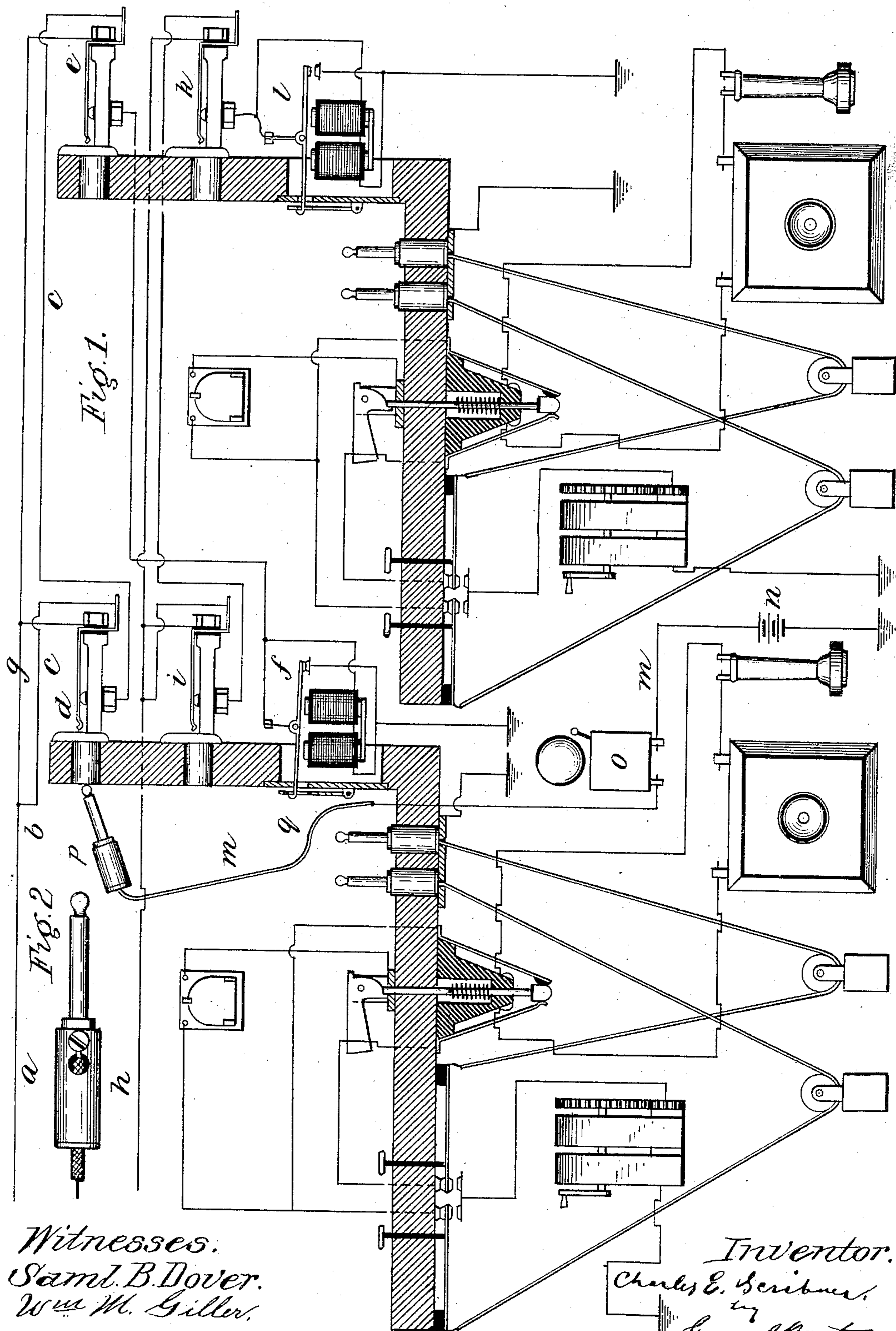


(No Model.)

C. E. SCRIBNER.  
TEST SIGNAL CIRCUIT.

No. 385,482.

Patented July 3, 1888.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

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

## TEST-SIGNAL CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 385,482, dated July 3, 1888.

Application filed December 27, 1886. Serial No. 222,708. (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-Signal Circuits and Apparatus for Multiple Switch-Boards, (Case 130,) 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 a telephone-exchange in which different lines are each provided with a different terminal on each of two or more switch-boards.

The object of my invention is to provide a test system for determining at the different boards whether or not the lines are busy.

My invention is especially designed for use in connection with telephone-lines which are connected each with a switch on each of the boards in two branches, one branch extending through the contacts of the switches and an annunciator to ground and the other branch being connected permanently to the insulated frames or test-pieces of the different switches of the line.

In my application, No. 222,701, (Case 123,) filed of even date herewith, I have described the arrangement of the test-wires and their connection to the insulated frames of the switches and to the lines more in detail.

It is evident that my system herein described may be used, also, in connection with metallic circuits in which the branch which includes the annunciator, instead of going to ground at the central office, is carried back to ground at the subscriber's station.

