

(No Model.)

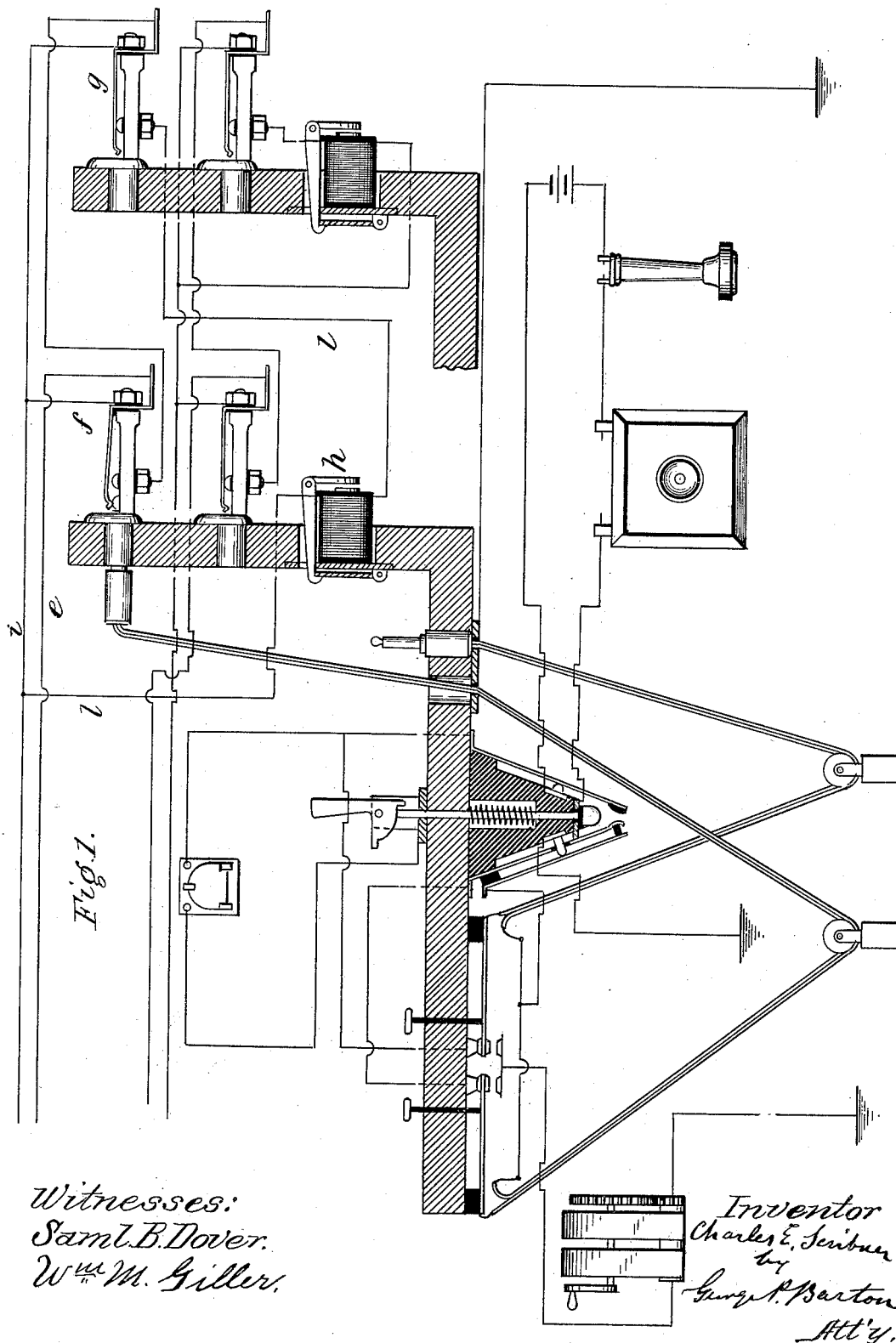
2 Sheets—Sheet 1.

C. E. SCRIBNER.

TEST CIRCUIT FOR MULTIPLE SWITCH BOARDS.

