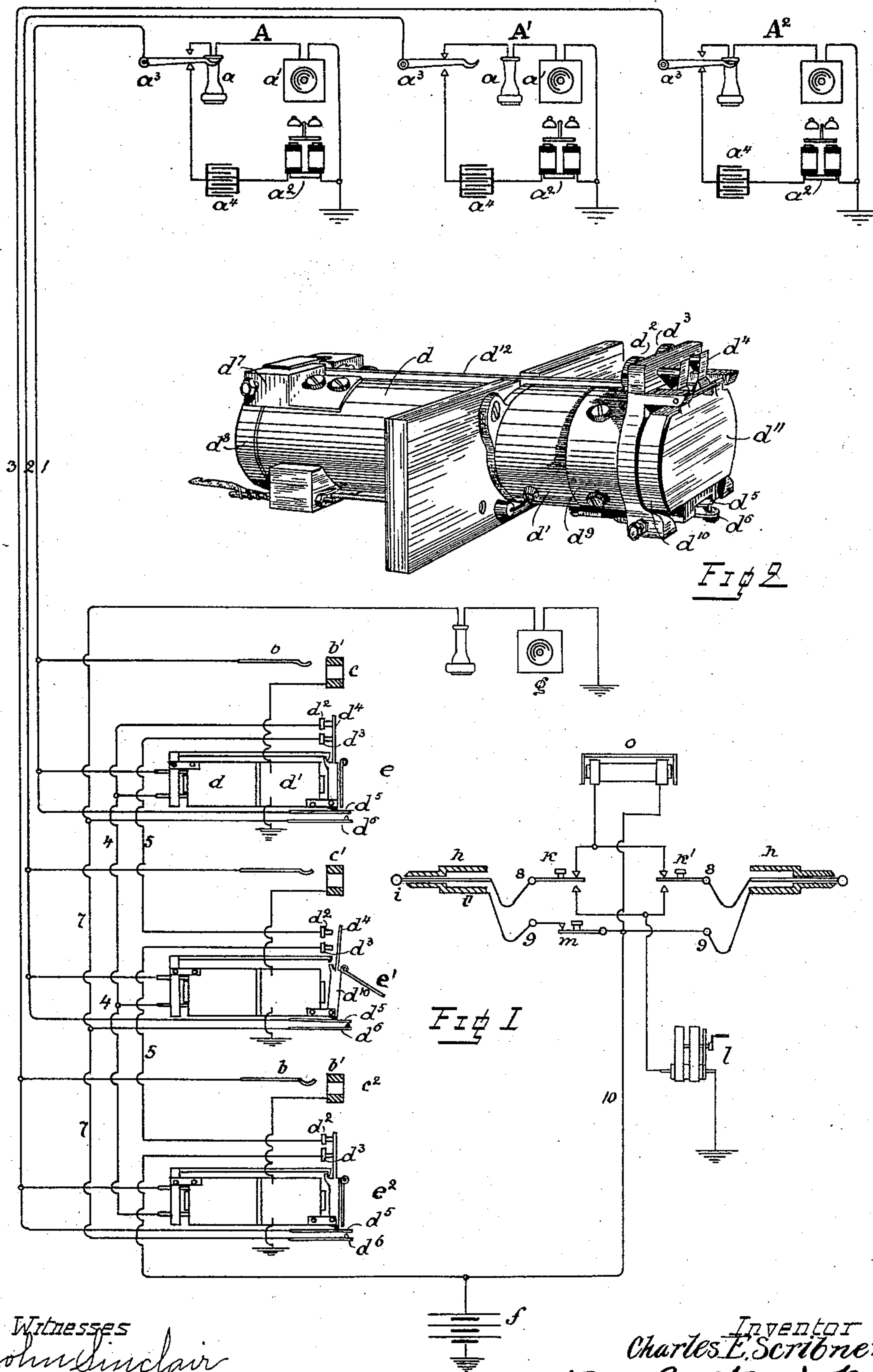


(No Model.)

