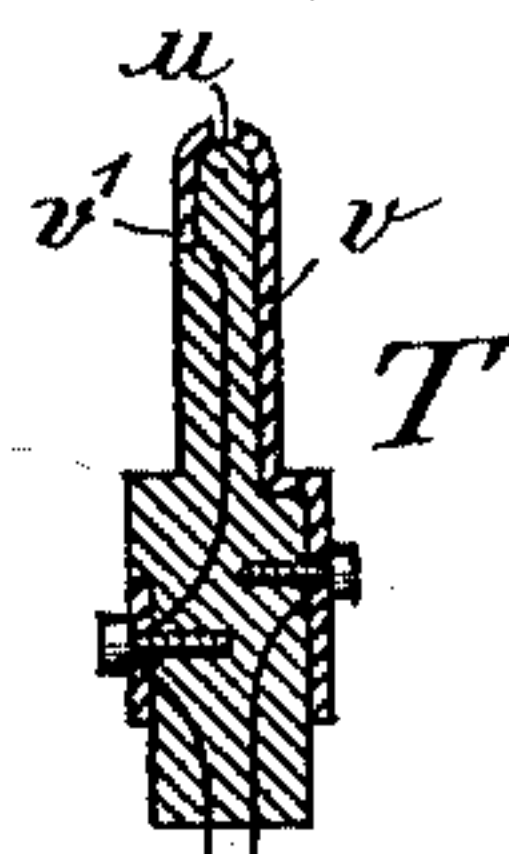
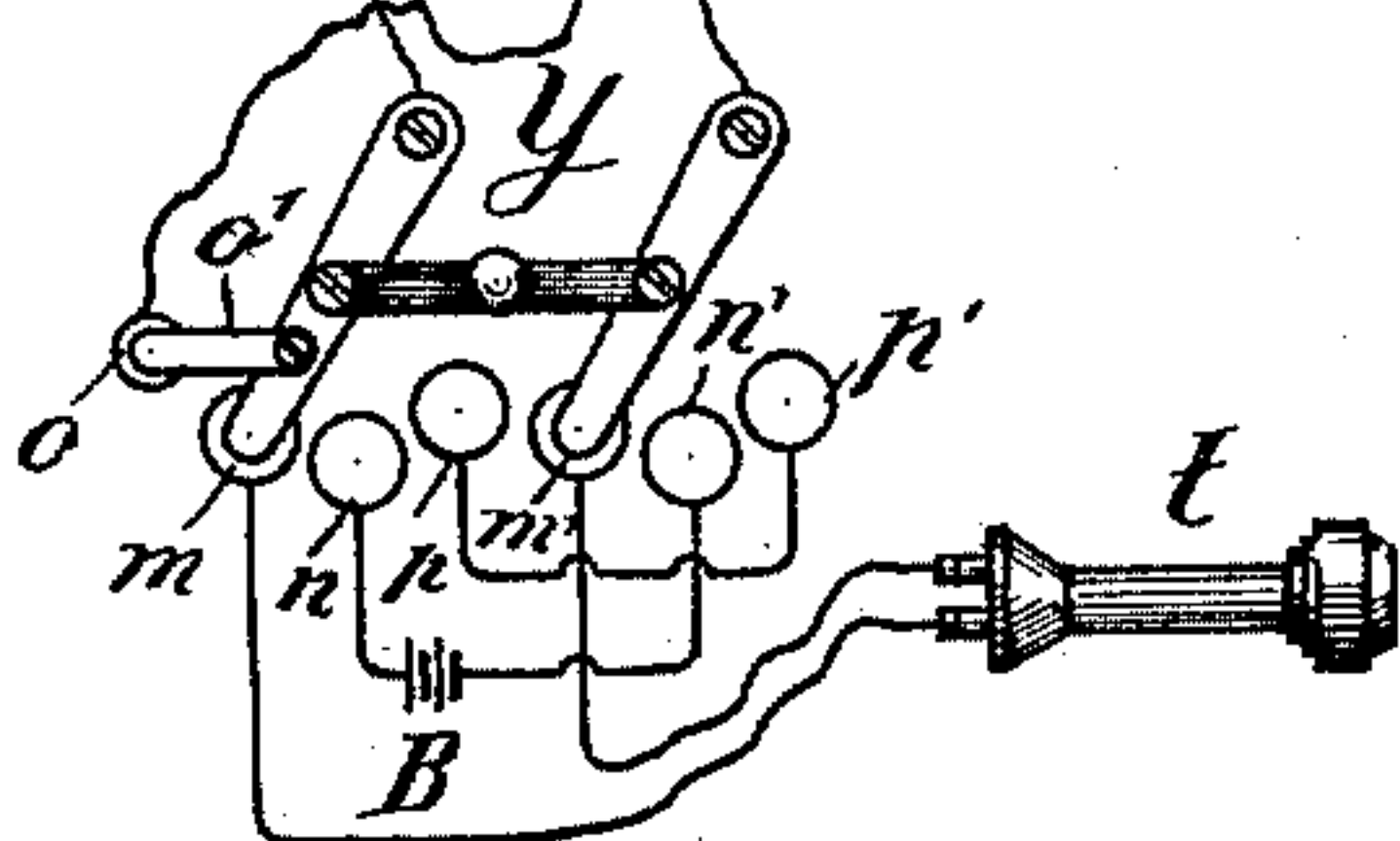
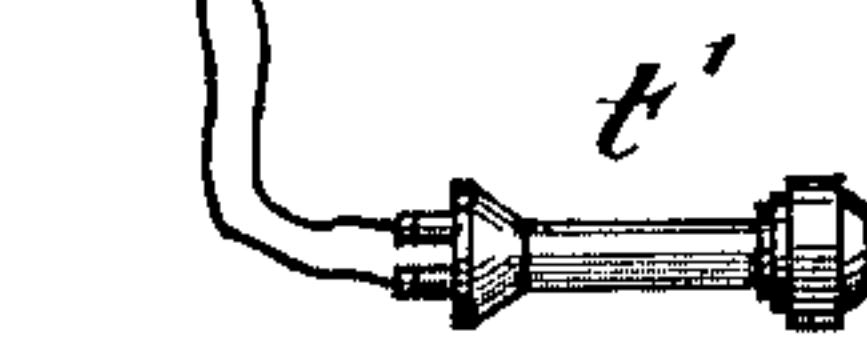


