(No Model.) 3 Sheets—Sheet 1.

C. E. SCRIBNER.

TELEPHONE EXCHANGE SYSTEM.

No. 383,013. Patented May 15, 1888.

Fig. 1.

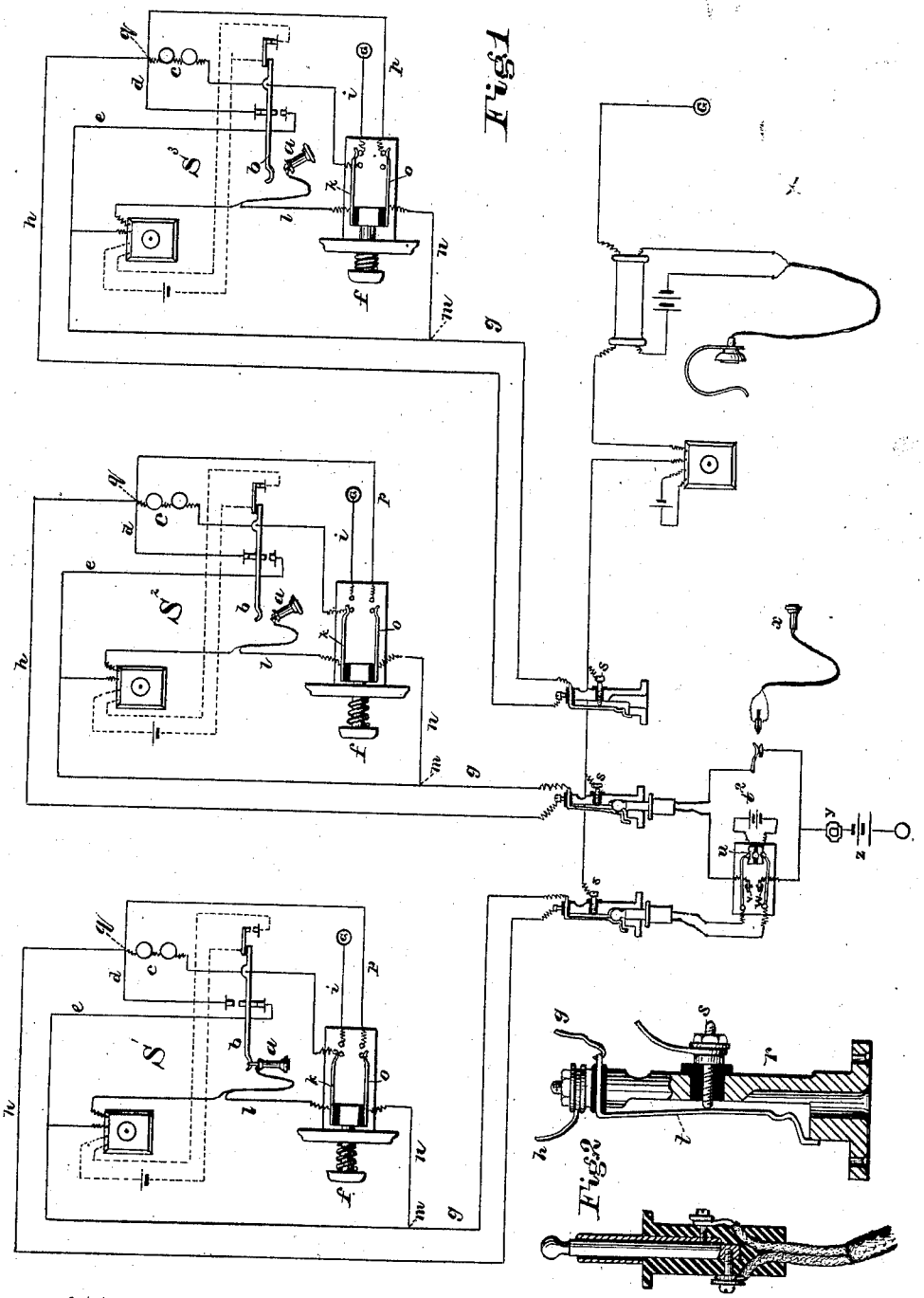

Fig. 2.

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3 Sheets—Sheet 2.

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Fig. 3.

