(No Model.)

M. G. KELLOGG.

MULTIPLE SWITCHBOARD.

No. 592,394. Patented Oct. 26, 1897.

Fig. 1.

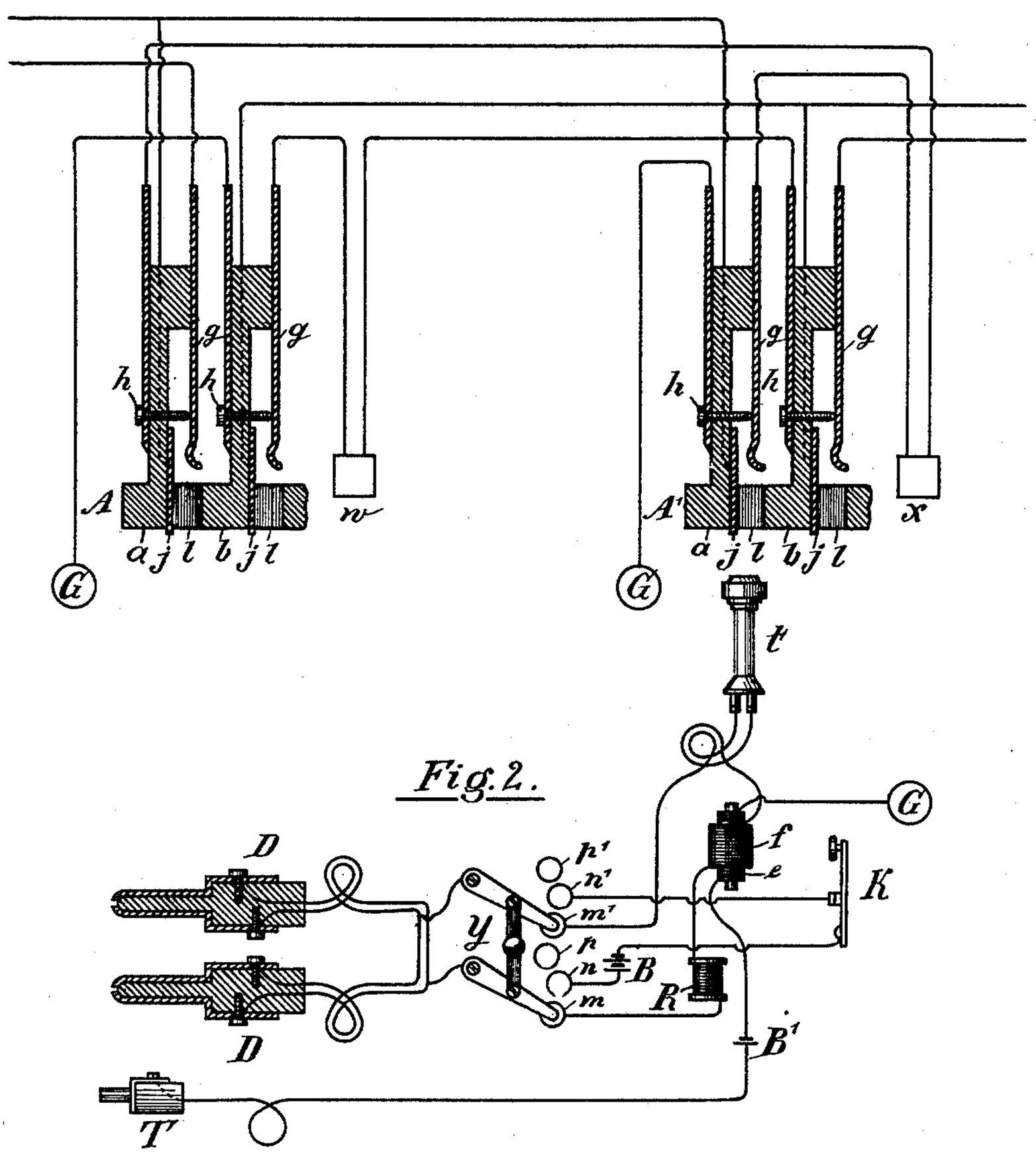

Fig. 2.

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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. 592,394, dated October 26, 1897.

Application filed May 16, 1891. Serial No. 392,963. (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 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.

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 connected together by double or loop flexible cord-conductors, or conductors that are permanently continuous; and it consists, first, in an organization 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, secondly, in an arrangement of the annunciators and switches by which special clearing-out annunciators for the pairs of cords are dispensed with.

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

G in each case represents a ground connection.

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 and thence 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. The line-annunciator is placed in the circuit between the last pair of contact-points and the pair before it and is located at the board where the last pair of points is located.

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. *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. 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. R is a resistance-coil of suitable resistance.

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, the resistance-coil, 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. The contact-points p p' are not connected by a loop.

The two contact-pieces of one of the loop-plugs are connected to the two contact-pieces of the other plug, respectively, by means of two permanently continuous or flexible conductors. One of these conductors is connected to one of the levers of the looping-in switch, and the other conductor is connected to the other lever of the switch. When, therefore, the levers of the looping-in switch are on its contact-points m m', the two cord or flexible conductors are bridged by a circuit which contains the telephone and the resistance-coil and the secondary of the induction-coil, and when the levers are on the contact-points n n' the conductors are bridged by a circuit which contains the operator's generator, and when the levers are on the points p p' the conductors are open to each other at the switch.

