

(No Model.)

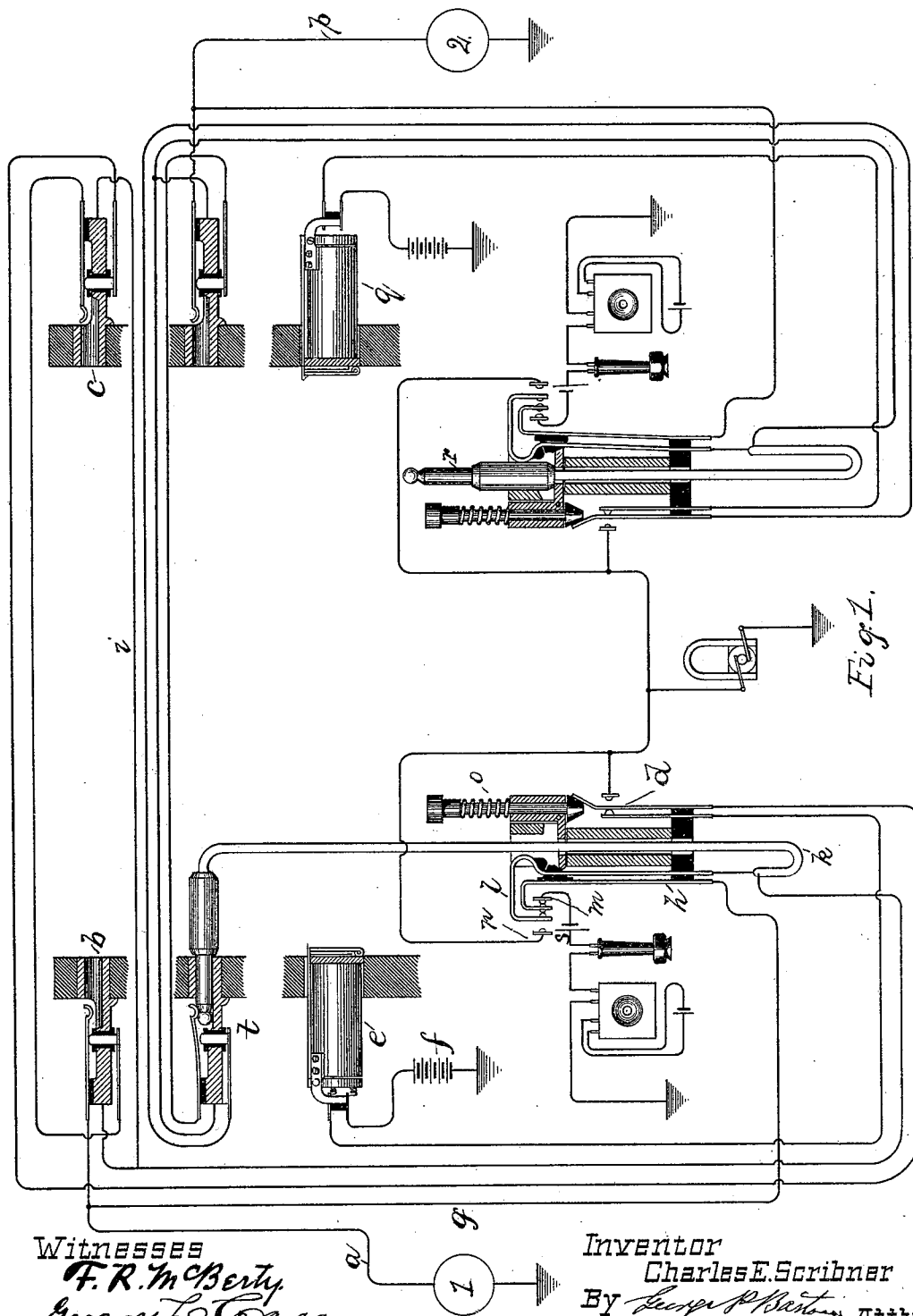
2 Sheets—Sheet 1.

