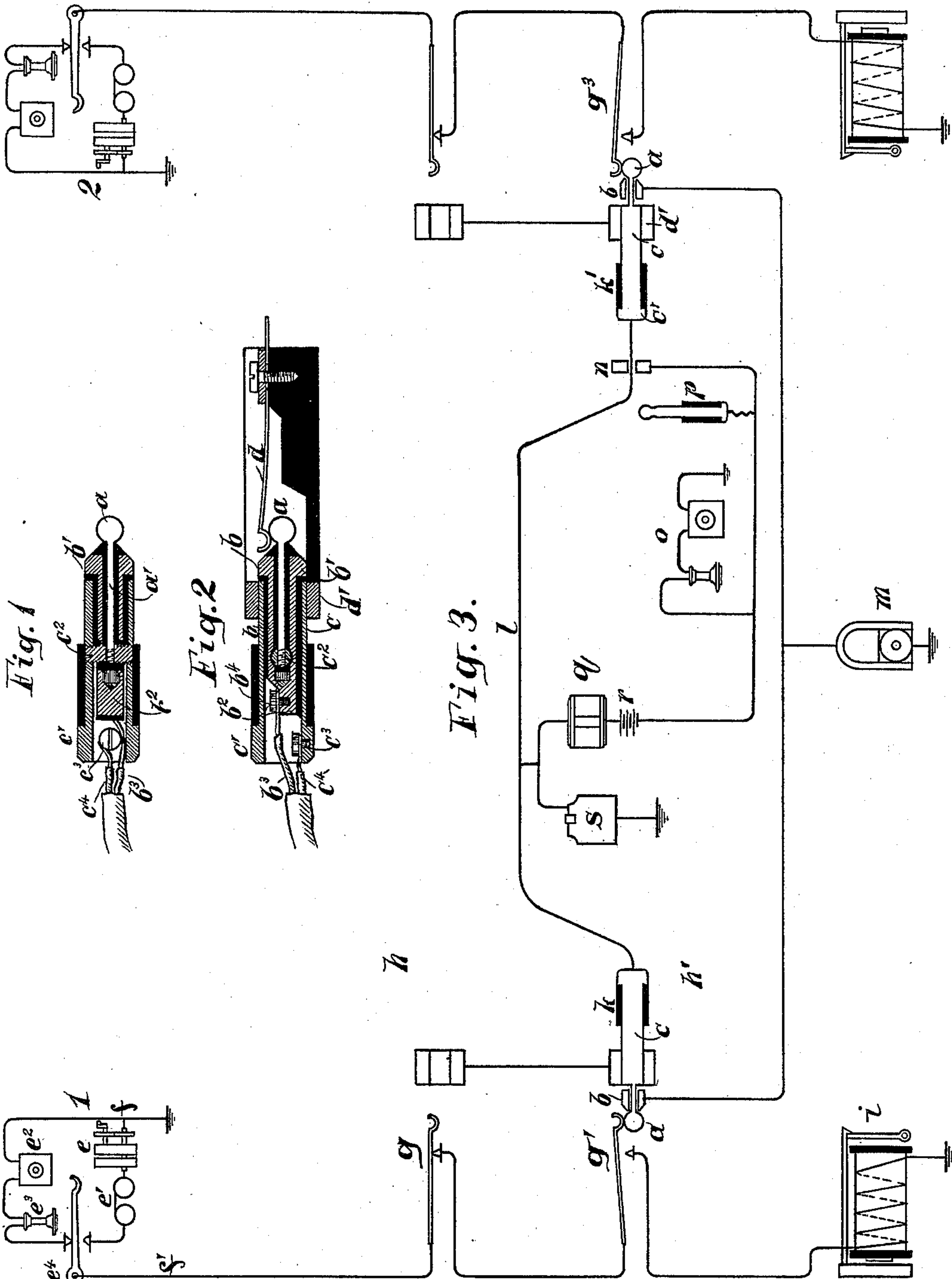


(No Model.)

