

(Model.)

3 Sheets—Sheet 1.

M. G. KELLOGG.

MULTIPLE SWITCH BOARD FOR TELEPHONE EXCHANGES.

No. 308,315.

Patented Nov. 18, 1884.

Fig. 1.

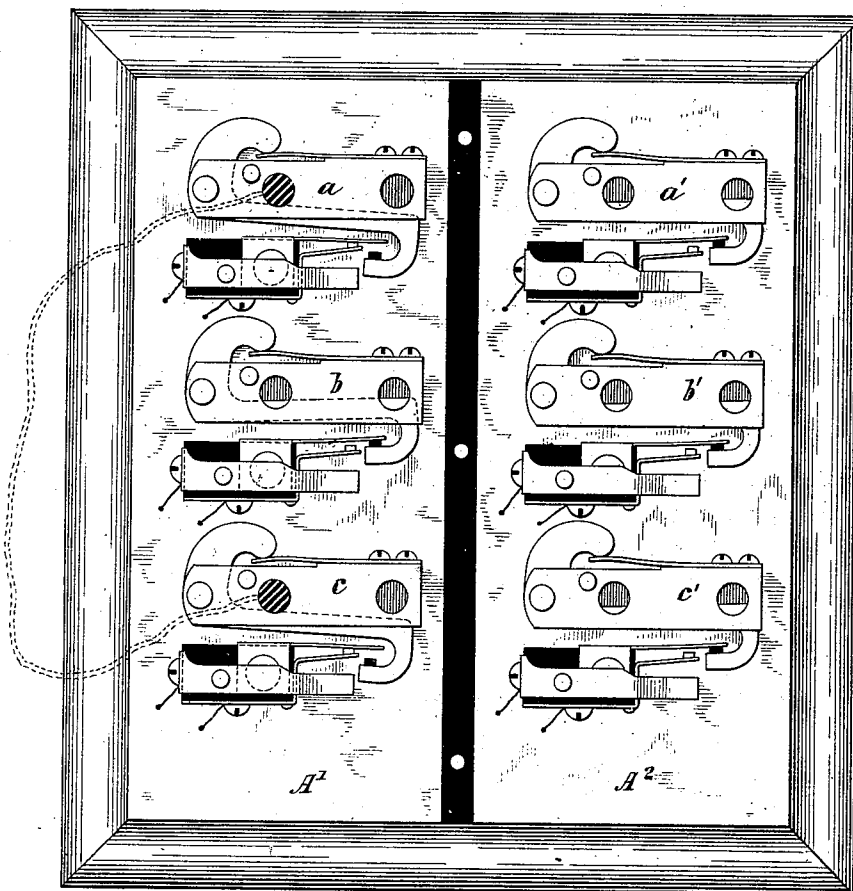


Fig. 3.

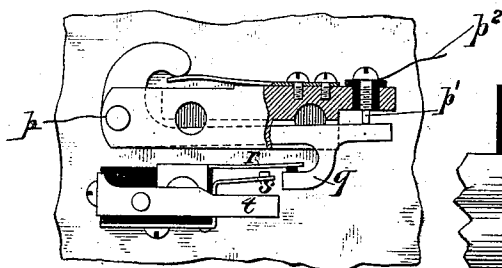
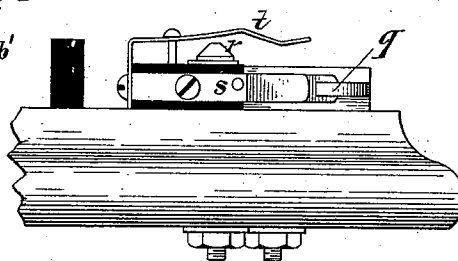


Fig. 2.



WITNESSES

Wm. A. Shunkle.
Geo. W. Buck.

INVENTOR

Milo G. Kellogg.

