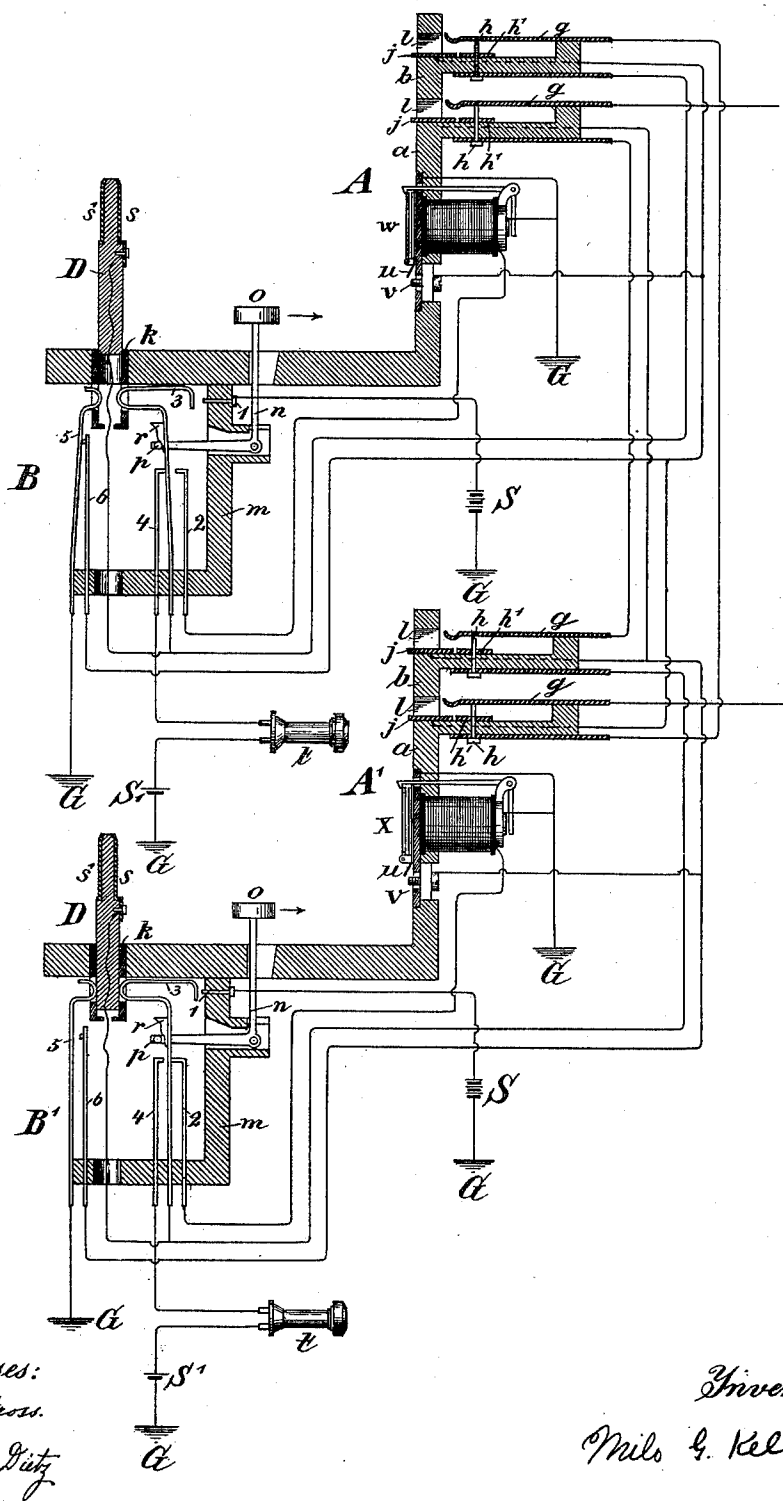


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,376.

Patented Oct. 26, 1897.



# 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. 592,376, dated October 26, 1897.

Application filed July 26, 1890. Serial No. 360,087. (No model.) Patented in England April 8, 1890, No. 5,295, and in Germany April 15, 1890, No. 63,413.

*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, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention has been patented to me in Great Britain, No. 5,295, dated April 8, 1890, and in Germany, No. 63,413, dated April 15, 1890.

My invention relates to a single-circuit telephone-exchange system; and it consists in a system of answering, switching, testing, and clearing out such lines, which I shall describe and claim in detail.