C. E. SCRIBNER.  
TELEPHONE SWITCHBOARD APPARATUS.

No. 533,147.

Patented Jan. 29, 1895.



Witnesses

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# UNITED STATES PATENT OFFICE.

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

## TELEPHONE-SWITCHBOARD APPARATUS.

SPECIFICATION forming part of Letters Patent No. 533,147, dated January 29, 1895.

Application filed May 13, 1892. Serial No. 432,899. (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. 300,) 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 operator's connecting apparatus or outfit of telephone switch boards.

The object of the invention is to simplify the construction and manipulation of the connecting outfit.

Heretofore it has been customary to provide pairs of loop plugs for the operator of the switch board, the different members of a pair being connected together through flexible conductors, and keys in connection with each pair of connecting plugs and cords, arranged to disconnect either plug from the other and to connect it to a source of electricity to send calling signals, and other keys to connect the operator's telephone apparatus with the cord circuit.

My invention is designed to dispense with the various keys of the connecting outfit, thus effecting a saving in the expense of the apparatus, and at the same time facilitating the establishment of connection between two telephone lines by reducing the number of operations or motions required in establishing such connection.

In my invention I employ spring jacks and connecting plugs adapted for insertion into them of construction essentially similar to those heretofore employed. In addition to the usual contact pieces of the connecting plug, however, I provide a short sleeve or contact piece upon the plug adapted to make contact with the line spring of the spring jack when the plug is fully inserted into the jack, but normally held out of contact with the line spring while the plug is in the spring jack, the tip of the plug being of such form that the pressure of the line spring thereupon prevents the insertion of the plug entirely into

the jack excepting by an additional effort. This additional contact piece is connected with a calling generator or other source of electric current appropriate to operate the signal apparatus at the substation. When the plug is inserted into the spring jack to its normal distance, the line circuit is completed to the connecting plug in the usual manner; but when it is desired to send a call signal to the substation from the exchange, the plug is thrust entirely into the spring jack, whereby the extra contact piece upon the plug, or the "calling contact," is forced into contact with the line spring, thus connecting the source of calling current with the line.

To enable the operator to communicate with a subscriber at any substation or with either or both of two connected subscribers, I have devised means as follows:—One of the connecting plugs is provided with a metallic heel piece connected with the tip or line contact piece of the plug, which rests in a metallic socket when the plug is idle, the socket forming one terminal of the operator's telephone set, the other terminal of the telephone being connected to earth or to a common return wire from the different substations. That plug which is not provided with a socket is employed in answering a call from a substation, so that when the operator has inserted the "answering plug" into the answering jack of a calling subscriber's line, her telephone set is connected with the line through the metallic socket, and heel piece of the other plug of the pair. To enable the operator to communicate with two subscribers in connection I employ a contact piece or tip connected with the operator's telephone set by a flexible cord, the contact piece or tip being adapted to be applied to the heel piece of any other connecting plug. Thus when the operator desires to communicate with either of two subscribers in connection, she applies this contact piece—which I shall call the "listening plug"—to the heel piece of either of the plugs employed in completing the connection between the subscribers, whereby her telephone set is connected in a branch from the complete loop circuit including the two substations.

I further provide novel means for testing



the spring jack of any line to determine whether the line is already in use at some other spring jack or not.

In a branch from the cord circuit to the operator's telephone set I include a source of electricity, a retardation coil being interpolated in the branch between the source of electricity and the cord circuit to prevent the escape of telephonic current from one cord circuit to another, when several cord circuits are thus connected with a single battery and telephone set. The connecting plug is arranged to cross together the normally insulated test ring and the line spring of the spring jack into which it may be inserted, in the usual manner, thus connecting the test rings to earth. When a line having such a connecting plug inserted into one of its spring jacks is tested in the usual manner,—that is by applying the tip of one of the connecting plugs to a test ring,—the test battery branched from the cord circuit finds circuit through the flexible cord to the tip of the connecting plug, thence to the test ring to which this tip is applied, thence over the line to earth, returning to earth at the exchange, thence through the operator's telephone set to the other pole of the battery. A click or other response is thus produced in the operator's telephone receiver which indicates to her that the line tested is in use,—that is that the test rings of the spring jacks of that line are connected to earth.