No. 383,495.

Patented May 29, 1888.



(No Model.)

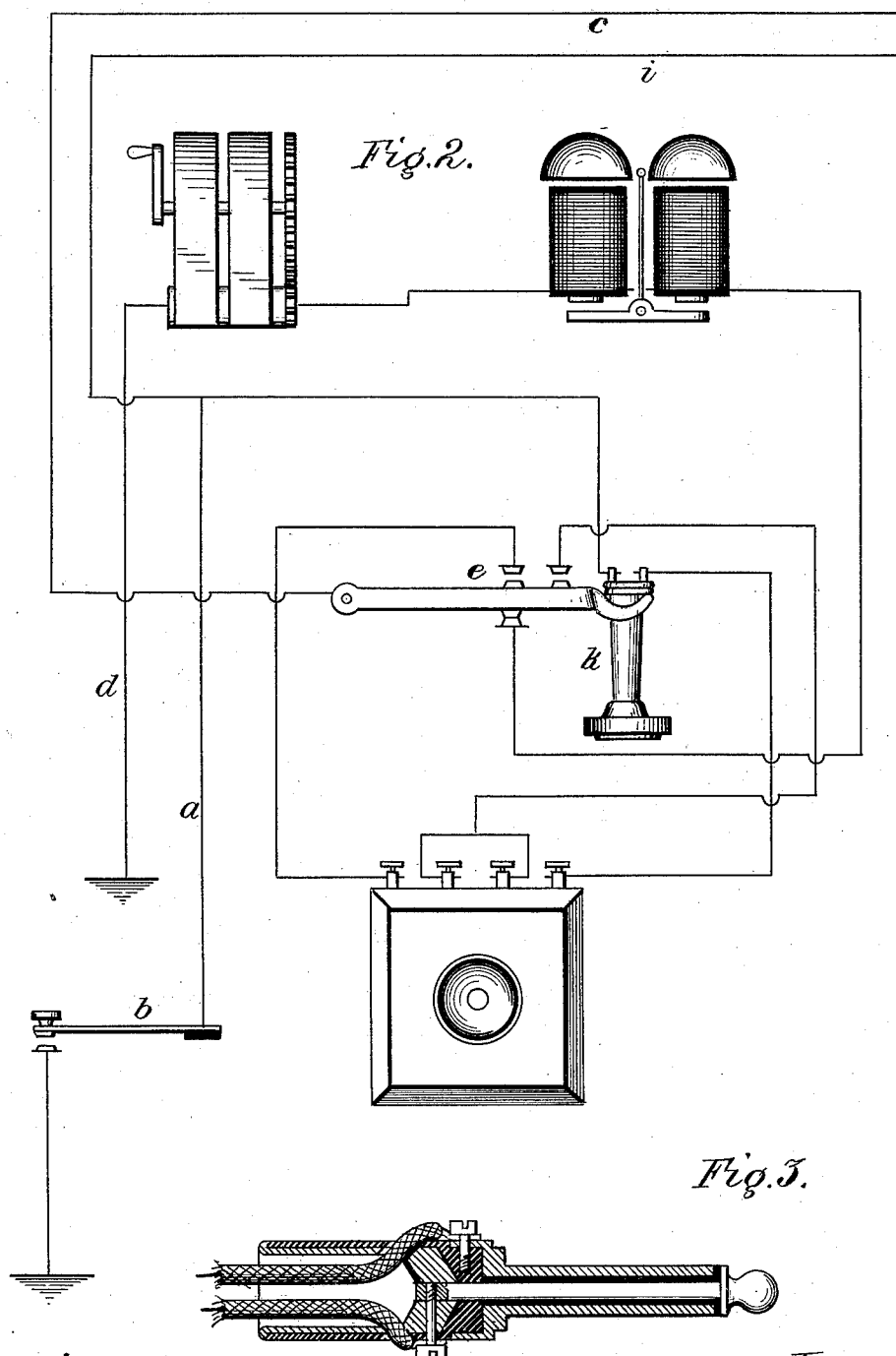
2 Sheets—Sheet 2.