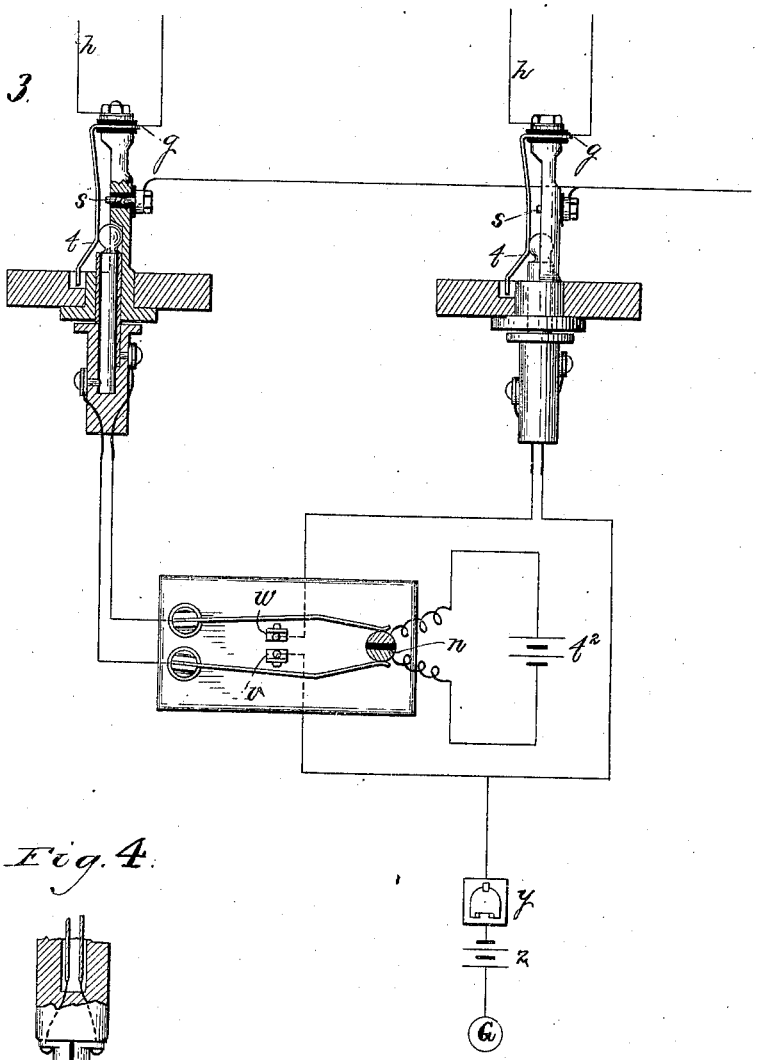
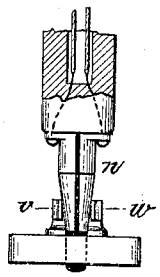


Fig. 4.



Witnesses.

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(No Model.) 3 Sheets—Sheet 3.

C. E. SCRIBNER.

TELEPHONE EXCHANGE SYSTEM.