By his Attorney

George P. Barton

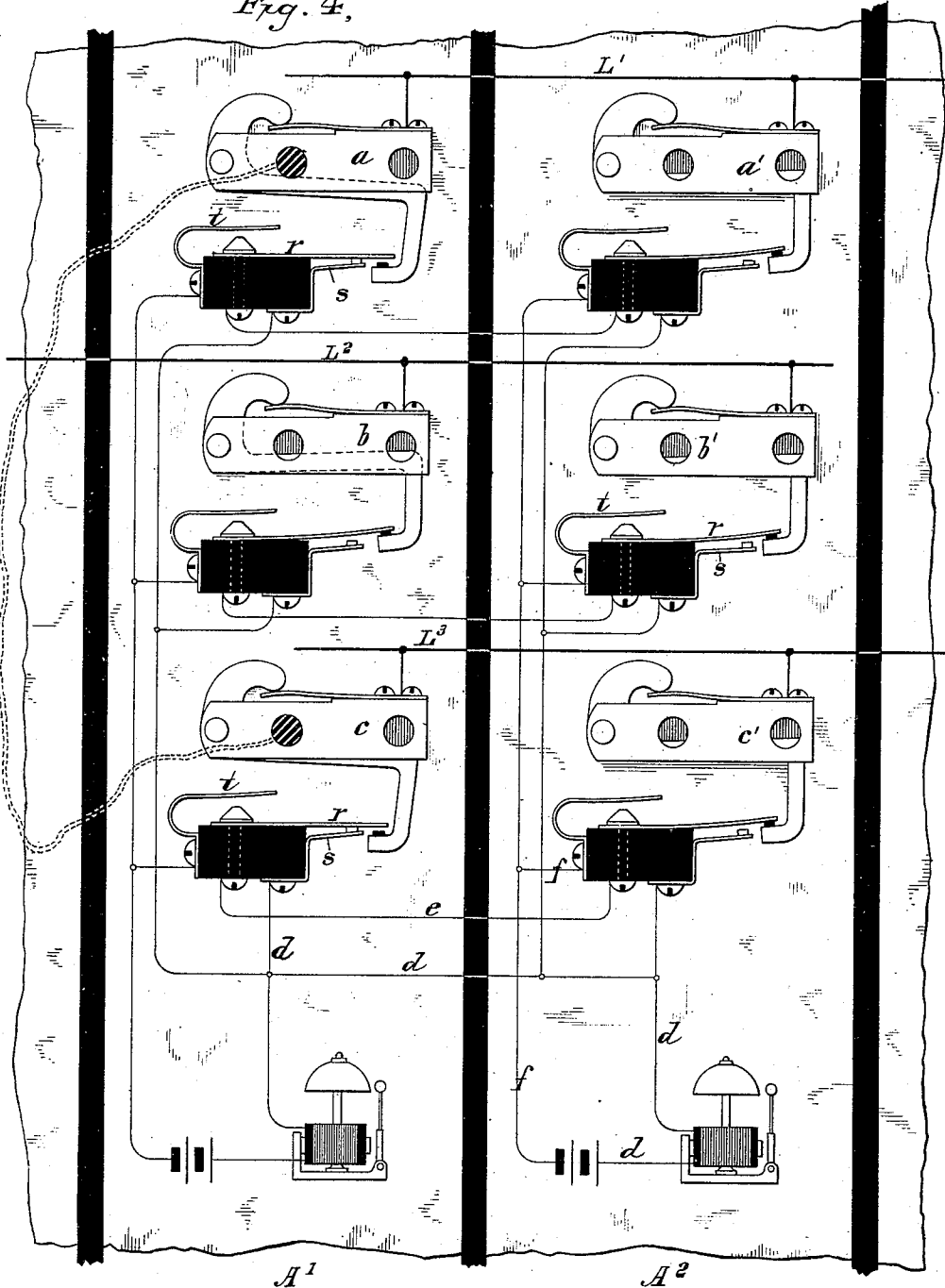
(Model.)