My invention is illustrated in the accompanying drawings.

Figure 1 of the drawings is a longitudinal central section of a connecting plug for use in my system, disclosing the construction of the plug. Fig. 2 is another longitudinal central section of the plug taken on the plane at a right angle to the first section. Fig. 3 is a diagram illustrating the circuit connections of my improved switch board system.

The plug depicted in Figs. 1 and 2 comprises a tip *a* adapted to engage with the line spring of the spring jack into which the plug may be inserted, a short sleeve *b* insulated from the tip *a*, and a shank or body *c* connected with or integral with the tip *a*. The shank *c* is constructed as a tube having an enlarged heel piece *c'*. Contact piece *b* is also tubular throughout the greater portion of its length, but is provided with an enlarged contact portion *b'* at its projecting end, and with a solid portion *b<sup>2</sup>* adapted to receive the terminal of a flexible conductor, as *b<sup>3</sup>*, the same being secured to the tube *b* by a small binding screw *b<sup>4</sup>*. The shank *c* and the tube *b* are insulated from each other by insulating material, as hard rubber, interposed between them. The tip *a* is provided with a stem *a'* which extends axially through the tubular portion of the piece *b* and is screwed into a pin *c<sup>2</sup>* which extends diametrically through the shank *c*, the stem *a'* and the pin *c<sup>2</sup>* being also insulated from the piece *b* by suitable insulation. A binding screw *c<sup>3</sup>* is provided on

the inner surface of the shank *c* to receive another flexible conductor, as *c<sup>4</sup>*. The tip *a* and the shank *c* are thus electrically and mechanically connected together, the piece *b* being securely held in its place, and being insulated from the other parts of the plug. The end of the tube *b* nearest the tip *a*, and the insulation interposed between that end of the tube and the tip, are beveled for a purpose which will presently be explained.

In Fig. 2 the plug is shown inserted into a spring jack. The slight bend in the extremity of the line spring *d* of the spring jack normally rests in the position shown behind the tip *a*, but by exerting a sufficient thrust upon the plug, the piece *b* may be forced under the line spring to connect with it; but as soon as the plug is again released, the pressure of the spring forces it from the spring jack until the line spring again rests in its normal position. The spring jack is provided with the usual test ring *d'* which makes contact with the shank *c* of the plug and hence is connected with the line spring *d* as long as the plug is in the jack.

Referring now to Fig. 3, the apparatus at the substation is of the usual character. It comprises a calling generator *e* and signal bell *e'*, and a telephone transmitter *e<sup>2</sup>* and receiver *e<sup>3</sup>* in two different branches from a conductor *f*, and a gravity switch *e<sup>4</sup>* connected to another conductor *f'*, and adapted to connect the signaling apparatus or the telephone apparatus alternately into circuit between the conductors *f f'* according to the position of the switch. The conductor *f* is grounded at the substation. The conductor or line *f'* extends to the exchange, where it is connected through the line spring and back contact of two spring jacks *g* and *g'* upon two sections *h h'* of a multiple switch board, and through an individual annunciator *i* of usual construction, at the board *h'* near its spring jack *g'* thereupon, thence to earth at the exchange.

The operator's connecting outfit comprises two connecting plugs *k k'* of the construction shown in Figs. 1 and 2. The tips or bodies of the plugs *k k'* are connected by a flexible conductor *l*. The contact pieces *b b* of the two plugs are connected by other flexible conductors which may in practice be included with the conductor *l* in a flexible cord in the usual manner. A calling generator *m*, grounded at one pole, has its other pole connected with the conductor joining the pieces *b b* of the two plugs.

A metallic socket *n* is provided for the plug *k'*,—the plug *k* being supposed to be the answering plug,—in which the plug *k'* normally rests and with which the heel piece *c'* of the plug makes electrical contact. The socket *n* is connected by a conductor with one terminal of the operator's telephone set *o*, whose other terminal is connected with earth, and by a flexible conductor with a listening plug *p*.