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 resistance-coil, one test-plug and cord, one test-battery, and one key K. There are as many pairs of cords, with pairs of plugs, as are required for her work. For each pair of cords there is one looping-in switch. Each pair of cords is connected to its looping-in switch, and each looping-in switch is connected to the operator's apparatus, 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 one of the plugs 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 levers of the looping-in switch, and the telephone which is then connected with the levers of the looping-in switch. 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 other plug of the pair of cords used from its normal position and 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 split signal-current goes over the metallic circuit. While the levers of the switch remain on the points p p', the lines are connected in an uninterrupted metallic circuit.

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'.

As I have stated, each cord-switch is normally, or during the time when the plugs are not in use, in such a position that the operator's telephone then bridges across between the two cord conductors. By this organization the operator's telephone is brought into circuit with the calling-line by the very act of placing one of her switch-plugs which are not in use in the switch of the line and without the necessity of then moving the switch of the pair of cords. Thus valuable time is

saved in the answering of a call as compared with other systems, in which it is required that the operator operate a cord-switch to bring her telephone into circuit with the calling-line when she attempts to answer the call.

By the organization as above 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 lever of the looping-in switch from its normal position to the one it occupies while the lines are connected for conversation.

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 over the circuit will be received and can be attended to at the board where the connection is made. The system therefore provides for a clearing-out annunciator in the circuit of any pair of lines connected together without providing a special clearing-out annunciator for each pair of cords.

By the use of the resistance-coil located as described an operator may listen into a circuit to determine whether the subscribers are through conversation without diverting an undue amount of any telephone-current into her telephone-circuit.

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

1. In a telephone-exchange system, pairs of loop-switch plugs, the two contact-pieces of one of each pair of which are connected to the two contact-pieces of the other, respectively, by two permanently-continuous conductors, in combination with an operator's telephone in a circuit connection normally or during the period when the plugs are not in use bridging or cross-connecting said conductors of each pair, said conductors of each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, substantially as set forth.

2. In a telephone-exchange system, pairs of loop-switch plugs, the two contact-pieces of one of each pair of which are connected to the two contact-pieces of the other, respectively by two permanently-continuous conductors, in combination with an operator's telephone and a resistance-coil in a circuit connection, normally or during the period when the plugs are not in use bridging or cross-connecting said conductors of each pair, said conductors of each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, substantially as set forth.

3. 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 permanently and metallically continuous conductors, in combination with a switch having two levers connected respectively to said conductors, two pairs of contacts with which said levers may, with one motion, be alternately connected first with one pair and then with the other pair and finally disconnected from either pair, a telephone in circuit between said first-mentioned pair and a calling-generator in circuit between said second-mentioned pair, by which the operator may in one motion first open a connection between the conductors through the telephone, then connect the conductors through the generator and then leave the circuits unconnected through either the telephone or the generator, substantially as set forth.

4. In a telephone-exchange system, two metallic-circuit lines temporarily connected together in metallic circuit for conversation, through two permanently-continuous conductors, in combination with a switch having two levers connected respectively to said conductors, two pairs of contacts with which said levers may be alternately connected first with one pair and then with the other pair, and finally disconnected from either pair, a telephone in circuit between said first-mentioned pair and a calling-generator in circuit between said second-mentioned pair, by which the operator may at one motion disconnect the telephone from the circuit, bridge the circuit through the generator, and leave the circuit unbridged through either telephone or generator, substantially as set forth.

5. In a telephone-exchange system, pairs of loop-switch plugs, the two contact-pieces of one of each pair of which are connected to the two contact-pieces of the other, respectively by two permanently-continuous conductors, in combination with an operator's telephone in a circuit connection which bridges or cross-connects said conductors of each pair, said conductors of each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, and a switch with contacts by which the operator may at will open said bridge or cross-connecting circuit, substantially as set forth.

6. In a telephone-exchange system, pairs of loop-switch plugs, the two contact-pieces of one of each pair of which are connected to the two contact-pieces of the other, respectively, by two conductors, in combination with an operator's telephone in a circuit connection which normally bridges or cross-connects said conductors of each pair, said conductors of

each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, substantially as set forth.

7. In a telephone-exchange system, pairs 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 conductors, in combination with an operator's telephone and a resistance-coil in a circuit connection which normally bridges or cross-connects said conductors, of each pair, said conductors of each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, substantially as set forth.

8. In a telephone-exchange system, pairs of loop-switch plugs the two contact-pieces of one of each pair of which are connected to the two contact-pieces of the other, respectively, by two conductors, in combination with an operator's telephone in a circuit connection which bridges or cross-connects said conductors of each pair, said conductors of each pair being otherwise normally or during the periods the plugs are not in use not bridged or cross-connected with each other, and a switch with contacts by which the operator may at will open said bridge or cross-connecting circuit, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

MILO G. KELLOGG.

Witnesses:
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