

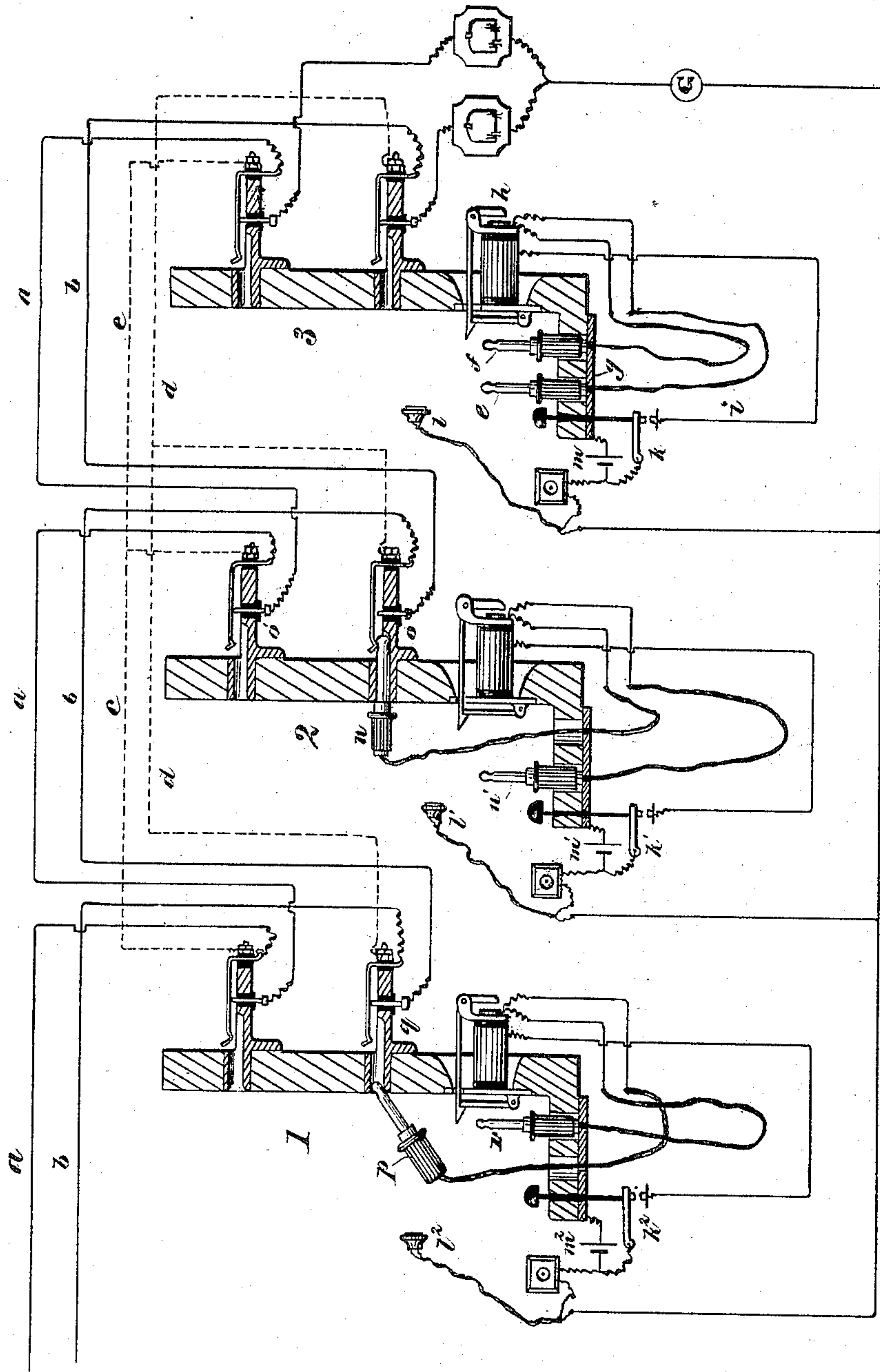
(No Model.)

C. E. SCRIBNER.

MULTIPLE SWITCH BOARD TESTING APPARATUS.

No. 330,059.

Patented Nov. 10, 1885.



Attest

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# UNITED STATES PATENT OFFICE.

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## MULTIPLE-SWITCH-BOARD TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 330,059, dated November 10, 1885.

Application filed October 15, 1883. Serial No. 108,985. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Multiple-Switch-Board Testing Apparatus for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to multiple-switch-board testing apparatus for telephone-exchanges. The connecting-cords at the different boards are arranged in pairs and provided with the usual terminal plugs. The different pairs of plugs at each board preferably rest in contact with a common connecting-piece. The frames of the different spring-jack switches are normally insulated from the telephone-lines, the frames, however, of a series of switches belonging to a given line being connected together. At each multiple board I provide a battery in the circuit of the operator's telephone and transmitter. The battery may consist of only one or two cells.

In the drawing, which is illustrative of my invention I have shown three multiple switch-boards, 1, 2, and 3, and two telephone-lines, *a* and *b*, connected each with a switch upon each board and through an annunciator to ground. The frames of the switches of each line are connected together. Thus the frames of the switches of line *a* are connected by wire *c*, and the frames of the switches of line *b* are connected by wire *d*, as indicated by dotted lines in the drawing. The frames of each series of switches, though connected together, are normally open to earth. The insertion of a plug in any switch of a series crosses all the switches of the series with the line which is connected with said plug.

My invention herein is designed to enable an operator to test to determine whether there is such a cross on a line wanted by means of the same plug with which he is about to establish a connection with the line wanted.

