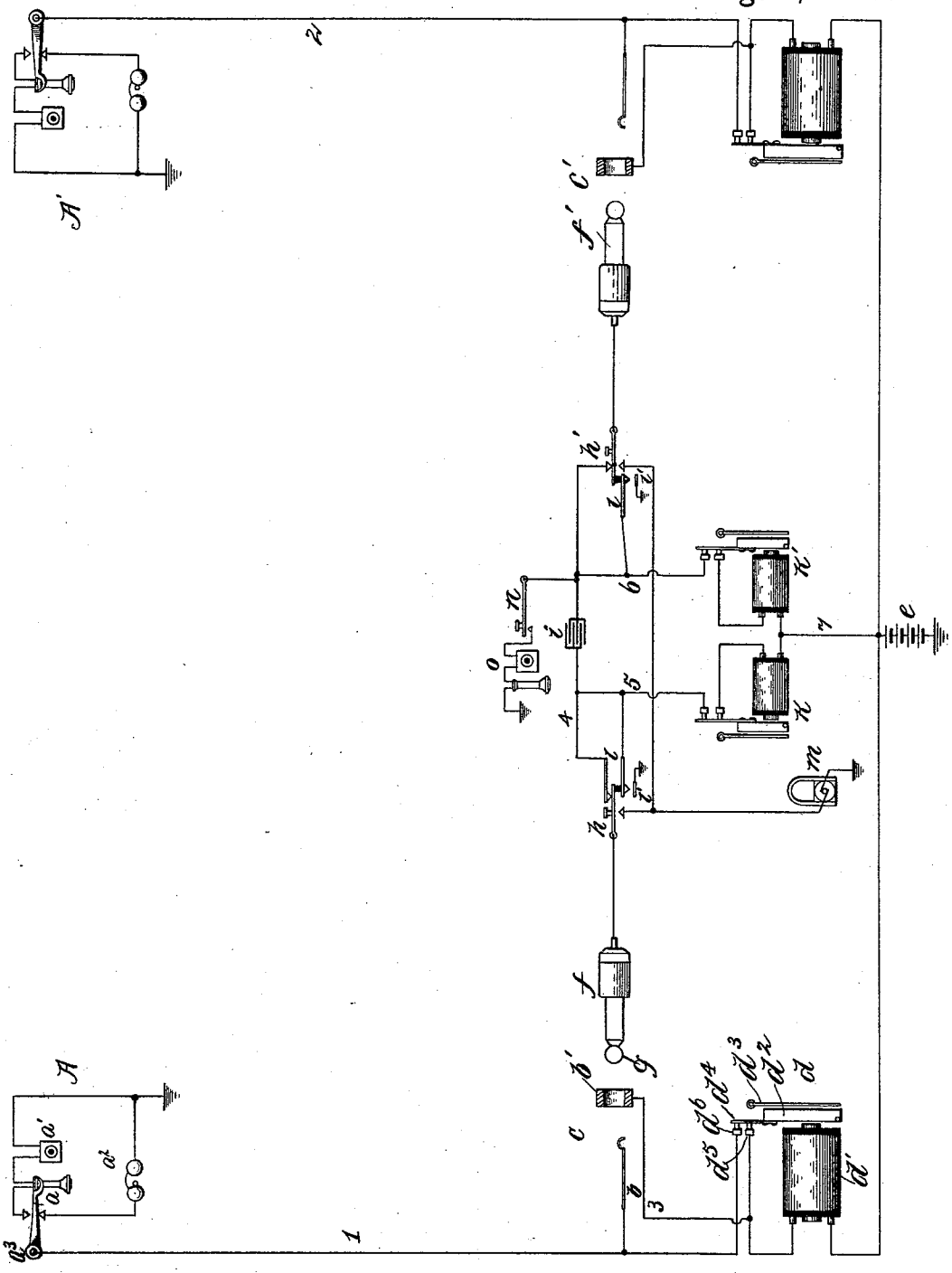
(No Model.)

C. E. SCRIBNER.

TELEPHONE EXCHANGE SYSTEM.

No. 543,901. Patented Aug. 6, 1895.



Witnesses:
George L. Cragg.
De Witt C. Tanner.

Inventor:
Charles E. Scribner.
By Burton & Brown
Attorneys.

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. 543,901, dated August 6, 1895.

Application filed November 12, 1894. Serial No. 528,527. (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. 364,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to signaling appliances for telephone-exchange systems, its object being to produce a new organization in which the various necessary signals from the sub-station to the central station may be transmitted automatically in the use of the sub-station telephone.

