

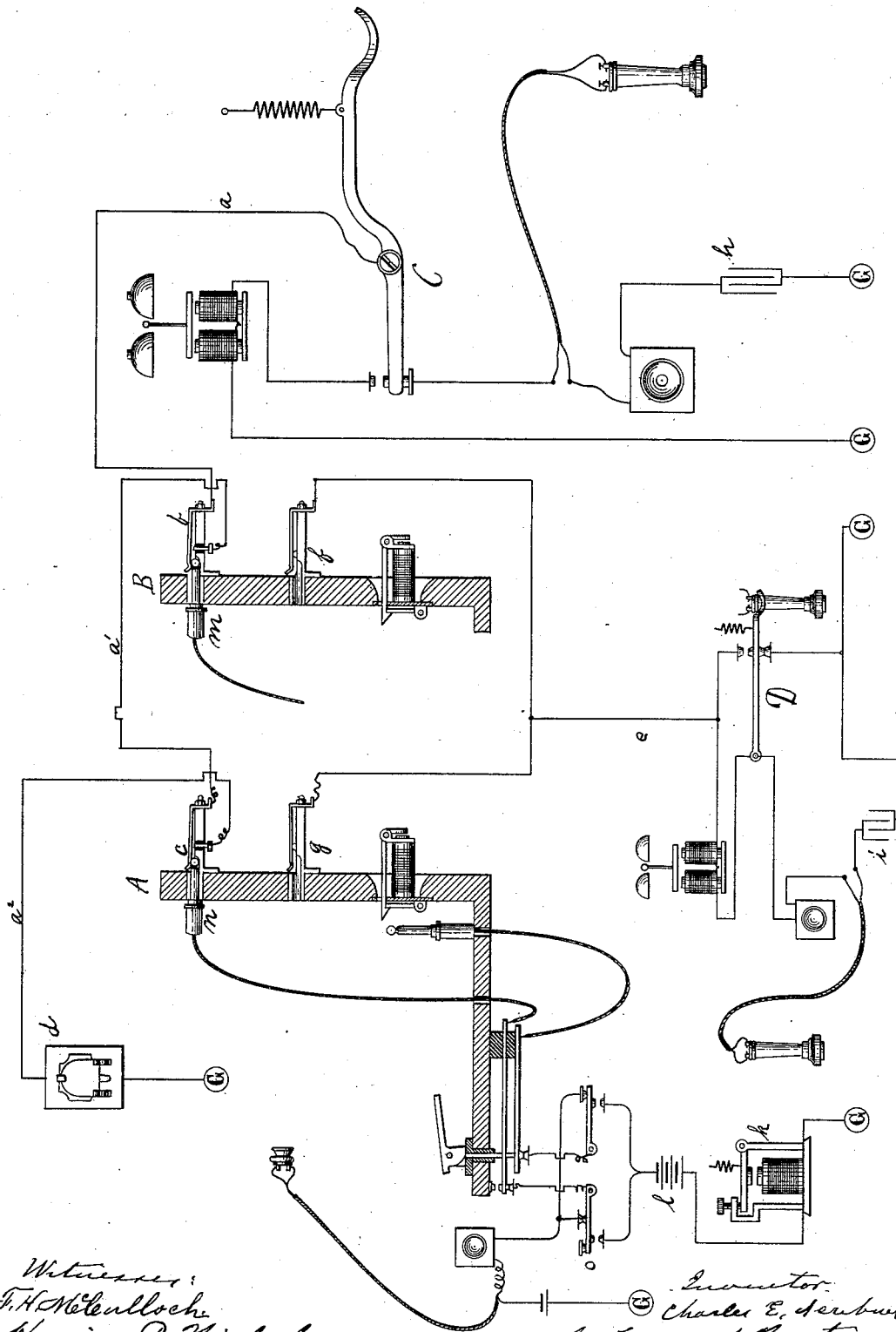
(No Model.)

C. E. SCRIBNER.

MULTIPLE SWITCH BOARD TESTING APPARATUS.

No. 384,644.

Patented June 19, 1888.



Witnesses:  
J. H. McElulloch  
Harriam P. Nichols.

Inventor:  
Charles E. Scribner  
By George P. Barton,  
att'y.

# UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN  
ELECTRIC COMPANY, OF SAME PLACE.

## MULTIPLE SWITCH-BOARD TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 384,644, dated June 19, 1888.

Application filed December 27, 1884. Serial No. 151,362. (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, 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 a telephone-exchange, and its object is to provide means for testing to determine whether the line of a subscriber wanted is engaged. To accomplish this, I take advantage of the well-known law that condensers are conductors of telephonic or voice currents, but when placed in circuit with a battery after the first impulse no current can traverse the circuit.

My invention consists in including a condenser in the circuit with the telephone at the different subscribers' stations and in providing a test-battery and signal-instrument at the central office and switching apparatus for connecting said battery with the different telephone-lines, whereby it may be determined whether the condenser of any given line is included in the circuit, and thereby enable the operator to determine whether the telephone of the given line is on or off the hook—that is, to determine whether the line is in use.

My invention is illustrated in the accompanying drawing, in which A and B, respectively, represent sections of two multiple switch-boards at the central office of a telephone-exchange.

C and D represent two subscribers' stations.

The circuit of the subscriber's station C may be traced, as shown, by the line *a* to the spring of the spring-jack *b* on board B, and from thence by wire *a'* to the spring of the spring-jack *c* on board A, and thence by wire *a''* through the annunciator *d* to ground.