C. E. SCRIBNER.
TELEPHONE EXCHANGE SYSTEM.

No. 572,221.

Patented Dec. 1, 1896.



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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 572,221, dated December 1, 1896.

Application filed October 16, 1894. Serial No. 526,062. (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 No. 362,) 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 switchboards of telephone-exchange systems, particularly to that system in which the act of calling automatically brings the signaling substation into connection with the operator's telephone to permit of communication between the operator and subscriber.

Heretofore it has been common to provide a signaling-annunciator in connection with each telephone-line, the annunciator being provided with switch-contacts adapted to connect the line-circuit with the telephone of a listening operator when the annunciator was actuated in response to a signaling-current transmitted in the line. The disadvantage of this system has been that in the event of several subscribers signaling simultaneously the different telephone-lines became connected with the operator's telephone at the same time and confusion of the orders to the operator resulted.

The primary object of my present improvement is to prevent the connection of more than one line with the operator's telephone at a time. To this end I have so organized the apparatus and circuits that after one annunciator has operated and connected the corresponding line with the telephone of the attendant the operation of the remaining annunciators of the group is rendered impossible until the first call shall have been attended to and the annunciator restored to its normal position. The call-signals are transmitted from the substations to the exchange by means of a source of signaling-current located at the exchange and connected with each line through its particular annunciator, the line being normally open as to continuous currents at the substation. At the latter station a switch is provided for

closing this circuit when desired. Hence when the switch of any substation is operated the corresponding line-annunciator upon the switchboard at the exchange is actuated and connects the line with the operator's telephone. Each annunciator is provided with a pair of switch-contacts in addition to the ordinary contacts by which the telephone is connected with the line, which control the continuity of the circuit of the common signaling-battery, the switch-contacts of all the annunciators of the group being included in series in the battery-circuit. It is thus plain that when an annunciator has been operated the transmission of a signal from any other substation of a group is prevented, since the connection of the other members of the group with a common signaling-battery is interrupted.

Subordinate features of my invention consist in means for restoring the annunciator of a signaling-line upon the establishment of connection with the line by means of the usual connecting-plugs and in a device for controlling the connection of the operator's telephone with any line during the use of the line. The first of these subordinate objects I accomplish by employing the type of annunciator known as a "self-restoring" or "self-resetting" annunciator, the restoring-magnet being included in a local circuit which is closed by coöperating contact-pieces at any spring-jack with which connection may be made by means of a plug, one of the contact-pieces being preferably located in the spring-jack itself and the other in the connecting-plug, the circuit-connections with the latter being made by means of the usual flexible cord.

The second-mentioned subordinate feature consists in a manually-controlled key for opening the local circuit to permit the operation of the annunciator in order to connect the operator's telephone with the line. Obviously if the restoring-circuit be thus interrupted while the line-circuit is still complete at the substation the annunciator will at once respond to the current flowing from the common signaling-battery in the line-circuit and will act to connect the line with the telephone, as in the case of an individual signal.

My invention is illustrated in the accompanying drawings and may be described with reference thereto.

Figure 1 represents, diagrammatically, the apparatus and circuits of my improved exchange system. Fig. 2 is an elevation of the line-annunciator, showing the special switch-contacts with which it is provided in my invention.

In the diagram of Fig. 1 three substations Λ , Λ' , and Λ'' are represented as connected with a telephone-switchboard by means of line-wires 1, 2, and 3, respectively. As the circuit connections of all the lines are alike those of line to substation Λ alone may be traced. The substation is provided with the usual telephone a , microphone a' , and bell a'' , together with an automatic switch a^3 for switching the bell and telephone alternately into circuit of the line. A condenser a^4 is included in the branch with bell a'' . The line-wire 1 is connected with the line-spring b of a spring-jack c at the exchange and with one terminal of the main or operating magnet d of the line-annunciator e . The remaining terminals of all the line-annunciators are connected with a common conductor 4, which terminates in the contact-anvil d^2 of annunciator e . This anvil is one of two which are crossed together by contact-piece d^4 on the annunciator while the latter is in its normal position. Contact d^3 of the pair is connected by conductor 5 with contact d^2 of annunciator e' , contact d^3 of the latter being connected in turn with contact d^2 of annunciator e'' , whose contact d^3 is grounded through the common signaling-battery f . Contacts d^2 d^3 upon the different annunciators are thus in series in a conductor 5, normally extending from conductor 4 through signaling-battery f to earth, all of the line-annunciators being included in branches from the common grounded battery to their respective lines.