3 Sheets—Sheet 2.

M. G. KELLOGG.

MULTIPLE SWITCH BOARD FOR TELEPHONE EXCHANGES.
No. 308,315. Patented Nov. 18, 1884.

Fig. 4,



WITNESSES

Wm. A. Shunk
Geo. W. Buck

INVENTOR

Milo G. Kellogg

By his Attorney

George P. Barton

(Model.)

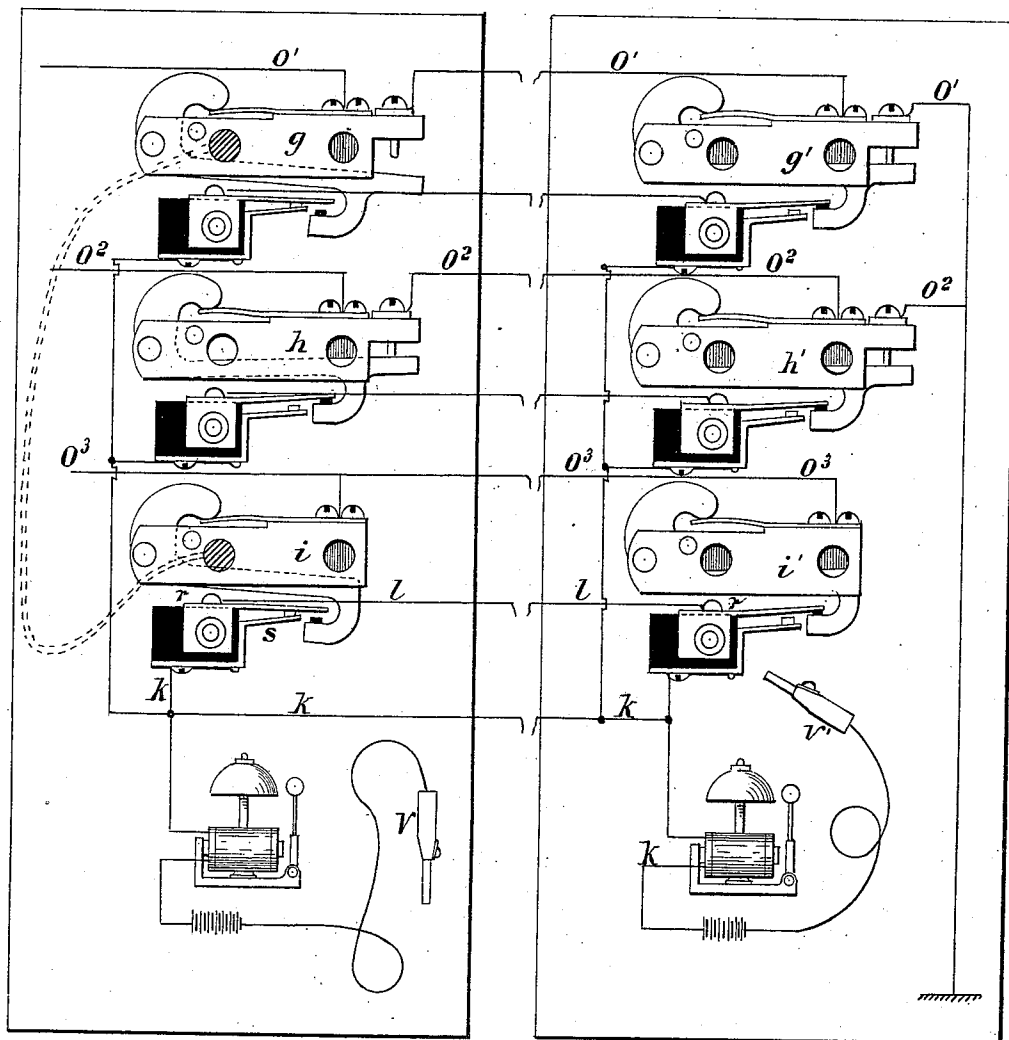
3 Sheets—Sheet 3.

