

(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,315.

Patented Oct. 26, 1897.

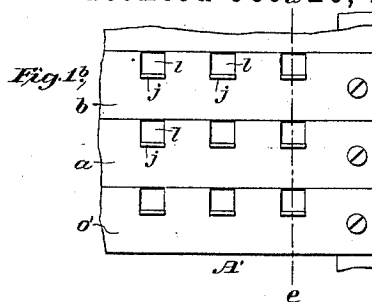
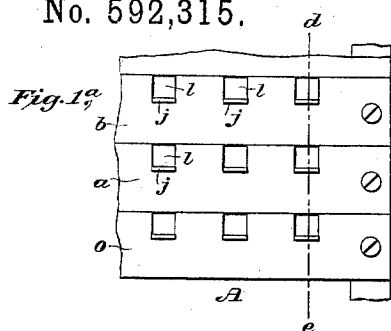
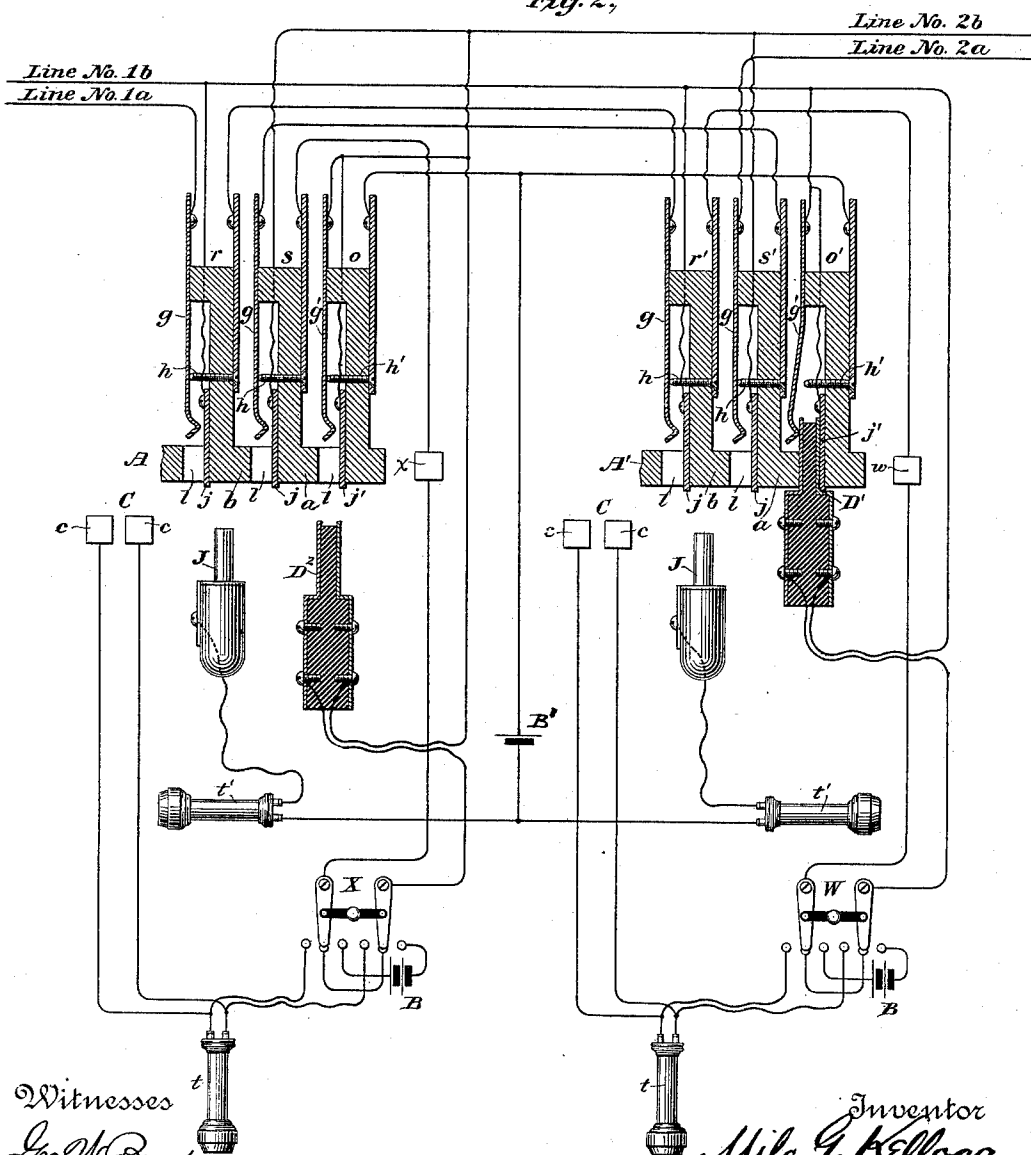


