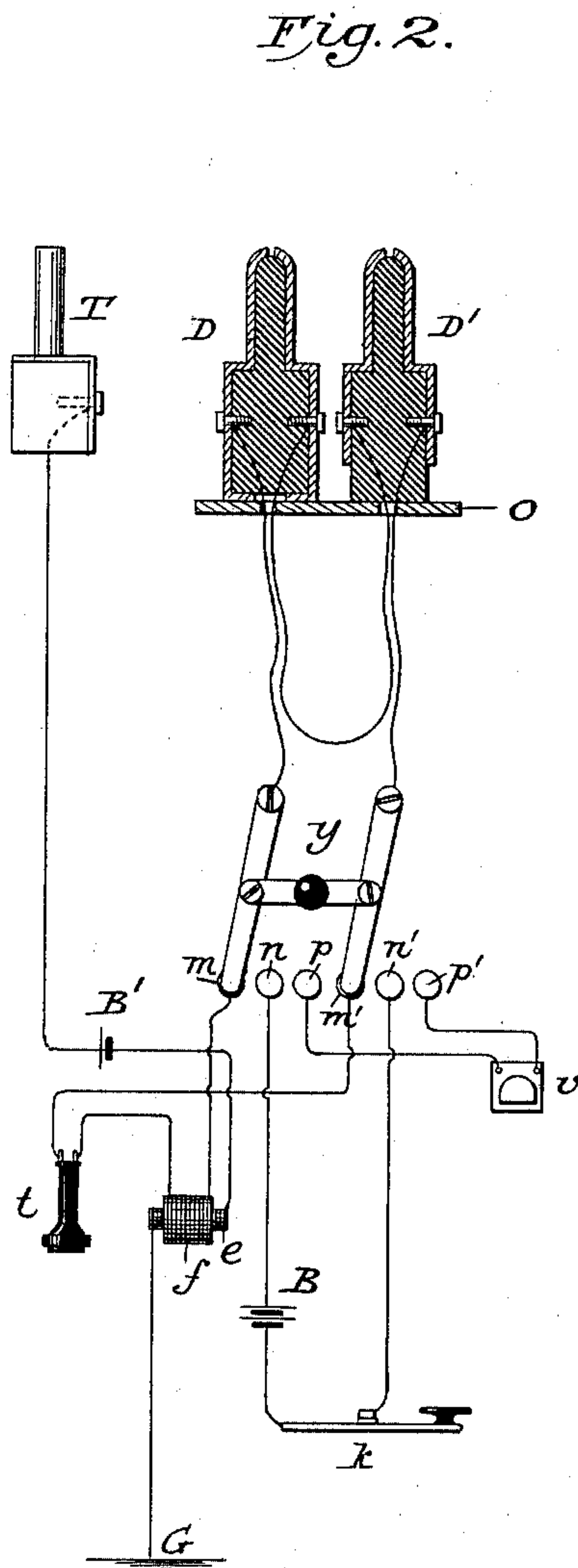