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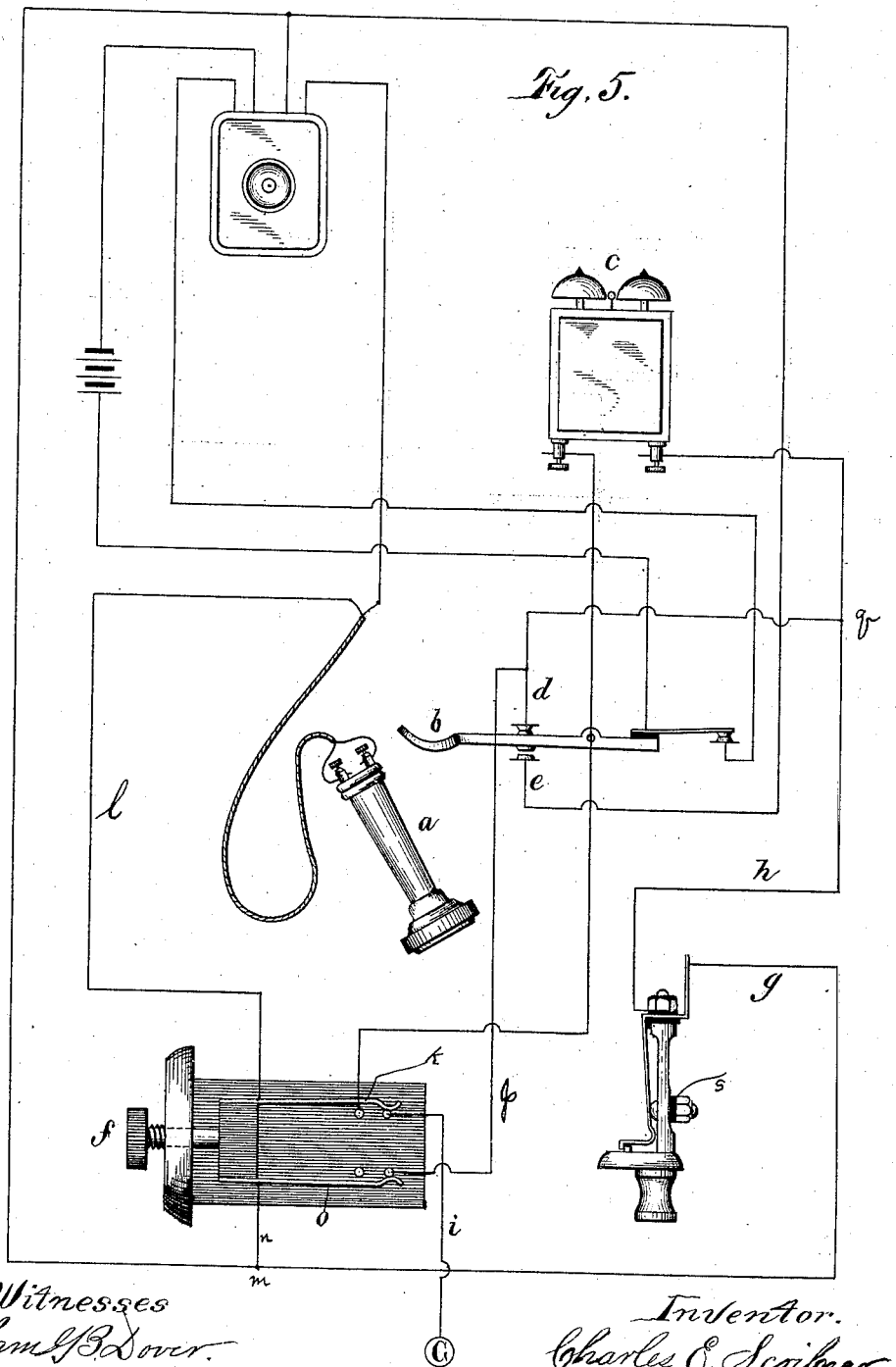
Fig. 5.



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UNITED STATES PATENT OFFICE.

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

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 383,013, dated May 15, 1888.

Application filed March 5, 1883. Serial No. 87,056. (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-Exchange Systems, (Case 47,) 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 is designed for use in connection with a system of telephone-exchange in which complete metallic telephone-circuits are employed. Complete metallic circuits have been used heretofore in large cities, and double-pointed connecting-plugs have been provided at the central office for the purpose of uniting into one circuit the complete metallic circuits of two subscribers.

My invention, as herein described, consists in new switching apparatus and circuits for the subscriber's outfit, by means of which a subscriber who desires to talk to the central office may ground his metallic circuit through his telephone and connect the two wires with the listening operator as a single ground-circuit.

My invention also consists in improvements in the spring-jack used upon the switch-board and in the apparatus for receiving and transmitting signals at the central office.

In the accompanying drawings, which are illustrative of my invention, Figure 1 is a diagram of the circuits between the central office and the subscribers' stations. Fig. 2 is a partial sectional view showing the double-pointed or loop plug and my improved spring-jack. Fig. 3 is an enlarged view showing certain parts of the central-office apparatus in detail. Fig. 4 is a detailed view of the calling-battery switching apparatus. Fig. 5 is a detailed view of the commutator and other apparatus at a subscriber's station with the circuits extending to the subscriber's station from the central office.

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

The subscribers S', S^2, and S^3 are each provided with a metallic circuit. The local circuit of the microphone and primary of induction-coil may be provided at each station, in the usual manner. Each subscriber is moreover provided with a telephone, a switch, a signal-bell, and circuit-changing key or commutator.

At station S' the telephone *a* is shown hanging on the lever *b* of the telephone-switch, and the bell *c* is directly in circuit. When the switch-lever is changed to its other position, as shown at S^2, the shunt *d* of the bell is closed and the shunt *e* of the telephone is opened. When the switch is in this position and the commutator in its normal position, the telephone receiver and transmitter are included directly in the metallic circuit. The circuit at station S^2 may be traced from one line of the metallic circuit through the telephone transmitter and receiver to the upper spring of the commutator to the contact-point upon which said spring rests, and thence to the switch-lever, and thence, by contact-point and shunt-wire *d*, to the other part of the metallic circuit. The transmitter and receiver are thus included directly in the metallic circuit, as shown at said station S^2.