It is usual in telephone-exchange systems to provide each sub-station with a device for transmitting the call or initial signal to the central station to indicate to the attendant operator that a connection is desired, and also to transmit a disconnection-signal to indicate to the operator that an established connection is no longer required. These signals have sometimes been transmitted automatically, various devices having been employed for this purpose. Of these the most common organization has comprised a source of current at the central station connected with each telephone-line through an individual or line annunciator, the continuity of the circuit being controlled at the sub-station by suitable switch-contacts in connection with the automatic telephone-switch. In some instances these switch-contacts have acted to open the line-circuit, retaining it discontinuous as to currents of constant direction during the use of the telephone, the annunciator being in this case adapted to display its signal upon and during the interruption of current through its magnet. In other forms the switch-contacts have acted to close the circuit during the use of the telephone, the annunciator being arranged to respond to its current through coils. It will be understood, however, that in practice the circuit of the telephone-line must be closed at the sub-station as to current of some character in order to permit communication by signals or by means of the telephone from the central station to the sub-station. This has necessitated the employment of two branches of the line at the sub-station, one, at least, of which must always be closed. In order to conform to the requirements of either of the methods of automatic signaling described, one of these branches must be constructed of great resistance, so as to practically open the line-circuit. The expense of the system is thus increased while its efficiency is somewhat reduced.

In my invention herein I have aimed to accomplish the automatic transmission of the required signals without making the branches containing the signaling telephonic appliances of widely-different resistances.

In my invention I provide means at the sub-station for momentarily interrupting the current in the line-circuit, and an annunciator or signaling device in the line at the central station adapted to display its signal in response to an interruption of the current through it. In order to prevent the immediate effacing of the signal at the central station, I construct the annunciator with switch-contacts connected to open the circuit through it when the signal is displayed. I have also combined with the line-circuit and annunciator an auxiliary or local circuit adapted to be closed in the act of making connection with the line, in response to a call, to effect the resetting of the annunciator, or to retain it inoperative independently of the continuity of the line-circuit when connection is made with the line in compliance with an order from a different subscriber. Suitable clearing-out annunciators constructed in the same manner and also adapted to be operated by the interruption of the line-circuit are employed in connection with the plug-circuit for uniting different subscribers' lines.

My invention comprises then, in general, means at the sub-station for momentarily breaking the line-circuit, an annunciator in the line adapted to respond to such an interruption, and, having responded, to open its circuit to prevent its re-energization, together with a source of current in the line, a local circuit for resetting the annunciator when connection is made with the line, and clearing-out annunciators adapted to be operated by a final interruption of the line-circuit upon the completion of conversation.

My invention is illustrated in the accom-

panying drawing. Therein two sub-stations A and A′ are represented connected by means of lines 1 and 2, respectively, with the switching and signaling appliances at the central station, together with plugs and accessory apparatus provided for the operator in connecting the different lines.

The apparatus at the sub-station comprises the usual telephone a and transmitter a' and the signal-bell a^2, in separate branches from the line-circuit, and a telephone switch-hook a^3 for automatically establishing connection with the telephonic or signaling appliances when the telephone is removed from or replaced upon the switch-hook. This switch is constructed to effect a momentary break in the line-circuit as it passes from one position to the other.

The line-conductor 1 connects at the central station with the line-spring b of a spring-jack c upon a telephone-switchboard, and with one terminal of a line-annunciator d, whose other terminal is grounded through a battery e, which is common to all the lines at the exchange. The annunciator d comprises a magnet d' and an armature d^2 therefor, which is pivoted at its lower edge, so as to fall outward when unattracted by the magnet. Before the armature is pivotally suspended a light shutter or shield d^3 in position to be struck by the armature d^2 in its outward movement and to be thrown into a horizontal position, thereby disclosing a number or other indication painted on the face of armature d^2. This armature carries a light spring d^4, which is adapted to cross together two contact-points d^5 d^6 when the shutter is attracted. These contact-points are included in the line-conductor between the line-wire and the annunciator d.

The spring-jack c comprises, in addition to the line spring b, a tubular thimble b', which is connected by a conductor 3 with the line-terminal of annunciator d.

The connecting-plug, as f, is adapted to make connection with both the line-spring b and the thimble b'. The two plugs f and f' of a pair are united through a conductor 4. This conductor includes two calling-keys h and h', and is rendered discontinuous as to currents of constant direction by the interposition in it of a condenser i.

Two clearing-out annunciators k and k' are employed—one in a branch 5 and the other in a branch 6 from conductor 4 on either side of condenser i—the branches being connected by a common conductor 7 with the free pole of battery e.

The calling-keys h and h' are of peculiar construction, having, in addition to the usual contacts, a pair of switch connections comprising a spring l and its anvil l'. The anvil l' is grounded, while the spring l is connected with the conductor, including the corresponding clearing-out annunciator. Either key acts to disconnect the tip of the corresponding plug from the other plug and to connect it with one terminal of a generator m of signaling-current, and at the same time to close the circuit of the corresponding annunciator to earth.

The usual listening-key n is provided for the operator to form a connection between the conductor 4 and her telephone-set o.

Having thus described the mechanism and circuits of my invention, I will trace its operation.

In the normal condition of the apparatus current from the battery e finds circuit through annunciator d and its switch-contacts d^5 d^6 to line 1, and thence through switch a^3 and bell a^2 to earth at the sub-station. Magnet d' of the annunciator is excited and retains the armature d^2 in its upright position, the shutter d^3 concealing the indication on the face of the armature.