In the accompanying drawing, illustrating my invention, A and A' are sectional views of sections of two multiple switchboards to which the same lines connect. Two lines and their line-switches on the boards, their annunciators, their plugs with cords, their compound answering-switches, two operators' outfits, including their telephones and calling generators or batteries, and the connections of the lines with their switches, annunciators, plugs, and cords, and of the operator's apparatus are shown in the drawing.

Each line-switch has a contact-spring which is normally in contact with a contact point or piece, and is separated from said point or piece when a switch-plug is inserted, and has a second contact-piece which is normally insulated from the other parts, but is in connection with said contact point or piece when a plug is inserted. Said parts are so related to each other and to the switch-holes and the switch-plugs are so constructed that when a plug is inserted into a switch it separates the contact-spring from the contact point or piece, connects the spring with the conductor of the cord belonging to the plug, and connects said contact point or piece with said second or normally-insulated contact-piece.

*g g* are the contact-springs, while *h h* are contact-points on which the springs normally

bear, *h' h'* extension-pieces to the points placed along the switch-holes, and *j j* are contact-pieces placed along the switch-holes in front of the extension-pieces *h' h'* and extending to the front of the holes. The holes marked *l l* are square or rectilinear holes adapted to receive the switch-plugs and cause them to operate the switches as described. *a b* are ebonite pieces on which the switch parts are mounted and through the fronts of which are the holes *l l*.

*D D* are the switch-plugs, one for each line and connected to the line through the conductor of its switch-cord. *SS'* are two contact-pieces for the plugs, one, *S*, connected to the cord conductor and adapted to form connection with the switch-spring, and the other, *S'*, adapted to bridge or connect pieces *j* and *h'* of the switch when a plug is inserted.

*B B'* are compound answering-switches, one for each line. These switches are operated on in part by the switch-plugs of their lines and in part by the operators, as will be described. In these compound answering-switches 1, 2, 3, 4, 5, and 6 are contacts, of which 2, 3, and 5 are springs, and 1, 4, and 6 may be points and rigid. *m* is a piece adapted to support the parts, and *k* furnishes a socket or support for the plug which belongs to the line of the switch.

*n* is an angle or bell-crank piece suitably pivoted, and with a knob (marked *o*) at one end within easy manipulation of the operator, and a projection (marked *p*) at the other end adapted to engage with and operate on the irregularly-shaped ebonite piece *r*, fastened to spring 3, as shown. When the plug is in the socket of its answering-switch, (the piece *n* being in its normal position, as shown,) spring 5 is forced by the plug out of contact with 6 and spring 3 is forced into contact with 2. When the plug is removed, spring 5 passes into contact with 6 and spring 3 passes from point 2 into contact with 4. When, then, (the plug being removed,) the operator presses the knob *o* to its extreme other position, (in the direction shown by the arrow,) the projection *p*, operating on spring 3, forces it into contact with point 1, and when thereupon the operator

releases the knob the pressure of the spring carries it away from point 1, and it is held by the projection  $p$  in contact with spring 2.

W and X are calling-annunciators, one for each line shown. These annunciators are located at the boards where their line-plugs and cords and compound answering-switches are located. These annunciators are a well-known form of annunciators used in telephone-exchanges. Each has two contacts normally separate, but brought into contact by the annunciator-drop on the drop falling and indicating a call. One of the contact-pieces  $u$  is a spring operated upon by the drop on falling and pressed by it into contact with the other contact, which is a point and marked  $v$ .

$tt$  are operators' telephones.

SS are calling generators or batteries, and S' S' are test-batteries, one of each being located at each board.

G in each case represents a ground connection. The connections are as follows: The line passes normally in succession through the spring  $g$  and point  $h$  of each of the line-switches on the several boards, passing in each case to the spring first. It is then connected to contact-piece S of its switch-plug and to contact-spring 3 of its answering-switch. Spring 2 of the answering-switch is connected through the magnet of the line-annunciator to earth. Point 1 of the answering-switch is connected through the calling generator or battery to earth, while point 4 is connected through the operator's telephone and test-battery to earth, and spring 5 is connected to earth. All the contact-pieces  $jj$  of the switches of a line are connected together and to point 6 of its answering-switch and to one of the contacts, say  $v$ , of its line-annunciator. The other contact  $u$  of the annunciator is connected to earth.

