

(No Model.)

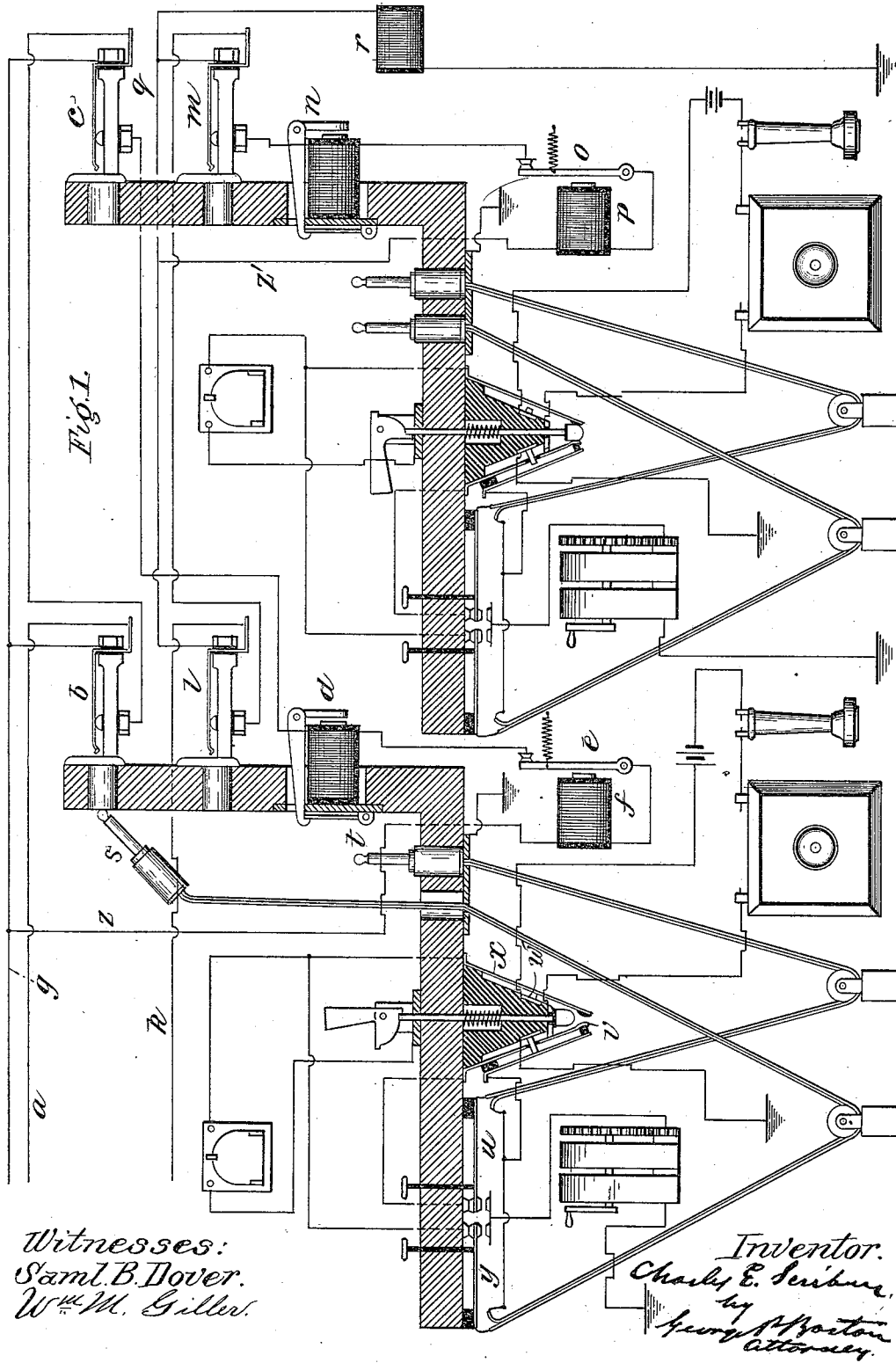
2 Sheets—Sheet 1.

C. E. SCRIBNER.

MULTIPLE SWITCH BOARD TESTING APPARATUS.

No. 427,121.

Patented May 6, 1890.



