

(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCH BOARD.

No. 387,890.

Patented Aug. 14, 1888.

Fig. 1^a.

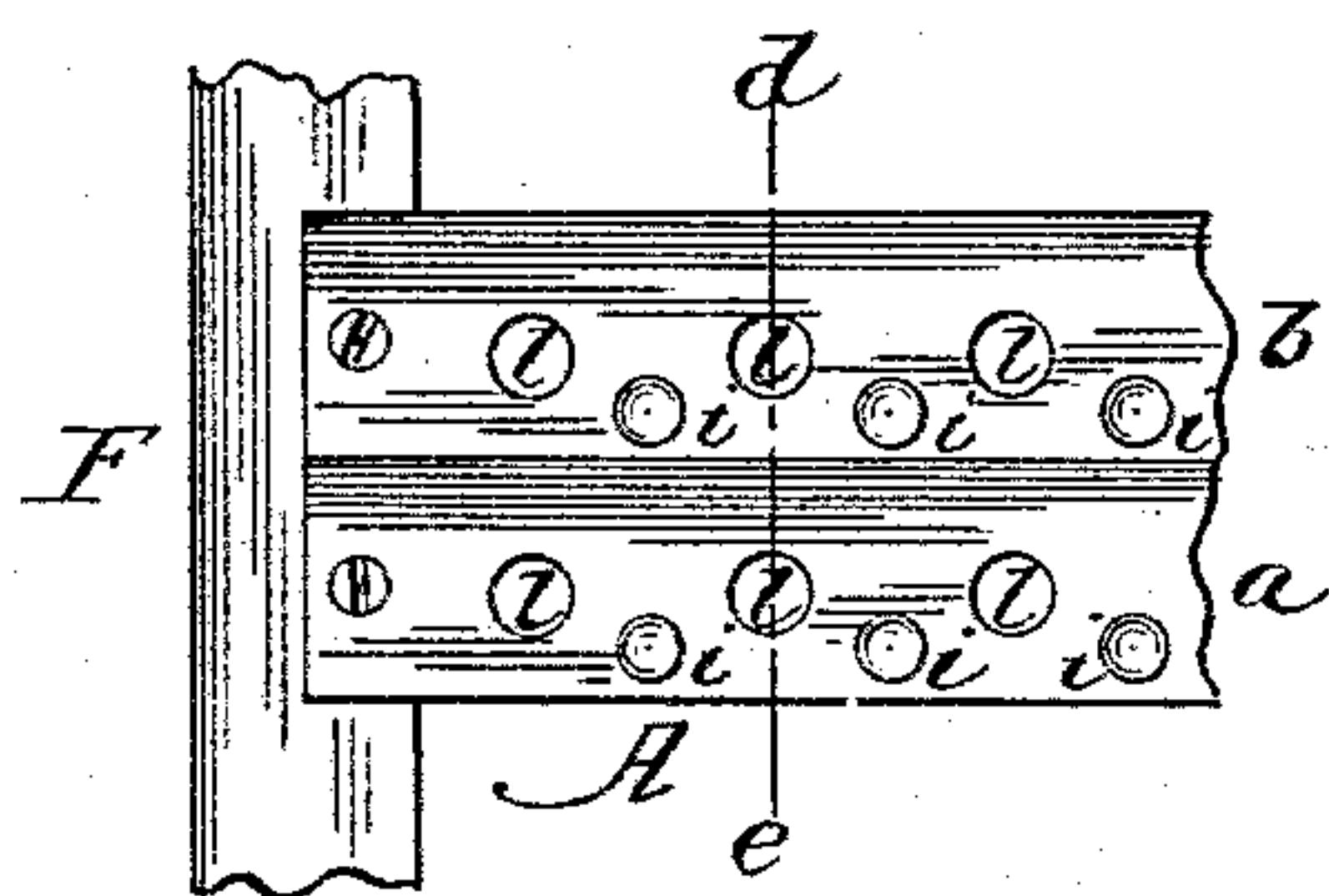


Fig. 1^b.