The operation of the system is as follows: A subscriber, wishing a connection, operates his line-annunciator. The operator, observing the indication, withdraws the line-plug from its normal position in its answering-switch and by so doing disconnects the line from its ground connection through the annunciator and connects the line to the ground through his telephone and test-battery. This is done by the opening of contacts 2 and 3 and the closing of contacts 3 and 4. At the same time all the contact-pieces  $jj$  of the switches of the line are connected to earth through the closing of the contacts 5 and 6. The operator then by conversation finds out what line is wanted. He then tests the line wanted, as will hereinafter be described, and if he finds it does not test "busy" he places the plug in the switch of the line tested and moves the angle or bell-crank piece of the answering-switch to its extreme position in the direction indicated by the arrow and releases it. When the operator puts the plug in the switch, the line is disconnected from its normal ground

connection through its annunciator and the two lines are connected together. When the angle or bell-crank piece is in its extreme position in the direction of the arrow, as indicated, the calling generator or battery, grounded on one side, is connected on its other side to the circuit of the two lines and will send a current to both lines which will ring the bell of the line wanted and will ring the bell of the calling-subscriber, if he has in the meantime replaced his telephone on its switch. When the knob is released, the angle or bell-crank piece takes a position, so that the circuit of the two lines is grounded at the central office through the annunciator of the calling-subscriber, and any disconnecting-signal sent by either subscriber will be indicated on the annunciator. The annunciators should preferably be of high resistance and of such construction as to offer considerable retardation to telephone-currents.

When the operator desires to listen to the circuit of the two lines to determine whether they are through conversation, he merely replaces the movable piece of the answering-switch to its normal position and his telephone grounded at one end is connected on its other side to their circuit.

The test system is as follows: When a line-annunciator indicates a call or the line is brought into use either by the withdrawal of its switch-plug from its normal position or by the introduction of a plug into one of its switches, the contact-pieces  $jj$  of the switches of the line are connected to the ground. In the first case the connection is made by the closing of the contact-points of the annunciator, in the second case by the closing of the contacts 5 and 6 caused by the withdrawal of the plug, and the third case by the connection established between  $h$  and  $j$  of the switch used through the medium of the piece  $s'$  of the plug. When the line-annunciator does not indicate a call and the line is not switched, the contact-pieces  $jj$  of the line are open to the ground. The operator on testing a line places the tip of the switch-plug of the calling-line on the contact-piece  $j$  of the switch of the tested line, and thereby through the answering-switch and the contact made connects his telephone and test-battery grounded on the other side to the contact-piece  $j$ . If, then, the line is in use and the piece  $j$  is also connected to the ground, a complete circuit is established and the operator will hear a sound or click in his telephone. If the line is not in use or engaged, he will hear nothing. He will therefore know on testing whether or not the line is free to be switched to. By this system of testing a subscriber's line is reserved to his own use from the very moment when he operates his calling generator or battery and the service of the exchange will be more satisfactory to him and the operators. This feature of my invention is applicable to other systems of op-

erations and of lines in ways which will now be apparent to those skilled in the art.

The operations of making a connection are, first, to remove the line-plug from its answering-switch; second, to test with the same plug the line wanted; third, to insert the plug in the switch of the line wanted; fourth, to move the angle or bell-crank piece of the answering-switch to its limit of motion, as indicated.

To disconnect two lines, the operator merely removes the plug from the switch and places it in its normal position and places the angle or bell-crank piece in its normal position, as shown.

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

1. In a telephone-exchange system, a telephone-line and a switch-plug connected to the line by a flexible conducting-cord, in combination with an operator's telephone, the line-annunciator, a compound answering-switch for the line into which the plug is normally placed, a contact-point in said switch connected with the line, a second point connected with the ground through the annunciator, and a third point connected to the ground through the telephone, said first and second points being closed while the plug is in the switch but automatically opened on the withdrawal of the plug, and said first and third mentioned points being open while the plug is in the switch but automatically closed on the withdrawal of the plug, and a commutator-piece in said switch adapted to be moved by the operator to close said first and second mentioned points, and open said first and third mentioned points, substantially as set forth.

2. In a telephone-exchange system, a telephone-line and a switch-plug connected to the line by a flexible conducting-cord, in combination with an operator's telephone, a compound answering-switch into which the plug is normally placed, a pair of contacts in said switch closed to each other while the plug is in the switch, but automatically opened on the withdrawal of the plug, to one of which the line is connected and to the other of which the ground is connected, a pair of contacts open while the plug is in the switch but automatically closed on the withdrawal of the plug, to one of which the line is connected and the other of which is grounded through the telephone, and a commutator-piece adapted, when the plug is out of the switch, to be moved by the operator to close said first pair and open said second pair of contacts, substantially as set forth.