Station D is connected by line *e* with the switches *f g* upon the switch-boards, as shown. At station C, I have shown the telephone and bell in separate branch circuits. At station D, I have shown the telephone and bell connected one after the other in the telephone-line, with means for shunting one instrument or the other

by means of the apparatus described and claimed in Patent No. 283,927, granted me August 28, 1883.

The telephone-line *e* of station D is shown open at central office. When the telephone-lines are thus left open, the Firman system of calling the central office, which consists of independent lines, is used.

I have shown one of the lines open at the central office and the other line closed through an annunciator, and at stations C and D, I have shown different circuits in order that it may be seen that my invention is not limited to any of the known systems of connecting the wires either at the central office or at the subscribers' stations. As shown at station C, the telephone is removed from the switch, and the circuit is thus connected through the telephone and thence through the condenser *h* to ground, while the circuit of the bell of station C is open.

At station D the telephone is shown upon its support. The bell at station D is thus included directly in the circuit, while the telephone and the condenser *i* are shunted. At the central office I have shown the signal-instrument *k* and battery *l* included in a ground-circuit and switching apparatus, whereby the circuit of said battery may be closed to the switch of any line upon the multiple board A. Similar apparatus may be provided at each board.

The telephone-line of each subscriber extends from the switch at his station to a spring jack or switch upon the switch-board at the central office. If the telephone is removed from the switch at any subscriber's station, the condenser will thereby be brought into the circuit. In this position, when the operator connects the battery to the line, the circuit will be found open at the condenser, and the signal-instrument will not be operated. If, on the other hand, the telephone is on the switch and the circuit of the line is closed through the bell directly to ground, the battery at the central office when connected to the line will find circuit to ground at the subscriber's station. If the battery finds circuit, the signal-instrument or sounder *k* will be energized, and the operator will know by the movement of the sounder that the telephone

is hung on the switch at the terminal or subscriber's station.

The closing of the sounder *k*, or whatever the signal-instrument may be, at the central office will thus indicate to the operator at the central office that the line is not being used by the subscriber. On the other hand, if the signal-instrument is not affected when the battery is closed to any given line, the operator will know that the telephone of the line is off the hook and the circuit of the battery cut off by the condenser. Thus when the signal-instrument indicates that the condenser is in circuit the operator will conclude that the line with which he has connected the battery is busy. Suppose the plug *m* at board B removed from the switch, so that the wires *a* and *a'* will be connected together through said switch. Suppose, now, that the operator at board A wishes to determine whether the telephone at station C is on the switch. By inserting the plug *n*, as shown, in the switch of the line at his board and depressing the key *o*, the circuit of battery *l* may be closed to said plug *n*, and thence through the medium of the switch to wire *a'*, and thence the circuit may be traced to station C, and thence through the telephone to the condenser *h*. The battery-circuit being thus open at the condenser, no indication will be made by the signal-instrument *k*, and this will be notice to the operator that the condenser *h* is in the circuit, and hence that the telephone is off the hook. If, however, the telephone were hung on the hook, the line *a* would be connected through the bell directly to ground, and the battery *l* accordingly would find circuit and operate the signal-instrument *k*, thus notifying the operator that the condenser *h* was out of the circuit, and hence that the telephone was on the hook. It will thus be seen that the operator at any switch-board may determine the position of the switch at any subscriber's station.

Any form of telephone switch may be used at the subscribers' stations. I have shown and described the gravity-switch, which is most commonly in use, and which is so arranged that when the telephone is hung up the circuit will be directed through the bell. On the other hand, when the telephone is removed from the switch the position of the switch is changed, so as to cut out the bell and bring the telephone into circuit.

There are several other well-known forms of switches, among which I would mention those shown in my Patents No. 248,671, granted

October 25, 1881; No. 271,280, granted January 30, 1883, and No. 287,873, granted November 5, 1883, and also patent to George M. Phelps, No. 222,201, granted December 2, 1879.

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

1. The combination, with the multiple switch-boards of a telephone-exchange, of telephone-lines connected therewith and each extending to a subscriber's station, a condenser permanently connected in the branch wire containing the telephone between the telephone and ground at each subscriber's station, a telephone-switch at each subscriber's station for bringing the telephone and condenser into the circuit of the line when the telephone is removed from the switch-lever, a battery and signaling instrument or sounder at the different switch-boards at the central office, and switching apparatus, whereby it may be determined at any of the boards whether the telephone of any station is on or off the switch.

2. A telephone-line extending from ground at a subscriber's station through a condenser and a telephone to a switch at said station and thence to the central office, said line being connected at the central office with a spring-jack switch on each of two or more switch-boards and thence to ground, in combination with a sounder or signaling device and battery in a ground-circuit at one of the switch-boards, and switching apparatus for connecting said ground-circuit with said telephone-line at the switch of said board, whereby it may be determined whether the line is open at the spring-jack of said line at any other of the boards, substantially as described.

3. The combination, with the bell, telephone-switch, and telephone at a subscriber's station, of a condenser included in the branch of the switch which includes the telephone, the telephone-line permanently connected with the switch-lever and extending through a spring-jack on each of two or more multiple switch-boards at the subscriber's station, a sounder and battery in a normally-open ground-circuit at each of the switch-boards, and switching apparatus whereby the position of the switch at the subscriber's station may be determined, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 19th day of December, A. D. 1884.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,  
WM. H. MARTIN.