

(No Model.)

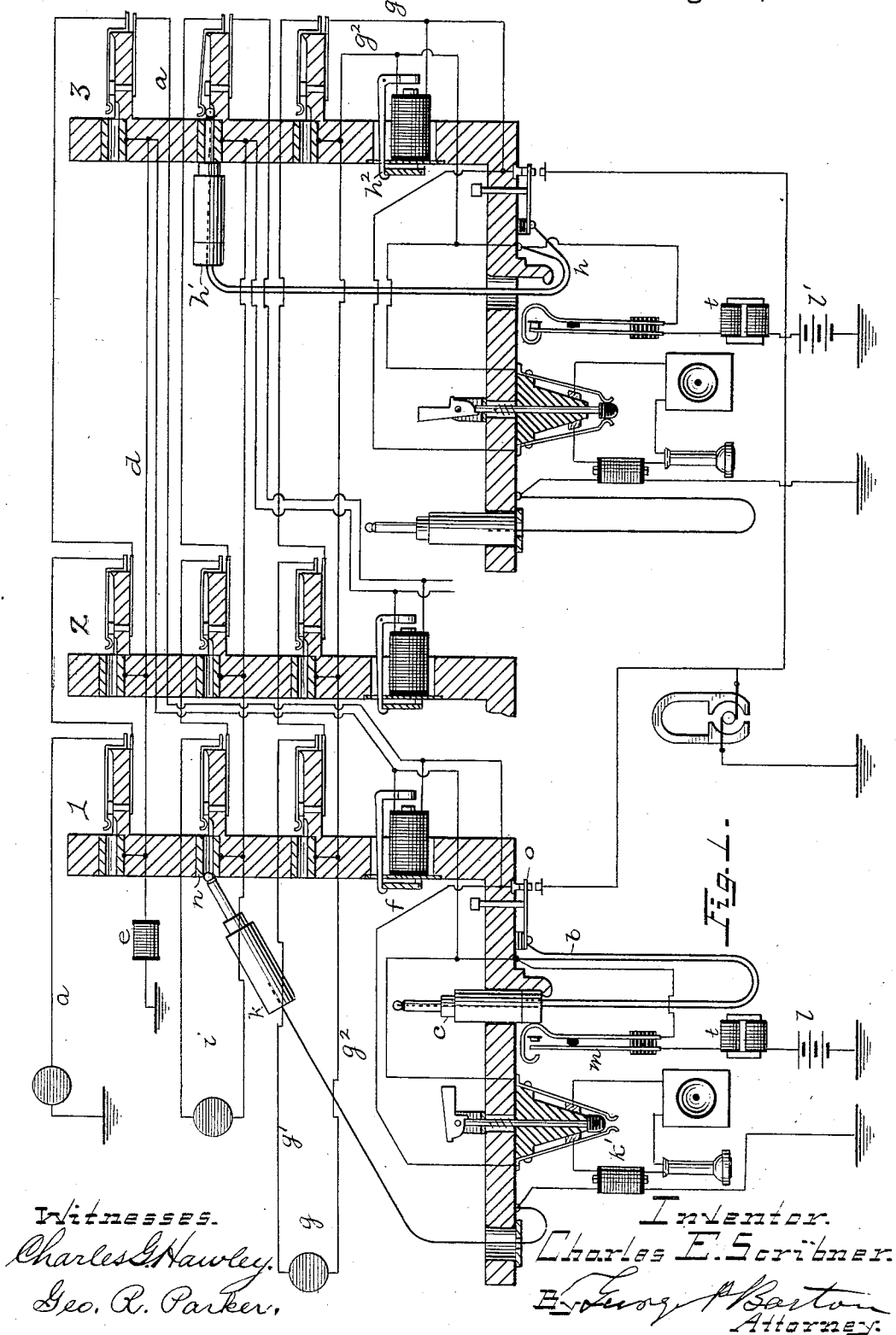
2 Sheets—Sheet 1.

C. E. SCRIBNER.

MULTIPLE SWITCHBOARD TELEPHONE EXCHANGE SYSTEM.

No. 481,678.

Patented Aug. 30, 1892.