3. In a telephone-exchange system, a telephone-line and a switch-plug connected to the line by a flexible conducting-cord, in combination with an operator's telephone, the line-annunciator, a compound answering-switch into which the plug is normally placed, a pair of contacts in said switch closed to each other while the plug is in the switch, but automatically opened on the withdrawal of the plug,

to one of which the line is connected and to the other of which the ground is connected, through the annunciator, a pair of contacts open while the plug is in the switch but automatically closed on the withdrawal of the plug, to one of which the line is connected and the other of which is grounded through the telephone, and a commutator-piece adapted, when the plug is out of the switch, to be moved by the operator to close said first pair and open said second pair of contacts, substantially as set forth.

4. In a telephone-exchange system, two lines temporarily connected together in a circuit for conversation, in combination with an operator's telephone, an annunciator and a calling-generator, each grounded on one side, a switching device having three contacts to which said telephone, annunciator and generator are respectively connected on their other side, a connection with the circuit of said lines, and a commutator-piece adapted at the will of the operator to close said connection with either of said contacts, substantially as set forth.

5. In a telephone-exchange system, two lines normally grounded through their line-annunciators, and temporarily disconnected from their annunciators and connected together in a circuit for conversation, in combination with an operator's telephone, a switching device having two contacts, one of which is grounded through the telephone, and the other of which is grounded through one of said line-annunciators, a connection with the circuit of said lines, and a commutator-piece adapted at the will of the operator to close said connection to either of said contacts, substantially as set forth.

6. In a telephone-exchange system, two lines temporarily connected together in a circuit for conversation, in combination with an operator's telephone, an annunciator and a calling-generator, each grounded on one side, a switching device having three contacts to which said telephone, annunciator and generator are respectively connected on their other side, a connection with the circuit of said lines, and a commutator-piece adapted at the will of the operator to be placed in three positions, in the first of which said connection is grounded through the telephone, in the second of which it is grounded through the annunciator, and in the third of which it is grounded through the generator, substantially as set forth.

7. In a telephone-exchange system, a telephone-line and a switch-plug connected to the line by a flexible conducting-cord, in combination with a test-circuit for the line normally open, a switching device into which the plug is normally placed, a pair of contacts in said switching device, normally open, but closed on the withdrawal of the plug, to one of which the test-wire is connected and to the other of which the ground is connected, an an-

nunciator for the line and a pair of contacts in the annunciator, normally open but closed while the annunciator indicates a call, to one of which the test-wire is connected, and to  
5 the other of which the ground is connected, substantially as set forth.

8. In a telephone-exchange system, a telephone-line, switches for the line, one on each of several boards, a switch-plug for the line  
10 connected to the line with a flexible conductor and adapted to be placed in the switches of other lines, and a line-annunciator normally in the circuit of the line, in combination with a switching device for the plug into  
15 which the plug is normally placed, a normally open test-circuit for the line, a pair of contacts in each of said switches, normally open but closed while a switch-plug is inserted into the switch, a pair of contacts in said switching device, normally open but closed while the plug is withdrawn from the device, and a  
20 pair of contacts in said annunciator, normally open but closed while the annunciator indicates a call, one contact of each pair being connected with the ground and the other with  
25 said normally open test-wire, substantially as set forth.

9. In a telephone-exchange system, a telephone-line, switches for the line, one on each  
30 of several boards, a switch-plug for the line

connected to the line by a flexible conductor and adapted to be placed in the switches of other lines, and a line-annunciator, normally in the circuit of the line in combination with  
35 a switching device for the plug into which the plug is normally placed, a normally open test-circuit for the line, a pair of contacts in each of said switches, normally open but closed while a switch-plug is inserted into the switch, a pair of contacts in said switching device,  
40 normally open but closed while the plug is withdrawn from the device, a pair of contacts in said annunciator, normally open but closed while the annunciator indicates a call, one contact of each pair being connected with the  
45 ground, and the other with said normally open test-wire, test receiving instruments, one at each board, each grounded on one side and connected on the other side to a plug or device adapted to be brought into connection  
50 with said normally open test-wire, and a battery between the ground and each test-plug, substantially as set forth.

In witness whereof I hereunto subscribe my name this 23d day of June, 1890.

MILO G. KELLOGG.

Witnesses:

EMIL ABENHEIM,  
C. STRICH-CHAPELL.