M. G. KELLOGG.

MULTIPLE SWITCH BOARD FOR TELEPHONE EXCHANGES.

No. 308,315.

Patented Nov. 18, 1884.



B¹

Fig 5

B²

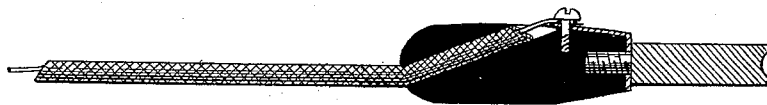


Fig 6

Witnesses

W. C. Corlies
Calvin D. Molf

Inventor

Milo G. Kellogg

By

George P. Barton
Attorney

UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF HYDE PARK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THE WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

MULTIPLE SWITCH-BOARD FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 308,315, dated November 18, 1884.

Application filed May 5, 1881. (Model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Hyde Park, Illinois, and doing business in the city of Chicago, in said State, have discovered certain new and useful Improvements in Multiple Switch-Boards for Telephone-Exchanges, of which the following is such a full, clear, concise, and exact description as will enable those skilled in the art of telephony to practice my invention, reference being had to the accompanying drawings, forming a part of this specification.

My invention is designed to facilitate the work of switching at the central office of a telephone-exchange district system. The multiple-switch-board system may be defined, speaking generally, as a plurality of switch-boards, to each of which the telephone-lines of all the subscribers are branched or connected, so that any two subscribers' telephone-lines may be connected upon any one of the multiple or duplicate boards. There are several methods of sending in the calls to the central office, as by an American District line connected with a group of terminal stations, or by sending a current along the telephone-line through an annunciator at the central office. When the American District signaling system is used, the individual telephone-lines are usually left open at the central office. When the signals are sent in upon the individual telephone-lines, each telephone-line passes to its individual switch or terminal plate upon each of the multiple boards, and from the switch of the last board through a number of annunciators and thence to ground. The terminal plates generally used upon the switch-boards are known as the "jack-knife switch." As heretofore used great confusion has arisen on account of switchmen at one board crossing in upon lines that are in use at other boards.

My invention consists in independent local circuits and electric apparatus, whereby a switchman at any board may readily determine whether the line of a subscriber called for is in use at either of the other boards, and is adapted to any of the known methods or combination of methods of sending in the calls or connecting the terminal stations with or through the central office.

In the drawings, Figure 1, Sheet 1, is a front elevation of two duplicate or multiple switch-boards, A^1 and A^2 , each provided with as many switches or terminal plates $a b c$ and $a' b' c'$ as there are terminal stations. These terminal plates are modified forms of the jack-knife switch, and are adapted to open circuits. Near each terminal plate is placed a circuit-closer in a try-circuit.

Fig. 2 is an edge view from below of the circuit-closer, which consists of a block of rubber, to which are attached three insulated metal pieces, $r s t$.

Fig. 3 is a modified form of the jack-knife switch, partly in section, adapted to closed circuits. My modification consists in the lug projecting from the movable lever, and which is designed to support the insulated metallic piece r of the circuit-closer, and is insulated therefrom, as shown. The telephone-line p of a subscriber may be connected with any portion of the frame of the jack-knife switch. In case said line is grounded at the central office, its circuit passes through the metallic frame and movable lever of the switch and insulated contact point p' , and thence by line p^2 through an annunciator, and thence to the ground-connection. When a plug is inserted in a hole of the jack-knife switch, the movable lever of the switch is wedged away from contact-point p' , thus taking off the ground-wire while the lug q is carried down, allowing the metallic spring or piece r to come in contact with the metallic piece or point s . When the telephone-lines are open at the central office, the switches may be made without the contact-point p' , as shown in Figs. 1 and 2.