Assuming that subscriber at station A wishes to communicate with subscriber at station A′, he removes the telephone a from its switch-hook, which rises to close the circuit through the telephone and thus momentarily interrupts the current flowing in line 1. During this interruption of the current the magnet d' of annunciator d loses its magnetism and releases armature d^2. In its first outward movement this armature removes the circuit connection between contacts d^5 d^6, thus opening the line-circuit at the annunciator, and in its subsequent movement it raises the shield d^3 and discloses the indication on the face of the armature d, thus signifying to the operator that connection is desired by the subscriber calling. The operator observing this, inserts plug f into spring-jack c. Line-circuit 1 is thus extended, through the medium of spring b and plug f, to the conductor 4 of the plug-circuit, and thence, key n having been depressed, to the operator's telephone-set o, and the subscriber gives his order orally for the desired connection.

By the insertion of plug f in the spring-jack the thimble b' is connected with line 1, whereby a circuit is provided from battery e through magnet d' to the line. The magnet d' is again excited and retracts armature d^2, effacing the signal and again closing contacts d^5 d^6 together. It may also be noted that circuit is provided from battery e through conductor 7, clearing-out annunciator k, and conductor 5 to the plug f, and thence to earth at the sub-station, whereby the clearing-out annunciator is placed in readiness to respond to any interruption of the line-circuit, and hence to indicate the replacement of telephone a upon the switch-hook after the completion of conversation.

Having received from subscriber at station A his order for connection with sub-station A′, the operator inserts plug f' into spring-jack c' of that line and depresses calling-key h' to connect the signaling-generator m with the line. Since the piece b' of spring-jack c' is connected with the line, circuit through the

annunciator of line to station A′ is thereby completed and this annunciator is prevented from responding either to the signaling-current, which may find circuit through it, or to the subsequent interruption of the line-circuit when the telephone at station A′ is removed from the switch-hook.

It will be observed also that during the operation of signaling by means of key h', a temporary circuit is created through clearing-out annunciator k', so that the latter is not released and does not disclose its indication during the interruption of conductor 4 at the signaling-key. When the subscriber at station A′ responds to the call-signal and removes his telephone from the switch-hook, the circuit from battery e through clearing-out annunciator k' to earth at the sub-station is momentarily interrupted and the clearing-out annunciator displays its signal. This is not, however, interpreted as a signal for disconnection, but indicates to the operator who has just completed the connection with the subscriber at that station that he is in communication with the calling-subscriber. The operator, therefore, replaces the signal without withdrawing the cords from the other springjacks. Similarly if either signal should be alone operated at any time during the existence of the connection this will indicate to the operator that the corresponding subscriber had replaced his telephone on its switch-hook, but that conversation has not yet been finished since the other subscriber is still at his telephone; but if both signals were operated this would indicate that both subscribers, having terminated their conversation, had replaced their telephones on their switch-hooks. The operator would, therefore, proceed to disconnect the lines by withdrawing the plugs f and f' from the springjacks.

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

1. The combination with a telephone line, of an annunciator and a battery normally included in the circuit of said line at the central station, a switch at the subscriber's station adapted to open the circuit of said line, and a pair of contact points in said line normally connected together, controlled by said annunciator and adapted to be opened to disconnect said annunciator from the line when the circuit of said line is interrupted by the switch at the subscriber's station.

2. The combination with a telephone line, of an annunciator and battery normally in circuit therewith at the central station, a switch at the subscriber's station for opening the circuit of said battery, contacts controlled by said annunciator adapted to be opened when the circuit of said battery is interrupted, and switch contacts closed together in the act of making connection with the line adapted to bridge the interruption of the circuit at the annunciator to restore the annunciator.

3. The combination with a telephone line, of an annunciator and a battery normally in circuit with said line at the central station, contacts controlled by said annunciator adapted to be opened when the circuit through said annunciator is interrupted, said line being provided at the subscriber's station with two branches of substantially equal resistance, one of said branches containing the telephonic apparatus and the other the calling apparatus, and a switch adapted to alternately include said branches in circuit with the line, and to momentarily open the circuit of said battery by the act of changing the connection through said branches.

4. The combination with a telephone line, of an annunciator and a battery in the line, contact points controlled by the annunciator adapted to open the circuit through the annunciator when the magnet of the annunciator is unexcited, a springjack for the line, and contact points therein adapted to be closed together when a plug is inserted in the springjack and to again connect the annunciator with the line, and means for interrupting the line circuit at the subscriber's station to operate the annunciator, substantially as described.

5. The combination with a telephone line, of means for interrupting the line circuit at the substation, a battery in the line at the central station, two annunciators in parallel branches of the circuit at the central station, each having contact points controlled by it adapted to open the circuit through it when the current through it is interrupted, and a circuit formed temporarily in the springjack, bridging the switch contacts of one of the annunciators, substantially as described.

In witness whereof I hereunto subscribe my name this 8th day of November, A. D. 1894.

CHARLES E. SCRIBNER.

Witnesses:
ELLA EDLER,
FRANK R. MCBERTY.