At station S^3 the commutator *f* is shown pressed in, so as to ground the two lines *g h* of the metallic circuit through the telephone. This circuit may be traced as follows: From the ground-line *i* to the lever *k* of the commutator, thence by line *l* through the telephone and secondary of the induction-coil to *m*. From *m* we have a single circuit in two branches to the contact-point of the spring-jack at the central office—one branch directly, the other branch by line *n* to the spring *o* of the commutator, thence by line *p* to point *q*, and thence by the other wire, *h*, of the metallic circuit to the spring-jack.

I will now describe my improved spring-jack as shown in detail in Fig. 2. The tubular frame *r* is provided with a contact-point, *s*. The spring or lever *t* is insulated from the frame *r* at one end and adapted to make contact with the frame at the other end. The wire *g* is connected directly to the spring *t* and thence to the insulated contact-point *s*. The wire *h* is connected to the frame and thence to the spring and the said contact-point *s*.

Referring now to Fig. 1, it will be seen that we have a single circuit composed of branch wires *g* and *h* from station S^3 direct to point *s*

of the spring-jack upon the central-office switch-board. The receiving-telephone is of the form shown in my Patent No. 298,783, issued May 20, 1884. The points *s* of the spring-jacks I call the "ground-contacts," since these points are normally connected with the ground branch, which includes the operator's telephone. Thus the spring-jack switch at the right in Fig. 1 is shown with its spring or lever resting upon its ground-contact *s*. The metallic circuit *g h* of station S^3 is thus connected with the ground branch, which includes the operator's telephone-outfit.

Suppose subscriber S^3 wishes to talk with the central office. By pressing in the knob of commutator *f*, as shown, a branch circuit will be formed, as shown at station S^3, from the metallic circuit through the telephone to ground at said station. The subscriber S^3 is thus brought into communication with the listening operator at the central office, the metallic circuit formed by wires *g h* being connected through a branch circuit to ground at station S^3, the subscriber's telephone being in said branch, and at the central office through the branch containing the listening operator's telephone, as shown.

The ground branch at the subscriber's station may be traced from the junction *m* through the induction-coil of the transmitter to the telephone, and by wire *l* to spring *k* of the commutator, and thence by wire *i* to ground.

When the telephone *a* is on the switch *b*, as shown at station S, the bell *c* will be in the metallic circuit, while the telephone will be shunted. On removing the telephone from the switch the position of the switch changes and the telephone is brought into the metallic circuit, while the bell is shunted, as shown at station S^2. The bell and telephone at any subscriber's station may thus be brought alternatively into and out of the metallic circuit by changing the position of the telephone-switch at the said station. I have thus described a circuit between the subscriber and the listening operator.

The metallic circuits of two subscribers, as S' and S^2, may be united by means of a pair of double-pointed or loop plugs and conducting-cords. The double-pointed plug is shown in detail in Fig. 2 and is essentially the same as the double-pointed plug shown in my Letters Patent No. 262,701, dated August 16, 1882. When this plug is inserted in my improved spring-jack, the spring is lifted from the contact-point *s* and also from contact with the frame of the said spring-jack. Wire *g* is thus disconnected from the frame and connected to the central point of the plug, while at the same time wire *h* is connected to the outer point or collar of the plug. One wire of the metallic circuit may thus be connected to one strand of the conducting-cord and the other wire to the other strand.

At station S^2, Fig. 1, the telephone is shown removed from the switch and included directly in the metallic circuit, as before described. This circuit at station S^2 may be traced, beginning at the spring of the spring-jack at the central office, thence through the transmitter and receiving-telephone to the upper spring of the commutator at said station, thence to the point on which said spring rests, thence to the telephone-switch, and thence by the shunt-wire *d* around the bell to the other portion of the metallic circuit. The telephone at station S^2 is thus included directly in the metallic circuit, and there is no branch circuit closed to ground, as shown at station S^3.

At station S^3 (for detail see Fig. 5) the position of the commutator is changed. This change in the position of the commutator is effected by simply pressing upon the knob or key *f*. The upper spring, *k*, of the commutator is thus separated from its normal contact-point and closed to the ground-line *i*, as before described.

I arrange the plugs in pairs and connect the conducting-cords with switching apparatus and a clearing-out annunciator. I also provide a calling-battery and a listening-out telephone, either of which may be looped into the metallic circuit of two connected subscribers. The calling-battery t^2 is shown in the drawings looped into the metallic circuit of station S'.

