

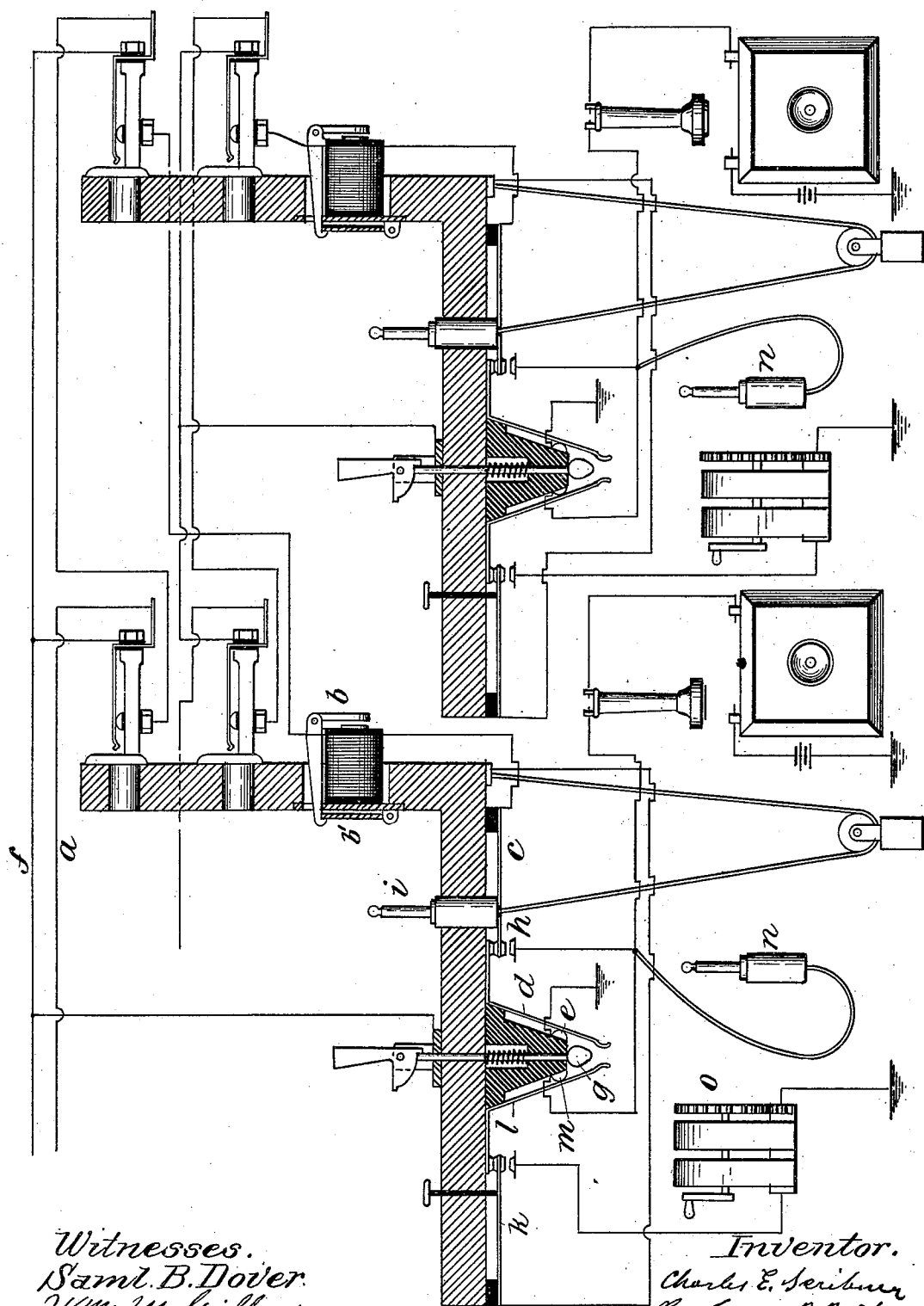
(No Model.)

C. E. SCRIBNER.

TEST CIRCUIT FOR MULTIPLE SWITCH BOARD SYSTEMS.

No. 356,425.

Patented Jan. 18, 1887.



UNITED STATES PATENT OFFICE.

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

TEST-CIRCUIT FOR MULTIPLE-SWITCH-BOARD SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 356,425, dated January 18, 1887.

Application filed November 6, 1886. Serial No. 218,193. (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-Board Systems of a Telephone-Exchange, (Case 112,) 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 test-circuits for multiple-switch-board systems of a telephone-exchange, and relates more especially to the system described and claimed in my Patent No. 305,021 of September 9, 1884.

The telephone-lines are connected each with a different switch upon each of the switch-boards, and each line passes through its individual annunciator and a flexible cord and plug, and thence to ground at the central office. Telephone-lines thus including cords and plugs in their circuits are shown in Letters Patent No. 306,414 of October 14, 1884.

Heretofore in systems in which cords and plugs are included in the circuits of the different lines, so that one line may be connected directly to the spring-jack of another line by inserting the plug, no test has been provided whereby the line of the subscriber whose plug is inserted in the spring-jack of another line may be tested to determine whether or not that line is busy. The line of the calling subscriber is connected with the spring-jack of the subscriber called by inserting the plug of the calling subscriber in a spring-jack of the called subscriber's line. The plug thus inserted will furnish the necessary cross or connection with the test-wire of the called subscriber, but, as above stated, there will be no means of testing the line of the calling subscriber, since no connection will be made with any of the spring-jacks of the said calling subscriber's line.