C. E. SCRIBNER.

SINGLE CORD GROUNDED CIRCUIT SYSTEM FOR MULTIPLE SWITCHBOARDS.

No. 544,384.

Patented Aug. 13, 1895.



Witnesses  
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(No Model.)

2 Sheets—Sheet 2.

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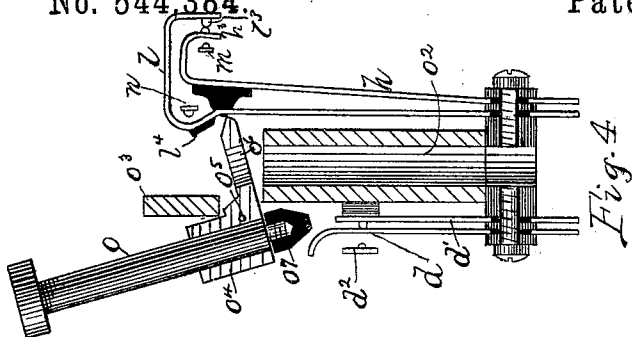


Fig. 4

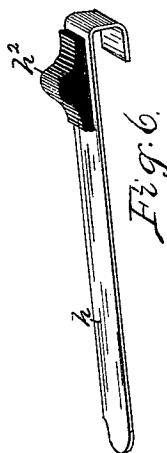


Fig. 6

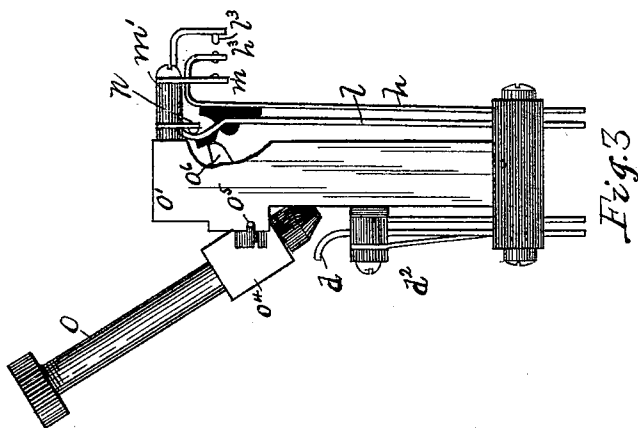


Fig. 3

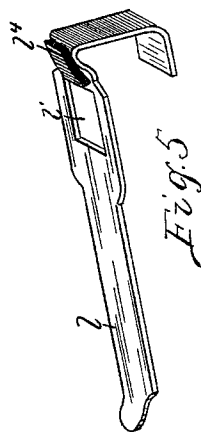


Fig. 5

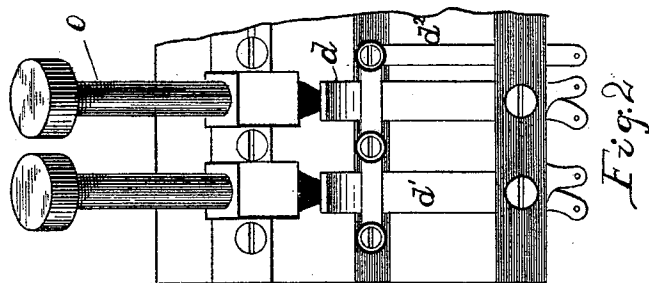


Fig. 2

Witnesses.

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# UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN  
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## SINGLE-CORD GROUNDED-CIRCUIT SYSTEM FOR MULTIPLE SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 544,384, dated August 13, 1895.

Application filed December 1, 1890. Serial No. 373,138. (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 Single-Cord Grounded-Circuit Systems for Multiple Switchboards, (Case No. 237,) 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 telephone-exchange systems in which single circuits are employed in connection with multiple switchboards, and its object is to simplify the apparatus and reduce the work of the operators in receiving and answering the calls and connecting and disconnecting the lines.

