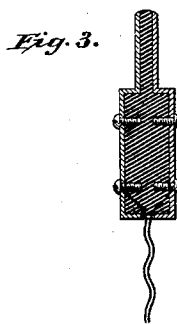
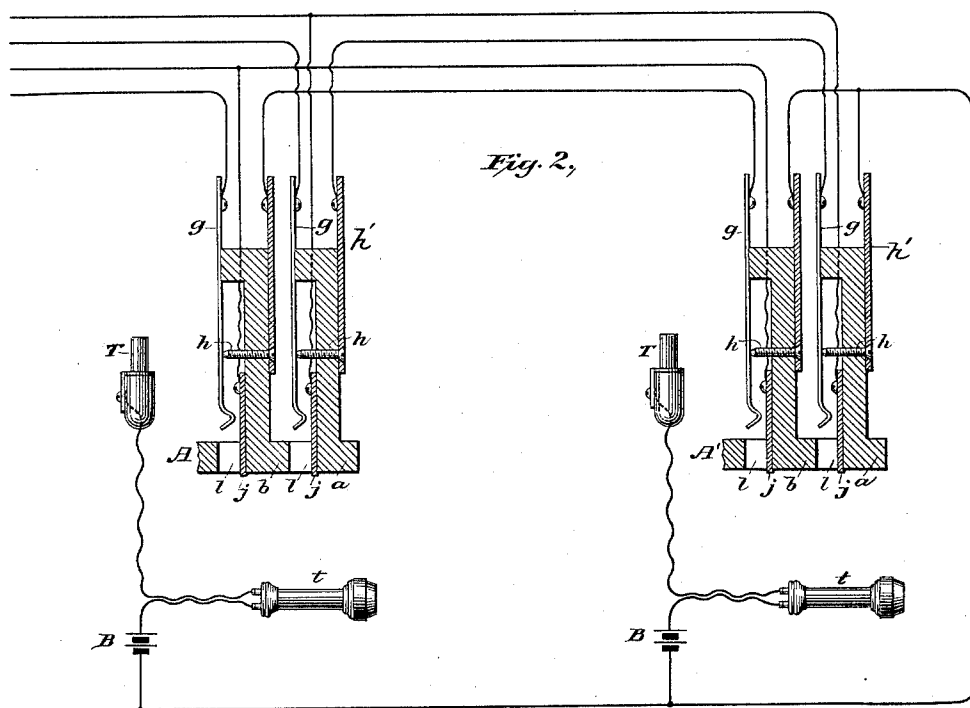
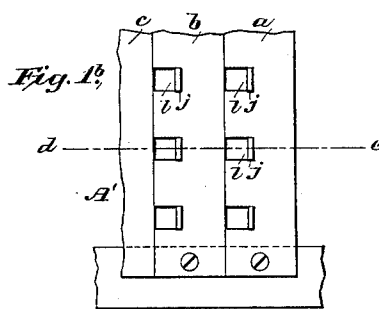
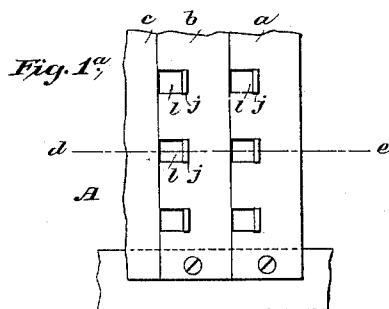


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,327.

Patented Oct. 26, 1897.



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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. 592,327, dated October 26, 1897.

Application filed December 11, 1889. Serial No. 333,340. (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 are connected to multiple switchboards; and it consists in a system of testing at any board to determine whether a line is in use.

I place as many switchboards in the central office as are found necessary or desirable in order to properly answer the calls and connect and disconnect the subscribers' lines. On each board I place a spring-jack or similar switch having two insulated contact-points which are normally in contact and a third contact-piece which is normally insulated from the rest, (except by the circuit connections,) said switch being adapted to receive a loop-switch plug and, when a plug is inserted, to disconnect the contact-points which are normally in contact and connect one of them to one of the contact-pieces of the plug and at the same time connect the other contact-piece of the plug with said third contact-piece of the switch. Said third contact-pieces of the switches are so placed and arranged that an operator may at will apply a test-plug or similar device to them.

Figures 1<sup>a</sup> and 1<sup>b</sup> of the drawings are front views of sections of two multiple switchboards to which the same lines are connected. Fig. 2 is a diagram of the boards, with the circuits and connections necessary to illustrate my invention. Fig. 3 shows a double or loop plug adapted to be used with the switches.

In Fig. 2, A is a sectional view of the switch-board shown in Fig. 1<sup>a</sup>, and A' is a sectional view of the switchboard shown in Fig. 1<sup>b</sup>, each as indicated by the line *d e*. *a b* represent rubber strips, of the shape substantially as shown, on which the metal parts of the switches are mounted, as shown. These strips may be of a length to receive any convenient

number of switch parts. *ll* are square holes through the fronts of and at the edges of the strips, adapted to receive and guide the switch-plugs. The contact-springs *g g* are mounted to the rear of and are parallel to the holes *ll* to which they belong, as shown. The contact-points *h h* corresponding to the contact-springs pass through the rubber strips, as shown, and are connected with their corresponding pieces *h' h'*. *j j* are the contact-pieces of the switches, insulated from the rest of the switch parts, (except by the circuit connections,) each adapted to connect one side of its line with one side or contact-piece of the switch-plug when inserted and also to be the test-piece of its line at its board. These switch-plugs are substantially as shown in Fig. 3.

