

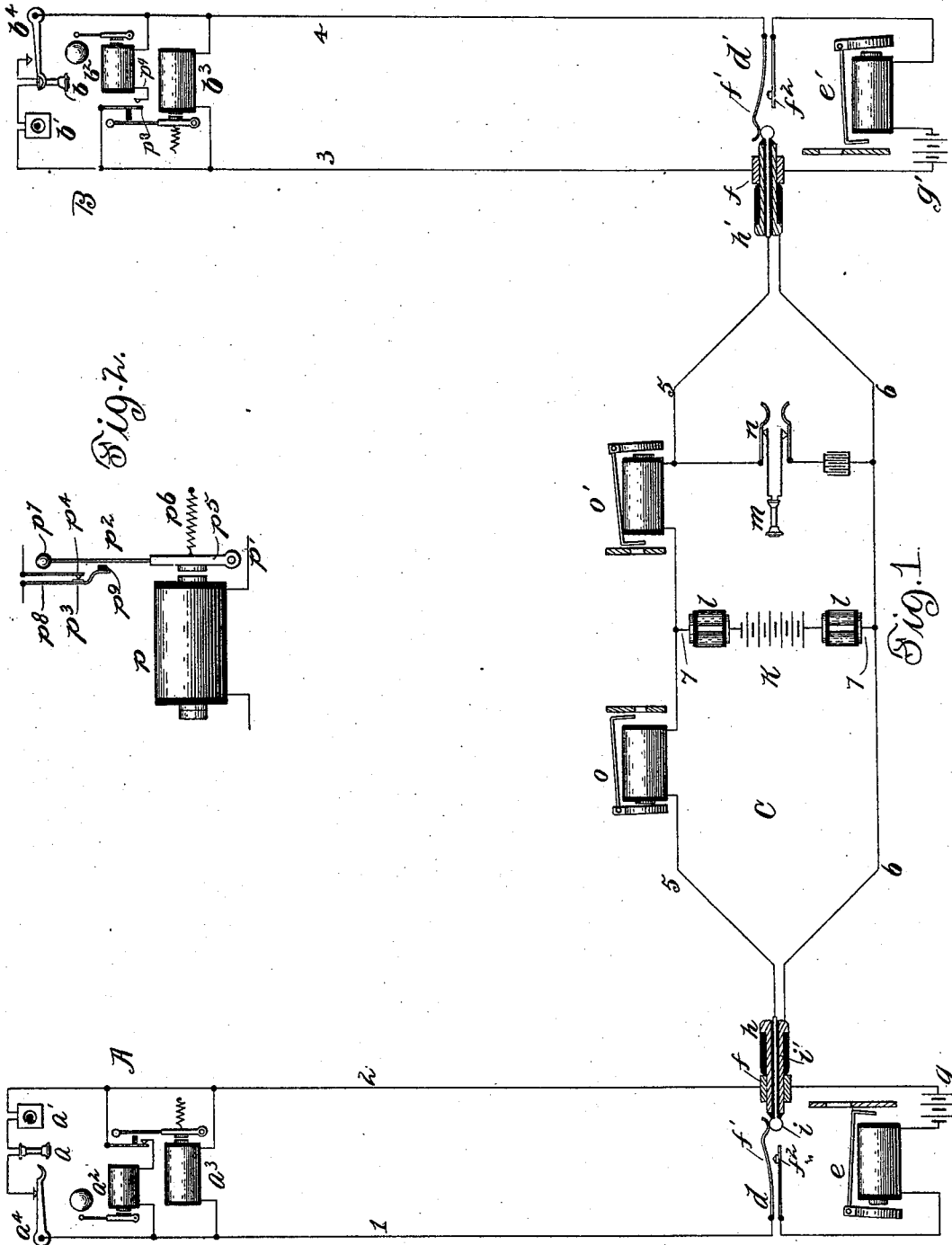
(No Model.)

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AUTOMATIC SIGNALING DEVICE FOR TELEPHONE EXCHANGES.

No. 574,280.

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Witnesses:

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SIGNALING DEVICE FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 574,280, dated December 29, 1896.

Application filed November 27, 1894. Serial No. 530,139. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SCRIBNER, residing at Chicago, in the county of Cook, and FRANK R. MCBERTY, residing at Downer's Grove, in the county of Du Page, State of Illinois, citizens of the United States, have invented a certain new and useful Improvement in Automatic Signaling Devices for Telephone-Exchanges, (Case No. 367,) 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.

Our invention relates to the mechanism of telephone-exchange systems, its object being to provide means for automatically transmitting signals from the central station to the substations of the system in the act of establishing connection with the lines at the central station.

