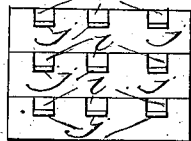
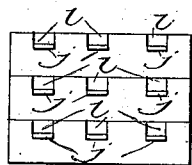
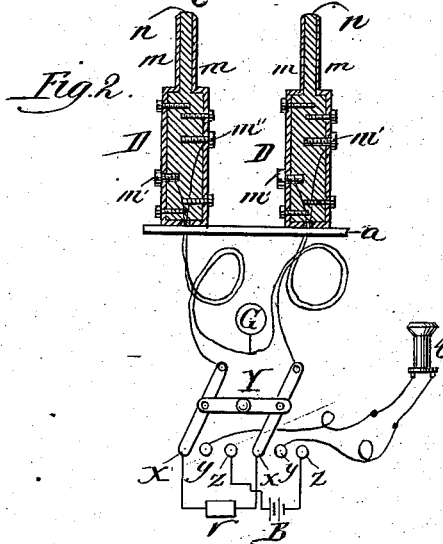
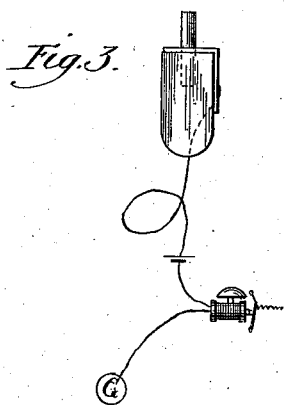
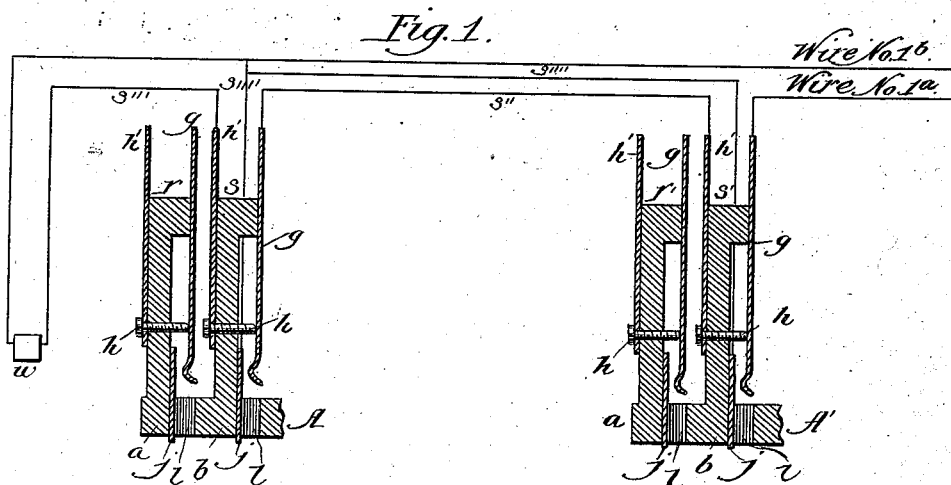


(No Model.)

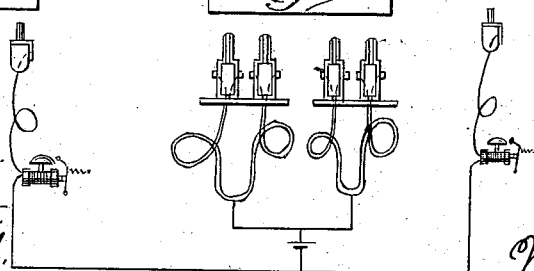
M. G. KELLOGG.
MULTIPLE SWITCH BOARD.

No. 382,477.

Patented May 8, 1888.



Witnesses:
Peter H. Witt.
Calvin DeWolf.



Inventor:
Milo G. Kellogg.

UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF HYDE PARK, ILLINOIS.

MULTIPLE SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 382,477, dated May 8, 1888.

Application filed August 29, 1887. Serial No. 248,163. (No model.)