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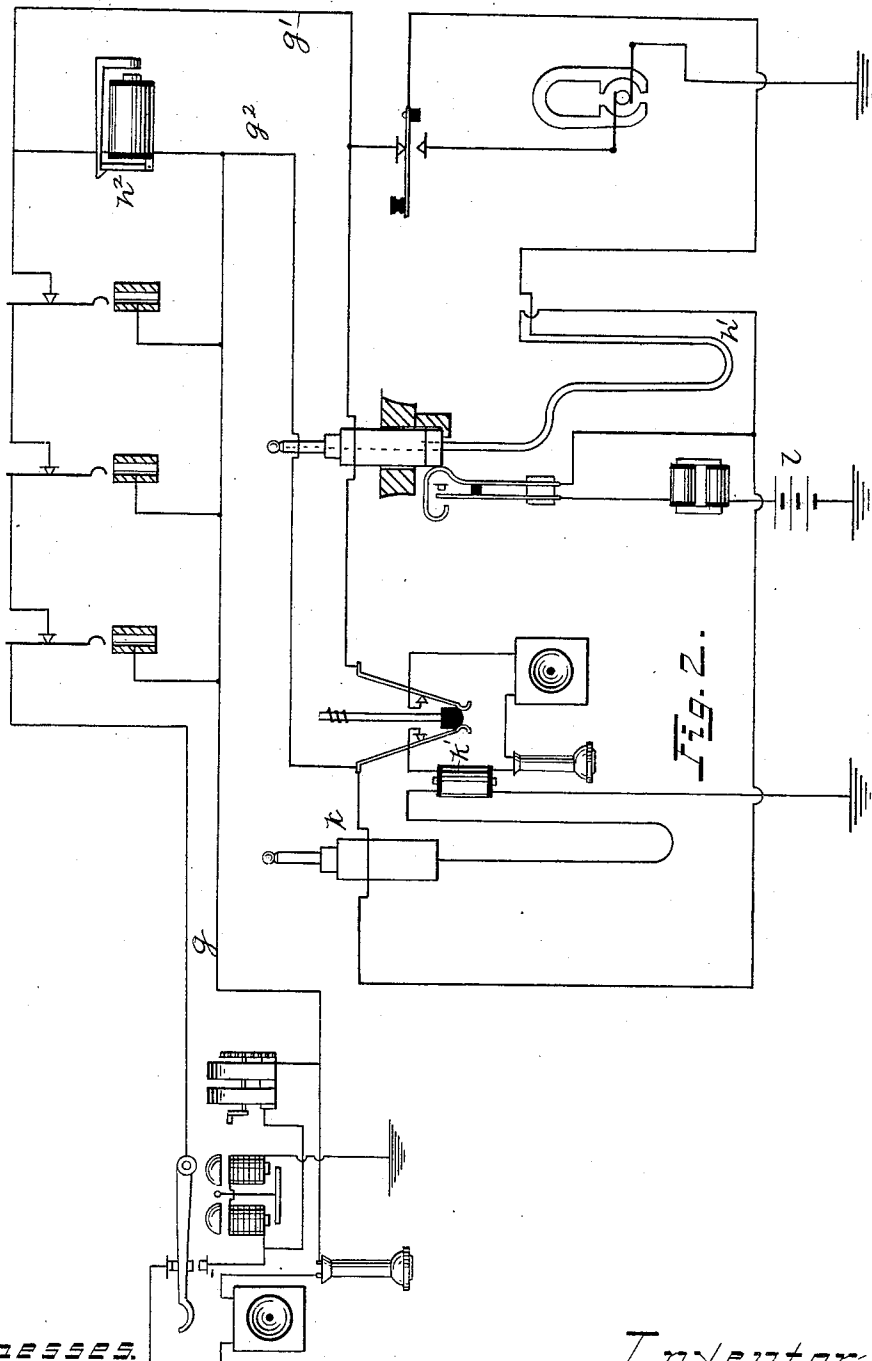
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No. 481,678.

Patented Aug. 30, 1892.



Witnesses.

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UNITED STATES PATENT OFFICE.

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MULTIPLE-SWITCHBOARD TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 481,678, dated August 30, 1892.

Application filed November 22, 1889. Serial No. 331,205. (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-Switchboard Telephone-Exchange Systems, (Case No. 216,) 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 that class of telephone-exchange systems in which multiple switchboards are employed, single lines and grounded lines being connected with the same switchboards and the different lines terminating each in a flexible cord and plug and so arranged that by inserting the terminal plug of one line into the switch of another line the two lines may be connected together for conversation.

As is usual in single-cord multiple-switchboard systems, the annunciator of a line and its terminal cord and plug are placed upon the same board, the annunciators of the different lines being distributed among the boards. A subscriber calling operates his individual annunciator, and the operator at the board where the annunciator is placed completes the connection with the line called for by inserting the plug of the calling subscriber into the switch of the called-subscriber's line upon the same board.