I have shown so much of the operator's apparatus at each of the three boards as is necessary to illustrate my invention. I will de-

scribe this testing apparatus in detail as shown at board 3.

The terminal plugs *e f* of the pair of flexible connecting-cords rest in contact with the common connecting-piece *g*. The clearing-out annunciator *h* is included in the circuit of the cords in the usual manner. The branch circuit *i* is connected between the two spools of the electro-magnet of the clearing-out annunciator and extends to the key *k* of the operator's telephone *l*. The testing-battery *m* is included in the circuit with the telephone. The calls of the subscribers are sent in in any well-known way. The operator whose business it is to answer the calls of a given subscriber, as soon as she sees the calling-annunciator fall, inserts a plug of one of the pairs at her board in the calling subscriber's switch. This is illustrated at board 2, plug *n* being inserted in switch *o* of line *b*. The line *b* is thus cut off from board 3 and connected to ground through the testing-battery *m'* and telephone *l'*. When the other plug, *n'*, is inserted into switch *o'* of another subscriber, the two subscribers will be connected together through the pair of cords, while the telephone *l'* and battery *m'* will be out of circuit.

The test to determine whether a line called for is in use is made by the operator while in the act of inserting the plug. The operator at the moment of making the connection with the line of the calling subscriber tests to determine whether a connection has been made with the said line during the few seconds which may have elapsed since the call was sent in. This test is made at the first contact of plug *n* with the frame of switch *o*. If at this first contact of plug *n* with switch *o* a click is heard in the telephone *l'*, the operator will know that a plug is inserted in some other switch of the line, forming a cross, which gives circuit to test battery *m'* through telephone *l'*. Therefore, when the click is heard, the plug *n* should not be inserted; but if no click is heard in the telephone *l'* the operator at once inserts plug *n* into switch *o*, as shown at board 2. The same plug is used for testing and for making the connection with the telephone-line.

The operator having learned which line is



called for, must also test to determine whether the line wanted is in use. In order to determine this the operator takes the plug from the switch of the calling subscriber and applies it to the switch of the subscriber who has been called for. Thus, as shown at board 1, plug *p* touches the frame of switch *q* of line *b*. The line being in use, as shown at board 2, the frame of switch *q* will be found crossed with line *b*. The operator will discover this by listening at telephone *l*<sup>2</sup> when the battery *m*<sup>2</sup> is closed to line as the plug *p* touches the frame of switch *q*. The circuit may be traced from the ground at the central office through telephone *l*<sup>2</sup>, the transmitter, and battery *m*<sup>2</sup> to the common connecting-piece, and thence to plug *r*, and thence through the pair of cords to plug *p*, and thence to the frame of switch *q*, and thence by line *d* to the frame of switch *o* of the second board, and from the point of the plug *n* to line *b*. Thus, if the battery *m*<sup>2</sup> is closed to line, the operator will hear a click at telephone *l*<sup>2</sup>. If she hears no click, she will know that this line *d* is open, and the line *b* not being in use she will insert the plug *p* in switch *q* and send a call to line *b* in the usual manner. The other plug, *r*, of the pair may then be lifted from the common connecting-piece and inserted in the switch of the subscriber who sent in the call. The two lines will thus be connected together through the pair of flexible cords, and the telephone *l*<sup>2</sup> and the test-battery will be out of the circuit.

The telephone-key *k* may be used to connect the telephone with the circuit of the connected lines to enable the operator to listen out.

There are modifications of my invention that will readily suggest themselves to an electrician which may be made in my apparatus without departing from my invention. The operator's telephone and battery, for example, may be included in any part of the circuit between the plug *p* and the central-office ground, and any well-known switching apparatus may be used to cut out the said telephone and battery from the circuit of two connected lines. Other forms of switches may also be used upon the multiple switch-boards. I therefore do not limit myself to the special constructions shown; but

I claim, broadly—

1. In a multiple-switch-board system, a test-circuit consisting of a pair of connecting-cords and their terminal plugs, a common connecting-

piece with which the plugs are normally in contact, a ground-connection for said common connecting-piece, and a telephone and test-battery included in said ground-circuit, substantially as and for the purpose specified.

2. The combination, at any one of the multiple switch-boards of a telephone-exchange, of one or more pairs of plugs and cords with a common connecting-piece, to which the different pairs of plugs are normally connected, and a testing-battery and telephone, whereby when either plug of a pair is applied to the switch of a subscriber's line the telephone and testing-battery will be included in the circuit between said plug and the central-office ground.

3. The combination, with the switches of a multiple switch-board, of a circuit including a telephone-receiver, a test-battery, and pairs of cords and plugs normally in connection with said circuit, whereby a test and connection may be made by means of either one of the plugs of any pair.

4. The combination, with a pair of connecting plugs and cords and a common connecting-piece with which said plugs are normally in contact, of a branched ground-circuit, one branch of said ground-circuit being connected through a battery to the common connecting-piece and the other branch connected through a normally-open listening-key to the circuit of the connecting-plugs, whereby a connection may be established through the telephone-receiver to the connected lines of two subscribers without including the battery in circuit, substantially as set forth.

5. The combination, with a pair of connecting plugs and cords, a common connecting-piece with which said plugs are normally in contact, and a clearing-out annunciator in circuit between the plugs, of a branched ground-circuit, one branch of said ground-circuit containing a battery and being connected to the common connecting-piece, the other branch containing a listening-key and being connected between the spools of the clearing-out annunciator, substantially as and for the purpose set forth.

In witness whereof I hereunto subscribe my name this 12th day of October, A. D. 1883.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,  
PAUL A. STALEY.