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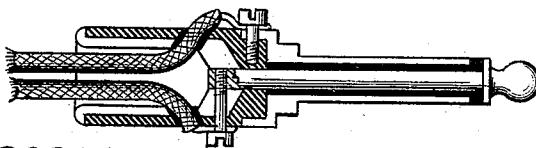
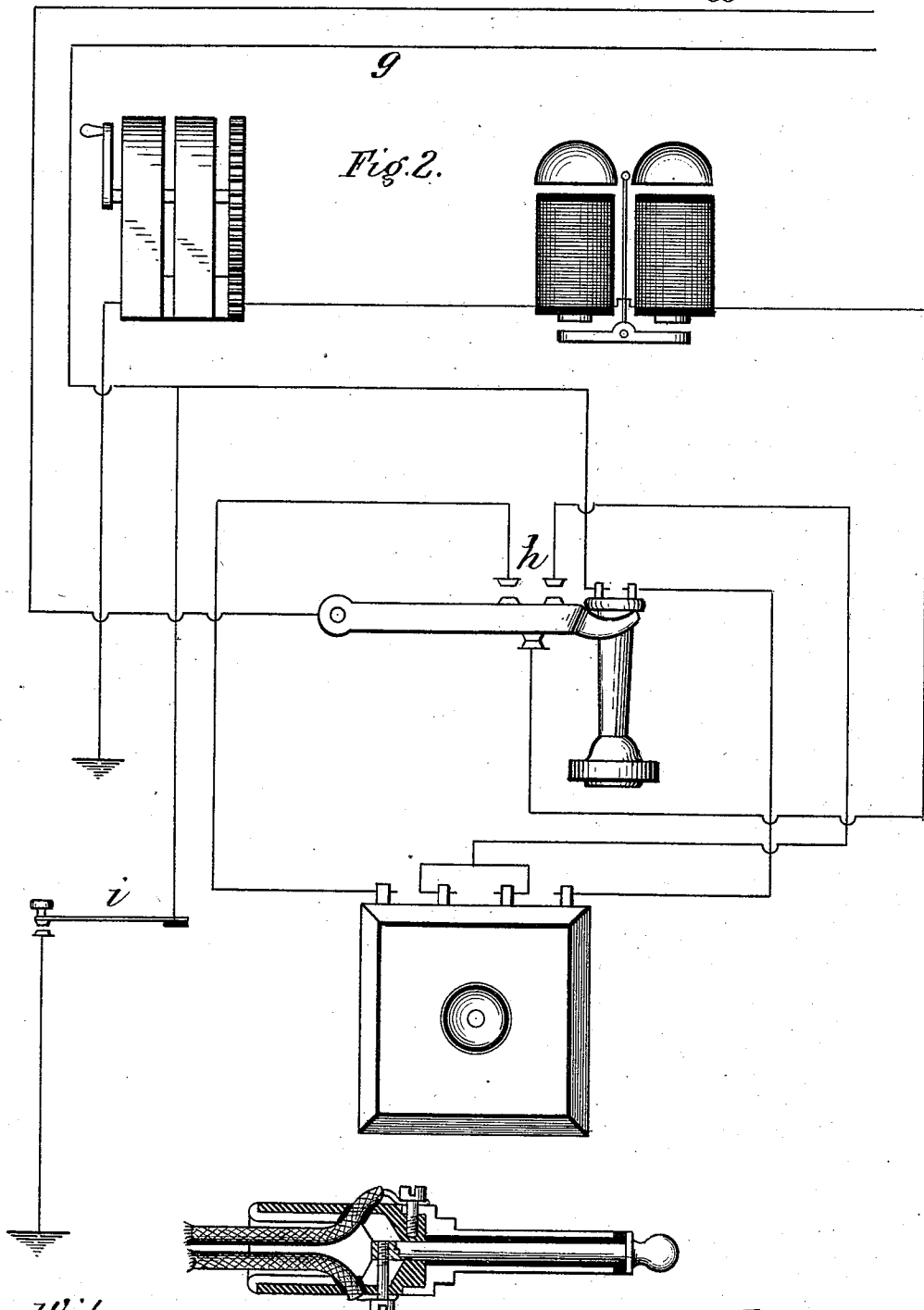
2 Sheets—Sheet 2.

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Patented May 6, 1890.



Witnesses:
Saml. B. Dover.
Wm. M. Giller.

Fig 3.

Inventor.
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By George P. Barton
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
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MULTIPLE-SWITCH-BOARD TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 427,121, dated May 6, 1890.

Application filed December 27, 1886. Serial No. 222,706. (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, (Case 128,) 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 telephone-lines, either metallic or ground or both metallic and ground, are connected, respectively, with a switch on each of two or more switch-boards; and its object is to enable the operator at one board to test any line to determine whether said line is connected or busy at any other of the switch-boards, in order that confusion may be avoided.

Heretofore many different test systems have been employed in connection with multiple-switch-board systems for this purpose.

As to the state of the art prior to my invention herein claimed, reference is made to my patents, No. 321,390, of June 30, 1885, and No. 305,021, of September 9, 1884.

My invention herein consists in placing a buzzer in circuit with the individual annunciator in each line in combination with circuits and testing apparatus, by means of which, when a test is made, the buzzer will cause a tone in the telephone if the line tested is free. In case the line tested is already in use the circuit through the telephone test-battery and buzzer will be found open, and hence the buzzer will not be set in vibration and no tone will be heard in the telephone.

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

Figure 1 is a diagram illustrative of two telephone-lines connected each with its switches on two multiple switch-boards and a buzzer included in the circuit with the annunciator of each line and key-board apparatus at the different boards. Fig. 2 is a diagram illustrative of the circuits of a metallic circuit at the subscriber's station. Fig. 3 is

a detailed sectional view of one of the loop-plugs.