My invention herein relates to bridging the annunciator across the two sides of the metallic circuit and to a switch in the circuit of the test-battery, the circuits and connections being so arranged that when a plug is lifted the test-battery will be connected to indicate the busy test, and when the plug is inserted in the switch of the line called for the line with which connection is thus made will test "busy."

In case of grounded circuits the annunciator is bridged between the contact of the spring-jack switch on the last board and the test-piece of said switch, so as to be relatively in the same position as when bridged between the sides of a metallic circuit.

In the accompanying drawings, which are illustrative of my invention, Figure 1 is a

diagram showing three telephone-lines, one grounded line, and two metallic lines, each connected with three switchboards, together with the keyboard apparatus at the first and last board. Fig. 2 is a diagram showing the apparatus at the subscriber's station of a metallic circuit-line, said line being connected with the switches and keyboard apparatus at the central office, the annunciator being bridged between the two sides of the circuit and the terminal plug resting in its normal position in its socket to hold the switch of the test-battery open.

As shown in Fig. 1, the circuit *a* extends from ground at its station through a switch on each of the switchboards in the usual manner and thence to the strand *b* of its terminal plug *c*, said strand *b* being connected with the tip of said plug. The wire *d* connects together the rings or test-pieces of the line *a* and extends to ground through resistance *e*. The individual annunciator *f* of line *a* is placed between the main portion *a* of the circuit after it has passed through all the switches and the line *d*, which connects together the test-pieces of the switches.

The metallic circuit-line *g* extends in two branches *g'* and *g''* to the central office, one branch or limb *g'* passing through a spring and contact of a switch on each of the boards, and from the contact of the switch on the last board to the strand *h* of the flexible cord leading to the tip of the terminal plug *h'* of said line *g*. The other branch *g''* is connected with the test-pieces of the switches of the line, this wire or limb *g''* extending to the strand connecting with the sleeve of loop-plug *h'*. The individual annunciator *h''* of the line is bridged between the two limbs *g'* and *g''*, as most clearly shown in Fig. 2.

In Fig. 1 I have shown the plug *h'* inserted in the switch of line *i*, line *i* being a metallic circuit connected with the central office in the same manner as described with respect to line *g*. A test-plug is provided for each operator. In Fig. 2 the test-plug *k* is shown connected through a secondary coil of a converter *k'*, the other coil of this converter being connected with the telephone of the operator.

The operation of my system is briefly as

follows: A subscriber by sending current over his line throws down his shutter, and the operator at the board where his shutter is placed, observing the signal, brings her telephone into connection with the line and finds out what connection is required. She then proceeds to test the line called for and if the line wanted is found free the terminal plug of the calling-subscriber's line is inserted in the switch of the line called for, thus completing the connection. The individual annunciator of the calling-subscriber's line will be bridged across the two sides of the united metallic circuit of the two lines in case the lines are complete metallic circuits.

In case two grounded circuits are connected the annunciator of the calling-subscriber's line will be in a wire between the circuit formed by the two lines and the wires connecting the test-pieces of the switches of the lines to serve as a clearing-out annunciator, and in case a metallic circuit-line is connected with a grounded line the individual annunciator of the calling-subscriber's line—that is, the line whose terminal plug is used to complete the connection—will be connected in a similar manner to serve as a clearing-out annunciator. Either of two connected subscribers may thus by sending current to line clear out.

The test-battery *l* is included in a branch to ground containing a retardation-coil *t*. The switch *m* in this branch is normally held open, so that the test-battery is normally disconnected from the strand of the cord, connecting with the sleeve thereof. When the plug is lifted from its socket, this switch *m* closes the circuit of the test-battery to the sleeve of the plug, and hence battery-current will be present at the test-pieces of all the switches of the line whose plug is thus raised, and when the plug is inserted in the switch of another line the battery will be closed, also, to the test-pieces of the switches of the line, with which connection is thus made. A switch thus arranged to be operated by the removal of the connecting-plug from its socket I designate a "cord-switch." Thus, as shown in Fig. 1, suppose the line *g* is connected with the line *i*, as shown at the last board, and suppose a signal is sent over line *a*, operating the individual annunciator *f* of the line. Now in case line *i* is called for by the subscriber of line *a* the operator will proceed to test line *i* by applying the test-plug, as shown, to the test-piece of the switch of said line *i* upon her switchboard. The line *i* being already connected with another line at the last board, current from the test-battery *l* of board 1 will find circuit through the test-plug which is being used at board 1 through the induction-coil or converter *k'*, and the operator, listening at her telephone, will hear the signal thus caused by the closing of the circuit. When, however, the line is free, no current will be sent through the test-plug and no sound will be heard in the telephone, in which case the operator would proceed to insert the

loop-plug *c* into the switch of the line called for—in this case switch *n*. If the plug is inserted, the subscriber wanted may be called by means of a calling-key *o*, by means of which suitable current may be thrown upon the line wanted.

