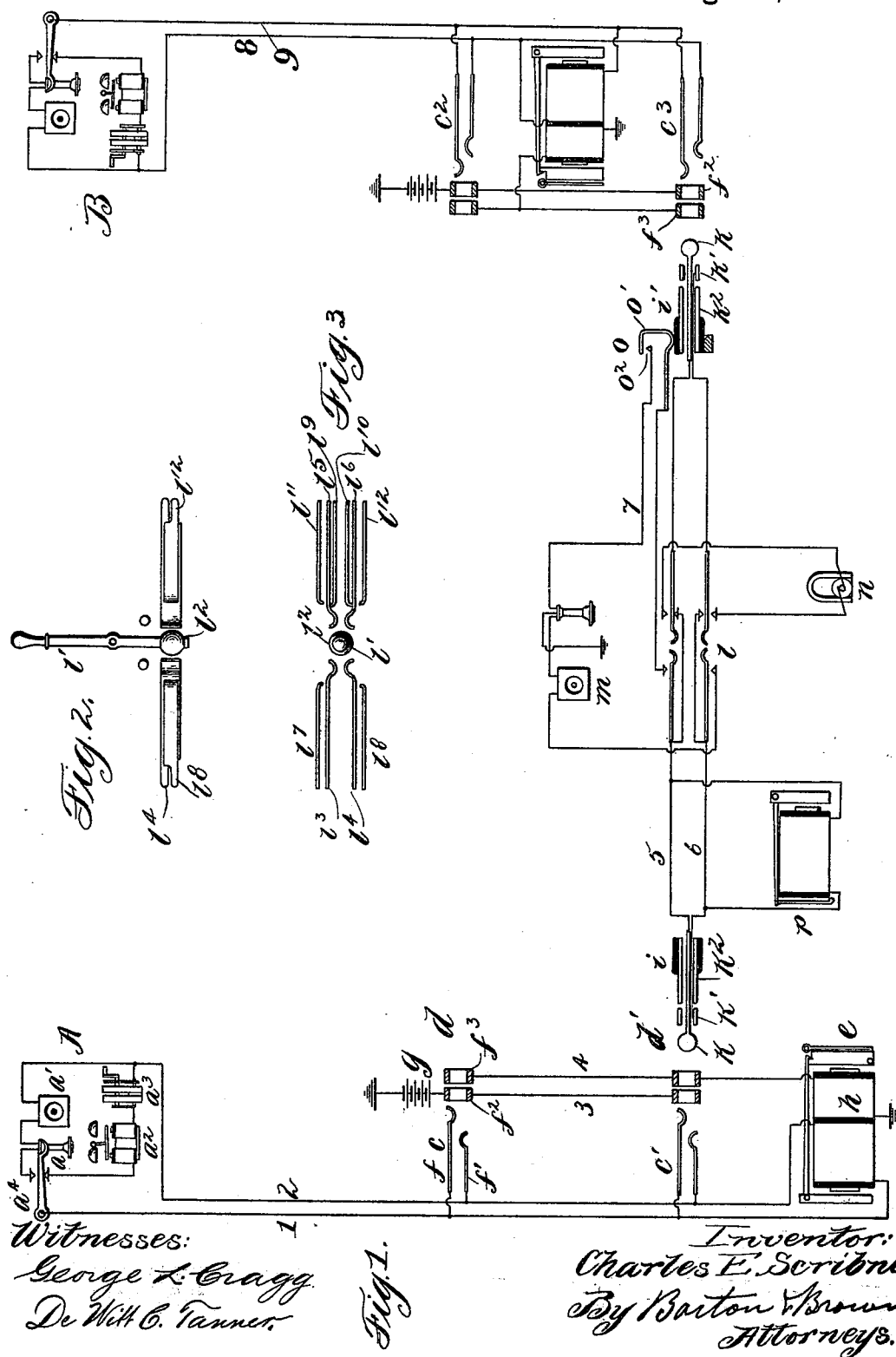


C. E. SCRIBNER.  
TELEPHONE SWITCHBOARD APPARATUS.

Patented Aug. 13, 1895.



# UNITED STATES PATENT OFFICE

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## TELEPHONE-SWITCHBOARD APPARATUS.

SPECIFICATION forming part of Letters Patent No. 544,386, dated August 13, 1895.