My invention consists, first, in the improvement in circuits which permits the direct connection between the connecting-plug of the subscriber and the line of that subscriber without the intervention of spring-jack contacts; second, in permanently connecting the test-circuit of each line with the terminal plug thereof in connection with a cord-switch, whereby the plug is connected with the line and the telephone when the plug is lifted from its socket; third, in branching the subscriber's line in two paths, one branch including the springs and contacts of the spring-jacks and the annunciator, the other branch including a cord-switch and the plug and cord, whereby when the plug of the line is used in making a connection the annunciator thereof is left in circuit as a clearing-out signal, while if a connection is made at a spring-jack switch the annunciator is disconnected, and, fourth, in the construction of the cord-switch with the circuits to permit the operator to ring the called subscriber or the calling subscriber by different manipulations of the same knob to connect different springs of the cord-switch with the generator.

An operator, seeing a shutter fall, picks up from its socket the terminal plug of the line corresponding thereto, thereby automatically connecting the line and also her telephone to the plug. Having received the order she tests the line called for by simply touching the previously-lifted plug to the frame of the switch

of the line. If the line is busy a click will be caused in the telephone by current from the test-battery. If no click is heard the operator will know that the line is free and she will insert the plug, completing the connection between the two lines. The plug thus inserted also forms an electrical connection between the called line and its test-circuit—that is, the spring and frame of the switch are electrically connected in a well-known way through the medium of the plug. The spring being lifted from its contact, the portion of the line including the annunciator will be cut off, and the annunciator of the line of the calling subscriber will act as a clearing-out signal; also the test-battery will remain connected. The operator having made the connection with the spring-jack switch signals the subscriber wanted by operating the cord-switch. By one manipulation of the cord-switch current may be sent over the called subscriber's line, and by another manipulation thereof current from the generator may be sent over the calling subscriber's line. By moving the cam a limited distance the cord-switch is operated to disconnect the operator's telephone, while on giving the cam a further movement the generator is connected with the cord to send current over the called subscriber's line, and again by depressing the plunger the generator is connected with a spring of a key included in the calling subscriber's line between the contact of the switch thereof on the last board and the individual annunciator thereof, thus sending current from the generator over the calling subscriber's line.

My invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram showing two telephone-lines, each connected with two different switchboards, with an operator's apparatus at each of the boards. Fig. 2 is a rear view of a strip containing two cord-switches. Fig. 3 is a side elevation showing the cam-lever thrown back, as in the act of signaling the called subscriber. Fig. 4 shows the cam-lever in position to cut out the telephone. Fig. 5 is a perspective view of the spring of the cord-switch which is permanently connected with the cord. Fig. 6 is a perspective view

of that spring of the cord-switch which is permanently connected with the telephone line.

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

Telephone-line  $a$  of Fig. 1 is connected with ground at station 1 and thence extends through the spring and contact of switches  $b$  and  $c$  on the different switchboards and from the switch on the last board through the contacts  $d$  of the cord-switch of the line and thence through the individual annunciator  $e$  and test-battery  $f$  and thence to ground. A permanent connection  $g$  extends from line  $a$ , before it passes through its first spring-jack switch  $b$ , to spring  $h$  of the cord-switch. The test-circuit of line  $a$  is connected with the insulated frames of the switches  $b$   $c$ , so that when a plug is inserted in either switch the test-circuit will be connected through the medium of the plug with the line to make the line-test "busy." This test-circuit  $i$  is extended to the cord  $k$  and the spring  $l$  of the cord-switch, whereat it is normally open, the plug being inserted in its socket. Thus the plug of each line is permanently connected with the test-circuit thereof. The springs  $h$   $l$  of the cord-switch are closed together when the plug is lifted from its socket, thus completing the circuit of test-battery  $f$  of that line through the spring-jacks of the line to the spring  $h$ , thence to spring  $l$ , thence to the connected test-strings of the spring-jacks of its particular line, electrifying them to a difference of potential from the earth and causing them to test "busy." At the same time the battery also finds circuit to the plug itself, and thence to the test-strings of any line, into one spring-jack of which it may be inserted, making that line also test "busy." The tension of the spring  $l$  is sufficient to carry the spring  $h$  against the fixed contact-point  $m$  of the operator's telephone. By throwing the cam-lever to the position shown in Fig. 4 the connection with contact  $m$  may be broken.