To all whom it may concern:

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

My invention relates to a metallic circuit telephone-exchange system, and especially to a system in which the subscribers' lines are not grounded at the subscribers' stations and are not normally grounded at the central office; and it consists in a method of testing at any of the boards to determine whether a line is in use at another board, which system I shall describe and claim in detail.

In the accompanying drawings, illustrating my invention, Figure 1 is a diagram illustrating the main-line apparatus and circuits. Fig. 2 shows a diagram of the operator's cord-system for receiving and answering calls, switching, and clearing out subscribers' lines. Fig. 3 shows an operator's test system, including a test plug, battery, bell, and connections. Fig. 4 shows a modification of the apparatus and system.

In Fig. 1, A is a sectional view of one switch-board, and A' is a sectional view of another switch-board to which the same lines are connected. I place as many boards in the office as are found necessary or desirable, in order to properly answer the calls and make the connections. On each board is a spring-jack or other suitable switch for each line. Each spring-jack has a contact-spring which normally bears on an insulated contact-point and has a contact-piece insulated from the rest of the switch, (except by line-connections,) and is adapted to receive a loop switch-plug, and when the plug is inserted to disconnect the spring from the contact-point (on which it normally rests) and connect the contact-pieces of the plug with the spring and the contact-piece, respectively. In the figure, *g g* represent the springs of the different switches; *h h*, the contact-points, and *j j* the contact-pieces. The plugs D D, (shown in Fig. 2,) when inserted into the switches, operate them as above

described. The contact-pieces should be so placed that a test-plug or other switch-testing device may be readily connected with them. Each subscriber's circuit begins, say, at the central office, and passes by a wire, which we will call "wire No. 1^a," to the subscriber's station, through the station apparatus, and back to the central office by another wire, which we will call "wire No. 1^b." One of the wires—say wire No. 1^b—is connected to all the contact-pieces above mentioned of its switches on the different boards. The other wire passes successively through the contact-points formed by the spring-levers and their corresponding points of its switches on the different boards, passing in each case to the spring first. It is then connected to wire No. 1^a. If an annunciator is used to receive the calls of a line, it is preferable to place it in the circuit of the line after it has passed through the contact-points, as above, and before it passes from there to the contact-pieces. The lines are not connected with the ground at the subscribers' stations or normally elsewhere; but they are connected with the ground at the central office when they are switched for conversation, as and for the purpose which will hereinafter appear.

Fig. 2 shows a pair of loop switch-plugs with flexible loop-cords adapted to fit into the spring-jack switches and make the switching-connections for two lines which are to be connected together for conversation. One of the conductors of the cord is grounded by a branch wire, as shown. It is evident that when one of the plugs is placed in the spring-jack switch of one line and the other plug is placed in the spring-jack switch of another line the two lines are connected together in metallic circuit and the circuit is grounded at the central office.

Fig. 3 shows a test-circuit with apparatus for use by an operator at any board. It consists, essentially, of a wire with a signal-bell and battery in its circuit, grounded at one end and terminating at the other end in a flexible cord with a plug adapted to be brought into contact with any of the contact-pieces at the board.

Each operator should have at her board a sys-

tem of pairs of cords with their plugs, with the necessary switches, telephone, and generator suitably placed and connected, so as to properly conduct the business assigned to her.

5 In Fig. 2 only one pair of cords is shown. Others could be added to her system in ways evident to those skilled in the art. She should also have at her board a test system similar to that described above. For the test-receiving
10 instrument she might use a telephone or other suitable apparatus in the place of the bell which is shown.

When an operator at any board desires to test a line to see whether it is in use at another
15 board, she connects her test-plug to the contact-piece at her board of the line to be tested, and if the line is in use there will be a complete circuit through her test-bell and the battery, and the bell will respond and she will
20 know that the line is already in use. The circuit can be traced as follows: Beginning with the ground, thence through the test-bell and battery to the test-plug, and thence through the contact-piece and the line back to the
25 ground, (to which the line is temporarily connected while switched for conversation.) If, however, the line is not switched for use, there will be no such complete circuit when the test is made, because the line is disconnected from
30 the ground, and the test-bell will not respond.