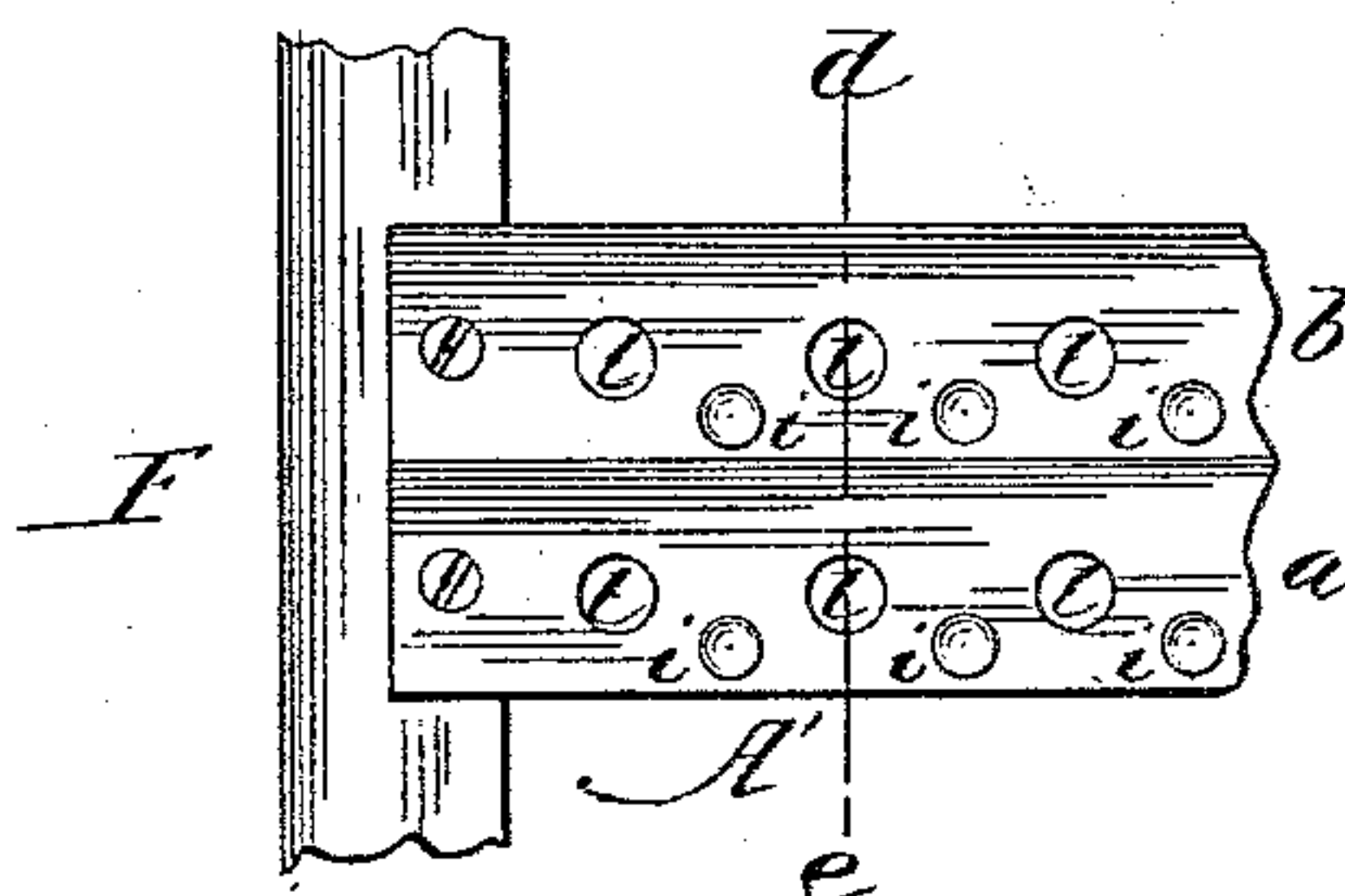