Fig. 2,



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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. 592,315, dated October 26, 1897.

Application filed November 29, 1889. Serial No. 332,018. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Chicago, 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.

My invention relates to a telephone-exchange system in which the subscribers' lines are metallic-circuit lines; and it consists in apparatus and a system of testing at any board of an exchange to determine whether a line is in use at another board.

In the accompanying drawings, illustrating my invention, Figures 1^a and 1^b are front views of sections of two multiple switchboards to which the same lines are connected. Fig. 2 shows a complete diagram of boards with their connections and all the central-office apparatus, circuits, and connections necessary to illustrate my invention.

In the drawings like parts and apparatus are indicated by the same letters of reference.

In Fig. 2, A is a sectional view of the switchboard shown in Fig. 1^a, and A' is a sectional view of the switchboard shown in Fig. 1^b, each as indicated by the line *d e*. I place as many boards in the central office as are found necessary or desirable in order to answer the calls and make the connections. On each board is a spring-jack or other switch for each line. Each switch has a contact-spring which normally bears on an insulated contact-point and has another contact-piece insulated from the rest (except by the circuit connections) and is adapted to receive a loop-switch plug and, when a plug is inserted, to disconnect the spring from the contact-point and connect the contact-pieces of the plug with the spring and said insulated contact-piece of the switch, respectively.

The switching apparatus of a line on the board where its calls are to be attended to is different from and is connected differently from the switching apparatus of the line on the other boards. At this board the line terminates on both sides in a double or loop cord with a loop-plug. This plug is normally (or

when it is not switched to connect its line for conversation) placed in a switching device adapted to connect electrically the two contact-pieces of the plug. This switching device has also contact-pieces which are separated by the insertion of the plug and are in contact when the plug is not inserted. One of them is connected to the line and the other is connected to one side of all the test receiving instruments of the boards. The pairs of switch points or pieces of a line which are normally in contact are placed in circuit in one of the sides or branches of the line and between the contact-piece of the switch-plug and the subscriber's station, and are so connected in the circuit that when a switch-plug of one line is inserted into any switch of another line it disconnects the said side or branch of the second line from said contact-piece of the plug of the second line and connects said side or branch with one of the contact-pieces of the plug which is inserted. The other branch of the line is connected at each board to a contact-piece suitably placed and with which a switch testing plug or device connected to the other side of a test receiving instrument from that mentioned above is adapted to be brought into contact. The side or branch of the line last mentioned is also connected at its switch at each board to a contact-piece suitably placed and adapted to be in connection with the other contact-piece of a switch-plug when it is inserted into the switch. The contact-pieces to which the test-plug is applied and these switch contact-pieces may be one and the same piece, as shown.

On each board I place in convenient positions one or more switching devices, each having two contact-pieces, with which the operator at will may bring into contact the two contact-pieces, respectively, of any loop-plug located at her board. At each board I also place in convenient positions switching devices adapted to loop a calling-generator and an operator's telephone into the circuit of any line which has its loop-plug located at the board.

