(No Model.)

M. G. KELLOGG.

MULTIPLE SWITCH BOARD.

No. 387,888. Patented Aug. 14, 1888.

Fig. 1a.

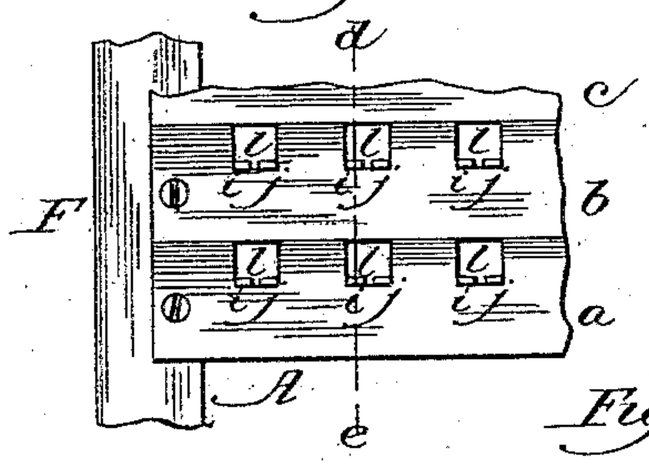


Fig. 1b.

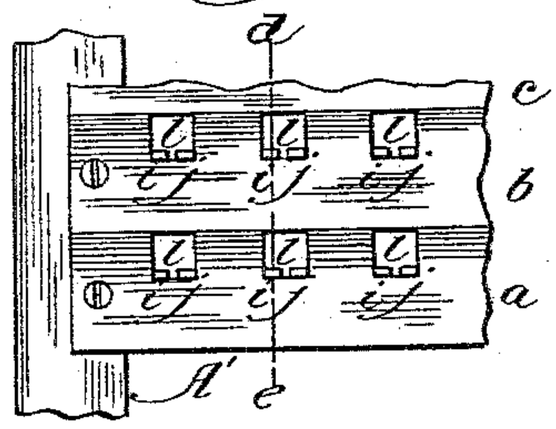
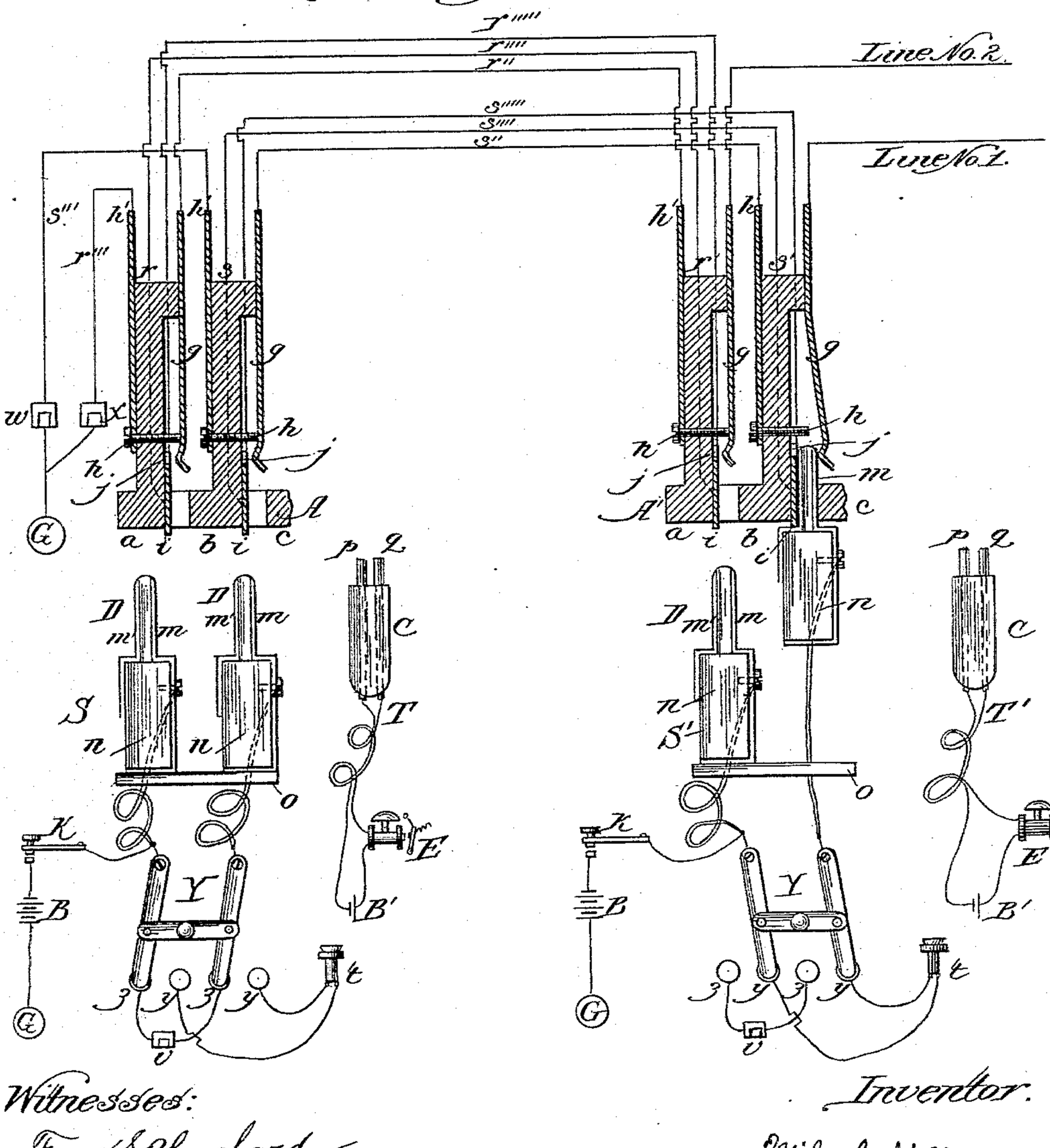