The object of my invention is to provide a connection which automatically closes the test-wire of the calling subscriber's line to ground when the line is put into use. I do this by placing in each circuit a listening-key, the plunger of which connects with the different test-rings of the spring-jacks of that line, the

listening-key being so connected that when the line is in use the plunger becomes connected or crossed with the said telephone-line through the medium of the springs of the listening-key. Thus all the test-rings of the spring-jacks of the calling-line are connected with the line through the medium of the plunger. When a line is busy, by touching the plug of the operator's telephone and battery to a test-ring of said line at any board, circuit will be closed through the telephone, and the operator will know by the click in the telephone that the line is busy. The act of throwing down the cam-lever of the listening-key forces down the plunger and disconnects the line from ground, and the normal connection between the plug and the operator's telephone is broken, and the line is connected through the head of the plunger to the cord and plug, and thence to the line into whose spring-jack the plug is inserted.

My invention is illustrated in the accompanying drawing, in which I have shown sections of two multiple switch-boards with two telephone-lines and test-circuits connected therewith, the operator's calling and testing apparatus being shown at each of the boards.

The circuit of telephone-line *a* may be traced through its switches on the different boards to its individual annunciator *b*, and thence to key *c* and spring *d* of the listening-key, said spring normally resting upon the ground contact-point *e*. Each telephone-line is thus normally connected to ground.

The test-wire *f* of line *a* is connected with the test-ring of each of the different switches of the line upon the different switch-boards. This test-wire is connected also with the plunger *g* of the listening or loop key, and it is through this connection that the cross between the test-wire *f* and the telephone-line *a* is established when said telephone-line *a* is connected with another line for the purpose of indicating that said line is busy.

It will be observed that a contact-point, *h*, is provided below the key *c*. When a call is sent in over line *a*, shutter *b'* is thrown down, and the operator, by pressing down upon plug *i*, closes the key *c* upon contact-point *h*, thus bringing the operator's telephone into the circuit of telephone-line *a*. The operator thus

while holding down key *c* finds out what connection is wanted. He thereupon takes up plug *i* to test the line called for, and key *c* resumes its normal position in contact with spring *d* of the listening-key. In this position it will be observed that when the plunger is raised and the springs of the listening-key are resting upon their contact-points, respectively, the operator's telephone will be included in the circuit of the cord and plug. This circuit may be traced from the plug through the cord to key *k*, said key normally making contact with spring *l* of the listening-key. This spring is connected with contact-point *m*, and from this point the circuit may be traced through the telephone to ground. The plug being thus connected with the operator's telephone is applied to the test-ring of the switch of the line wanted in the usual manner to determine whether the line is busy.

We will suppose, now, that the line tests "not busy." The operator thereupon inserts the plug in the spring-jack of the line wanted, and then forces down the plunger, so as to connect the two springs of the loop-key together through the medium of the plunger. The two lines are thus connected together for conversation, and the test-wires of the two lines are crossed with their respective lines. The test-wire of the called line is crossed at the spring-jack through the medium of a plug. The test-wire of the calling-line is crossed with its line through the medium of the plunger *g* of the listening-key.

A test may thus be made at any of the boards to determine whether any line be busy, whether that line be connected through the medium of its terminal plug or through the medium of one of its spring-jacks. For convenience, I have provided at each board an extra plug, *n*, which the operator may carry in his hand. The subscriber wanted may be notified of the call by depressing key *k* after the plug *i* has been inserted in the spring-jack of the called subscriber.

When key *k* is depressed, the circuit from the generator *o* may be traced, as shown, to said key *k*, and thence through the cord to the plug, and when the plug is inserted in a spring-jack to the line connected with said spring-jack.

It will be observed that the flexible cord and plug are not normally included in the circuit of the line when the line is not in use. When, however, the plug of a line is inserted in the spring-jack of another line, and the springs of the loop-key are connected together, the plug and cord are included in the circuit.

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

1. The combination, with the test-wire connected with the insulated frames or test-pieces of the different switches of a telephone-line, of a ground-connection and switching apparatus, whereby said test-wire may be connected to ground when said line is connected to the switch of another line.

2. The combination, in a telephone-exchange switching apparatus, with a telephone-line connected with switches distributed on different boards and through an annunciator and listening or loop key to ground, of a test-wire for said line and a connection from said loop-key to the test-wire, whereby a ground-connection is provided for said test-wire.

3. A telephone-line connected with two or more multiple switch-boards and through an annunciator and switching device to ground, in combination with a plug supported by said switching device and a contact-point connected with the operator's telephone-outfit, whereby on depressing said plug the telephone-line is disconnected from its normal ground and connected with the operator's telephone, substantially as shown and described.

4. A telephone-line connected with two or more multiple switch-boards and through an annunciator and loop-key to ground, in combination with a flexible cord and plug and a key, *k*, and a generator, whereby on depressing said key the cord and plug are disconnected from the telephone-line and connected with the generator, substantially as shown and described.

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

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,
CHAS. C. WOODWORTH.