In Fig. 2 of the drawings two metallic-circuit lines are shown, and they are connected to the switches and apparatus on the two

boards in such a manner as to allow all the necessary operations of an exchange system and show the principles of my invention. The two sides of one line are marked line No. 1^a and line No. 1^b. *r* and *r'* are the two spring-jack switches for this line. The two sides of the other line are marked line No. 2^a and line No. 2^b. *s* and *s'* are the two spring-jack switches of this line.

a b are the rubber strips on which the metal parts of the switches are mounted.

g g are the spring contact-pieces of the switches.

h h are the contact-points on which the springs normally rest, and *l l* are the switch-holes adapted to receive the switch-plugs.

j j' are the contact-pieces of the lines on the different boards, to which the test-plugs are applied. They are also the pieces mentioned above which form the connection between one contact-piece of a plug inserted into a switch and the other side of the line from that in which are its pairs of contact-points.

o o' are the switching devices in which the plugs are normally placed.

g g' are contact-springs connected to their respective lines. Contact-points *h' h'*, on which these contact-springs rest when their plugs are not in the switching devices, are connected to one side of each of the test receiving instruments. The pieces *j' j'* are connected with their corresponding springs *g' g'*. There is one switching device for each line, and it is located at the board where the double plug of the line is located, and the plug is normally in position in the switching device which belongs to its line.

w and *x* are calling-annunciators for the two lines.

D' and *D*² are two loop-plugs attached to double flexible cords, *D'* being for line No. 1 and *D*² for line No. 2.

W and *X* are looping-in switches for the lines, connected to their circuits and to the other apparatus substantially as shown.

B B are calling generators or batteries, and *t t* are operators' telephones. There should be one looping-in switch for each line, each at the board where the calls of the line are to be answered, and they should be connected to the operator's telephone, calling-generator, and to the line, substantially as shown and as will be apparent to those skilled in the art.

J J at the two boards are test-plugs adapted to be brought into connection with the pieces *j j* at their respective boards.

t' t' are test receiving instruments, and *B'* is a test-battery. One side of the test-battery is connected by metallic connection with the contact-pieces *h' h'* of all the switching devices of the exchange. Each test receiving instrument is connected on one side to its test-plug and is connected on its other side to the other side of said test-battery.

C C are switching devices at the two boards, the contact-pieces *c c* of which are connected to the two sides of the operators' telephones

of the boards and are adapted at the will of the operator to be brought into connection with the two contact-pieces of any loop-plug at their board.

The main-line connections are substantially as shown, and, as heretofore indicated, usual forms of apparatus may be used at the subscribers' stations.

The operation of the system is as follows:

When a subscriber operates his generator, the annunciator of the line indicates a call. The operator then removes the line-plug from its switching device and, placing it to her switch device *C*, finds out by conversation what line is wanted. She should leave the plug in the switching device *o* or *o'* and accomplish the same result by means of the switch *W* or *X*, as will be plain on tracing the circuit. She then tests the line wanted and if she finds it tests "free" she places the loop-plug in the spring-jack of the line. The two lines are thereby connected together in metallic circuit, and the operator can by moving the looping-in switch of the calling-line send a calling-current or loop her telephone into the circuit. It will be seen that when the lines are thus connected the annunciator of the line whose plug is used is in their circuit and the annunciator of the other line is not in their circuit.

The testing system is as follows: It will be noticed that when the loop-plug of any line is removed from its normal position in its switching device the line is connected with one side of all the test receiving instruments (at *g'*) and that when the plug is inserted this connection is broken. When the operator thereupon inserts the plug into the switch of another line, that line is also brought into similar connection with the test receiving instruments. When an operator at any board applies her test-plug to the contact-piece *j* of either line thus connected, there will be a complete circuit established, in which is her test receiving instrument and a battery, and her instrument will respond. If, however, when she tests a line it is not switched for conversation, (either by its loop-plug having been taken from its normal position or by the loop-plug of another line being in one of its switches,) the line is not connected with the side of the test receiving instrument opposite to the test-plug, and there being no complete circuit the instrument will not respond. The operator can therefore determine whether or not the line is switched for use.

The test-circuit may be traced as follows: Assume, for instance, that the plug *D'* has been inserted into switch *s'* of line 2^a 2^b at board *A'* and that the operator at board *A* desired to test the said line. The test-plug *J* is brought into contact with the test-contact *j* of switch *s*. The test-circuit is then from one pole of the test-battery *B'*, through test instrument *t'*, plug *J*, and contact *j* of switch *s* to test-piece *j* of switch *s'*, contact of plug *D'* in contact therewith, to spring *g'* of switch *o'*, and

contact h' of said switch to opposite pole of test-battery.