The battery-plug *n* consists of two insulated metallic pieces. This plug, when inserted, as shown, between the two springs of the switch, disconnects the springs from contact-points *v w*. The battery is thus connected into the circuit of the subscriber called for, and does not find circuit through the line of the subscriber who sent in the call. On removing the battery-plug the springs of the switch close upon the contact-points *v w*, and the metallic circuits of the two subscribers are united in a single metallic circuit.

The central-office operator may determine whether two subscribers thus connected have ceased talking by looping in the listening-out telephone *x*. I also provide a clearing-out annunciator, *y*, so that either of two connected subscribers may send in a signal to disconnect. This annunciator I place in a branch line connected to ground through a battery. This branch line, as shown in the drawings, is connected to the metallic circuit at the conducting cord of the pair of plugs. It may, however, be connected to any other part of the circuit with like results. The battery *z* may consist of any number of cells and may be made common to any number of connections, so that a separate clearing-out battery need not be used for each connection established in the exchange.

Until the key *f* of the commutator of one of two connected subscribers is depressed the battery *z* will remain open. On depressing the key *f* at one of the connected stations the circuit of the clearing-out battery *z* will be closed through the annunciator *y*, and the shutter will fall, indicating that the subscribers are through talking.

I claim as my invention—

1. The combination of a metallic circuit with a branch circuit containing the operator's telephone and a switch included in the metallic circuit, whereby said metallic circuit may be connected to and disconnected from said branch circuit, substantially as specified.

2. A metallic circuit, in combination with a branch circuit to ground at the central office, including a telephone and a switch at the subscriber's station, whereby the telephone of said subscriber may be connected into a circuit branched from the metallic circuit to ground at the subscriber's station.

3. The united metallic circuits of two subscribers, in combination with a branch circuit to ground, including an annunciator and battery and switches, whereby either subscriber may ground the metallic circuit, and thereby close the battery and drop the annunciator, substantially as set forth.

4. The combination of a series of metallic circuits each extending from the central office to a different subscriber's station, and a branch line to ground at the central office, including the operator's telephone, and switches at the central office, one switch included in each metallic circuit, said switches normally connecting their respective metallic circuits with the said branch line.

5. A spring-jack consisting of the frame *r*, insulated point *s*, and the insulated spring or lever adapted to make contact with said frame and contact-point.

6. In a subscriber's telephone outfit for metallic-circuit lines, the signal-bell and telephone, in combination with a branch circuit to ground, and switches and connections whereby the subscriber may bring the telephone and signal-bell alternately into and out of the line-circuit and may remove the telephone from the line-circuit and connect it into said branch circuit.

7. A loop-plug, in combination with a switching device, said switching device being adapted to receive said loop-plug and having three contact-pieces, said contact-pieces being electrically connected in the switching device when the plug is not in it and being electrically disconnected in the switching device when the plug is in it.

8. A loop-plug, in combination with a switching device, said switching device being adapted to receive said loop-plug and provided with three contact-pieces, two of which are line contact-pieces, said contact-pieces being in electric connection with the third contact-piece when the plug is not in the switching device and being electrically disconnected from said third contact-piece when the plug is in the switching device.

9. The combination of a loop-plug with a switching device adapted to receive said loop-plug, the switching device having two insulated line-connections and a third insulated connection, and one of said insulated line-connections being normally in electric contact with the other line-connection, and also with said third insulated connection, and being removed from electric contact with said line-connection and said third connection when the plug is inserted.

10. The combination of a loop-plug with a switching device, the loop-plug having two insulated connections, and the switching device having two insulated line-connections and a third insulated connection and adapted to receive the loop-plug, one of said line-connections being normally in electric contact with the other line connection and with said third insulated connection when the plug is not inserted, and when the plug is inserted said line-connections being disconnected from each other and from said third insulated connection, and each connected with a corresponding insulated connection of the loop-plug.

11. In the central office of a telephone-exchange, two or more switching devices, each of which has two insulated contact-pieces connected to the two terminals of a metallic circuit telephone line, and a third insulated contact-piece connected with a ground-line common to said switches, and loop-plugs with flexible cords adapted to be placed in and removed from said switching devices, in combination with an operator's telephone in said ground-line, whereby when a loop-plug is inserted into any switching device the operator's telephone is disconnected from the line connected with said switching device, said operator's telephone being again automatically connected to said line when the plug is removed.