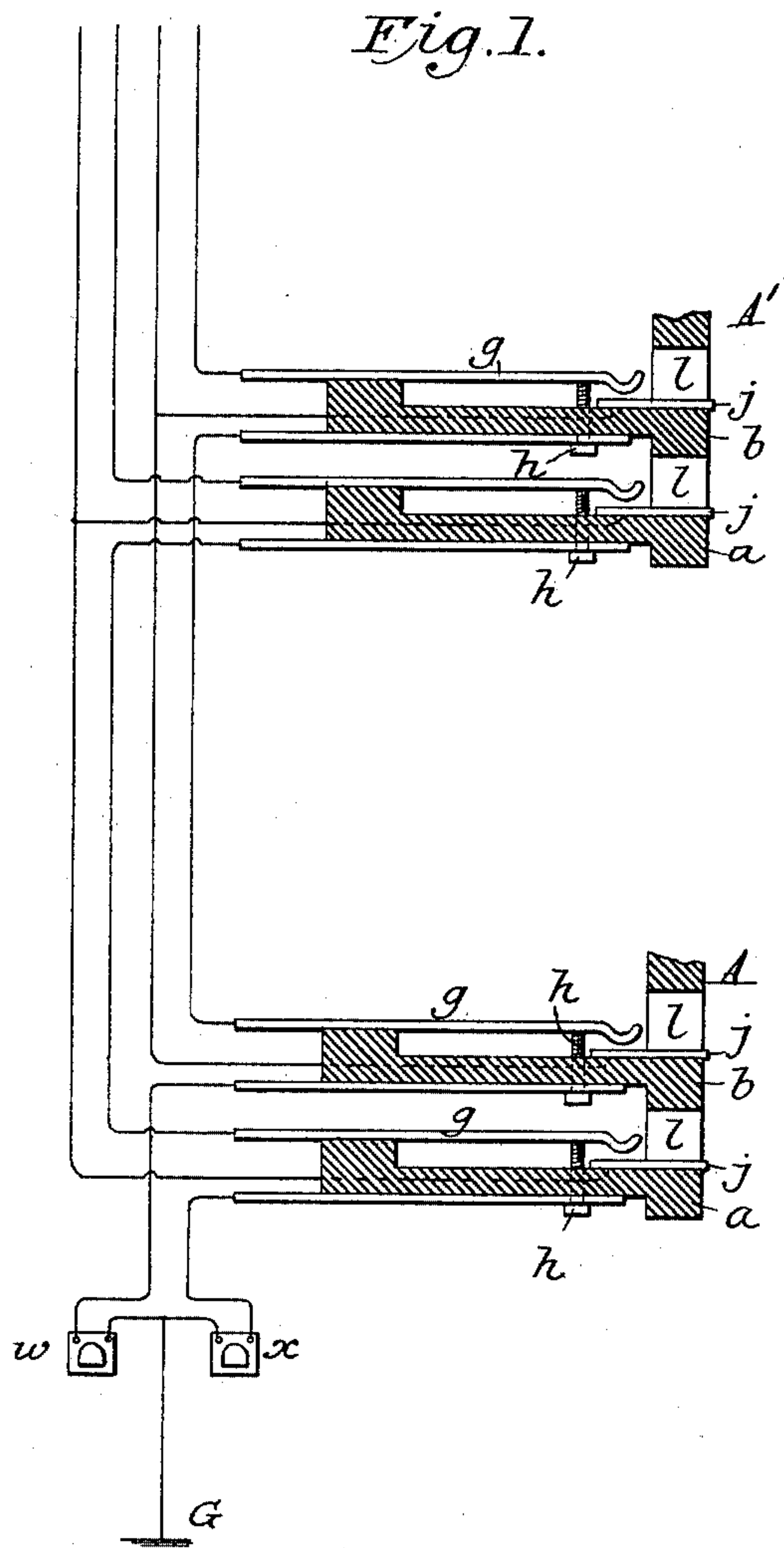