When a connecting-plug is inserted in any switch of a line, a connection is made from the shank of said plug to the frame or test-piece of the switch and thence directly to line without passing through any contact-points. The individual annunciators are polarized, so that when current of one polarity is sent through an annunciator its centrally-pivoted armature will be tilted in one direction and closed upon a direct ground-contact, so that the coils will be shunted out without throwing down the shutter. Current, however,

sent in reversals will set the armature of the annunciator in vibration and so throw down the shutter. At each board I provide a normally-open circuit including a battery and a bell and a flexible cord and plug, which serves as the normally-open terminal of this ground-circuit. This plug I call the "test-plug," and it is designed to be carried in the hand of the operator. This test-plug, being closed to the frame or test-piece of any switch, will send current in one direction through the polarized annunciator, and thus the resistance of the polarized annunciator will be shunted out and a direct ground-circuit formed from ground through the test-battery, the bell, the test-plug, and the frame or test-piece of the switch to which it is applied, and thence to the telephone-line, and thence through the branch of the line containing the contact-points of the switches to the armature of the polarized annunciator, and from said armature directly to ground.

The coils of the electro-magnet of the bell are of low resistance—say about one ohm. Current, therefore, sent from the test-battery through the bell and the resistance of the coils of the polarized annunciator, which may be of one hundred ohms, will not ring the bell; but the armature of the annunciator shunting out this resistance, the circuit will be directly to ground and the bell will ring.

If there be a break in the branch of the line tested at one of the spring-jacks of the line, the test-battery will find no circuit to ground at the central office, and hence the bell will not ring. The resistance of the line to the subscriber's station and through the subscriber's bell is such that the test-battery will not be sufficient to ring the bell over the circuit thus formed.

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

Figure 1 is a diagram illustrative of my invention. Fig. 2 is a detail view of an ordinary terminal plug provided with a metallic point and cord connected therewith.

Telephone-line *a* extends from the subscriber's station to point *b* at the central office, and from thence one branch, *c*, passes through the switches *d e* on the different boards, and from the switch on the last board through the po-



larized annunciator *f* to ground. The other branch of the line *g* is permanently connected with the frames of the switches *d e* on the different boards. Line *h* is connected in the same manner with its switches *i k*, one on each of the boards, and through its polarized annunciator *l* to ground. The calling, connecting, and clearing-out apparatus shown at the different boards form no part of my invention  
 10 herein, and I will not describe the same in detail.

At the first board I have shown a normally-open ground-circuit, *m*, in which is included a battery, *n*, and a bell, *o*. The test-plug *p*, connected with a flexible cord, may be carried by the operator, and by touching this test-plug against the frame of any switch the circuit *m* will be closed to the line connected with the switch to which plug *p* is applied. Plug *p* is shown touching the frame of switch *d*. A circuit is thus formed over circuit *m* from battery *n*, through bell *o* to plug *p*, the frame of switch *d*, and to line *a* at *b*, and thence through branch *c*, which includes the switches to the individual polarized annunciator *f*. The armature of annunciator *f* will thereupon be moved, as shown, so as to close upon the direct ground-contact, thus removing the resistance of the coils of the polarized annunciator  
 20 *f* from the circuit of bell *o* without throwing down the shutter *q*. The circuit of battery *n* thus being closed directly to ground, bell *o*, although of low resistance, will ring, and this ringing of the bell is a signal that the line is not open at any switch in branch *c*. If, however, branch *c* should be open when the test is made, the battery *n* would find no circuit to ground at the central office and the bell *o* would not respond. The resistance of line *a*  
 30 toward the subscriber's station is so great that the bell could not be rung by current sent in that direction.

I provide similar testing apparatus at each of the boards, and am thus able to determine readily whether any line wanted is in use.

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

1. The combination, with a normally-open ground-circuit including a bell or signal device of low resistance, of a telephone-line provided with two branches, one branch connected through the switches of the line on two or more switch-boards and through a polarized annunciator to ground, the other branch being con-

55 nected to the insulated frames or test-pieces of said switches, the armature of said polarized annunciator, and a ground contact-point, whereby on closing said ground-circuit to the frame or test-piece of one of the switches the coils of the polarized annunciator will be shunted out of circuit and the signal-instrument operated, substantially as described.

2. Two or more multiple switch-boards, in combination with telephone-lines connected therewith, each switch consisting of a spring or lever and its opposing contact-point and an insulated frame or test-piece, each line being connected in one branch through the spring and contact-point of its switch on each of the boards and through a polarized individual annunciator to ground, the other branch being permanently connected with the insulated frames or test-pieces of the switches of the line, a shunt-circuit to ground being provided which may be closed around the coils of each individual annunciator by the operation of the armature thereof, and at each of the boards a normally-open ground branch containing battery and bell of low resistance, whereby any line at either of the boards may be tested to determine whether the line is in use.

3. The combination, with two or more multiple switch-boards, of two or more lines connected with the different multiple switch-boards, polarized annunciators, one polarized annunciator in the circuit of each line, a contact-point upon the armature of each annunciator, a co-operating contact and wire, by which the coils of the annunciator may be shunted out of circuit when current of one polarity traverses the coils, test-contacts, one test-contact connected with each line on each board, a test-battery, and an electro-magnetic test-signal included in circuit with said test-battery, and a contact-piece connecting with the circuit of said test-battery, whereby, upon applying the contact-piece to one of the test-pieces, current from the test-battery may be closed through the polarized annunciator and its contact-points closed to operate said electro-magnetic test-signal.

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.