(No Model.) 2 Sheets—Sheet 1.

G. M. PHELPS, Jr.

DUPLICATE SWITCH BOARD FOR TELEPHONE EXCHANGES.

No. 285,670. Patented Sept. 25, 1883.

Fig. 1

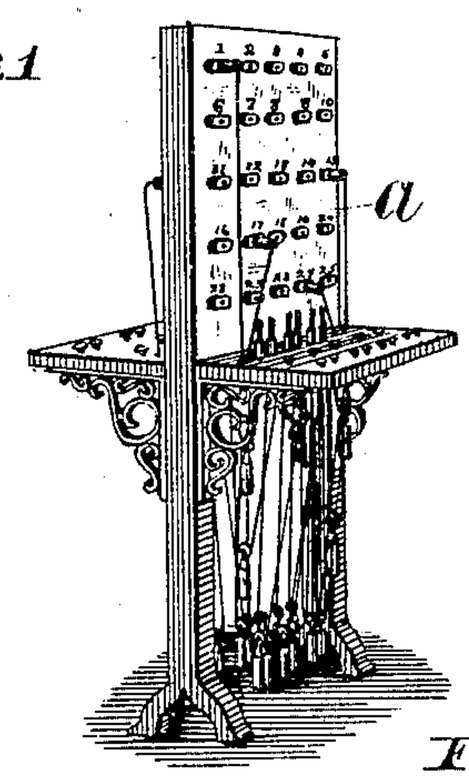


Fig. 2

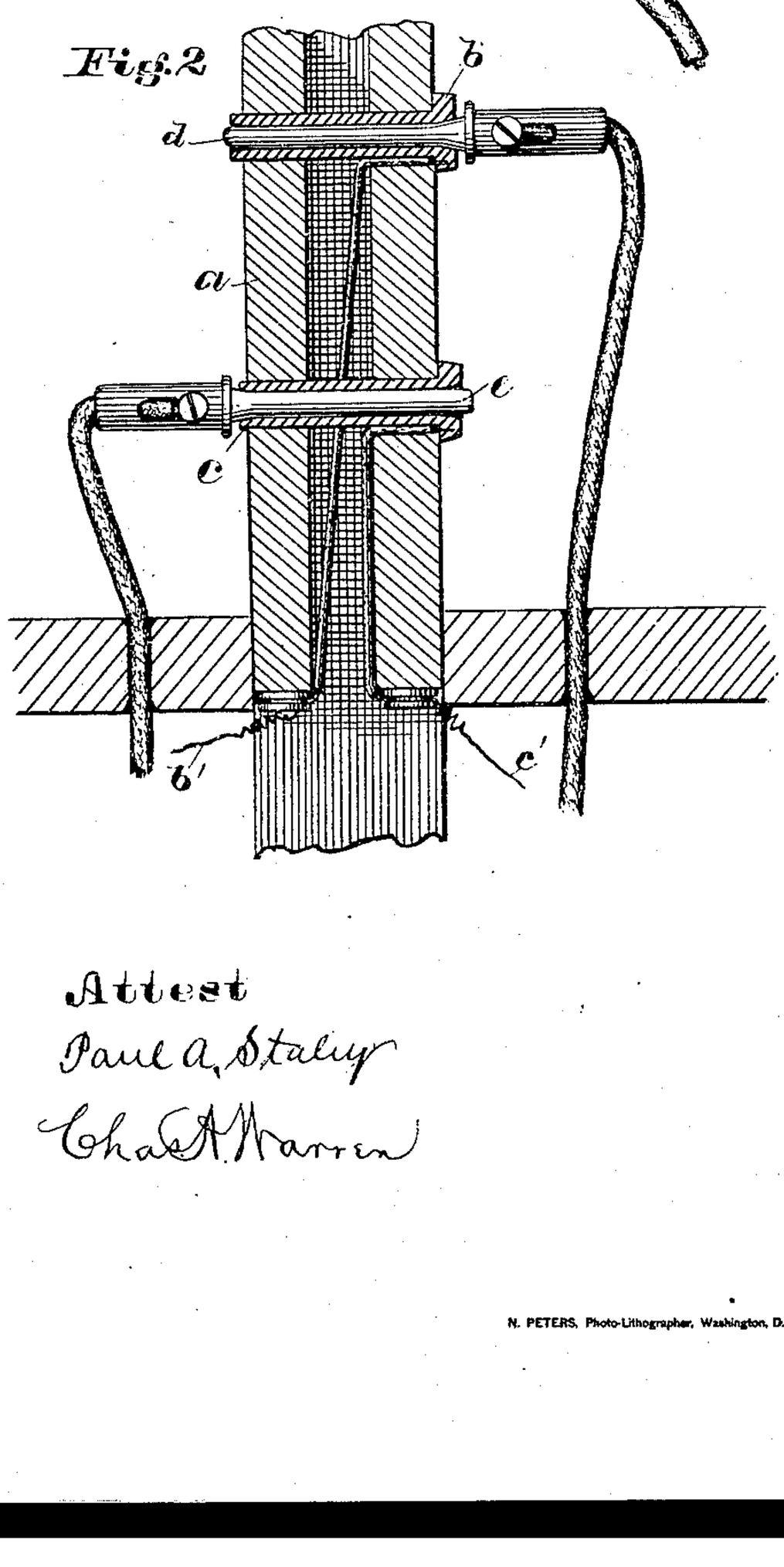


Fig. 3

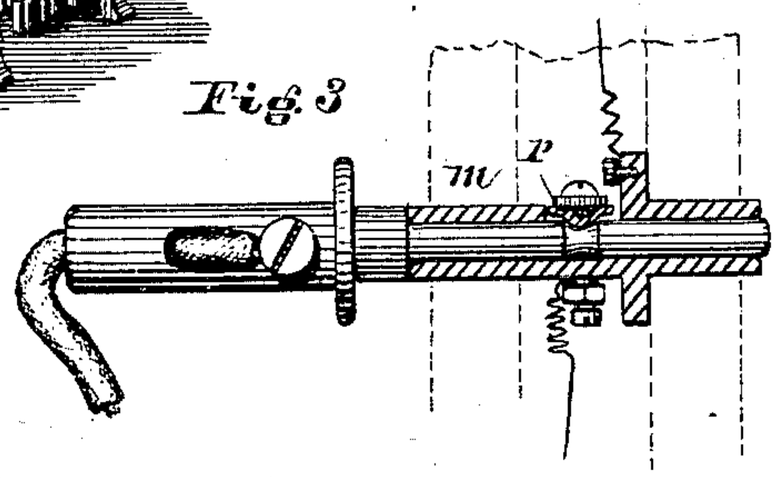
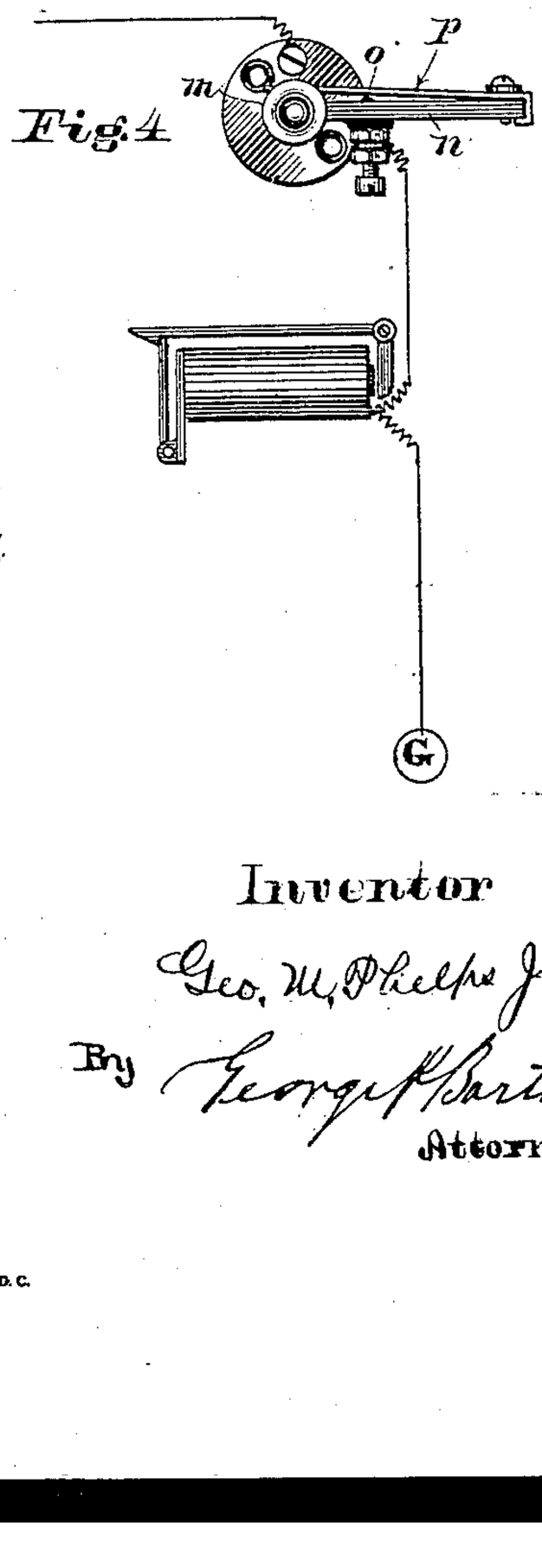