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### TEST CIRCUIT FOR MULTIPLE SWITCH BOARDS.

No. 383,495.

Patented May 29, 1888.



*Fig. 3.*

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Saml. B. Dover.  
W<sup>m</sup> M. Giller.

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.

## TEST-CIRCUIT FOR MULTIPLE SWITCH-BOARDS.

SPECIFICATION forming part of Letters Patent No. 383,495, dated May 29, 1888.

Application filed December 27, 1886. Renewed November 21, 1887. Serial No. 255,769. (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 Test-Circuits for Multiple Switch-Boards, (Case 118,) 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 multiple-switch-board systems of telephone-exchange in which the different subscribers are provided with metallic circuits each connected with a different spring-jack switch upon the different switch-boards.

The object of my invention is to enable the operators at the different boards to test to determine whether any line is busy when said lines are connected with ordinary spring-jack switches, and without the use of special test-wires and special connections therefor.

My invention herein is an improvement upon the system described and claimed in my patent, No. 305,021, of September 9, 1884.

The spring-jack which I use herein requires only the same number of points or connections as that described in my said patent. I use, however, a pair of loop-plugs with double-stranded cords and key-board apparatus of novel construction. The key-board apparatus I will only describe incidentally herein, as the improvements therein form the subject-matter of another application, and as it is evident that other key-board apparatus which is well known might be used in connection with the circuits which form the subject-matter of my invention claimed herein.

My invention consists in connecting the different telephone-lines through the switches upon the different boards and back to the subscribers' stations, respectively, and in connecting the different lines at their respective stations in such manner that one branch will be open at the subscriber's station when the telephone is in its normal position upon the switch-lever, while the branch containing the bell and generator will be closed to ground.

From the line side of the open branch containing the telephone I provide means for closing said branch to ground when it is desired to call the central office. By this arrangement of circuits of the telephone-lines it is evident that when the circuit of a battery including a telephone is closed to the test-piece of one of the switches at either of the switch-boards the circuit will be completed through the branch of the line connected with the frames of the switches to the subscriber's switch, and thence through the branch containing the subscriber's bell and generator to ground. Thus when a test is made the operator will know by the click in his telephone that the line tested is free. When, however, a line is connected with another in metallic circuit and the pair of loop-plugs are inserted, respectively, in switches of the different lines for connecting said lines together, the springs of the said switches will be lifted from their contact-points and connected with the tips of the two plugs. The springs are thus connected together through the strand of the cord which connects the tips, while the frames of the jacks are connected together through the medium of the sleeves of the plugs and the strands connecting said sleeves together. Under such conditions, as is well known, an operator testing the line will get no circuit through his telephone and hear no click, and hence will know that the line is busy.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagram illustrative of two metallic circuits connected with their spring-jack switches on two multiple switch-boards and key-board apparatus at one of said switch-boards. Fig. 2 is a diagram of the circuits at the subscriber's station. Fig. 3 is a sectional detailed view of one of the loop-plugs provided with a metallic heel connected with the tip.

Like parts are indicated by similar letters of reference throughout the different figures.

As shown in Fig. 2, I provide a branch, *a*, in which is included a key, *b*. By means of this key the branch *c* of any line which connects through the different switches of the line may be closed to ground while the sub-

scriber is sending in a call. The circuit thus formed may be traced, beginning at the ground-line *d* at the subscriber's station, through the subscriber's generator and bell, to the subscriber's telephone switch-lever *e*, thence through branch *c* of the circuit of the line, through the contact-points of the switches *f g*, to the subscriber's individual annunciator *h*, and thence by branch *i* of the line to branch *a* at the subscriber's station, and thence to key *b*, which is depressed when the subscriber rings. Thus the circuit is completed from the subscriber's station to the central office and back again to ground at the subscriber's station.