12. In the central office of a telephone-exchange, a loop-plug with a flexible cord and a switching device adapted to receive said plug, said switching device having two insulated contact-pieces connected to the two terminals of a metallic circuit telephone-line, and also a third insulated contact-piece connected to a ground-line, said third contact-piece being electrically connected with the other contact-pieces when the plug is not in the switching device, and being electrically disconnected from said pieces when the plug is in the switching device, in combination with an operator's telephone in said ground-line, whereby when the plug is in the switching device the operator's telephone is disconnected from the line-terminals, and when the plug is not in the switching device the operator's telephone is in electrical connection with both of said line-terminals.

13. In the central office of a telephone exchange, loop-plugs with two or more switching devices, each of which has two insulated line contact-pieces connected to the two terminals of a metallic circuit telephone line, and also each provided with a third insulated contact-piece, which pieces are respectively in electrical connection with said line contact-pieces when a loop-plug is not in the switching device, said third pieces being disconnected from said line contact-pieces when a loop-plug is in the switching device, and an

operator's telephone in a ground-line connected to said third insulated contact-pieces, whereby when a loop-plug is in either switching device the operator's telephone is disconnected from both terminals of the line connected thereto, and when the loop-plug is not in the switching device the operator's telephone is connected to both terminals of said line.

14. A subscriber's telephone-circuit, said circuit extending from the central office to the subscriber's office and thence back to the central office, a telephone in said circuit at the subscriber's office, a switching device by which said telephone may be removed from said circuit and connected into a branch circuit, one end of which is connected to said subscriber's circuit and the other end of which is connected with the ground, in combination with a switching device and an operator's telephone at the central office, the operator's telephone being connected on one side to the ground and on the other side to the switching device, the switching device being connected to the two terminals of the subscriber's circuit, whereby the subscriber, by operating the switching device at his station, may bring his telephone into circuit with the operator's telephone, and whereby the operator, by operating the switching device at the central office, may disconnect the subscriber's circuit from his telephone and connect it with another subscriber's circuit.

15. The switching device, consisting of a frame provided with a plug-hole of considerable depth, a spring or lever, and a third contact-point, in combination with a loop-plug adapted to lift the spring or lever from the contact-point, and also at the same time from contact with the frame, whereby the lever and frame may be connected, respectively, to different contacts of the loop-plug, and when the plug is removed automatically connected to the third contact point.

16. A metallic-circuit telephone-line terminating in the central office of an exchange, in combination with a branch line at the central office containing the operator's telephone, said branch line being grounded on one side of the telephone, and being normally connected on the other side of the telephone to both terminals of said telephone line, and a switching device, whereby said branch line may be disconnected from the terminals of said telephone-line.

17. The combination of two or more metallic-circuit telephone-lines centering in the central office of a telephone-exchange, with a branch line at the central office containing the operator's telephone, said branch line being grounded on one side of the telephone, and normally connected on the other side of the telephone with all of said lines, and switching devices, whereby any of said telephone-lines may be disconnected from said branch line.

18. The combination of two or more metallic-circuit telephone-lines centering in the central office of a telephone-exchange, with a branch line at the central office containing the operator's telephone, said branch line being grounded on one side of the telephone, and normally connected on the other side of the telephone with all of said telephone lines, and switching devices, whereby any of said telephone-lines may be disconnected from said branch line, and any two of said telephone-lines may be looped together in metallic circuit for conversation.

19. In a telephone-exchange system, a metallic-circuit telephone-line normally grounded at the central office through an operator's telephone, in combination with a switch at the subscriber's office, whereby the subscriber may, for conversation with the central office, establish a circuit which shall embrace the ground, his own and the operator's telephone, and part or all of said telephone-line.

20. In a telephone-exchange system, two or more metallic-circuit telephone-lines, all normally grounded at the central office through an operator's telephone, in combination with switches, one at each subscriber's office, whereby any subscriber may, for conversation with the central office, establish a ground-circuit which shall embrace his own and the operator's telephones and part or all of his telephone line.

21. In a telephone exchange, two or more metallic-circuit telephone-lines, all normally grounded at the central office through an operator's telephone, in combination with switches, one at each subscriber's station, whereby any subscriber may, for conversation with the central office, establish a ground circuit which shall embrace his own and the operator's telephones and part or all of his telephone line, and switching devices at the central office, one for each of said lines, whereby the operator may connect together any two of said lines for exchange communication.

In witness whereof I hereunto subscribe my name this 31st day of August, A. D. 1882.

CHARLES E. SCRIBNER.

Witnesses:
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