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

5 1. In a telephone-exchange system, a test-battery, two metallic-circuit lines normally disconnected from said battery, a double or
10 loop-switch plug for one of said lines the two contact-pieces of which are connected to the two sides or branches of its line, respectively, a line-switch for the other of said
15 lines adapted to receive said plug and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or
20 branches, respectively, of the line to which the switch belongs, and a switching device for said plug in which it is normally placed, said switching device having two contact-
25 points which are disconnected when the plug is inserted and electrically connected when the plug is withdrawn, one of said contact-
30 points being connected with the line to which the plug belongs and the other one being connected with one side of said test-battery but
not through the ground, in combination with
a switch testing device connected on the
other side of said test-battery and adapted,
at the will of the operator, to be brought into
connection with either line, and a test receiv-
ing instrument in the test-circuit thus estab-
lished, substantially as set forth.

2. In a telephone-exchange system, a test-battery, a metallic-circuit line normally disconnected from said battery, the two sides
35 or branches of which are connected to the two contact-pieces, respectively, of a double or loop-switch plug, another metallic-circuit line also normally disconnected from said bat-
40 tery and having a line-switch adapted to receive said plug and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or branches, respectively,
45 of the line to which the switch belongs and thereby connect the two lines together for conversation, and a switching device with contact-points to connect the circuit of said
lines with one side of said test-battery but
not through the ground when they are thus
connected for conversation and not other-
50 wise, in combination with a switch testing device connected on the other side of said test-battery and adapted, at the will of the operator, to be brought into connection with
55 either line, and a test receiving instrument in the test-circuit thereby established, substantially as set forth.

3. In a telephone-exchange system, a test-battery, two metallic-circuit lines normally disconnected from said battery, a double or
60 loop plug for one of said lines the two contact-pieces of which are connected to the two sides or branches of its line, respectively, a line-switch for the other of said lines adapted to
receive said plug and when the plug is in-
serted to connect the two contact-pieces of
the plug with the two sides or branches, re-
spectively, of the line, to which the switch be-

longs, and a switching device with two contact-points normally separated but in contact
70 when the lines are switched for conversation, one of said points being connected to one of said lines and the other point being connected to one side of said test-battery but not
75 through the ground, in combination with a switch testing device connected to the other side of said test-battery and adapted, at the will of the operator, to be brought into con-
nection with either line, and a test receiving instrument in the circuit thereby established, substantially as set forth. 80

4. In a telephone-exchange system, a local ungrounded test wire or circuit containing a test receiving instrument and a test-battery, in combination with two metallic-circuit lines
85 normally disconnected from said test wire or circuit, a double or loop plug the two contact-pieces of which are connected to the two sides or branches of one of said lines, a line-switch for the other line adapted to receive said plug
90 and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or branches of said other line and connect the two lines together for conversation, a switching device in which said plug is nor-
95 mally placed, adapted on the withdrawal of the plug from it to connect electrically the line to which the plug belongs with one end of said test wire or circuit, and a switch testing device adapted, at the will of the opera-
100 tor, to connect said test wire or circuit at its other end to either of said lines, substantially as set forth.

5. In a telephone-exchange system, a local ungrounded test wire or circuit containing a test receiving instrument and a test-battery, 105 in combination with two metallic-circuit lines normally disconnected from said test wire or circuit, a double or loop plug the two contact-pieces of which are connected to the two sides or branches of one of said lines, a line-switch
110 for the other line adapted to receive said plug and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or branches of said other line and connect the two lines together for conversation, 115 a switching device with contact-points to electrically connect the circuit of the two lines when they are thus connected together with one end of said test wire or circuit, and a switch testing device adapted, at the will of
120 the operator, to connect said test wire or circuit, at its other end, to either of said lines, substantially as set forth.