Fig. 2.



Witnesses:

Frank S. Blanchard

Howard B. Hallock.

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. 387,888, dated August 14, 1888.

Application filed May 21, 1887. Serial No. 238,948. (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, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention consists, first, in a multiple switch-board system of operating an exchange and testing at one board to determine whether any given line is in use at any other board, which system I shall hereinafter describe and claim in detail.

It consists, secondly, of a certain construction of spring-jack switch, which I shall hereinafter describe and claim in detail, said switch being adapted to said multiple switch-board system mentioned above and to other systems of telephone-exchange switch-boards.

In my multiple switch-board system I place as many switch-boards in the central office as are found necessary or desirable in order to properly answer the calls and disconnect and connect the subscribers' lines. On each board I place for each line which centers at the office a spring-jack or similar switch having four insulated contact-pieces, two of which are normally in contact, said switch being adapted to receive a plug, and when the plug is inserted to disconnect the pieces which are normally in contact and connect one of them with the flexible conductor attached to the plug, and at the same time to bring the two other contact-pieces in electrical connection, and when the plug is withdrawn to disconnect these latter pieces and connect again the first two. The pieces mentioned above which are normally in contact are main-line contact-points, and the other two are local contact-points. The spring-jack switches of a line on the different boards may be called a "series of spring-jack switches."

Figures 1ª and 1ᵇ are front views of sections of two or more multiple switch-boards to which the same lines are connected. Fig. 2 shows a complete diagram of the boards with all the central-office apparatus, circuits, and connections necessary to operate them according to 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 switch-board shown in Fig. 1ª, as indicated by line *d e*, and A′ is a sectional view of the switch-board shown in Fig. 1ᵇ, as indicated by line *d e*.

a b represent rubber strips on which the metal parts of the spring-jack switches are mounted. These strips may be long enough to receive any convenient number of spring-jack parts.

l l are rectilinear holes through the fronts of and at one of the edges of the strips, adapted to receive the switch-plugs. The contact-springs are mounted to the rear of and are parallel to the holes *l l* to which they belong, as shown. The contact-points *h h*, on which the contact-springs or spring-levers normally bear, pass through the rubber strip, as shown, and each has a connecting-piece, *h′*, as shown. Toward the front of the switch-holes, and along their lower faces, as shown, I place two contact-pieces normally insulated from each other and from the rest of the apparatus, except by conducting-wires, as will hereinafter be described. These contact-pieces are marked *i* and *j*. They extend to the front of the holes, so that the contact-points of a double test-plug may be brought in contact with them.