Application filed December 26, 1894. Serial No. 532,960. (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 Telephone-Switchboard Apparatus, (Case No. 372,) 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 the switching apparatus of telephone-switchboards, and particularly to the apparatus controlling the connection of the attendant's telephonic and signaling appliances with the telephone-lines. Its object is to facilitate the work of the operator in establishing connection between lines by automatically controlling the connection and disconnection of her telephone with the plug-circuit employed in uniting lines.

As is well known in the art of telephony, the essential operations in establishing connections between lines in a switchboard of ordinary type consists in inserting the "answering-plug" of a plug-circuit into the spring-jack of a calling subscriber, connecting the operator's telephone with the plug-circuit to receive the order, inserting the connecting-plug in a spring-jack of the subscriber called for, disconnecting the telephone, and signaling over the line called for.

Hitherto the disconnection of the telephone and the transmission of the calling-signal over the line called for have been effected simultaneously by a single key, which in its normal position connected the operator's telephone with the plug-circuit. The key is placed in its normal position by the operator at her leisure, so that upon the insertion of the answering-plug in the spring-jack of a calling-line, the telephone is found already connected with the plug-circuit. The movements of an operator in making connection between two lines are thus limited to the insertion of the two plugs and the operation of the key for signaling the subscriber called for. It has been found in practice, however, that it is convenient for an operator receiving several calls simultaneously to insert the answering-plugs of a number of plug-circuits into the spring-jacks of the calling-lines and

to complete the connections successively as rapidly as possible thereafter. This requirement necessitates the separation of the telephone from all but one of the plug-circuits thus employed and its connection with the plug-circuits consecutively at a later stage in the process of completing the connections. It is to this requirement that my invention is addressed, its object being, particularly, to bring the operator's telephone into connection with a plug-circuit equipped with the before-described apparatus in the act of completing the connection—that is, in inserting the final plug of a pair into the spring-jack of the answering-line. This I have accomplished by including in the conductor uniting the telephone with each plug-circuit the switch-contacts of a plug-seat switch in the socket of the connecting-plug, the circuit connections being such that the conductor of the telephone is severed while the plug rests in its socket. The operator is thus permitted to throw her key into position to connect her telephone with the plug-circuit at any convenient time; but the telephone is not actually connected with the plug-circuit until the operator has raised the final plug of a pair from its socket in the act of completing a required connection.

My invention is particularly applicable to the multiple type of switchboards, in which it is desirable that the telephone shall remain connected with the plug-circuit until the "test" has been made.

I have illustrated my invention in the accompanying drawings, and will describe it more fully in connection therewith.

Figure 1 in the drawings represents two substations A and B, connected by line-conductors with the usual apparatus of a multiple telephone-switchboard of two sections. Fig. 2 is a side elevation of a key particularly suitable for use in my invention. Fig. 3 is a view of the same from beneath, showing the arrangement of the switch-springs.

In Fig. 1 the apparatus at the sub-station may comprise a telephone  $a$  and microphone  $a'$ , a signal-bell  $a^2$ , a generator  $a^3$  of signaling-current, and an automatic telephone-switch  $a^4$  arranged to switch the telephonic and the signaling appliances alternately in

connection with the line. The apparatus at station A is connected by line-wires 1 and 2 with spring-jacks  $c$  and  $c'$ , one upon each section  $d$  and  $d'$  of the multiple switchboard.

5 The line is also connected with an annunciator  $e$  of the self-restoring type. Each spring-jack consists of a pair of springs  $f$  and  $f'$ , which constitute the terminal contacts of the line-circuit 1 2, and a pair of contact-pieces

10  $f^2 f^3$ , which constitute the normally open or separated terminals of a local battery-circuit for restoring the annunciator and providing the "busy test." The contact-pieces  $f^2$  of the jacks belonging to one line are connected together by a conductor 3 and to earth through

15 a battery  $g$ . The remaining contact-pieces  $f^3$  are connected with a conductor 4, which includes the resetting or restoring magnet  $h$  of the line-annunciator  $e$ ; but one pair  $i i'$  of

20 connecting-plugs, with their accessory circuits and mechanism, is shown in the drawings. Each plug is constructed with a spherical tip  $k$  and a short sleeve  $k'$ , which are adapted to register with the line-contacts  $f f'$  of a spring-jack in which the plug is inserted, and a

25 longer sleeve  $k^2$ , which makes connection between the contact-rings  $f^2 f^3$  of the spring-jack. The tips  $k$  of the plugs  $i$  and  $i'$  are united by a flexible conductor 5 and the

30 sleeves  $k'$  by a conductor 6.