The several parts mentioned above are so made, shaped, arranged, and adjusted that when a plug is inserted into any switch-hole it raises the spring in the rear of the hole from the contact-point (on which it normally rests) and the spring is connected with one of the contact-pieces of the plug, while the other contact-piece of the plug is connected to the contact-piece *j* of the switch which is used. Each section of a rubber strip, with its contact-point, contact-spring, contact-piece, and the hole, all operating as shown, may be called a "spring-jack switch."

*tt* in Fig. 2 are test receiving instruments. *T T* are test-plugs, and *B B* are test-batteries, one plug and one test receiving instrument for each operator, and each plug connected to one side of its test receiving instrument, as shown. The plugs and cords are so constructed that the operator may at will bring the metal tip of the plug into contact with any contact-piece *j* at her board.

The circuit of each subscriber's line is as follows: One side or branch *x* is connected to all the contact-pieces *j j* of its switches on the several boards. The other side or branch *y* passes successively through the pairs of contact-points *g h* of its switches on the several boards, which are normally in contact, being connected in each case to the spring first. From the last contact-point *h* of the switches it is connected to all the test receiving instruments on the several boards on the other side of the instruments from that to which

their test-plugs are connected. The test-batteries are connected into the circuit so that they are between the pairs of contact-points of the lines and the test-plugs T T—that is, all the wires are connected after leaving the last contact-points of their switches to a common wire C, from which the test-wires branch, and the common test-battery may be in this wire, or there may be, as shown, a test-battery in each test-wire branch.

I have not indicated the calling apparatus nor the operator's answering and connecting apparatus, as it is not necessary to do so to illustrate my invention, and well-known forms of apparatus can be used for them. For the calling system an independent circuit common to many lines, such as the Law or the American district system, may be used.

The subscribers' lines are normally disconnected at all points from the test receiving instruments, except by the normal connection of one of their branches through the switches, as described. When a line is switched by the insertion of a plug, it is disconnected from its normal connection with the test receiving instruments and batteries.

The system of testing is as follows: The operator places her test-plug on the contact-piece *j* of the line to be tested, and if it is not switched at any board a complete circuit is established through the line, the switch contact-points, the common conductor C, the test receiving instrument, and the battery and the instrument will sound, indicating that the line is not switched at any board. If, however, the line is switched by a plug being placed in one of its line-switches, such complete circuit is interrupted at the pair of contact-points of the switch and the instrument will not sound, indicating that the line is switched at some board. The operator can therefore determine, on testing, whether or not the line is switched for use. By this system of switching and testing the test receiving instruments are not grounded, but are open to the ground at the central office; and an accidental ground on a line tested between the subscriber's station and the pairs of contact-points of the switches would not cause, on testing, a false signal that the line was free when it was switched at the central office, as would be the case were the test receiving instruments connected with the ground. It is well known that such accidental grounds are liable to occur, and it is apparent that were the instruments connected with the ground confusion would be liable to occur in the operation of the system.

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

1. In a multiple-switchboard exchange, an ungrounded test-circuit comprising in the

order named, test-contacts at two or more boards, line conductors between the subscriber's station and the central office, normally closed pairs of contacts at said boards open while the line is switched for use, a central conductor, and test outfits and plugs or devices one of each at each board, adapted to be applied to the test-contacts at their boards for testing.

2. In a multiple-switchboard exchange, ungrounded test-circuits comprising in the order named, a test plug and outfit, an ungrounded common conductor for a number of telephone-circuits, a limb of each circuit between the subscribers' stations and the central office containing normally closed pairs of contacts open while the line is switched for use, a return limb of each circuit, and test-contacts.

3. In a multiple-switchboard exchange, an ungrounded telephone-circuit comprising in the order named, test-contacts located in a spring-jack, one at each of two or more boards, line conductors closed to each other at the subscribers' stations, normally closed pairs of contacts, one pair at each board located in the jack at that board, and a connection to an ungrounded central conductor; in combination with a test outfit at each board connected on one side to said ungrounded conductor, and on the other side to a plug or device adapted to be brought into connection with the test-contact at its board, and a switch plug or device adapted to open a pair of normally closed contacts while the line is switched for use.

4. In a multiple-switchboard exchange, an ungrounded telephone-circuit comprising in the order named, test-contacts located in the spring-jacks, one at each of two or more boards, line conductors closed to each other at the subscriber's station, normally closed pairs of contacts, one pair at each board located in the jack at that board, and a connection to an ungrounded central conductor; in combination with a test outfit at each board connected on one side to said ungrounded conductor, and on the other to a plug or device adapted to be brought into connection with the test-contact at its board, and a switch plug or device with contacts connected to the two line conductors while inserted in a line-jack, one contact of the plug connected to a test-contact, the other contact of the plug being connected to a spring-contact, and thereby lifting said spring-contact from its anvil.

MILO G. KELLOGG.

Witnesses:

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