Fig. 3.



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UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,395, dated October 26, 1897.

Application filed May 16, 1891. Serial No. 392,964. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

10 My invention relates to a telephone-exchange system in which the lines are metallic-circuit lines and in which the necessary switching between the lines is accomplished by means of pairs of double or loop plugs
15 connected together by double flexible cord conductors.

It consists, first, of a system of testing the lines at any board to determine whether or not they are in use; secondly, of an organiza-
20 tion of loop-switches and connections for said cords by which the movements required of the operator in making the necessary connections and disconnections are few and convenient to make, and, thirdly, of an arrange-
25 ment of the annunciators and switches of the different lines by which special clearing-out annunciators are not required.

In the accompanying drawings, illustrating my invention, Figure 1 represents sectional
30 views of sections of two multiple switchboards and the main-line central-office connections and apparatus of the two lines connected to the two switchboards. Fig. 2 represents a diagram of an operator's cord system and ap-
35 paratus necessary to illustrate my invention. Fig. 3 represents an operator's test system.

I place as many switchboards in the central office as are found necessary or desirable in order to properly operate the exchange. On
40 each board is a spring-jack switch for each line. Each switch has a contact-spring which normally connects with a contact-point and is separated from the point while a plug is inserted into the switch and has a contact-
45 piece insulated from the rest except by the circuit connections. To the contact-point is attached an extension-piece or connection along the surface of the switch-hole by means of which one of the contact-pieces of the loop
50 test-plug (hereinafter described) forms con-

nection with the contact-point when the plug is inserted, as hereinafter described. The insulated contact-piece mentioned above is also placed along the surface of the switch-
hole and preferably in front of said extension- 55 piece to the contact-point and is so placed that one of the contact-pieces of the loop-switch plugs (hereinafter described) forms connection with said contact-piece when the
plug is inserted. Said plugs are so con- 60 structed and said contact-pieces and extension-pieces of the switches are so placed that when the test-plug is inserted into a switch the contact-piece of the plug does not come
into contact with said contact-piece and 65 when a switch-plug is inserted into a switch the contact-piece of the plug does not come into contact with the extension-piece or point of the switch.