The key shown in Figs. 2, 3, and 4 combines in itself a cord-switch for connecting the plug with the line and completing the test-circuit, a listening-key for automatically connecting the operator's telephone with the line and for normally disconnecting the same, and a calling-key for sending a call-signal to either the calling or answering subscriber independently of the other. The key consists essentially of a base  $o'$ , perforated at suitable intervals with openings  $o^2$  to admit of the passage of the cords through it, each perforation expanding at its upper portion into a socket to receive the plug, the springs  $h$ ,  $l$ , and  $d$ , and the contact-points  $m$ ,  $n$ , and  $d'$  and  $d^2$  therefor mounted upon said base and insulated from it, and the tilting plunger  $o$  for actuating the various springs. The spring  $l$  is so formed that when the plug is allowed to rest in its socket its lower end enters between the portion  $o^3$  of the socket and the spring  $l$ , forcing the latter forward. The spring  $l$  is

provided with an opening  $l'$ , through which an insulating-block  $h^2$  upon the spring  $h$  passes, the block being provided with a flange at its base of such size and shape as to prevent the contact of the two springs  $h$  and  $l$ . The springs are provided with contact-points  $h^3$   $l^3$  opposite each other and adapted to be closed together by the resiliency of spring  $l$  when it is free to move. Contact-point  $m$  is provided, so disposed that the spring  $h$  rests against it when free to move in response to its own resiliency. Contact-point  $n$  is also provided, so arranged that the spring  $l$  may be forced into contact with it by a considerable forward movement. These contact-points  $m$  and  $n$  are carried by fixed metallic straps supported by the pillar  $m'$  of insulating material.

The plunger  $o$  extends through a block  $o^4$  of metal, which is pivoted to the base at  $o^5$ . The plunger is free to move longitudinally through the block  $o^4$ , and is thus capable of both an endwise and tilting movement. The block  $o^4$  is provided with an extension  $o^6$ , projecting through the base  $o^2$  at the bottom of the socket and adapted to enter into engagement with either the block  $h^2$  or a plate  $l^4$  of insulating material upon spring  $l$ . Normally the extension  $o^6$  lies horizontally, resting beneath the block  $h^2$  and out of engagement with it.

The contact-spring  $d$  is placed beneath the conical tip  $o^7$  of the plunger, so that when the latter is forced downward it presses spring  $d$  outward, away from contact with its anvil  $d'$  and into contact with strap  $d^2$ .

In the normal position of the key the plunger  $o$  stands vertically. The plug being in its socket, spring  $l$  is forced forward, out of contact with spring  $h$ , at the same time, through the medium of the flanged block  $h^2$ , forcing spring  $h$  out of contact with anvil  $m$ . If the plunger  $o$  and block  $o^4$  be slightly tilted the toe of the block will engage with block  $h^2$ , pressing the spring  $h$  forward independently of spring  $l$  until their contacts  $h^3$   $l^3$  come into contact, at the same time separating spring  $h$  from the contact-anvil  $m'$ . If the plunger be still further tilted the toe of block  $o^4$  leaves block  $h^2$  and enters upon plate  $l^4$  on spring  $l$ , pressing spring  $l$  forward out of engagement with spring  $h$  and into contact with the contact-anvil  $n$ . If plunger  $o$  in its vertical position be thrust down, the conical tip  $o^7$  presses spring  $d$  forward, away from its normal resting contact  $d'$  and against contact  $d^2$ .