Fig. 4



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(No Model.) 2 Sheets—Sheet 2

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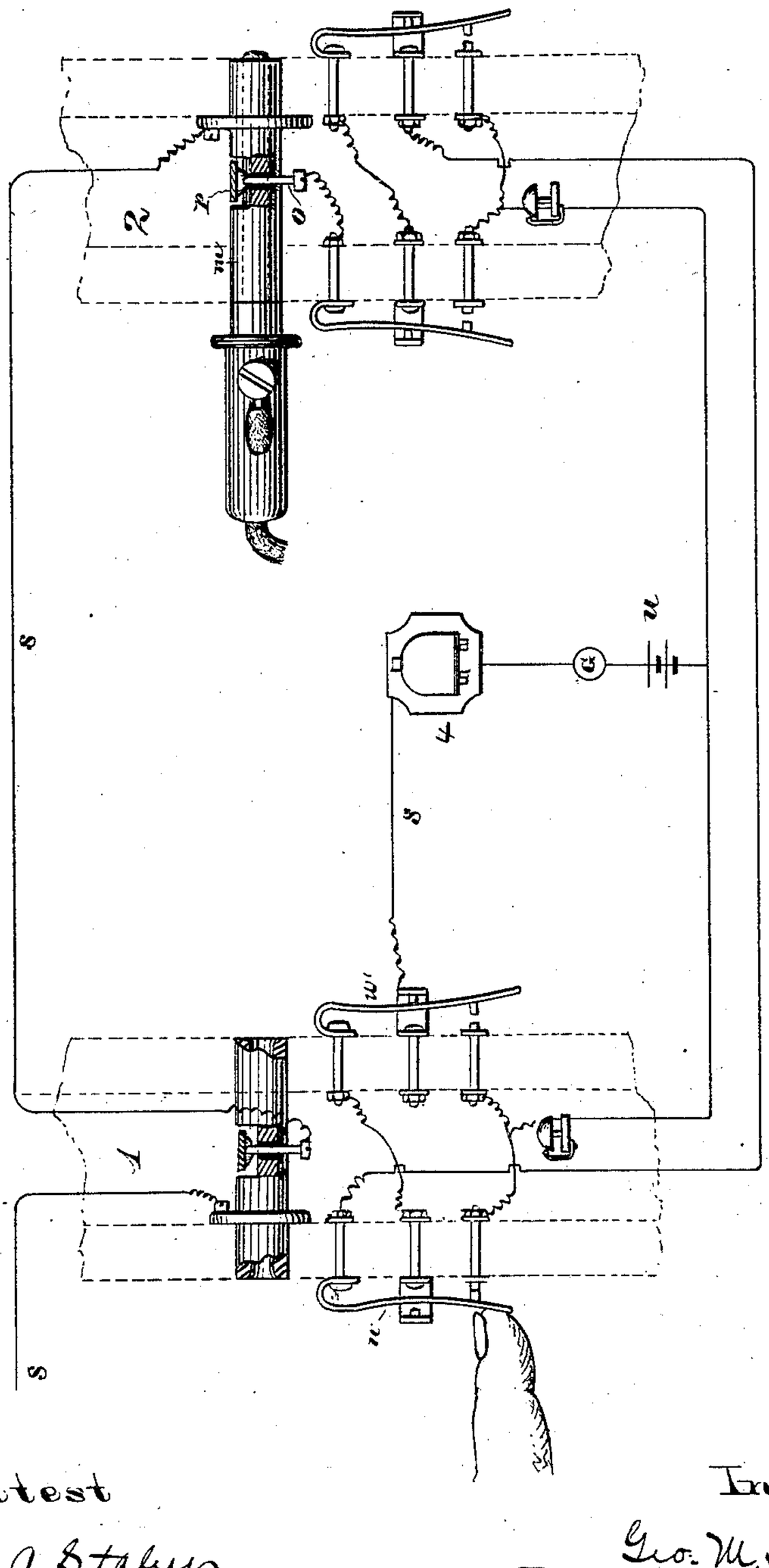
Fig. 5