It is not a necessity in my system that the lines should be grounded when they are switched for conversation, if the apparatus and connections are modified accordingly. The
35 lines, when switched, may be connected to a common metallic test circuit or wire, to which are also connected the test-circuits at the different boards. In the modification shown in Fig. 4 the connections are thus made. It is,
40 however, convenient to use the ground as a part of the test-circuit, and I have heretofore described its use.

It is known not to be detrimental to the working of a metallic-circuit telephone exchange
45 change to have the metallic circuits grounded at the central office while they are used for conversation, provided they are not then grounded elsewhere, or to have the circuits joined together at one point in each, provided
50 they are not looped together. For these reasons my test system as originally described or as modified will not effect the successful working of the metallic-circuit system.

The test-battery may be placed in the common ground-wire or in the common test-wire,
55 should one be used, instead of their being one in the test-circuit of each board after it branches from the ground or the common test-wire. In Fig. 4 the test-battery is placed in
60 the common test-wire.

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

1. In a telephone-exchange system, two metallic-circuit telephone-lines normally dis-
65 connected from the ground and temporarily connected together for conversation, with their

circuit grounded, in combination with a test-bell grounded on one side and connected on its other side to a switch-testing device, adapted to be brought into connection with either line
70 for testing, and a battery in the test-circuit between the ground-connection on one side of the bell and the temporary ground-connection of the two lines, substantially as and for the purpose set forth.

2. In a telephone-exchange system, two metallic-circuit telephone-lines normally disconnected from the ground and temporarily
75 connected together for conversation, with their circuit grounded, in combination with a test-wire grounded on one side and connected on its other side to a switch-testing device, adapted to be brought into connection with either line
80 for testing, and a battery and test-bell in the circuit of said test-wire, substantially as and for the purpose set forth.

3. In a telephone-exchange system, the combination of two metallic-circuit lines temporarily connected together for conversation, a
85 test-circuit containing a test-receiving instrument and a test-battery, said test-circuit being electrically connected on one side of said instrument and battery with said lines when they are thus connected for conversation, and then only, a test-bolt connected to said metallic circuit, and a switching device connected
90 to said test-circuit on the other side of said instrument and battery, adapted at the will of the operator to be brought into electrical connection with said test-bolt, substantially as
95 and for the purpose set forth.

4. In a telephone-exchange system, metallic-circuit lines normally disconnected from the ground, two or more switch-boards, to each of
100 which the lines are connected, and switching devices at each board adapted to temporarily connect any two of the lines together for conversation, and when they are thus connected to ground their circuit, in combination with
105 test-receiving instruments, one at each board, grounded on one side, switch-testing devices at each board adapted at the will of the operator to connect its test-receiving instrument on the other side to the circuit of any line for
110 testing, and a battery in the test-circuit thus established, substantially as and for the purpose set forth.

5. In a telephone-exchange system, the combination of metallic-circuit lines, two or more switch-boards for said lines, test-circuits, one
120 at each board, each test-circuit containing a test-receiving instrument and a test-battery, said test-circuits being electrically connected on one side to their test-receiving instruments and test-batteries, and normally disconnected
125 from said lines, switching devices at each board adapted to connect any two of said lines together for conversation and to connect them temporarily or when thus connected electrically with said test-circuits on said side of their
130 test-receiving instruments and batteries, test-bolts, one for each line on each board, each

test-bolt being connected to its line when it is
switched for conversation, and switch-testing
devices at each board, each connected to the
test-circuit at its board on the other side of
5 the test-receiving instrument and battery, and
adapted at the will of the operator to be brought
into electrical connection with any of the test-

bolts at her board, substantially as and for the
purpose set forth.

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Witnesses:

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