6. In a telephone-exchange system, metallic-circuit lines each normally disconnected 125 from one side of a test-battery and having its two sides or branches connected to the two contact-pieces respectively of a loop-switch plug adapted to be placed in the switch of
130 any other line and when so placed to connect the two contact-pieces of the plug with the two sides or branches of such other line, in combination with a switching device for each plug, into which the plug is normally placed,

contact points and connections by which its line is automatically connected with such side of said test-battery by the withdrawal of the plug from its device, a test plug or device
5 connected to the other side of said test-battery and adapted to be brought for testing into connection with either of said lines and a test receiving instrument in any circuit thereby established on testing, substantially
10 as set forth.

7. In a telephone-exchange system, metallic-circuit lines and loop-switch plugs, one for each line, to the two contact-pieces of which are connected, respectively, the two sides or
15 branches of the line, in combination with a test-battery, a switching device for each line, into which the plug of the line is normally placed, said switching device containing two contact-pieces which are out of contact when
20 the plug is in the device but are automatically closed to each other by the withdrawal of the plug, one of said contacts being connected to the line and the other to one side of said test-battery, a plug connected to the
25 other side of the battery and adapted to be brought for testing into connection with the line and a test receiving instrument in the test-circuit thereby established on testing, substantially as set forth.

8. In a telephone-exchange system, electric circuits and switch-plugs, one for each circuit, in combination with a test-battery, a switching device for each circuit, into which
35 the plug of the circuit is normally placed, said switching device containing two contact-pieces which are out of contact when the plug is in the device but are automatically closed to each other by the withdrawal of the plug, one of said contacts being connected to
40 the circuit and the other to one side of said test-battery, a plug connected to the other side of the battery and adapted to be brought for testing into connection with the circuit and a test receiving instrument in the test-circuit thereby established on testing, substantially
45 as set forth.

9. In a telephone-exchange system, a local test wire or circuit containing a test receiving instrument and a test-battery in combination
50 with two metallic-circuit lines normally disconnected from said test wire or circuit, a double or loop plug the two contact-pieces of which are connected to the two sides or branches of one of said lines, a line-switch for the other line adapted to receive said plug
55 and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or branches of said other line and connect the two lines together for conversation, a switching device in which said plug is normally placed, adapted on the withdrawal of
60 the plug from it to connect electrically the line to which the plug belongs with one end

of said test wire or circuit, and a switch testing device adapted at the will of the operator,
65 to connect said test wire or circuit at its other end to either of said lines, substantially as set forth.

10. In a telephone-exchange system, a local test wire or circuit containing a test receiving
70 instrument and a test-battery, in combination with two metallic-circuit lines normally disconnected from said test wire or circuit, a double or loop plug, the two contact-pieces of which are connected to the two sides or
75 branches of one of said lines, a line-switch for the other line adapted to receive said plug and when the plug is inserted to connect the two contact-pieces of the plug with the two sides or branches of said other line and connect
80 the two lines together for conversation, a switching device with contact-points to electrically connect the circuit of the two lines when they are thus connected together with one end of said test wire or circuit, and a
85 switch testing device adapted at the will of the operator, to connect said test wire or circuit, at its other end, to either of said lines, substantially as set forth.

11. In a telephone-exchange multiple-switchboard system, a metallic-circuit line, a loop-switch plug for said line in the two contact-pieces of which the two sides or branches
90 of the line respectively terminate, and a switching device in which said plug is normally placed, said device having electrically-connected contact-pieces, with which the two contact-pieces of the plug make contact to electrically connect or bridge the contact-pieces of the plug when it is inserted therein,
95 and a contact against which a line-connected contact bears, when the plug is withdrawn, to connect the line with one side of a test receiving instrument, substantially as set forth.
100

12. In a telephone-exchange multiple-switchboard system, a metallic-circuit line, a loop-switch plug for said line in the two contact-pieces of which the two sides or branches
105 of the line respectively terminate, and a switching device in which said plug is normally placed, said device having means for electrically connecting or bridging the two sides of the line when the plug is in its normal position therein and a contact against
110 which a line-connected contact bears, when the plug is withdrawn from the switching device, to then connect the line with one side of a test receiving instrument, substantially as set forth.
115

In witness whereof I hereunto subscribe my name this 1st day of October, 1889.

MILO G. KELLOGG.

Witnesses:

FRANCES D. KELLOGG,
MARGARETHA RIEHL.