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UNITED STATES PATENT OFFICE.

GEORGE M. PHELPS, JR., OF BROOKLYN, NEW YORK, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

DUPLICATE SWITCH-BOARD FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 285,670, dated September 25, 1883.

Application filed November 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. PHELPS, Jr., a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Duplicate Switch-Boards and Spring-Jacks 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 telephone-exchange apparatus; and it consists of a switch-board having switches or connecting-plates adapted to be used from either side of the board for connecting any of the telephone-lines on the board.

It further consists in a novel construction of spring-jack switches, and in combinations of parts hereinafter described and claimed.

Prior to my invention multiple switch-boards, with automatic means for ascertaining what lines were in use upon the different boards, were largely used, and the Warner spring-jack was usually employed where the telephone-lines were closed at the central office; but no system had been devised whereby the two sides of one switch-board could be used for making the connections between the same telephone-lines.

My invention may be used in any exchange where switch-board room for two or more switchmen is required. Where only two switchmen are required to do the work of switching, I use only one of my boards. My system, however, is adapted to multiple systems where many boards are used, and when thus applied the system may be appropriately termed the "double-multiple" system of telephone-exchange, since every multiple-board would have two sides, upon either of which any two telephone-lines could be connected, and the automatic system of determining at any given board which lines are in use upon another board can be operated from either side of my switch-board before a plug is inserted in a spring-jack or switch from either side of the board.

In the drawings which are illustrative of my invention, Figure 1 is a perspective view of my double-sided switch-board. Fig. 2 is a partial sectional view of the same enlarged, showing two terminal bolts or switches for open lines, with plugs inserted. Fig. 3 is a sectional view of my improved switch or spring-jack, which I use when the lines are closed at the central office. Fig. 4 shows the circuit of a telephone-line to the spring-jack, and thence through an annunciator, 4, to ground. Fig. 5 represents my system adapted to multiple-boards.

Like letters are indicated by similar letters of reference.

The switch-board *a* is provided with as many bolts or switches *b c* as there are telephone-lines *b' c'*. The plugs *d* and *e* are made preferably long enough to be seen on the opposite side of the board from which they are inserted, and thus when a line is connected on one side the plug-hole of the switch is obstructed on the other side, and the operator on that side can see at a glance that a particular line is occupied, and confusion is avoided.