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,359.

Patented Oct. 26, 1897.



Witnesses,  
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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. 592,359, dated October 26, 1897.

Application filed January 9, 1890. Serial No. 336,381. (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, temporarily residing at Stuttgart, in the Empire of Germany, have invented certain new and useful 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.

The invention consists in an organization of answering switches and cords for a metallic-circuit double-cord system by which the movements required of the operators in making the necessary connections and disconnections are few and convenient to make.

Figure 1 shows sectional views of sections of two boards with the main-line circuits and connections of two metallic-circuit lines. Fig. 2 shows an operator's cord system necessary to illustrate the second part of my invention.

In Fig. 1, A and A' represent sectional views of sections of two multiple switchboards to which the same lines are connected. *g g* represent the springs, and *h h* the contact-points on which the springs normally rest and from which they are separated by the switch-plugs on their insertion into the switches. *j j* represent contact-pieces insulated from the rest of the apparatus, (except by the circuit connections.) *l l* are the switch-holes, and *a b* are rubber strips, of the shape substantially as shown, on which the metal parts are mounted.

The pieces *j j* are placed along the faces of their respective holes, as shown, and project to the front of the boards, so that a test-plug may readily be applied to them. The switch-holes are adapted to receive the loop-switch plugs shown in Fig. 2 and marked D D', and when a plug is inserted into a switch it separates the spring *g* from the contact-point *h*, and the spring and the contact-piece *j* form connection with the two contact-pieces of the plug, respectively.

*w* and *x* are calling-annunciators. The circuit of each metallic-circuit line is as follows and as shown: One side or branch of the line is connected to all the contact-pieces *j j* of the switches of the line on the several

boards. The other branch of the line passes successively through the pairs of contact-points *g h* of its switches on the several boards, passing in each case to the spring first. It then passes through the line-annunciator to the ground. The line is otherwise normally ungrounded, but may be grounded by the subscriber while he sends a calling-current on his line.

In the operator's cord system shown in Fig. 2, D D' are a pair of loop-switch plugs, the two contact-pieces of each of which are connected to the other apparatus by flexible conductors, substantially as shown and as will be described. In one of the plugs D the two contact-pieces pass to the bottom of the plug-handle, as shown, and are adapted to rest normally, or when the plug is not in use, on the metal plate *o*, which then electrically connects or bridges them. Weights, as is usual, or similar devices may be used to bring these plugs D into their normal position on the plate *o* and secure a good connection. The other plug D' of each pair is so constructed and placed that when it is in its normal position its two contact-pieces are not bridged or connected, (except by the circuit connections through the cords.) In the drawings the contact-pieces of the plug D' do not pass to the bottom of the plug (as in plug D) and the plug does not rest on the metal piece *o*. *t* is the operator's telephone. B is her calling-generator. T is a test-plug. *e* and *f* are the primary and secondary, respectively, of an induction-coil. B' is a test-battery. V is the clearing-out annunciator for the pair of cords, and Y is a looping-in switch for the pair of cords. *k* is a key the two contact-points of which are normally in contact.

The looping-in switch has two levers and three pairs of contact-points on which the levers of the switch may be alternately placed. These contact-points are marked *m m'*, *n n'*, and *p p'*, respectively. In a loop-circuit between the pair of contact-points *m m'* are placed the operator's telephone and the secondary of her induction-coil. In the loop-circuit between the pair of contact-points *n n'* are the operator's calling-generator and the two contact-points of her key *k*. In the loop-circuit which connects the pair of con-



tact-points  $p p'$  is the clearing-out annunciator of the pair of cords.

The two levers of the switch are connected by flexible conductors to two contact-pieces of the pair of plugs, (one contact-piece of each plug,) and the other contact-pieces of the two plugs are connected together by a flexible conducting-circuit.

The levers of the looping-in switch rest normally, or when the plugs are not in use, on the contact-points  $m m'$ , as shown in the drawings. The two contact-points  $n n'$  adjoin the contact-points  $m m'$ , so that when the levers are moved from  $m m'$  they rest on the points  $n n'$ . The points  $p p'$  adjoin the points  $n n'$ , so that when the levers are moved to the right from  $n n'$  they rest on  $p p'$ .

The test-plug  $T$  is connected through a flexible conducting-cord to the primary of the induction-coil and is connected through the coil and the test-battery to the ground. The flexible cord enables the plug to be applied to any contact-piece  $j$  at the operator's board.

When the key  $k$  is depressed, the loop in which is the operator's generator is opened, so that a signal will not then be sent over a circuit to which the contact-points  $n n'$  are connected.

For each operator's cord system there is required but one telephone, one calling-generator, one induction-coil, one test-plug and cord, one test-battery, and one key  $k$ . For each pair of cords there is one looping-in switch and one clearing-out annunciator. Each pair of plugs is connected to its looping-in switch, and each looping-in switch is connected to the operator's apparatus and to the annunciator of the pair of cords, substantially as shown and described.

