

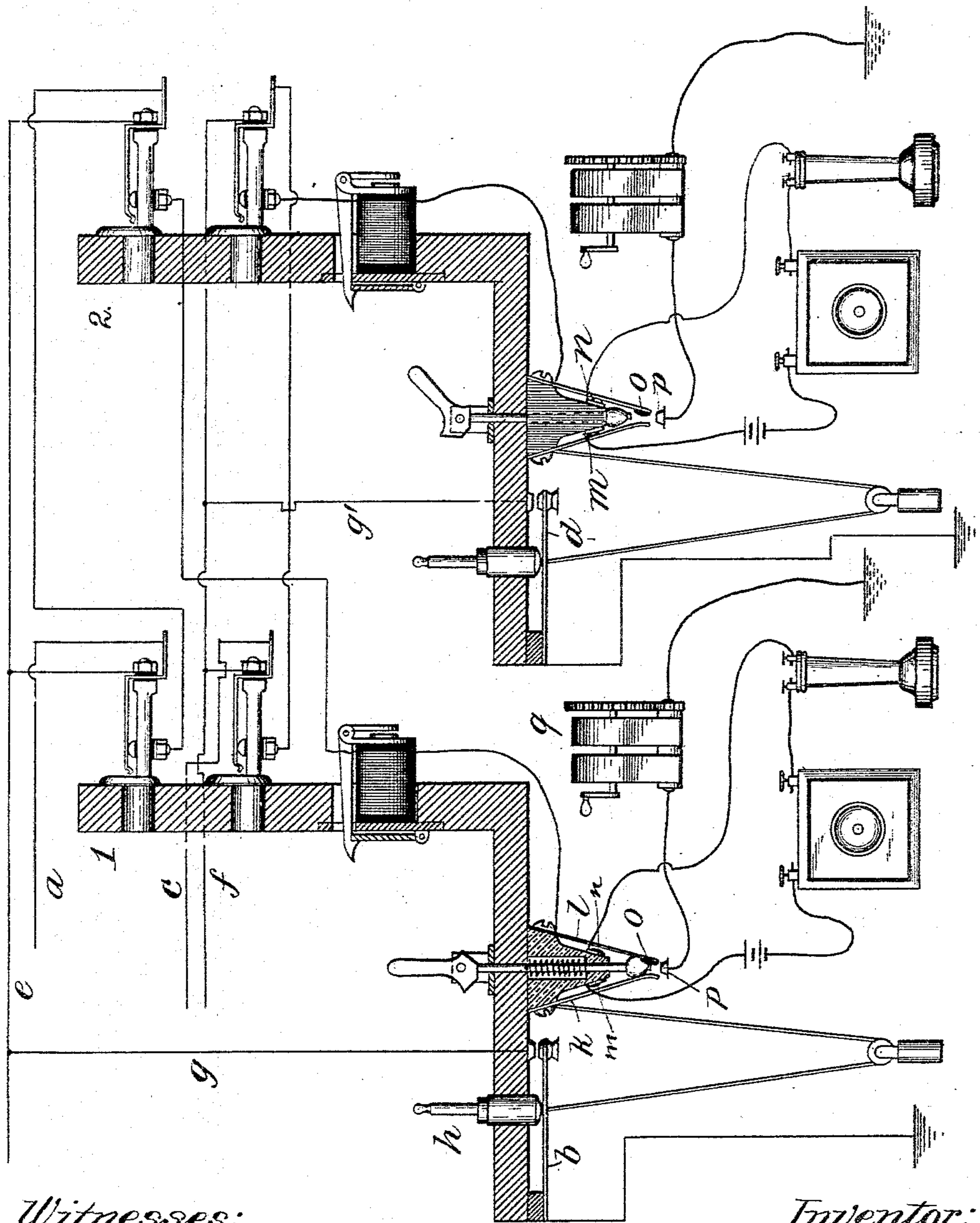
(No Model.)

E. P. WARNER.

MULTIPLE SWITCH BOARD SYSTEM OF TELEPHONE EXCHANGES.

No. 356,859.

Patented Feb. 1, 1887.



Witnesses:  
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Att'y

# UNITED STATES PATENT OFFICE.

ERNEST P. WARNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN  
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MULTIPLE-SWITCH-BOARD SYSTEM OF TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 358,859, dated February 1, 1887.

Application filed November 6, 1886. Serial No. 218,172. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST P. WARNER, 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 Systems of 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 systems of telephone-exchanges, and more particularly to that system in which the telephone-lines, after passing through their spring-jacks and other apparatus, are connected through cords and plugs to ground, a cord and plug thus being included in the ground portion of each of the lines. The cords are distributed at the different boards, preferably in the same manner as the individual annunciators, so that when a call comes in from any line the cord of said line will be at the same board as the individual annunciator which indicates the call.