Branch *i* of the telephone-line, it will be seen, is connected with the insulated frames of the different switches, and when the telephone *k* at the subscriber's station is hung upon the switch, as shown, said branch *i* remains open at the subscriber's station. We have then a metallic circuit consisting of two branches, *c* and *i*. Branch *i* is open at the subscriber's station as long as the telephone *k* remains upon the switch-lever. On the other hand, branch *c* is closed to ground when the telephone *k* is upon the switch-lever. Thus, tracing from the frames of the switches *f g* by line *i*, it will be found that there will be no connection from line *i* to ground as long as the telephone *k* remains upon the switch at the subscriber's station. Tracing, however, from the frame of any switch *f* or *g* at the central office by wire *l* to the spring of the switch on the last board, and thence to branch *c*, and thence to the subscriber's station, and through the bell and generator to ground *d*, it will be found that all the frames or test-pieces of the switches of the line are normally connected to ground at the subscriber's station by branch *c*. Thus, when a test is made at any spring-jack *f* or *g* of a line, circuit may be found to ground from branch *c* to the subscriber's station. If, however, a plug is inserted in any spring-jack *f* or *g* of the line, all the frames of the switches of the line will be disconnected from said branch *c* of the line at the switch where the plug is inserted. Thus when a plug is inserted in any switch of the line, and a test is made at any other board, no circuit will be found, and the operator will know that the line is busy.

Upon inserting a plug at any spring-jack of the line the connection between the test-frames and the branch *c* of the line will be opened at the spring-jack where the plug is inserted, and as branch *i* is normally open at the subscriber's station a test at any spring-jack will indicate an open circuit, and consequently that the line tested is in use at some other board, as before described.

I have described a key, *b*, at the subscriber's station as operated by hand. It is evident that this circuit may be closed automatically by turning the crank of the generator in the same way, for example, that the shunt around the generator is now usually opened.

There are many different devices for doing this work, which are well known in the art, by means of which the push-button *b*, operated by hand, might be dispensed with.

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

1. In a multiple-switch-board system of telephone-exchange, the combination, with a spring-jack switch on each of the boards, of a circuit extending from ground at the subscriber's station through his generator and bell and switch to the central office, through said switches and an annunciator to a line connected with the test plates or frames of said switches and extending to the subscriber's station, and two branches of said line at the subscriber's station, one branch including the telephone and being normally open at the telephone-switch, and the other branch being connected with a normally-open ground-switch, whereby signals may be sent between the subscriber's station and the central office, substantially as described.

2. In a multiple-switch-board system, the combination of switches, one on each board for each telephone-line of the telephone-lines connected therewith, each line consisting of two branches, one branch of which, after passing through its switches and an annunciator, being connected with the other branch, which other branch is connected with the insulated frames or contact-pieces of the switches of the line, said branches extending to the subscriber's station, and the former being connected with the subscriber's telephone-switch, and when the telephone is on the switch through the bell and generator to ground, and the other branch, which includes the telephone, being normally open at the subscriber's telephone-switch when the telephone is hung thereon, and a branch connection including a ground-switch on the lineside of the telephone, whereby a complete circuit may be formed from ground at the subscriber's station through the switches and the annunciator of the line at the central office, and back to ground at the subscriber's station, substantially as and for the purpose specified.

3. In a multiple-switch-board system of telephone-exchange, switches *f g* on different boards and telephone-line consisting of branches *c i*, connected therewith, and through an annunciator, *h*, said branches extending to the subscriber's station, and branch *c* being normally connected with ground, and branch *i* being normally open, in combination with a loop-plug inserted in switch *f* at the central office, whereby the insulated frames of the switches are disconnected from branch *c*, substantially as shown and described.

4. A subscriber's circuit extending from ground at the subscriber's station through the springs of a series of switches on different sections of a multiple switch-board and an annunciator back through the insulated frames or test-pieces of said switches, and thence back

to the subscriber's station, the portion of the  
circuit connecting with the frames or test-  
pieces being normally open at said subscri-  
er's station, in combination with a plug which,  
5 being inserted in a switch at either of the  
boards, opens the metallic circuit at said  
switch.

In witness whereof I hereunto subscribe my  
name this 16th day of November, A. D. 1886.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,  
WM. M. GILLER.