Fig. 4 is a detail diagram of the connections of the telephone-lines with their switches upon the multiple-boards and the local or try circuits. Suppose three subscribers, S^1 , S^2 , and S^3 , have their lines L^1 , L^2 , and L^3 respectively connected with a single switch or terminal plate on each of the multiple-boards in the usual manner, and that these subscribers are provided with ordinary call-boxes upon an American District wire calling the central office by means of a prearranged signal. Now, suppose S^1 has sent in his call indicating

that he wishes to talk with some one. The attendant switchman at the board to which the calls of S' have been assigned—we will say the board A' —on receiving the call, inserts a plug at the end of a conducting-cord connecting with the listening operator's telephone in the right plug-hole of switch a . The lever of the switch is thus wedged downward by the plug, and the support of insulated piece or spring r of the circuit-closer being thus removed, said spring comes in contact with contact-point s , as shown. The listening operator, having ascertained in the usual manner that S' wishes to talk with another subscriber—we will say S^3 —tells the switchman, who thereupon connects said listening operator's outfit with line L^3 by inserting another plug at the end of a flexible conductor-cord in the right plug-hole of switch c , and the listening operator, by throwing his battery to line, rings up S^3 . The listening operator having ascertained that the two subscribers are in communication informs the attendant switchman, who thereupon makes the final connection upon the switch-board by inserting plugs at the ends of a flexible conducting-cord in the left holes of the switches a and c respectively of the subscribers S' and S^3 . The switchman now removes the plugs from the right holes of the two switches, and the listening operator is ready to attend to another call. Either one of the subscribers, by a prearranged signal sent over the American District wire, may notify the central office when they are through talking. When this signal is received, it is the duty of the switchman to disconnect their lines by pulling out the plugs from their switches. It will be seen that as long as a plug remains in either one of the holes of a switch the spring r of its circuit-closer will be in contact with point s , and that when there is no plug in either of the plug-holes the contact of spring r with point s of the circuit-closer of said switch is broken. All the circuit-closers of each board are connected with a signaling-instrument and a battery or other source of electricity, as shown. All the metallic pieces t of the several circuit-closers of a given board are connected with one pole of the battery, while all metallic pieces s are connected through an annunciator with the other pole of the battery or other source of electricity, and also with all pieces s of the circuit-closers of the other duplicate boards. The metallic spring r of the circuit-closer of switch c is connected, however, with its corresponding piece-spring, r , of the circuit-closer of switch c' of the second switch-board, A^2 , and in like manner, where there are other duplicate switch-boards, with all springs r of the circuit-closers of the switches of line L^3 , which are severally placed on the different boards. Thus all pieces r of the circuit-closers belonging to a series of switches of a given line are electrically connected. Let us suppose, now, that while S' and S^3 are thus connected on board A' the switchman at any

other of the boards—we will say board A^2 , for example—wishes to connect switch b' of subscriber S^2 with switch a' or c' —we will say, for example, c' of said board A^2 . If the switchman should do this, it would cause confusion, as line L^3 is already in use. Therefore it is necessary for the switchman to find out whether the line L^3 of subscriber S^3 is in use at any other board. He does this by bringing metallic piece t of the circuit-closer of switch c' into contact with metallic piece r of said circuit-closer, which may be done in any suitable manner, as by pressing down upon the portion of the piece t which projects over the conical projection or contact-point of the piece r . Take, for example, circuit-closer of switch c of board A' . When there is a plug in either one of the holes of said switch, metallic pieces r and s of its circuit-closer remain in contact, as shown. When pieces t and r of switch c' are brought into contact, the circuit of the battery at board A^2 will be closed through the signaling apparatus, and the switchman will be notified thereby that the line wanted is in use. The local circuit thus established may be traced as follows: from said battery through the spool of the electro-magnet of the signaling-instrument, as indicated by d , to metallic piece s of the circuit-closer of switch c , thence to spring or piece r , and thence by line e to metallic spring or piece r of the circuit-closer of switch c' , and thence by metallic piece t of said circuit-closer, as indicated by f , to the other pole of said battery. When the switchman thus finds that the line called for is in use at another board, the listening operator informs subscriber S^2 that S^3 is busy. In case the switchman gets no response from his annunciator he proceeds to make the necessary connections with switch c' in the manner heretofore indicated, or in any other well-known way. If, however, the plug of switch c is removed, the lever of said switch will be brought back to its normal position, thereby lifting spring r from contact with piece s . When these pieces r and s are thus separated, the circuit before described is open and the signaling-instrument will not respond, although the switchman at board A^2 should bring spring t into contact with spring r of switch c' . It is necessary in all cases for the switchman, before making a connection with the switch or terminal plate of a subscriber that has been called for, to try and see whether the line wanted is in use at any other board.