Each annunciator is provided with another pair of contact-points d^5 d^6 , which are adapted to be closed together when the shutter d^{10} of the annunciator is operated. The contacts d^5 upon the different annunciators are connected with their respective lines, while pieces d^6 are united with a common conductor 7, which constitutes one terminal of the operator's telephone set g .

Each spring-jack has, in addition to the line-spring b , a thimble b' , which constitutes one terminal of the restoring-magnet d' of the corresponding line-annunciator, the other terminal of the magnet being connected to earth.

The operator is provided, as usual, with a number of pairs of connecting-plugs for uniting two lines into continuous circuit. In the diagram but one pair is represented, together with the various accessory appliances required for signaling and for bringing the operator's telephone into connection with the line. Each plug, as h , is provided with a

contact-piece i , adapted to make connection with the line-spring b and with a sleeve contact-piece i' , arranged to register with thimble b' of the spring-jack, into which it may be inserted. The tips i of the plugs h h' of a pair are connected together by a flexible conductor 8, two calling-keys k and k' being included in the circuit, each being adapted to send a signaling-current from the generator l through the corresponding plug when the key is depressed. The sleeve contact-pieces i' are connected together by a conductor 9, a branch 10 from which extends to the free terminal of battery f . A key m is included in conductor 9, adapted to open the circuit when depressed. A clearing-out signal o of ordinary character is connected in a branch from conductor 10 to conductor 8 of the plug-circuit.

The general construction of annunciator e is represented with sufficient clearness in the diagram, but I will describe it in some detail with reference to Fig. 2.

Magnets d and d' may be of the tubular type, with their closed extremities placed together. The shell of magnet d carries a bracket d^7 , provided with trunnions, upon which an armature d^8 is pivoted, being hung from its upper edge. The shell of magnet d' likewise carries a bracket d^9 , in which a shutter d^{10} is pivoted at its lower edge. Before the shutter hangs a light shield d^{11} , which is thrown into a horizontal position by the shutter when the latter falls forward. The shutter is normally engaged and held in its vertical position by a catch at the extremity of an arm d^{12} , carried by armature d^8 . The two contact-points d^2 d^3 are carried in a plate of insulating material secured to the bracket. They are crossed together while the shutter is in its normal position by a light strip of metal d^4 , fastened to the shutter and adapted to bear against them. The contact-points d^5 d^6 are arranged on the lower part of the bracket d^9 in the manner of the ordinary night-bell springs, the spring d^5 being in position to be engaged by the shutter in its fall outward and to be closed upon by d^6 . When the magnet d is excited, it attracts its armature d^8 and thus releases the shutter d^{10} . The latter falls outward, throwing the shield d^{11} into its horizontal position and at the same time removing the cross between anvils d^2 d^3 and closing contacts d^5 d^6 together.

I will now trace the operation of the system throughout with reference to Fig. 1. In the normal condition of the apparatus the circuit from each line to earth at the substation is interrupted at the condenser a^4 at the substation. When the telephone is removed from the hook for use, the circuit to earth is completed, whereby a path for current from battery f is created through conductor 5, including the various contact-points d^2 d^3 , conductor 4, magnet d of the line-annunciator of the corresponding line, thence through the line-wires—as, for example, line 2—to earth

at the substation. The annunciator is thus operated and displays its signal, at the same time closing a circuit from the line through contact-points d^5 d^6 and conductor 7 to the operator's telephone set g . The subscriber then, addressing the listening operator at the exchange, communicates the order for the connection which he desires. The operator inserts plug h into the spring-jack c' of the calling-line and places the remaining member h' of the pair of plugs in a spring-jack of the line called for. Circuit is thus completed between the two lines, being by way of the tips of the plugs and conductor 8 of the plug-circuit.