In Fig. 1, A A' are sectional views of sec- 70 tions of the two switchboards shown. *g g* represent the springs of the different switches, *h' h'* the contact-points of the switches on which the springs normally rest, and *h h* the extension-pieces of the points placed along
75 the surface of the holes of the switches in front of the points. *j j* are the insulated contact-pieces of the switches, also placed along the holes of their respective switches
80 and preferably in front of the extension-pieces. *a b* are rubber strips on which the metal parts of the switches are mounted and through the fronts of which are the switch-
85 holes *l l*. These holes are rectilinear holes and are adapted to receive the loop-plugs mentioned above and to cause them to operate the switches, as described. W and X are
calling-annunciators, one for each line shown and each connected into the circuit of its line,
as will hereinafter be described. B' B' are 90 test-batteries, one for each line and each connected into the circuit of the line, as will hereinafter be described. Two metallic-circuit lines are shown in the figure, and they are
95 connected to their respective boards as follows and as shown: One side or branch of the line is connected to the contact-pieces *j j* of its switches on the several boards. The other
side or branch of the line passes successively
100 through pairs of contacts *g h* of its switches

on the several boards, passing in each case to the spring first. It then passes out through the test-battery of the line and is then connected to the other side or branch of the line, (to which the contact-pieces $j j$ are connected.) The annunciator of the line is placed in the circuit between the last pair of contact-points before the two branches are united and the pair of points immediately preceding the last pair and is located at the same board as said last pair of contact-points. The two branches of the line are normally on closed circuit at the subscriber's station and may be provided with any usual and appropriate subscriber's-station apparatus.

In the operator's cord system shown in Fig. 2, $D D'$ are a pair of loop-switch plugs adapted for use with the switches shown in Fig. 1. $r r$ are the rubber insulations of the plugs. $S S'$ are the two contact-pieces of the plug. The plugs are constructed and the contact-pieces are arranged so that when a plug is inserted into a switch the spring is pressed away from its contact-point, the contact-piece S forms connection with the spring g , the contact-piece S' forms connection with the contact-piece j of the switch, and the contact-point h' is insulated from the contact-pieces of the plug. The plugs should be inserted into the switches in such a direction that they form the connection as above described.

Y is the looping-in switch for the pair of cords shown. t is the operator's telephone, and B is her calling-generator. The looping-in switch has two levers and three pairs of contact-points, on which the levers may be alternately placed at the will of the operator. One pair of the contact-points are marked $m m'$, and they are connected by a loop which contains the operator's telephone. The pair adjoining them are marked $n n'$, and they are connected by a loop which contains the operator's calling-generator. The next pair are marked $p p'$, and they are connected by a simple loop. When the levers pass from $m m'$ to $p p'$, they rest on $n n'$.

One contact-piece of one plug of the pair of plugs is connected by flexible conductor to one contact-piece of the other plug. The two other contact-pieces of the plugs are connected by flexible conductors to the two levers of the switch.

$o o'$ are a pair of contact-points, of which o is a stationary point and is connected by a circuit-wire to the cord-circuit which connects the two contact-pieces of the plugs which are not directly connected to the switch-levers, and o' is a contact-point which is connected to one of the levers, as shown, and moves with the lever. The contact-points $o o'$ are in contact when the switch-levers are on the contact-points $m m'$ and are out of contact when the levers are moved to the other points of the switch.

Only one pair of switch-plugs with their

cords and looping-in switch are shown. Other pairs as are found desirable may be added to the operator's system in a way which will be apparent to those skilled in the art. She needs but one telephone and calling-generator.

The levers of each looping-in switch normally rest on the contact-points $m m'$.

In the operator's test system shown in Fig. 3, T is the loop test-plug, and t' is the test receiving instrument, which may be the operator's telephone or any suitable instrument. u is the rubber insulation of the plug, and $v v'$ are its contact-pieces. The plug is constructed and the pieces are arranged so that when the plug is inserted into any switch the spring is pressed away from the contact-point, the contact-piece v forms connection with the spring g , the contact-piece v' forms connection with the extension-piece h , and the contact-piece j of the switch is not in contact with the contact-pieces of the plug. The plug should be inserted into the switches in such a direction that they form the connections as above described. The two contact-pieces $v v'$ of the plug are connected by a flexible conducting-loop, in which is the test receiving instrument.