In Fig. 5 I have shown front elevations of two multiple boards, B' and B^2 , each provided, as in the case of boards A' and A^2 , with switches g h i and g' h' i' , respectively. The telephone lines O' , O^2 , and O^3 connect with a switch on each of the boards, as in the case of boards A' and A^2 . The lines O' and O^2 , however, are connected with jack-knife switches of the form shown in Fig. 3. These lines come from their terminal stations, and connect, respectively, with the frames of switches g and h be-

ing connected with the frames of switches *g'* and *h'*, the contact-points of the switches *g'* and *h'* of the second board being connected with the ground-wire, an annunciator may be placed at the central office in each of the circuits of the telephone-lines which are connected with the ground, so that the subscribers can signal the central office by throwing a current to their telephone lines. When the telephone-lines are left open at the central office, as in the case of line *O*³, some other means of sending in the call is provided, as before described. Both systems may, however, be combined and worked successfully upon the same multiple boards. The circuit-closers may be the same as heretofore described, and the connections with the signaling devices and batteries or other sources of electricity at the different boards may be the same. I have, however, in Fig. 5 modified the circuit-closers by leaving off the metallic pieces or springs *t*, heretofore described, and in place thereof and their connections have provided the flexible conducting-cords provided with the metallic pointed plugs *v* and *v'*, as shown. One of said plugs is shown in section in Fig. 6.

In order to ascertain whether the line of a subscriber called for is in use, the switchman presses the metallic point of the plug *v* or *v'*, as the case may be, upon the metallic piece *r* of the circuit-closer of the switch of said subscriber. For instance, suppose line *O*³ to be in use at board *B'*, as indicated. On forming contact between the point of plug *v* and the metallic piece *r* of the circuit-closer of switch *i'*, the circuit is complete through the signaling-instrument of board *B'*, as follows: From the battery, as indicated by *k*, through the signaling-instrument to metallic piece *s* of circuit-closer of terminal plate *i*, which is in contact with spring *r*, and thence by line *l* to metallic piece *r* of the circuit-closer of terminal plate *i'*, and thence by metallic pointed plug *v* and its conducting-cord to the other pole of the battery or other source of electricity.

When a plug is inserted in a switch of a telephone-line which is provided with a ground-connection, the lever is separated from the insulated contact-point of said switch, thereby removing the ground-connection, while the insulating-block of the lug *q* is carried away from spring *r*, as before described, allowing said spring to come in contact with metallic piece *s*. The circuit-closers of switches *g* *h* and *g'* *h'* are operated in the same way as the circuit-closers of switches *i* and *i'*.

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

1. Two or more duplicate switch-boards and closed telephone-circuits in combination with local try-circuits, one local circuit for each telephone-circuit and independent therefrom, and electrical apparatus at each board, whereby an attendant at either of the switch-boards may determine whether the line of the subscriber called for is in use.

2. The combination of multiple switch-

boards to which the same telephone-lines are connected with local circuits each normally open at two places, one local circuit for each telephone-line, means for automatically closing at one point the local circuit of any given line when a connection is made with any switch of the line, and signaling apparatus at each multiple board, whereby a preliminary test may be made to determine whether any given line called for at one board is in use at any other board.