I have shown the test-batteries *l* each connected with one line. It is evident that the same battery may be connected with many lines. It will be observed that each telephone-line, whether metallic or grounded, is looped through the spring-jack switches thereof on the different switchboards, one portion of the loop including the springs and contacts of said switches and the other portion of the loop including the test portions of said switches, the individual annunciator in either case being bridged across the loop.

The retardation-coil which I preferably use is of iron, of the form shown in the drawings, and has in the neighborhood of ten thousand convolutions of No. 36 copper wire. The object of this retardation-coil is to afford a free path for the current of the test-battery, while it offers great retardation to alternating currents, such as telephone-currents.

The form of listening-key shown in the drawings consists of two side springs, which make contact with anvils, upon which they normally rest. These springs are connected one to each side of the loop, and the plunger working between them serves to open the contacts by pressing back the springs.

The subscriber's outfit consists, as shown in Fig. 2, of the usual generator, ringer, transmitter, telephone, and gravity-switch, connected in circuit.

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

1. In a multiple-switchboard system, the combination, with each line of the system, of a cord provided with a terminal loop-plug, one for each line, and branch circuits, one from a strand of each cord through a retardation-coil and battery to ground, in combination with a switch included in the circuit of each of said branches to open and close its said branch circuit to make its particular line test "busy" or "not busy," as may be desired.

2. In a telephone-exchange system, the combination, with each line of the exchange, of test-rings upon the different switchboards, the said test-rings being connected together, a connecting-cord for each line, with which said test-rings are connected, a branch circuit through a retardation-coil and battery to ground, said branch circuit being connected with the circuit of the test-rings and cord, and a switch included in the circuit of the branch circuit to open and close said branch circuit, whereby the battery may be connected to or disconnected from the said test-ring circuit, substantially as and for the purpose specified.

3. In a telephone-exchange system, the combination, with each telephone-line, of switches,

one switch upon each of the switchboards, one portion of the line being connected to the springs and contacts of the switches and another portion of the same line being connected to the test-rings of the said switches, plugs and cords, one plug and cord for each line, each cord being connected with its line, switches, one for each line, adapted to be operated by its plug, a branch circuit through a retardation-coil, and a battery connected through said switch to its line, whereby on lifting the plug the circuit of the battery is closed to the line to bring the line in electrical condition to indicate the busy-test.

4. In a telephone-exchange system, the lines connected with their respective switches on the different boards, each line connecting with a double-stranded cord terminating in a double-contact plug, one portion of the plug being adapted to make contact with the test-piece of the spring-jack into which it is to be inserted, a branch circuit from this strand through a switch, a retardation-coil, and a battery to ground, substantially as and for the purpose specified.

5. A telephone-line looped through the switches of the different switchboards, one portion of the loop connecting with the test-rings, the other portion of the loop connecting with the springs and their contacts, an annunciator bridged across the loop, a listening-key, two of the contacts of which are connected to the two sides of the loop, a double-stranded cord, each of the two strands being connected with a side of the loop, and a two-part connecting-plug connected with said double-stranded cord, substantially as and for the purpose specified.

6. A subscriber's outfit consisting of a generator, bell, and telephone connected with different switches upon different switchboards of the same telephone-exchange in metallic circuit, one side of said metallic circuit including the springs and contacts of the switches and the other side being connected with the test-pieces of said switches, in combination with an individual annunciator bridged across the two sides of said metallic circuit between the contact of the switch on the last board and the test-piece of said switch, said line being provided with a double-stranded flexible cord and terminal plug, one of the strands of said cord being connected with a switch normally held open by said plug resting in its socket, and a ground branch including a battery and retardation-coil connected through said switch with one of the strands of the cord of said plug, said switch being closed when the plug is lifted from its socket, substantially as and for the purpose specified.

7. The combination, with metallic circuits connected with switches on different switchboards at the central office, of the terminal loop-plug, a cord-switch, and a branch from each line through a retardation-coil to a test-battery and ground, said branch being closed to the line automatically on lifting the plug of the line from the socket of its cord-switch, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 19th day of November, A. D. 1889.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,

GEO. R. PARKER.