A branch from the conductor *l* extends through the retardation coil *q*, to one pole of



the battery *r*, the other pole of the battery being connected with the operator's telephone set *o*. A clearing-out annunciator *s* is included in another branch connection from the conductor *l* to earth.

I will now proceed to explain the operation of the system shown.

Suppose the subscriber at station 1 desires to communicate with the subscriber at station 2. The telephone receiver *e*<sup>3</sup> being upon the switch hook *e*<sup>4</sup>, the subscriber at station 1 rotates the handle of the generator *e*, thus sending current from the substation over the line *f*' to the exchange, through the spring jacks *g* *g*' thereat, thence through the annunciator *i* to earth. The annunciator is thereby actuated, attracting the attention of the attendant operator at board *h*'. The operator then inserts the answering plug *k* of the pair into the jack *g*' of the calling line at her board. The circuit is thus continued from the substation to the line spring of spring jack *g*', thence to the tip *a* of the plug *k*, thence through the cord *l* to the heel of plug *k*' and thence,—the plug *k*' being as not yet in use, and hence resting in its socket—to the socket *n*, thence by a conductor to the telephone set *o* and to earth. The operator is enabled to receive the order from subscriber at station 1, we will assume for connection with substation 2. The operator next proceeds to test the line to substation 2 to determine whether it is already in use, by the usual process of applying the tip of the remaining connecting plug *k*' to the test ring *d*' of the spring jack *g*<sup>3</sup> at her board. If the line tested were in use, current would flow from the battery *r* through the retardation coil *q* to the conductor *l*, thence to the tip of the plug *k*', to the test ring tested, thence to the shank of the plug by means of which the existing connection is made, to the line spring *d* of the spring jack into which the plug is inserted, thence over the line to earth, thence returning to earth at the exchange, through the operator's telephone set *o*, to the other pole of the battery *r*. This flow of current through the operator's telephone set would produce a click in the telephone receiver at each application of the testing plug to the spring jack tested. If, however, the line were not in use, no circuit would be completed when the plug *k*' was applied to the test ring of the spring jack, and no response would be received by the operator. Having found the lines to station 2 not in use, the operator inserts the plug *k*' fully into the spring jack *g*<sup>3</sup>, whereby the line spring of the jack is caused to enter upon the contact sleeve *b* of the plug, completing circuit from the calling generator *m* through the sleeve *b* to the line spring of the spring jack, over the telephone line to substation 2, where it traverses the signal bell, and thence to ground, operating the signal bell and notifying the subscriber at station 2 of the call. The operator then allows the plug *k*' to return to its normal position as shown in Fig. 2. The two substa-

tions are now connected through their lines to line springs of their respective spring jacks *g*' and *g*<sup>3</sup>, which are united through the plugs *k* and *k*' and the conductor *l*. The operator's telephone set may be considered as being disconnected from the cord circuit, since no telephonic current can pass the retardation coil *q*. If at any time she desires to communicate with either of the subscribers, she applies the listening plug *p* to the heel piece *c*' of that one of the plugs which is most convenient, whereby her telephone set *o* is connected in a bridge between the earth and the conductor *l* joining the subscribers, and she is enabled to talk with the subscribers, or to hear their conversation. When the subscribers have completed their conversation, one of them,—we will assume for example that one at station 1,—will replace his telephone upon the switch hook and rotate his generator *e*, thereby sending signaling current over the line to spring jack *g*' whence it finds circuit through the plug *k* to the conductor *l*, thence through the clearing-out annunciator *s* to earth. The shutter of the clearing-out annunciator is thus released indicating the signal for disconnection to the attendant operator.

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

1. The combination with a connecting plug of a tip *a* and a shank *c* electrically connected together and a sleeve or contact piece *b* insulated from the said shank and tip, substantially as described.