The operation of the system is as follows: All the looping-in switches of any operator remain normally (or when their plugs are not in use) with the levers on the contact-points  $m m'$ . When an operator receives a call on a line, she places the plug  $D'$  of a pair of her cords in the switch of the line, and the line is thereby disconnected from the ground and is connected in a closed metallic circuit with the operator's telephone, so that she can find out by conversation what line is wanted. This closed circuit is from the two branches of the line, through the contact-pieces of the plug inserted into the switch, the flexible-cord circuits, the looping-in switch in one of the cord-circuits, the telephone which is then connected with the levers of the looping-in switch, and the two contact-pieces of the other plug, which are bridged or connected by means of their connection with the metal piece  $o$ . When the operator finds out what line is wanted, she places her test-plug on the contact-piece  $j$  of the line. If the line is not switched at any board, there is a complete circuit established from the ground through the test-battery and the primary of the induction-coil to the circuit of the line and through the line to the normal ground connection of the

line at the central office. A current will therefore pass through the primary of the induction-coil, which will produce a secondary current in the circuit in which is the operator's telephone. This will produce a click in the telephone, which indicates to the operator that the line is free. If the line tested were switched at any board by the insertion of a plug into its switch, it would be disconnected from the ground and there would be no current and no click in the telephone. When the operator finds that the line wanted is free to be switched to, she raises the plug  $D$  of the pair of cords used from its normal position and by so doing opens the closed circuit of the calling-line and her telephone. She places the plug in the switch of the line wanted, and the normal ground connection of the line is thereby broken and the two lines are connected together in metallic circuit. She then moves the levers of the looping-in switch from their normal position on the contact-points  $m m'$  to a position on the contact-points  $p p'$ . While in this operation the levers are passing over the contact-points  $n n'$  they are in contact with those points and a signal-current goes over the metallic circuit. While the levers of the switch remain on the points  $p p'$  the clearing-out annunciator of the pair of cords is in the circuit of the lines.

Should the operator desire to listen to ascertain whether the subscribers are through conversation, she presses on the key  $k$  and while the key is in that position moves the levers of the switch so that her telephone is in circuit with the lines. When the operator receives a clearing-out signal and desires to clear out a connection, she merely removes the plugs from the switches and places them in their normal position and moves the levers of the looping-in switch back to their normal position on contact-points  $m m'$ .

By the organization as described the operator is enabled in a double-cord multiple system to answer a subscriber, make his connection, and call the line wanted with a minimum of operations and work. These operations are merely to place one plug in the switch of the calling-line, test the line wanted, place the other plug in the switch of the line wanted, and move the levers of the looping-in switch from its normal position to the one it occupies while the lines are connected for conversation.

It is necessary for the quick operation of this system that the contact-pieces of one of the plugs of each pair should normally be in connection and that those of the other plug should not normally be connected. Were the contact-pieces of neither plug in normal connection, the operator could not connect her telephone into the circuit of the calling-line by placing a plug in its switch. Were the contact-pieces of both plugs of each of her pairs in normal connection, her telephone would be on short circuit with each pair of cords not in use for switching and it would



be unavailable for conversation in answering calls or in the other operations of the exchange.

If both plugs had their contact-pieces bridged, when one plug D' is placed in a calling-line switch the operator's telephone would be connected in circuit with the line, but it would be short-circuited through all the other pairs of cords and the operator would be obliged to leave the switch-levers normally not in the position shown, but in their other position, and when she used a pair of cords she would have to move their switch. To connect her telephone with a line, she would therefore have to make two motions, one with the switch and one to insert the plug.

I claim as my invention and desire to secure by Letters Patent—

1. In a metallic-circuit telephone-exchange system, a pair of double or loop switch plugs with double flexible cords, the two contact-pieces of one plug being connected with the two contact-pieces of the other plug, respectively, the contact-pieces of one plug being normally bridged and those of the other being normally open to each other, in combination with an operator's telephone and a switch with contact-points by which said telephone is left normally in circuit between two of the contact-pieces of said plugs (one piece on each plug) and is at the will of the operator disconnected from said circuit while the plugs are in use for switching, substantially as set forth.