The switch-plugs are substantially as shown, and as will hereinafter be described. The several parts mentioned above are so made, shaped, arranged, and adjusted that when a switch-plug is inserted into a switch-hole, as shown, it raises the spring-lever in the rear of the hole from the contact-point *h*, on which it normally bears, and the flexible cord is connected to the spring-lever, while the contact-pieces *i* and *j* are electrically connected through the medium of the metal piece *m′* of the switch-plug, which then touches both *i* and *j* of the switch.

Each section of a rubber strip, with its spring-lever, contact-point, contact-pieces, and the hole, all arranged and operating as above, may be called a "spring-jack switch." The rubber strips are placed one above the other, as shown. The lower edge of one strip therefore provides the upper edges of the holes of the strip which is below it. The holes may be of any convenient shape adapted to the shapes and arrangement of the parts used.

Two subscribers' lines are shown. They are

marked "line No. 1" and "line No. 2." *s* and *s'* are the spring-jack switches of line No. 1 on the two boards, and *r* and *r'* are the spring-jack switches of line No. 2 on the two boards. The circuits and connections of the lines and switches are as follows: Line No. 1, for instance, after entering the office, passes first to spring-lever *g* of switch *s'*, and thence through contact-point *h* and connecting-piece *h'* of that switch and wire *s''* to spring-lever *g* of switch *s*, and thence through contact-point *h* and connecting-piece *h'* of that switch and wire *s'''* to its annunciator, and thence to the ground. The contact-pieces *i i* of the switches *s* and *s'* are connected together by wire *s''''*, and the contact-pieces *j j* of the switches *s* and *s'* are connected together by wire *s'''''*. In a similar manner all of the other lines could be connected to their switches and the contact-pieces of the switches be connected together. Other boards might be added to the exchange, and the connections of the lines and the switches on them would be similar to the above and such as will be evident to those skilled in the art.

s s', Fig. 2, are operators' systems of cords, with plugs, keys, switches, clearing-out annunciators, operator's telephone, calling generator or battery, and circuits. One system is shown at each board, and is intended for one operator. Only one pair of cords, with its plugs, key, switch, and clearing-out annunciator, is shown in each system. Others could be added in a manner which will be apparent to those skilled in the art.

D D are the two switch-plugs connected to the pair of cords and adapted to be inserted in the line-switches.

m m are the metal pieces of the plugs, adapted to come in contact with the spring-levers *g* of the switches and connect them with the cords of the plugs. *m' m'* are metal pieces of the plugs, adapted to come in contact with pieces *i* and *j* of a switch, when the plug is inserted into a switch, and connect them together.

n n are the rubber insulations of the plugs. The pieces *m m* extend to the bottom of the plugs, as shown, and are adapted to rest on the metal strip *o*, which is connected to the ground and normally connects the cords with the ground. Weights, as is usual, or other similar devices, may be used to bring the metal piece *m* of a plug in normal contact with the strip *o* and form a good connection. The plugs should be inserted into the switches in such a manner as to make the connections above described. A plug is shown thus inserted in one switch.

Y is a looping-in switch. *y y* and *z z* are the connecting-bolts of the switch, on which the operator may at will place the pair of switch-levers. The cross-piece between the levers may be of rubber, as is usual, or of other suitable insulating material.

k is a calling-key, constructed, connected, and operating as shown.

v is a clearing-out annunciator. *t* is an operator's telephone, and B is her calling generator or battery. The letter G in each case represents a ground-connection. The circuits are substantially as shown.

T T' are operators' testing systems at the two boards, one at each board. C is the rubber handle of the test-plug.

p q are the contact-pieces of the test-plug, so made, placed, and adjusted that the operator can readily connect them simultaneously to any pair of contact-pieces *i* and *j* of any switch at her board—as, for instance, *p* to *i* and *q* to *j*, or the reverse.