The switch-springs of a combined listening and calling key  $l$  are connected with the conductors 5 and 6 in a manner which will be traced after the description of the key, the

35 function of the key being to control the connection with the plug-circuit 5 6 of the operator's telephone  $m$  and a source  $n$  of signaling-current.

Referring to Figs. 2 and 3, the key  $l$  is seen to consist of a pivoted lever  $l'$ , which is

40 adapted to assume three positions, carrying at its lower extremity a wedge or plunger  $l^2$ , and two sets of switch-springs  $l^3 l^4$  and  $l^5 l^6$ , respectively, between which the plunger may be

45 thrust alternately to change their circuit connections. When the lever  $l'$  is thrust into one oblique position the wedge or block  $l^2$  enters between the curved ends of springs  $l^3 l^4$  and forces them outward. When thrown into

50 the opposite oblique position, it enters between springs  $l^5 l^6$  and presses these apart. The springs  $l^3 l^4$  are provided with anvils  $l^7 l^8$  against which they are thrust when forced outward. Springs  $l^5 l^6$  have each two sets of

55 anvils  $l^9 l^{10}$  and  $l^{11} l^{12}$ , from the former of which they are separated, respectively, when the plunger enters between them, and against the latter of which they are thrust. Stops limit the movement of the lever, the stops being

60 so disposed that the wedge  $l^2$  is permitted to enter so far between springs  $l^3$  and  $l^4$  that it is held between them until forcibly returned to its central position, but that when it is thrust between springs  $l^5 l^6$  it is pressed

65 out from between them when released.

Returning to Fig. 1, the spring  $l^3$  and the anvil  $l^9$  are connected with the conductor 5 of

the plug-circuit and the spring  $l^4$  and anvil  $l^{10}$  with conductor 6. The other switch-springs  $l^5 l^6$  are connected with the line-contacts  $k k'$  70 of plug  $i'$ . Anvils  $l^7 l^8$  constitute the terminals of the operator's telephone set  $m$ , while the other pair of anvils  $l^{11} l^{12}$  are connected with the poles of the generator  $n$  of signaling-current.

The continuity of the circuit containing the telephone set  $m$  is controlled by a plug-seat switch  $o$  in the socket of connecting-plug  $i'$ . This plug-seat switch comprises only a spring  $o'$ , which projects into the socket of the 80 plug and is adapted to be forced aside while the plug rests in its seat, and an anvil  $o^2$  against which the spring is pressed when it is permitted to project into the socket. These contact-points are in circuit in the conductor 85 7, which includes the telephone. The operator's telephone-receiver is grounded at the middle of its coil for testing purposes, as usual. A clearing-out annunciator  $p$  is permanently connected in a bridge between conductors 5 90 and 6.

In the normal position of the apparatus the plug  $i'$  rests in its socket as shown, and the lever  $l'$  of key  $l$  is thrown into position to connect the telephone with springs  $l^3 l^4$ . It will 95 be noted that the telephone-circuit is open, however, at the plug-seat switch  $o$ .

In order to trace the operation of this system, let it be assumed that subscriber at station A wishes to converse with subscriber at 100 station B. The former subscriber by operating his signaling-generator  $a^3$  transmits a current in line 1 2, which causes annunciator  $e$  to display its indicator. The operator at switchboard  $d'$ , observing this signal, inserts plug  $i$  105 into spring-jack  $c'$  of the corresponding line. The signal of annunciator  $e$  may be one of a number of signals occurring simultaneously. The operator therefore inserts the answering-plugs  $i$  of a number of different pairs of plugs 110 into spring-jacks of the different calling-lines; but her telephone is not as yet connected with any plug-circuit. At her convenience, however, she raises plug  $i'$  from its seat, preparatory to inserting it into the spring-jack of a 115 line which may be called for. By this act the conductor 7 is completed and the telephone  $m$  is brought into connection with plug-circuit 5 6, and the operator is permitted to receive the order of subscriber at station A for the connection desired. She then tests the 120 line called for, to determine that it is free, in the usual way—that is, by applying the tip  $k$  of plug  $i'$  to the test ring or thimble  $f^3$  of spring-jack  $c^3$ . It will be understood that if 125 this line were in use the battery  $g$  would be connected through the sleeve  $k^2$  of the plug already inserted in the spring-jack of the line with conductor 4, and hence with the testing  $f^3$ , and at each application of test-plug  $i'$  130 to the test-ring current would find circuit from test-ring  $f^3$  through conductor 5 to the spring  $l^3$ , thence to its anvil  $l^7$  through contacts  $o' o^2$  of the plug-seat switch and through