Each operator has a cord system and a test system, and they are conveniently mounted at her board for her work. The conducting-cords of the plugs should be long enough so that she can connect any plug with any switch at her board.

The operation of the switch system is as follows: When an operator receives a call on the annunciator of a line, she places the plug D of a pair of her plugs in the switch of the line. By so doing she opens the closed circuit of the line and loops her telephone into the circuit. The closed circuit of the line is opened at the pair of contacts gh of the switch. The two cords of the plug are connected to the two branches of the line by the connection of the two contact-pieces of the plug with the two contact-pieces g and j of the switch, and the two cords are bridged or connected by the contacts $o o'$ of the looping-in switch. When the operator finds out by conversation what line is wanted, she tests the line wanted, as will be hereinafter described, and if she finds it is not busy she places the plug D' of the pair in the switch of the line, opening the closed circuit of the line and connecting its two branches to the cord-circuits of the plug. She then moves the levers of the looping-in switch so that they rest on the points $n n'$. By so doing the bridge connection between the cords at $o o'$ is removed and a signal-current from the operator's generator goes to the metallic circuit. She then moves the levers of the switch so that they rest on $p p'$, and the lines are connected in metallic circuit for conversation with neither the operator's telephone nor generator in the circuit. When the operator receives the clearing-out signal, she will remove the plugs

from the switches and move the levers of the looping-in switch so that they rest on the points *m m'*, when they are ready to be used for another connection.

5 When a line is switched at the central office by having one of the switch-plugs *D* placed in its line-switch at any board, the test-battery of the line is in a cut-off portion of the line-circuit and is then in open circuit. This
10 is readily seen from the fact that the contact *h* of the switch in which the switch-plug is placed, which contact is connected to one side of the battery, is opened or disconnected from the contact *g* of the switch, while the two
15 contacts of the plug are then in contact with the contact *g* of the switch and with contact *h* of the switch, respectively, which latter contact is connected to the line-circuit on the other side of the test-battery. Thus the test-
20 battery is then switched from circuit with the line and is in an open cut-off portion of the circuit.

The test system is as follows: When an operator at any board tests any line, she places
25 her test-plug in the switch of the line and by so doing connects the two contact-pieces of the plug with the two contact-points *g h* of the switch. If the line is not switched at any board, the test receiving instrument will be
30 included in the close metallic circuit of the line and the test-battery of the line, and the instrument will sound, indicating that the line is free to be connected to. If, however, when the test is made the line is switched at some
35 board and the plug is inserted in the cut-off portion of the line, the circuit of the test receiving instrument is open at the contact-points *g h* of the switch used in switching, and the instrument will not sound. If, again,
40 when the line is switched the test-plug is inserted in the portion of the circuit which is included with the other line, the instrument will not sound, because the test-battery is not included in the circuit with it, being then, as
45 stated above, in the cut-off portion of the line. Therefore in either case whenever a line is switched for conversation at any board and a test-plug is inserted into the switch of the line at any other board no closed circuit is
50 established which contains a test receiving instrument and battery, and the test receiving instrument cannot then respond, because no current is passing through it. When, therefore, the test is made and the instrument
55 does not sound, the operator knows that the line is switched at some board.

When a call is received on a line and it is answered and the line is connected, as described, with another line whose calling-annunciator is located at another board, the annunciator of the line in which the call originated is in their circuit and the annunciator of the other line is not included in the circuit. As the annunciator which is in the circuit is located at the board where the connection is made, any clearing-out signal sent
65 over the circuit will be received and can be

attended to at the board where the connection is made. This system therefore provides for a clearing-out annunciator in the circuit
70 of any two lines connected together without requiring a special clearing-out annunciator for each pair of cords.