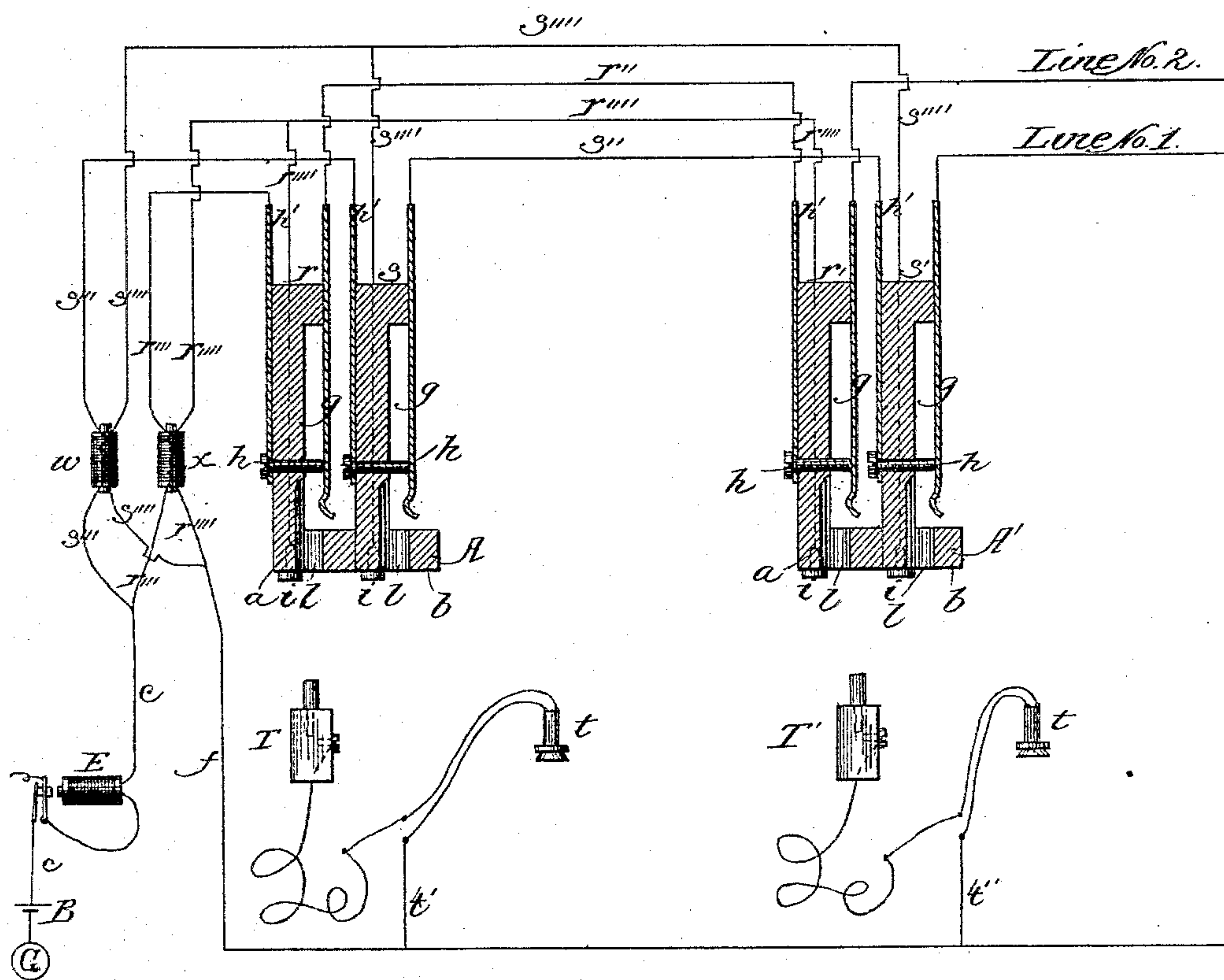


Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF HYDE PARK, ILLINOIS.

MULTIPLE SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 387,890, dated August 14, 1888.

Application filed August 25, 1887. Serial No. 247,843. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Hyde Park, Illinois, have invented a certain new and useful Improvement 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 in independent local circuits and electric apparatus whereby an operator 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 methods or combination of methods of sending in the calls and connecting the subscribers' lines with or through the central office.

Figures 1^a and 1^b of the drawings are front views of sections of two multiple switch-boards to which the same lines are connected. Fig. 2 shows a complete diagram of the boards with their connections and all the central-office apparatus, circuits, and connections necessary to operate 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. 1^a, as indicated by line *d* *e*, and A' is a sectional view of the switch-board shown in Fig. 1^b, as indicated by line *d* *e*. *a* *b* represent rubber strips on which the metal parts of the line-switches are mounted. These strips may be long enough to receive any convenient number of switch parts. Spring-jack switches are shown; but others might be used. *ll*, &c., are round holes through the front of the strips, adapted to receive the switch-plugs. The contact-springs *g* *g*, &c., of the switches are mounted on the strips to the rear of and parallel to the holes *ll*, &c., to which they belong, as shown. The contact-points *h* *h*, &c., on which the contact-springs or spring-levers normally bear, pass through the strips and have connecting-pieces *h'* *h'*, &c., as shown.

The several parts mentioned above are so made, shaped, arranged, and adjusted that when a plug is inserted into any of the holes it raises the spring-lever in the rear of the hole from the contact-point on which it normally bears and the metal piece of the plug, and con-

sequently its conducting-cord is connected to the spring-lever. Each section of a rubber strip, with its spring-lever contact-point and the hole, all arranged and operating as above, may be called a "spring-jack switch." I place on each board one switch for each line. The switches for a line on the different boards may be called a "series of switches." I also place on each board for each line a test-bolt or contact-piece adapted to have a test-plug or other test device applied to it. The test-bolts of a line or the different boards may be called a "series of test-bolts." The test-bolts are marked *i* *i*, &c. One is placed for each line to the right of the hole of the line-switch, as shown. They may be placed in any other convenient position, providing they are so placed or marked that the operators may readily tell to what lines they belong.

Two subscribers' lines are shown in the drawings. They are marked "line No. 1" and "line No. 2." *s* and *s'* are the switches for line No. 1 on the two boards, and *r* and *r'* are the switches for line No. 2 on the two boards. Line No. 1, after entering the office, passes to the 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 the common ground-wire *c*. Line No. 2 is shown as connected in a similar manner through its series of switches and to the common ground-wire. The other lines of the exchange would be connected in a similar manner. Other boards might be added to the exchange, and the circuit of the lines through their respective series of switches on the different boards would be similar to the above and such as would be apparent to those skilled in the art.

I place in the common ground-wire an electric battery (marked B) and an automatic electric vibrator, (marked E.) The battery and the vibrator are so adjusted to each other and to the circuits that the vibrator will continually operate when connected as shown. The battery should not, however, be strong enough to operate any calling-annunciator or signal-bell which may be in the circuit of any subscriber's line.

In the circuit of each line in the office I place one of the coils of an induction-coil. w represents the induction-coil for line No. 1, and x the induction-coil for line No. 2. Each line has an induction-coil connected as shown.

The independent local circuits for testing are as follows: f is a return or common wire for the system. t t' are test-wires, which branch off from the common or return wire f at the boards A and A', and, passing through the telephones t and t' , terminate in the test-plugs T and T'. From the common or return wire individual test-wires branch off for each line, each of which passes through the coil of the induction-coil, mentioned above, of its line which is not connected in the circuit of its line and is connected to all the test-bolts i i' of the series of test-bolts of the line. r'''' and its branches (also marked r'''') is the individual test-wire of line No. 2, as described above, and s'''' and its branches (also marked s'''') is the individual test-wire of line No. 1.