one-half of the telephone-receiver *m* to earth, producing a click in the telephone. Having found the line free, however, the operator inserts plug *i'* fully into spring-jack *c*<sup>3</sup> and places lever *l'* in position for ringing—that is, in that position in which the wedge *l*<sup>3</sup> is forced between springs *l*<sup>5</sup> *l*<sup>6</sup>. These springs are thus separated from their normal resting-anvils *l*<sup>9</sup> *l*<sup>10</sup> and are closed upon the contacts *l*<sup>11</sup> *l*<sup>12</sup>, whereby the generator *n* is looped into circuit with the line-contacts of the plug, and a signaling-current is transmitted to station B which operates the signal-bell there. When the lever *l* is left free, after the operation of ringing, it returns to its normal vertical position. The conductors 5 6 are thus completed between plugs 1 2, so that the line-circuits 1 2 and 8 9 are connected together in a complete metallic circuit, but the springs *l*<sup>3</sup> *l*<sup>4</sup> are permitted to separate from their anvils and thus to disconnect both terminals of the telephone from the plug-circuit.

When the subscribers have terminated their conversation, one of them may, by rotating his signaling-generator, operate the clearing-out annunciator *p*, the signaling-current finding circuit to conductors 5 and 6 and thence through the clearing-out annunciator. When the operator has noted this signal, it is customary for her to bring her telephone again into connection with the circuit to assure herself that the connection is no longer desired. Having found that the connected subscribers are no longer in conversation, she removes the plugs *i i'* from the spring-jacks and returns them to their idle positions, leaving the key *l* in its position of connecting the telephone with the plug-circuit. This circuit is, of course, now open, however, at the switch-contacts of plug-seat switch *o*.

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

1. The combination with a telephone line, of a springjack connected therewith, a plug forming one terminal of a plug circuit inserted in the springjack, an operator's telephone in a conductor connected with the plug circuit, a plug forming the other terminal of the plug circuit, and a plug-seat-switch in the resting socket of the latter plug, the separated switch contacts of the plug-seat-switch being included in the conductor containing the tele-

phone, whereby the telephone may be brought into complete connection with the plug circuit by removing the plug from its socket to complete a connection.

2. The combination with a telephone line, of a connecting plug forming the terminal of the line, a switch key adapted to connect an operator's telephone with the line, a plug-seat-switch in the resting socket of the plug having normally separated switch contacts included in circuit with the telephone, a calling key adapted to connect a source of signaling current with the terminal plug, and mechanism adapted to be actuated in the operation of the calling key to return the listening key to its position of disconnecting the telephone, substantially as described.

3. The combination with a telephone circuit, of a plug constituting the terminal thereof, a switch key capable of being thrown into three different positions, in one of which it connects an operator's telephone with the telephone line, in another of which it disconnects the said telephone, and in the third of which it connects a source of signaling current with the terminal plug, and a plug-seat-switch having normally separated contacts included in circuit with the telephone, whereby raising the plug to make connection closes the circuit through the telephone, and operating the calling keys opens the circuit through the telephone.

4. In combination, several pairs of connecting plugs with their uniting plug circuits, a telephone and listening key for each plug circuit adapted to connect the terminals of a conductor including the telephone with the corresponding plug circuit, a plug-seat-switch for the final or test plug of each pair, the switch contacts thereof being included in the conductor between the telephone and the corresponding plug circuit to open the connection normally, a calling key and mechanism for simultaneously operating the calling key to signal and the listening key to disconnect the telephone, substantially as described.

In witness whereof I hereunto subscribe my name this 30th day of November, A. D. 1894.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,  
DUNCAN E. WILLETT.