In the circuit shown spring  $h$  is connected with the line; spring  $l$  with the test-rings and with the plug; anvil  $m$  with the operator's telephone; and anvils  $n$  and  $d^2$  with one pole of a grounded calling-generator. Spring  $d$  forms the terminal piece of the line, and its anvil  $d'$  is connected with the line-annunciator. Thus, when all the apparatus is in its normal position, the test-rings are insulated, the line is connected through annunciator to earth, and the generator and the telephone are dis-

connected. When the plug is lifted from its socket the test-rings are automatically connected with the line-circuit, and the operator's telephone is also put into connection with it. When the plunger is tilted slightly the telephone is disconnected; when it is further tilted all the apparatus of the switchboard, except the test-rings, are disconnected from the line, and a calling-signal is sent to the called line. By thrusting down plunger *o* a call-signal is sent to the calling-line.

It will be understood that there will be many lines with similar connections.

Thus telephone-line *p* is connected with a switch on each of the switchboards and thence through its individual annunciator *q*. The plug *r* of line *p* is shown resting in its socket in the cord-switch. Suppose subscriber at station 1 sends current over line *a* to operate annunciator *e*. The operator observing the signal picks up the *p* terminal plug of cord *k* and the springs of the cord-switch assume the positions shown—that is, springs *h l* are closed together—thus connecting telephone-line *a* directly by branch *g* and spring *h* with the cord *k*. Moreover, the test-circuit *i* of line *a* is connected therewith since said test-circuit *i* is permanently connected with the cord, while at the same time the cord-switch makes connection with the telephone-contact *m*.

I have shown the line *a* connected between annunciator *e* and ground with battery. Therefore the battery will be connected with the plug when the plug is lifted from its socket, the circuit of the battery being through individual annunciator *e*, key *d*, contacts and springs of switches *c b*, and thence by wire *g* to springs *h l* and thence to the cord *k*. The test-battery *f* may be common to many lines, or, if desired, a battery may be placed in the circuit of the operator's telephone, as indicated at *s*. The operator having touched the tip of the terminal plug of cord *k* to the frame of switch *t* of line *p* and having found no circuit—that is, hearing no click in her telephone—will know that the line *p* is free and will proceed to insert the plug, as shown in switch *t*. Then by throwing over the cam of the cord-switch to the position shown in Fig. 4, she will throw the calling-current onto the cord *k*, and thence over line *p* to ring up subscriber 2 called for.

When a plug is inserted in a switch to connect one line with another the individual annunciator, as *e*, of the calling subscriber will be left in circuit as a clearing-out annunciator, while the individual annunciator of the

called subscriber will be disconnected from the circuit at the switch where the plug is inserted.

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

1. A telephone line extending from the subscriber's station thereof through switches on each of two or more switch boards and through an annunciator to ground, in combination with a branch wire *g* and springs *h l* included therein of the cord switch and the flexible cord and plug, said cord having a permanent connection with the test circuit provided for said line, substantially as and for the purpose specified.

2. The combination with a telephone line connected with switches on two or more switch boards and provided with a test circuit connected with the insulated frames of said switches, of a flexible cord provided with a terminal plug with which said test circuit is permanently connected, said plug being normally disconnected from the line, substantially as and for the purpose specified.

3. The combination with the test circuit of a telephone line, of the terminal plug and cord thereof normally disconnected from said line, the operator's telephone, and a cord switch, adapted to connect said plug with said line when actuated, whereby the plug is connected with the line and the telephone when the plug is lifted from its socket in the cord switch.

4. The combination with the subscriber's telephone line branched in two paths, one branch including the springs and contacts of the spring jacks and the annunciator, the other branch including a cord switch and the plug and cord, and a test battery, whereby when the plug of a line is used in making a connection the annunciator thereof is left in circuit as a clearing out signal, and whereby on making a connection at a spring jack switch the said annunciator is disconnected from the circuit.

5. The cord switch provided with a socket for the terminal plug of that line with which the cord switch is connected, said plug and cord, the operator's telephone and the pivoted cam lever provided with the plunger *o*, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 11th day of November, A. D. 1890.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,  
GEORGE L. CRAGG.