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

As shown in Fig. 1, branch *a* of the metallic circuit is connected through spring-jack switches *b c*, one on each of the boards, and thence through individual annunciator *d*, and thence through armature *e* of electro-magnet *f*, and thence to branch *g* of the metallic circuit, which is permanently connected with the frames or test-pieces of the switches *b c*, and extends to the subscriber's station through the telephone and transmitter to the contact-point *h* near the telephone-switch. This branch *g*, it will be noted, is normally open at the subscriber's station. A key *i* is, however, provided at the subscriber's station, so that this branch *g* may be closed to ground by the subscriber while he is sending in a call.

The circuit of the ground telephone-line may be traced, as shown in Fig. 1, through the spring-jack switches *l m*, the individual annunciator *n*, and the armature *o* and electro-magnet *p* of the buzzer to wire *q*, which is connected with the frames, respectively, of switches *l* and *m* and through resistance *r* to ground. It will be noted that the ground-wire *q* of the ground-circuit corresponds to the branch *g* of the metallic circuit, the difference being that branch *g* extends to the subscriber's station, where it is normally open, while ground-wire *q* passes through resistance *r* to ground at the central office. This resistance *r* may be, say, of one hundred and fifty ohms, and for the purposes of testing, as will be hereinafter described, is equivalent to a break in the circuit.

At the first board I have shown plug *s* with its point touching the insulated frame of spring-jack *b*, the other plug of the pair *t* having its metallic heel resting upon the ground-plate, and the loop-key being in position to bring the telephone and test-battery into the circuit. When the tip of plug *s* is thus applied to the frame of the spring-jack of the line to be tested, if said line is free the armature *e* of the buzzer will be set in vibration to interrupt the circuit and cause a tone in the

telephone. This circuit may be traced, as shown, from the ground-plate upon which the heel of plug *t* rests to the tip of said plug *t*, thence through a strand of the cord to calling-key *u*, and thence to spring *v*, and thence through the telephone and test-battery to point *w* and spring *x* of the loop-key, and thence to calling-key *y*, and thence to the tip of plug *s*, and thence to the frame of spring *b*, and thence to branch *g*, and said branch *g* being open at the subscriber's station the test-battery will find circuit by branch *z* through the electro-magnet *f* and armature *e*, through annunciator *d*, through the spring-jacks *c* and *b* to branch *a* of the metallic circuit, which branch *a* is connected through the subscriber's bell and generator to ground, as shown in Fig. 2. In my application, No. 222,696, filed of even date herewith, upon which patent No. 383,495 was granted May 29, 1888, I have shown a similar ground branch through the subscriber's bell and generator. If there is no break at any of the switches *b c* in the line, armature *f* will vibrate in the circuit including the telephone and test-battery, and the operator, listening at the telephone, will know by the sound caused by the buzzer that the line is not connected at any one of its switches. If, however, a plug were inserted in switch *c* or any other switch in the line, the branch *a* would be found open at said switch, and the circuit thus being open the buzzer would not respond, and the operator listening at the telephone would hear no tone, and would hence know that the line was in use. By touching the tip of the plug *s* in the same manner to the frame of spring-jack *l* line *k* may be tested. Wire *k*, extending to its subscriber's station, would be there closed to ground in the usual manner and resistance *r* would be sufficient to cause current to be diverted through the buzzer. Thus if the tip of the plug *s* were applied to the frame of switch *l* the circuit would be traced, as before described, from a ground-plate to tip of plug *t* and thence through the loop-key, the telephone, and test-battery to the tip of plug *s*, and thence to the frame of spring-jack *l*, and thence by branch *z'* through the electro-magnet *p* and armature *o* of the buzzer, and thence through switches *m l* over line *k*. In case line *k* were connected through all its switches the

armature *o* would vibrate in the circuit thus formed, and the operator, listening at his telephone, would know that the line was free, and in case of a break at any one of the switches *l m* of line *k* the operator would get no circuit through the buzzer and hearing no tone in his telephone would know that the line was in use.

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

1. A telephone-line, in combination with switches distributed on different boards, a buzzer included in said circuit back of all the switches, said circuit after passing through the buzzer being connected with the insulated frames or test-pieces of each of the switches and a telephone and battery included in a normally-open ground-circuit, and switching devices whereby on closing the circuit of said telephone and battery to the frame of a switch of the line it may be determined whether said line is open at any one of its switches.

2. The combination, with a telephone-line connected with ground at the subscriber's station and through switches one on each of two or more switch-boards at the central office, of a branch from the contact-point of the switch on the last board, including a buzzer, said branch, which includes the buzzer, after passing through the buzzer, being permanently connected with the insulated frames of the switches of the line, and testing apparatus, whereby it may be determined at any one of the boards whether the circuit of said line is broken at any switch of the line.

3. In a multiple switch-board system, the combination of spring-jack switches, one switch upon each board, circuits connecting with the spring-jacks and to ground, a buzzer included in the said circuit between the last spring-jack and the ground, and testing apparatus whereby an operator may determine at any board whether the buzzer is disconnected at any other board.

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.