2. In a metallic-circuit telephone-exchange system, pairs of double or loop switch plugs with double flexible cords, the two contact-pieces of one plug of each pair being connected with the two contact-pieces of the other plug of the pair respectively, the contact-pieces of one plug being normally bridged and those of the other being normally open to each other, in combination with an operator's telephone and switches, one for each pair of plugs, by which the telephone is left normally in circuit between two contact-pieces of each pair, (one piece on each plug) and is at the will of the operator disconnected from the circuit with any pair of plugs while the plugs are in use for switching, substantially as set forth.

3. In a metallic-circuit telephone-exchange system, pairs of double or loop switch plugs located at a switchboard, one plug of each pair having its contact-pieces normally disconnected (except by the cord connections) and adapted to be inserted into the switch of any line whose calls are received at the board and when inserted into the switch to connect the two contact-pieces of the plug with the two sides or branches of the line, and the other plug of the pair having its contact-pieces connected by flexible conductors with the two contact-pieces of its mate respectively, having said contact-pieces normally (or when the plug is resting in its normal position) bridged or connected, and adapted to be inserted into any switch at the board

and when inserted to connect the two contact-pieces of the plug with the two sides or branches of the line.

4. In a metallic-circuit telephone-exchange system, pairs of double or loop switch plugs located at a switchboard, one plug of each pair having its contact-pieces normally disconnected (except by the cord connections) and adapted to be inserted into the switch of any line whose calls are received at the board and when inserted into the switch to connect the two contact-pieces of the plug with the two sides or branches of the line, and the other plug of the pair having its contact-pieces connected by flexible conductors with the two contact-pieces of its mate respectively, having said contact-pieces normally (or when the plug is resting in its normal position) bridged or connected, and adapted to be inserted into any switch at the board and when inserted to connect the two contact-pieces of the plug with the two sides or branches of the line, in combination with the operator's telephone and switches, one for each pair of plugs, with contact-points by which the telephone is left normally in the cord-circuit between the contact-pieces of two plugs of each pair, and may be switched from the circuit of any pair while they are in use connecting two lines, substantially as set forth.

5. In a telephone-exchange system, a pair of switch-plugs, in combination with a looping-in switch and clearing-out annunciator for the plugs, and an operator's telephone and her generator, said looping-in switch having two levers to which are connected, respectively, by flexible conductors, a contact-piece of each plug, and three pairs of contact-points, the points of one pair of which are connected to a loop in which is the telephone and on which the levers normally rest, the points of another pair of which are connected to a loop in which is the calling-generator and are contiguous to said first-mentioned pair of points, and the points of the third pair being connected to a loop in which is the clearing-out annunciator, and are contiguous to said second-mentioned points, whereby while the levers of the switch are moved from their normal position to the position they occupy when the plugs are in use for switching they connect with the terminals of the generator and a calling-current is sent over their circuit.

6. In a telephone-exchange system, a pair of switch-plugs, in combination with a looping-in switch and a clearing-out annunciator for the plugs and an operator's telephone and her generator, said looping-in switch having two levers to which are connected respectively by flexible conductors a contact-piece of each plug, and three pairs of contact-points, the points of one pair of which are connected to a loop in which is the telephone and on which the levers normally rest, the points of another pair of which are connected to a loop



in which is the calling-generator and are contiguous to said first-mentioned pair of points, and the points of the third pair being connected by a loop contiguous to said second-  
5 mentioned points and being the points on which the levers rest while the plugs are in use for switching, whereby when the levers are moved from their normal position and their connection with the operator's telephone

to the position they occupy while their plugs are in use, a signaling-current is sent over their circuit.

In witness whereof I hereunto subscribe my name this 20th day of December, 1889.

MILO G. KELLOGG.

Witnesses:

EMIL ABENHEIM,

MARGARETHA RIEHL.