2. The combination with a telephone line of a signal bell in circuit therein, a spring jack at the exchange having a line contact connected with one side of said telephone line, a connecting plug adapted to be placed in two different positions in the spring jack, said connecting plug having two contact pieces disposed to make contact one at a time with the line contact of the spring jack according to the position of the plug therein, a source of calling current having one terminal connected with one of the contact pieces, the other terminal thereof being connected with the other side of the line circuit, and telephone apparatus connected with the remaining contact piece of the plug, substantially as described.

3. The combination with a telephone line extending from a substation to an exchange, of a signal bell at said substation included in the line circuit, said line including line springs and contacts of spring jack, and an individual annunciator at the exchange, each of said spring jacks being provided with a normally insulated test ring, all the test rings of the line being connected together, a connecting plug inserted into a spring jack of the line having a contact piece connecting with the line spring and the test ring of the spring jack and having another contact piece normally out of contact with both the line spring



and test ring but adapted to be moved to connect with the line spring, a source of calling current connected between the remaining side of the said line circuit and said extra  
 5 contact piece upon the plug, and another connecting plug having similar contact pieces connected by a conductor with the first mentioned plug, a metallic socket in which the  
 10 contact is connected, and the operator's telephone set connected in a branch from the said socket to the other side of the said line circuit, substantially as described.

4. In combination, two connecting plugs  
 15 each having three contact pieces, one contact being insulated from the remaining two, the remaining two being electrically connected, each of said plugs being adapted to be placed in either of two positions in a spring jack,  
 20 the contact pieces of the plug being disposed to make contact one at a time with the line contact of the spring jack, the like contact pieces of the two plugs being connected by conductors, a grounded source of calling current connected with one of the said conductors,  
 25 and a grounded telephone set connected with the other of said conductors, substantially as described.

5. In combination, two connecting plugs  
 30 each having three contact pieces, one contact being insulated from the remaining two, the remaining two being electrically connected, each of said plugs being adapted to be placed in either of two positions in a spring jack, the  
 35 contact pieces of the plug being disposed to make contact one at a time with the line contact of the spring jack, the line contact pieces of the two plugs being connected by conductors, a grounded source of calling current connected to one of the contact pieces, a metallic  
 40 socket adapted to receive one of the plugs when idle and to connect with the remaining contact piece, and a grounded telephone set connected with the said socket, substantially  
 45 as described.

6. In combination, two connecting plugs each having three contact pieces, one contact being insulated from the remaining two, the remaining two being electrically connected,

each of said plugs being adapted to be placed  
 50 in either of two positions in a spring jack, the contact pieces of the plug being disposed to make contact one at a time with the line contact of the spring jack, the line contact pieces  
 55 of the two plugs being connected by conductors, a grounded source of calling current connected with one of the contact pieces of the plug, a metallic socket adapted to receive one of the plugs when idle and to connect with the  
 60 remaining contact piece thereof, a listening plug attached by a flexible conductor to the said socket, and a grounded telephone set also connected with the same socket, substantially as described.

7. In combination, two connecting plugs  
 65 having contacts adapted to connect with the line contacts of a spring jack, a metallic socket adapted to receive one of the plugs when idle and to connect with its line contact piece, a branch extending from the conductor joining  
 70 the line contacts of the two plugs to the said socket, and including a source of electricity, and a telephone set grounded at one terminal having its remaining terminal connected with the said branch between the said source of  
 75 electricity and the socket, substantially as described.

8. In combination, two connecting plugs having contacts adapted to connect with the line contacts of a spring jack, a metallic socket  
 80 adapted to receive one of the plugs when idle and to connect with its line contact, a branch extending from the conductor joining the line contacts of the two plugs to the said socket, and including a source of electricity, and a  
 85 retardation coil included between said source of electricity and the said cord circuit, and a telephone set grounded at one terminal having its remaining terminal connected with the said branch between the said source of elec-  
 90 tricity and the socket, substantially as described.

In witness whereof I hereunto subscribe my name this 10th day of March, A. D. 1892.

CHARLES E. SCRIBNER.

Witnesses.

M. J. TALLETT,  
 GEORGE MCMAHON.