The operator finds out by listening at his telephone what connection is wanted, and then inserts the plug of the calling subscriber in the switch of the subscriber called, and, throwing battery to line, summons the called subscriber. The plug of the calling subscriber having been inserted in the switch of the called subscriber, the test-wire of the line will be crossed or connected with the line called through the medium of the plug in the usual manner; but there will be no connection between the line of the subscriber who sent in the call and the test-wire of said line, because the spring-jack of the line of the calling subscriber will not be used in making the connection between the two subscribers. Hence, the test-wire of the calling subscriber would be left entirely disconnected, and there would be no means of testing at the different boards to determine whether a line having its plug inserted in the switch of another line was thus busy.

My invention consists in providing a switching device and connection for each of the different test-circuits, so that on taking up the plug of any line the test circuit or wire of said

line will be immediately closed to ground, so that an operator at any other board, on connecting with the said test-wire at any other board, will find circuit, and will thus know that the line is busy.

My invention also consists in certain modifications in the listening-key, whereby the listening key may be used as a calling-key.

As to the state of the art prior to my invention reference is made to United States Letters Patent No. 305,021, of September 9, 1884, and No. 306,414, of October 14, 1884.

My invention is illustrated in the accompanying drawing, in which I have shown sections of two multiple switch-boards, each provided with spring-jacks for two lines, the lines connected therewith, the test-circuits, and the ground-connection, which I have invented.

The telephone-line *a* passes through a switch on each of the boards, and from the switch on the last board through an annunciator and listening-key, and thence through a cord and plug to switch *b*, and thence to ground. The other telephone-line, *c*, passes in like manner across the boards through its annunciator, listening-key, and cord and plug to switch *d*, and thence to ground.

The test wires or circuits *e* and *f* of the different lines are connected in the usual way with insulated frames or test-pieces of the switches. A plug inserted in any switch connects the frame, and hence the test-wire, with the telephone-line, and thus a test made at a switch of the line on any other board will show that the line is busy, as is shown in the well-known multiple switch-board system claimed in my said Patent No. 305,021, of September 9, 1884.

As only one plug is used in connecting two lines, it is necessary to provide means for testing the line whose plug is inserted in the other line. This I accomplish by providing ground-connections *g g'* for the different test-wires. When a plug, *h*, is lifted, the switch *b* closes upon the point of ground-wire *g*, and thus the test-wire *e* is connected to ground. The fact that it is thus connected may be readily determined by touching the test-plate of any switch of that line at any board with the test-plug connected in circuit with the telephone and battery of the operator. This connection with

the test-plate of a busy line at any board will give a click in the operator's telephone to indicate that the test-plate is grounded, and hence that the line is busy.

5 At board No. 1 I have shown the cam-lever of the listening and calling key in its upright position, in which the plunger is in its intermediate position. In this position the circuit of the telephone-line is closed between  
10 the springs *k l* through the medium of the plunger. This is the normal position of the plunger when the telephone-line is not in use, and also when the telephone-line is connected with another line.

15 At board No. 2 I have shown the cam-lever turned to the right, so as to raise the plunger to its highest position. The plunger is thus disconnected from both springs of the switch, and the springs, by their own resiliency, close  
20 upon the contact-points *m n*, thus looping the operator's telephone into circuit. When the cam-lever is in this position, the switch is used as a listening-key.

On one of the springs of each switch I have  
25 provided the insulation *o*, and below the springs a contact-point, *p*. On throwing the cam-lever to the left the plunger is forced down, so as to impinge against the insulating material *o* and close upon contact-point *p*. In this position  
30 the circuit of the generator *g* may be traced to the plunger, thence to the spring of the switch with which the cord is connected, (not to the other spring because of the insulation *o*,) and thence, when the plug is inserted, to the  
35 line of the subscriber called. Thus the called subscriber may be summoned.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

40 1. In a multiple-switch-board system of telephone-exchange, the combination, with tele-

phone-lines connected with different switches upon the different boards, of test-circuits, one for each telephone-line, connected with the insulated frames or test-pieces of the switches of their different lines, respectively, and ground-connections *g g'*, connected with the different  
45 test-circuits and switches *b d*, operated by the plugs, whereby the different test-wires are connected to ground, substantially as shown and described.

2. In a multiple-switch-board system of telephone-exchange, the combination, with a telephone-line, *a*, which is connected with the switch on each of the boards and through an annunciator, listening-key, cord and plug, and  
55 switching device to ground, of a test-circuit, *e*, connected with the test-plates of the different switches of said line, and a ground-connection, *g*, whereby said test-wire is automatically closed to ground when said plug is lifted  
60 for insertion in the spring-jack of a called subscriber, substantially as and for the purpose specified.

3. In a calling and listening key, the combination, with the plunger, of two springs, *k l*,  
65 supported on opposite sides of the plunger, contact-points *m n*, against which said springs close when the plunger is raised, the insulation *o* upon one of said springs, against which the plunger impinges when forced to its lowest  
70 position, and the contact-point *p*, upon which the plunger closes, substantially as shown and described.

In witness whereof I hereunto subscribe my name this 1st day of November, A. D. 1886.

ERNEST P. WARNER.

Witnesses:

GEORGE P. BARTON,  
CHAS. C. WOODWORTH.