3. The combination of local circuits, each normally open at two points, with series of switches upon the multiple switch-boards of the telephone-exchange, one local circuit for each series of switches, circuit-closers or test-keys in said local circuits, one circuit-closer or test-key near each switch, and signaling apparatus at each board, whereby a preliminary test may be made to determine whether any given line called for at one board is in use at any other board.

4. A circuit-closer in a local circuit on each board of a multiple system of switch boards, in combination with each subscriber's switch, the circuit-closers being connected with a local battery and signaling-instrument at each of the boards.

5. Two or more duplicate switch-boards, each provided with a switch for each subscriber's line, the switches on the different boards being combined with local circuit-closers in try-circuits of a local battery, and signaling-instruments at each of said duplicate boards.

6. The combination of two or more duplicate switch-boards of a telephone-exchange system with series of switches, one series for each telephone-line, and one switch of each series being on each board, local circuit-closers, one circuit-closer for each switch, each circuit-closer being closed automatically by inserting a plug in its switch, signaling-instruments, one at each board, and local circuits, as described, whereby the operator at any board, by trying, may determine whether a line is in use at another duplicate board.

7. The circuit-closer consisting of a block of insulating material, and metallic pieces *r* and *s*, in combination with a plug and flexible cord, or their equivalents, and a battery and signaling-instrument, substantially as shown and described.

8. A jack-knife switch, the lever of which is provided with lug *q*, in combination with a circuit-closer of the try-circuit.

9. The combination of two or more series of switches, each switch of a series being on a different switch-board, with telephone-lines, one line passing through each of said series and to ground, and mechanism or electric apparatus whereby a switchman at either of the boards may readily determine whether the line of a subscriber called for is in use at any other of the duplicate boards.

10. The combination, substantially as hereinbefore set forth, of multiple switch-boards,

each provided with as many terminal plates or switches as there are telephone-lines, with two contact-pieces near each terminal plate or switch, permanently insulated therefrom and normally disconnected from one another, means for automatically connecting the pair of contact-pieces near any given terminal plate or switch when a connection is made with said terminal plate or switch, the contact-pieces, as piece *r*, of the pairs belonging to the series of switches of any given line being electrically connected, a branch circuit, including a battery and signaling-instrument, at each board, permanently connected with all of the other contact-pieces, as pieces *s* of all the pairs upon all the boards, and means for connecting the other pole of the battery at any given board with any one of the several contact-pieces of the different pairs, as piece *r*, upon said board, whereby a preliminary test may be made at any board to determine what telephone-lines are in use at other boards.

11. The combination, with telephone-exchange multiple switch-boards, of test circuits, one test-circuit for each telephone-line, a battery, and means for connecting and disconnecting the battery and any test-circuit and apparatus at the different boards, whereby an operator may determine whether the battery is connected with any given test-circuit.

12. The combination, with a spring-jack switch and its plug, of a key provided with contact-points and controlled by the movement of the lever of the spring-jack, whereby the spring-jack is opened and the contact-points of the key closed when the plug is in-

serted, the spring-jack being closed and the points of the key opened on the removal of the plug, substantially as and for the purpose specified.

13. The combination, with a spring-jack switch, of an insulated contact spring operated thereby, whereby a local circuit may be closed, substantially as and for the purpose specified.

14. Multiple switch-boards provided with series of switches, one series for each telephone-line, and one switch of each series on each board, in combination with local try-circuits, one for each line, extending to all the boards, and electrical apparatus, whereby the attendant at any given board may make a preliminary test to determine whether the line called for is in use.

15. Multiple switch-boards provided with series of switches, one series for each telephone-line, and one switch of each series on each board in combination with electric apparatus and circuits, whereby a switchman at either board may determine whether the line of a subscriber called for is in use.

16. In a telephone-exchange system, the combination of two or more switch-boards, two telephone-lines connected together for conversation, and electric apparatus and circuits, whereby an attendant at either of said boards may readily determine that either of said lines is in use.

MILO G. KELLOGG.

Witnesses:

CHAS. A. BROWN,
WM. R. PATTERSON.