Well-known apparatus and methods may be used to receive and answer the calls and make the necessary connections of the exchange. The telephones which are described above are used as test-receiving instruments, and by suitable arrangements of circuits and apparatus they may be also used as operators' telephones on which to receive the orders of subscribers. The lines are grounded at the central office and their other ends.

When the apparatus and lines are connected as above described, and intermittent currents are generated in the common ground-wire, and a line is not switched for conversation at any board, such currents will pass through the line-wire. When a line is, however, switched for conversation at any board, the circuit from the common ground-wire through the line is interrupted, and no such intermittent current will pass from the battery to the line.

Should an operator at any board apply her test-plug to the test-bolt of any line and the line should not be switched at either of the other boards, an intermittent induction-current would pass through her telephone, which she would hear, and would therefore know that the line was not in use. Should she not hear the noise of the intermittent current in her telephone, she would know that the line she was testing was in use at another board, and she would act accordingly. This is my test system, which is based on the use of induction-coils to transmit intermittent currents to the lines into induced currents in independent test-circuits for the lines and in apparatus and switching devices for testing their existence.

Any kind of switching apparatus and any system of operating an exchange may be used which will cut off the current from an induction-coil when its line is switched for conversation.

I do not herein claim as of my own invention in a multiple switch-board system the circuit connecting together the springs of several

spring-jacks—one upon each board—another circuit connecting together the test-pieces of the said jacks, and a constantly-vibrating circuit-breaker included in the circuit between the frames of the jacks, in combination with a telephone and test battery whereby an operator may determine, by closing the said telephone to one of the test-pieces, whether the line is open at any one of the spring-jack switches, as my invention involves a different organization of apparatus having material advantages.

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

1. In a telephone-exchange system, subscribers' telephone-lines normally grounded at the central office and grounded at their other ends, two or more switch-boards at the central office for said lines, each board having a switching device for each line, each switching device being adapted to temporarily disconnect its line from the office-ground and to connect the line with another line for conversation, a battery, and an automatic vibrator, or their equivalent, in the common ground-wire of said lines, induction-coils, one for each of said lines, one of the coils of each of said induction-coils being in the circuit of its line, individual test-wires, one for each line, in the circuit of each of which is the other coil of the induction-coil of the line, test-bolts, one for each of said lines on each of said boards, to each of which the individual test-wire of its line is connected on one side of its coil, a common or return wire to which said individual test-wires are connected on the other sides of the coils, and branch test-wires, one for each board, each having in its circuit a telephone or other test-receiving instrument, each branch wire being connected on one side of its test-receiving instrument to said common or return wire, and being connected on the other side to a flexible cord with a test-plug or other switch-testing device adapted to be brought into connection with any test-bolt at its board, whereby an operator at any board may connect her test-receiving instrument into a circuit with the test-wire of any line and determine whether the line is in use.

2. In a telephone-exchange system, telephone-lines connected to two or more switch-boards and adapted to be switched at either of them, induction-coils, one for each line, one coil of which is in the circuit of its line and the other coil of which is in an independent test-wire for said line, an intermittent electric-current producer in the circuit of each of said lines when it is not switched for conversation, but not otherwise, test-receiving instruments, one at each board, and switch-testing devices whereby any test-receiving instrument may at the will of an operator be placed in circuit with any of said test-wires, and she may thereby determine whether the line which belongs to said test-wire is switched for conversation.

3. In a telephone-exchange system, a telephone-line, a local test-circuit for said line, an

induction-coil for said line, one coil of which is in the main line and has an intermittent current passing through it when it is not switched for conversation, and the other coil of which is in said local test-circuit, a switching device or devices adapted at the will of an operator to switch said line for conversation, and while the line is so switched to cut off said intermittent current from said coil, a test-receiving instrument, and a switch-testing device or devices adapted to close said test-receiving instrument through said local test-circuit, substantially as and for the purpose set forth.

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Witnesses:

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