By the insertion of plug h into spring-jack c' the local restoring-circuit of the annunciator e' was closed through a circuit from grounded battery f through conductor 10, conductor 9 of the plug-circuit, key m , sleeve i' of plug h , thimble b' of the spring-jack, and thence to earth through the restoring-magnet d' of the annunciator. This instrument is thus returned to its normal position, the signal is effaced, the contacts d^5 d^6 are permitted to separate and thus to disconnect the operator's telephone set g from the line 2, and the contacts d^2 d^3 are again closed together, completing the circuit of the signaling-battery f to conductor 4, and thus making possible the transmission of a signal from another substation. By the insertion of plug h' in the spring-jack of the line called for the restoring-circuit of that line also is closed, so that its shutter is prevented from falling when the answering subscriber removes his telephone from its switch-hook to enter into conversation.

If at any time the operator should desire to connect her telephone to line 2, she may depress the key m . The restoring-circuit of annunciator e' is thereby interrupted, and since current is still flowing through the magnet d of the annunciator of that line, the telephone at the substation being removed from the switch-hook, the shutter of the annunciator is released and connects the line with the telephone g .

While the telephones are in use there exists current from battery f through clearing-out annunciator o to conductor 8 and thence to earth at the substations. When, after the completion of conversation, the subscribers replace their telephones on their switch-hooks, current through the clearing-out signal is interrupted and it gives the signal for disconnection.

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

1. In combination with the telephone-lines of a group, each provided with means for making connection with it in a switchboard, a relay in each line normally responsive to currents in the line, a local circuit containing an operator's telephone adapted for connec-

tion with any of the lines through the agency of the corresponding relay, a device actuated in the movement of any relay adapted to prevent the operation of any other relay at the same time, and mechanism actuated in making connection with the line adapted to restore the said device to its normal position to permit the subsequent operation of other relays, substantially as described.

2. The combination with telephone-lines of a group, of a relay in connection with each line responsive to currents in the line, a local circuit including an operator's telephone adapted for connection with any line through the agency of the corresponding relay, a circuit controlled by each of the relays to all the other relays adapted when changed by one relay to prevent the operation of the other, electrical mechanism in each relay adapted to return the relay to its normal position, a circuit including said mechanism, and a switch operated in making connection with the line controlling the said last-mentioned circuit, substantially as described.

3. The combination with each of several telephone-lines, of a common source of signaling-current adapted to be closed through any of the lines to signal from the substation to the exchange, an annunciator in the line, and switch-contacts thereon controlling the connection of the source of signaling-current with all the lines, an electrical device for restoring the relay to its normal position, and a switch actuated in making connection with the line controlling the circuit through said device, substantially as described.

4. The combination with each of several telephone-lines normally open at the substation and including a common source of signaling-current at the exchange, of means for closing the line at the substation for signaling, and an annunciator in each line having switch-contacts adapted to disconnect the source of signaling-current from all the lines when the annunciator is operated, substantially as described.

5. The combination with each of several telephone-lines normally open at the substations and connected with a common source of signaling-current at a central station, of means at each substation for closing the line-circuit to signal, an annunciator in each line at the central station having one pair of switch-contacts adapted, when the annunciator is operated, to connect its particular line with an operator's telephone and another pair of switch-contacts adapted to disconnect the common source of signaling-current from all the lines of the group, substantially as described.

6. The combination with a telephone-line, of a self-restoring annunciator in the line together with a source of electric current, switch-contacts controlled by the annunciator adapted to connect the line with an operator's telephone when it is operated, a local circuit

through the restoring-magnet, switch-con-
tacts for closing the same when connection
is made with the line, and a key adapted to
open the local circuit, whereby the operator's
5 telephone may be brought into connection
with the line during the use of the line, sub-
stantially as described.

In witness whereof I hereunto subscribe my
name this 3d day of September, A. D. 1894.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,

LUCILE RUSSELL.