My spring-jack switch shown in Figs. 3 and 4 consists of a hollow frame, *m*, having at right angles thereto an arm, *u*, provided with the insulated contact-point *o* and the lever or spring *p*, which normally rests against the said contact-point *o*. The telephone-line is connected to the frame *m*, and the point *o* is connected by suitable means to ground. The circuit of the telephone-line is thus normally closed through an annunciator to ground by frame *m*, spring *p*, and contact-point *o*. When a plug is inserted from either end of the frame *m*, the spring *p* is lifted, as shown, so that the circuit of the line to ground is broken and a new circuit is established through the plug and conducting-cord.

In Fig. 5 I have shown the telephone-line connected with double spring-jacks and test-keys on multiple-boards through an annunciator, 4, to ground. I have also shown a local circuit containing a signaling-instrument at each board. I have shown but one telephone-line, S, passing from the switch on board 1 to the switch on board 2. From the contact-point *o* of the switch on the last board the cir-

cuit may be traced to test-keys on the two sides of the last board, as shown, and thence to test-keys *w w'*, and thence through annunciator 4 to ground. Thus each telephone-line of a system may be connected to a single switch upon each of the double multiple-boards, and from the switch of the last board through test-keys, one on each side of each of the double multiple switch-boards, and through an annunciator to ground. This circuit is normally closed, so that a subscriber, on sending a current to line, drops the shutter of annunciator 4. When a plug is inserted in a spring-jack, as shown at board 2, the line *s* is connected to the flexible cord of the plug and opened at the contact-point *o* of the spring-jack, thus disconnecting the line from all test-keys and from the ground. Suppose a line thus in use is called for at another board. By closing the battery *u* through the buzzer or magneto-bell *v* by test-key *w*, a test may be made at any of the other boards to ascertain if the line is in use. As shown in the drawings, the circuit being open, no current will be sent through the buzzer or magneto-bell *v*. If, however, the line be not connected at any of the boards, the buzzer will ring, indicating that the line is free, and at the same time current will be sent to line, giving the subscriber notice of the call. Any other system of test or try circuits may be used to adapt my system to the multiple system.

Having thus described my invention, I claim as new and original—

1. The combination, upon a switch-board, of switches and telephone-lines, one switch for each line, and means, substantially as described, whereby any two lines may be connected from either side of the board.

2. The combination, upon a telephone-exchange switch-board, of switches, one for each telephone-line, said switches being each provided with a plug-hole adapted to receive a plug from either side of the board, whereby any two telephone-lines may be connected from either side of the switch-board, substantially as and for the purpose specified.

3. A spring-jack composed of a frame, *m*, adapted to receive the plug from either end, in combination with the spring *p* and insulated contact-point *o*, substantially as and for the purpose specified.

4. In a spring-jack, a frame, *m*, hollow throughout its length, and having at right angles thereto an arm, *n*, provided with a spring, *p*, and insulated point *o*, said spring being placed in the middle of the length of said frame, in combination with a plug, which may be inserted from either end of the frame *m* and come into contact with the spring *p*, substantially as and for the purpose set forth.

5. The combination, with a switch-board for telephone-exchanges to which many telephone-lines are connected, of switches, one for each line, through which a telephone-line is normally closed to ground, each of said switches being adapted to receive a plug from either side of the board, whereby any two telephone-lines may be connected and their ground-circuits automatically opened, substantially as described.

6. A double-sided switch-board, in combination with switches and telephone-lines, one switch for each line, and connecting-plugs which, when inserted from one side, are visible on the other side of the board, as and for the purpose specified.

7. The combination of two, three, or more switch-boards with switches adapted to receive plugs from either side of the boards, respectively, one switch on each board for each telephone-line, and electric apparatus at each board adapted to be operated from either side thereof, whereby the switchman may test to determine whether a line wanted is in use, and at the same time send current to line to ring up the subscriber.

8. The combination of the circuit of telephone-line *s* with spring-jack switches, one switch on each of the multiple-boards, and testing apparatus on each board near each switch, and buzzers or magneto-bells *v v*, one for each board included in local circuit, said switches and testing apparatus being adapted to be operated from either side of any given board, as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 30th day of October, A. D. 1882.

GEORGE M. PHELPS, JR.

Witnesses:
WM. J. ARMSTRONG,
CHAS. A. BROWN.