E is an electric bell or other test-receiving instrument, and B' is an electric battery, both being placed in the loop which connects the two contact-pieces *p q*, as shown. The connection between the apparatus E and B' and the test-plug is by flexible conductors of sufficient length, so that the operator may readily apply the contact-pieces *p q* of her test-plug to the pair of contact-pieces *i* and *j* of any line at her board, as described.

Each operator has one testing system and one cord system. The cords should be of sufficient length and the apparatus should be placed in convenient arrangement at her board, so that she can conveniently operate the exchange system. The levers of all switches Y should normally rest on *z z;* but the levers of a switch are to be moved to *y y* when the operator desires to use her telephone with a pair of cords to which the switch belongs.

The method of operating the exchange system at either board, including answering calls, making connections, sending signals, clearing-out connections, &c., are such as will be apparent on an examination of the apparatus and circuits shown.

For convenience, I call a pair of contact-pieces *i* and *j* of a switch a "pair of test-bolts." The pairs of test-bolts of the switches of a line on the different boards may be called a "series of pairs of test-bolts."

It will be seen that when there is no plug in any switch of a line none of the test-bolts *i* of the line are in electric connection with the corresponding test-bolt *j*, and if a test-plug is applied, as above, to any pair of test-bolts of a line in such a condition there is not a complete circuit established through the bell and battery of the plug, and the bell will not ring. If, on the other hand, there is a switch-plug in any switch of a line, an electric connection exists between any test-bolt *i* of the line and its corresponding test-bolt *j*, and if a test-plug is then applied to any pair of test-bolts of the line the bell will ring. Consequently an operator may at any time find out whether a given line is in use at some other board by applying her test-plug, as above, to the pair of test-bolts of the line, and if her bell rings she knows that one of the switches of the line has a plug in; but if it does not ring she knows that none of the switches of the line have plugs in them.

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

1. A spring-jack switch containing a contact point or piece, a spring-lever normally bearing on said contact-point, and two insulated contact-pieces, all mounted on an insulating-strip, said lever being transverse to the front of said strip, said strip having through its front a transverse rectilinear hole in front of said lever, said insulated contact-pieces being mounted on one of the faces of said hole and adapted to be crossed with each other by the insertion of the switch-plug, substantially as set forth.

2. A spring-jack switch containing a contact point or piece, a spring-lever normally bearing on said contact-point, and two insulated contact-pieces, all mounted on an insulating-strip, said lever being transverse to the front of said strip, said strip having through its front a transverse rectilinear hole in front of said lever, said insulated contact-pieces being mounted on one of the faces of said hole and extending to or near the front of said hole, substantially as and for the purpose set forth.

3. In a multiple switch-board, the combination of a series of line-switches, a series of test-bolts, one pair for each switch, insulated from each other and from the switch, continuous circuit-connections between the similar test-bolts of the different boards, circuit-connections between the switches, plugging devices for connecting the subscribers' lines at the switches and for simultaneously crossing the test-bolts at the plugged switch, the test-plug having double contacts adapted to close the test-circuit through the pair of test-bolts at the tested switch and through both contacts of the test-plug, and a loop-circuit, including a battery and signal, connected with both contacts of the test-plug and adapted to be closed through the contacts of the plug, whereby a test-circuit is established through the test-bolts at both the plugged switch and the tested switch and through both contacts of the test-plug and the signal-circuit connected therewith, substantially as set forth.

4. In a multiple switch-board, the combination of the main lines, a series of switches at each board for each line, a pair of normally-closed contact-pieces at each switch for each line, a pair of test-bolts, *i* and *j*, at each switch, continuous connecting-wires *s''''* for the bolts *i*, and continuous connecting-wires *s'''''* for the bolts *j*, a switch-plug having two parallel insulated contact-pieces adapted to open the main-line contacts at the plugged switch and connect one of them with one contact-piece of the plug and to cross the test-bolts at the plugged switch, and a test-plug having double contacts adapted to close the test-circuit through the pair of test-bolts at the tested switch, and a loop-circuit connected with the contacts, including a battery and signal, substantially as set forth.

MILO G. KELLOGG.

Witnesses:
MILTON HEAD,
WALLACE L. DEWOLF.