When in this system the line is not switched for conversation and the subscriber
75 who has sent in a call on his annunciator has removed his telephone from its switch to listen for the operator to answer his call, battery-current of constant character is passing through his telephone. On account of the
80 character of the current, however, no sound or noise will be produced in his telephone. When, however, the operator at the central office places a switch-plug into the switch of the line to answer the call, the battery-current
85 through the subscriber's telephone will be automatically broken or interrupted, and the subscriber will consequently hear a click or sound in his telephone. He will thereby know that the operator has connected his
90 telephone with his line and can at once proceed to talk and give his order to the operator without waiting for the latter to inform him by word that he is ready to receive the order.
95

I claim as my invention—

1. In a telephone-exchange system, multiple switchboards, metallic-circuit lines and switches for said lines, one for each line on each board, each switch having a pair of con-
100 tacts normally closed through which in series one side of its line passes to one side of an individual test-battery for the line, each switch having a third or insulated contact to which the other side of the line and the other
105 side of the individual test-battery for the line are connected, and said individual test-batteries, one for each line, in combination with switching apparatus at each board connecting the two sides of any line with another
110 line by opening the normally closed pairs of switch-contacts of the line at the board and forming connection with one of said normally closed contacts and said third or insulated contacts respectively, and test receiving
115 outfits, one at each board, each having a test receiving instrument and a loop test-plug to the two contacts of which plug the two sides of the test receiving instrument are respectively connected, each loop test-plug
120 being adapted to be inserted into each switch at its board, and when inserted opening the pair of normally closed contacts, and forming connection between the two contacts of the plug and said two normally closed con-
125 tacts of the switch respectively.

2. In a telephone-exchange system, multiple switchboards, metallic-circuit lines, switches for said lines, one switch for each line on each board, one side or branch of each line pass-
130 ing successively through pairs of contacts of the line-switches on the several boards and from the last contact-point through a test-battery to contact-pieces, one for each switch

of the line, and to the other side or branch of the line and said test-battery, in combination with pairs of double or loop switch plugs at each board, the two contact-pieces of one
 5 plug being connected by flexible conductors to the two contact-pieces of its mate, adapted to be inserted into the switches and when a plug is inserted into a switch to disconnect the pair of contact-points and connect one of
 10 the contact-pieces of the switch-plug with that contact-point which is connected with said first-mentioned side or branch of the line, while the other contact-piece of the plug forms connection with said contact-piece of the
 15 switch and test receiving instruments, one at each board, each connected on its two sides to the two contact-pieces of a loop test-plug adapted to be inserted into any switch at its board and when inserted to disconnect the
 20 pair of contact-points of the switch and form connection between them and its two contact-pieces, substantially as set forth.

3. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces
 25 of one of which are connected to the two contact-pieces of the other, respectively, by two flexible switch cord conductors in combination with a switching device having a movable lever or commutator-piece and two
 30 contacts operated by said commutator-piece to be opened and closed to each other, one contact being connected to one of said flexible switch cord conductors and the other contact to the other of said flexible switch cord
 35 conductors, by which the operator may at will connect or disconnect said cord conductors, substantially as set forth.

4. In a telephone-exchange system, a pair of loop-switch plugs, the two contact-pieces
 40 of one of which are connected to the two contact-pieces of the other, respectively, by two flexible switch cord conductors, in combination with a switching device, having a movable part containing two levers connected in
 45 series in one of said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers in one position connect, another
 50 pair of contacts in electrical connection with which said levers in another position connect, and a pair of contacts connected to the two cord-circuits respectively closed to each other when the levers are in the first-
 55 mentioned position and open to each other when the levers are in the second-mentioned position, by which when the movable part of the switch is in one position the two cord-circuits are connected together and the tele-
 60 phone is in one of the cord-circuits and when the movable part is in another position said connection between the cord-circuits is open and the telephone is switched from the cord-circuit, substantially as set forth.

65 5. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces of one of which are connected to the two con-

tact-pieces of the other, respectively, by two flexible-cord circuits, in combination with a
 70 switching device, having two levers in one of said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers in
 75 one position connect another pair of contacts connected through a calling-generator with which said levers in another position connect, and a pair of contacts connected to the two cord-circuits respectively closed to each other
 80 when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which when the movable part of the switch is in one position the two cord-circuits are con-
 85 nected together and the telephone is in one of the cord-circuits and when it is moved to another position said connection between the cord-circuits is open, the telephone is switched from the cord-circuit and the calling-genera-
 90 tor is included in the same cord-circuit, substantially as set forth.

6. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces of
 95 one of which are connected to the two contact-pieces of the other, respectively, by two flexible-cord circuits, in combination with a switching device having two levers in one of
 100 said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers in one position connect another pair of contacts
 105 connected through a calling-generator with which the levers in another position connect, another pair of contacts in electrical connection with which said levers in another position connect, and a pair of contacts connected to the two cord-circuits respectively closed to
 110 each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which when the movable part of the switch is in one position the two cord-cir-
 115 cuits are connected together and the telephone is in one of the cord-circuits, when the movable part is placed in another position the telephone is switched from the cord-circuit, the cord-circuits are disconnected and the calling-generator is included in one of the
 120 cord-circuits and when the movable part is placed in another position, the cord-circuits are disconnected from each other and from both telephone and generator, substantially as set forth.

7. In a telephone-exchange system, a pair
 125 of loop-switch plugs the two contact-pieces of one of which are connected to the two contact-pieces of the other, respectively, by two flexible-cord circuits, in combination with a switching device having two levers in one of
 130 said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers

in one position connect another pair of contacts connected through a calling-generator with which the levers in their next position connect another pair of contacts in electrical connection with which said levers in another position connect, and a pair of contacts connected to the two cord-circuits respectively closed to each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which when the movable part of the switch is in one position the two cord-circuits are connected together and the telephone is in one cord-circuit; when the movable part is in the adjoining position said connection between the cord-circuits is open and the telephone is switched out of and the generator is switched into one of the cord-circuits; and when the movable part is in its third position said connection between the cord-circuits is open and they are disconnected from both telephone and generator, substantially as set forth.

8. In a telephone-exchange system, a pair of loop-switch plugs the two contact-pieces of one of which are connected to the two contact-pieces of the other respectively, by two flexible-cord circuits, in combination with a switching device having two levers in one of said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers in one position connect another pair of contacts connected through a calling-generator with which the levers in their next position connect another pair of contacts in electrical connection with which said lines in another position connect said levers being adapted by one motion to be placed successively on said pairs of contacts, and a pair of contacts connected to the two cord-circuits respectively closed to each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, whereby by one motion or operation the operator may first disconnect the two cord-circuits and switch the telephone out of one of them, secondly switch the generator into one of them and thirdly switch the generator out of the circuit, substantially as set forth.

9. In a telephone-exchange system, two metallic-circuit telephone-lines temporarily connected together in metallic circuit for conversation, in combination with a switching device having two levers in one of said cord-circuits connected to the two plug contact-pieces respectively of that cord-circuit, a pair of contacts connected through the operator's telephone with which said levers in one position connect, another pair of contacts in elec-

trical connection with which said lines in another position connect, and a pair of contacts connected to the two cord-circuits respectively closed to each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which the operator can at will switch the telephone into the metallic circuit and at the same time bridge or cross-connect the two sides of the metallic circuit, substantially as set forth.

10. In a telephone-exchange system, two metallic-circuit lines temporarily connected together for conversation, in combination with a switching device having two levers connected respectively to the two terminals of one side or branch of said circuit, a pair of contacts connected through the operator's telephone, with which said levers in one position connect another pair of contacts connected through a calling-generator with which said levers in another position connect, and a pair of contacts connected to the two sides respectively of said metallic circuit closed to each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which the operator may at will open such bridge or cross connection and switch the telephone out of and the generator into the circuit, substantially as set forth.

11. In a telephone-exchange system, two metallic-circuit lines temporarily connected together into metallic circuit for conversation, in combination with a switching device having two levers connected respectively to the two terminals of one side or branch of said circuit, a pair of contacts connected through the operator's telephone with which said levers in one position connect another pair of contacts connected through a calling-generator with which the levers in another position connect, another pair of contacts in electrical connection with which said levers in another position connect, and a pair of contacts connected to the two sides respectively of said metallic circuit closed to each other when the levers are in the first-mentioned position and open to each other when the levers are in the second-mentioned position, by which the operator may at will open such bridge or cross connection and switch the telephone out of and the generator into the metallic circuit or leave the circuit unconnected with either telephone or generator, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:

FRANK S. OBER,

EDWARD C. DAVIDSON.