In the telephone-exchange organization which is now generally in use each telephone-line from a substation to the central station terminates in a spring-jack or connection-socket at the central station and is provided with a bell for signaling purposes at the substation. The attendant at the switchboard is furnished with a number of plugs adapted for insertion into the connection-sockets to establish electrical connection with the line and with an equal number of switch-keys, one in circuit with each plug, for looping a generator of signaling-current suitable for the operation of the bell into circuit with the plug. After the completion of a connection with a line called for the operator has been required to manipulate this "ringing-key" in order to signal the subscriber at the substation. It is the object of our present invention to dispense with these manually-operated switch-keys and to provide mechanism for performing the same function automatically upon the completion of connection with the line. To this end we connect a source of continuous current permanently with the plug-circuit, so that a continuous flow of current is set up in the line-circuit after connection therewith, and we provide an electromagnetic signaling instrument, as, for example, a bell, at the substation, together with a relay or circuit-

breaker, which is adapted to interrupt the circuit periodically for a short time and then to come to rest, leaving the circuit in its normal condition. This relay is of special construction and constitutes a feature of our invention. It comprises an electromagnet, a vibrating weighted tongue or pendulum carried by the armature of the electromagnet, and switch-contacts controlled by the tongue or pendulum. When the magnet is excited, its armature is brought quickly to its pole, whereby the weighted tongue is set into vibration and the current through the bell is periodically closed or interrupted. The vibration of the weighted tongue soon ceases, however, and the switch-contacts controlled by the tongue return to their normal position.

It will be obvious from this general description of the mechanism of our invention that when a connection is made with a line at the central office the relay at the substation of that line will be excited and will cause the substation-bell to ring during a short time, the length of time being dependent on the adjustment of the relay.

We have illustrated our invention in the accompanying drawings and will proceed to describe it in detail with reference thereto.

Figure 1 of the drawings represents diagrammatically an exchange system comprising a central station and two substations connected with it. The system is organized to receive current for operating the microphones and bells from a common source of supply at the central station—a battery, which is connected with the plug-circuits employed for uniting telephone-lines. The substations are furnished with our apparatus for permitting the momentary ringing of the signaling-bell, alternative forms of the invention being shown at the different substations. Fig. 2 is a view of the relay for controlling the operation of the bell.

Referring to Fig. 1, A and B designate the substations, and C the central station. The telephone-lines 1 2 and 3 4 from the substation terminate in spring-jacks or connection-sockets *d* and *d'* in the switchboard at the central station, and are connected with line annunciators or signals *e* and *e'*. Each

spring-jack comprises two contact-pieces—a thimble f and a spring f' , the latter resting normally upon an anvil f^2 . The connection of the line with the corresponding line-signal is through the spring f' and its anvil f^2 . A battery g , which may, if desired, be common to the different annunciators of the exchange, is connected in the circuit with the signal.

The switchboard is equipped with the usual connecting-plugs h and h' , adapted to fit the spring-jacks, and with appropriate circuit connections. The plug has two contact-pieces—namely, a spherical tip i and a tubular sleeve i' —which correspond in position with the contact-pieces of the spring-jack. When the plug is inserted in the spring-jack, the tip i registers with spring f' of the spring-jack, lifting the spring from its anvil and thus interrupting the connection between the line and the signal, while the sleeve i' makes contact with the thimble f . The tips i of the two plugs of a pair are connected together through a conductor 5, and the sleeves i' through a conductor 6. In a branch or bridge wire between the conductors 5 and 6 of the plug-circuit a battery k is included, a retardation-coil l being placed in the circuit at each side of the battery in order to prevent cross-talk between the different plug-circuits which may be connected in common with this battery. The operator is provided with the usual telephone set m and with a key n , controlling its connection with the conductors of the plug-circuit. Two clearing-out signals o and o' are included in the conductor 5, one at each side of the connection from the battery to that conductor.

At the substation A a telephone a and a microphone a' , a signal-bell a^2 , and a relay a^3 are located, together with an automatic telephone-switch a^4 , which acts to switch the telephone appliances into connection with the line when the telephone is removed from the switch-hook.

The relay a^3 may be best described in connection with Fig. 2. This instrument comprises, essentially, a magnet p , its armature p' , a tongue p^2 , carried by the armature, and switch-contacts $p^3 p^4$, controlled by the tongue. The armature is carried by a pivoted lever p^5 and is normally retracted from the magnet by a spring p^6 . The tongue p^2 is preferably of steel and is so thin that it may be thrown into vibration by a movement of the armature. It carries at its upper extremity a weight p^7 to increase its inertia and to reduce its period of vibration. The contact p^3 is mounted upon the extremity of a light spring p^8 , which presses the contact-point against its anvil p^4 . The spring p^8 carries also a projection or stud p^9 . The spring p^8 is so located that when the armature p' is drawn up to its magnet and the tongue p^2 is not in vibration the stud or projection p^9 does not touch the tongue, but when the tongue is vibrating with sufficient amplitude it will strike the stud p^9 , and will thus lift the contact p^3 from its anvil p^4 at each os-

cillation, interrupting their electrical connection. Hence when magnet p is excited its armature will be quickly drawn up to rest against its pole, the momentum of weight p^7 throwing the tongue into vibration. In each oscillation in one direction the tongue will separate the contacts $p^3 p^4$ until the vibration has practically ceased and the tongue remains stationary.

At station A of Fig. 1 the relay a^3 is connected permanently between the conductors 1 and 2 of the line-circuit. The bell a^2 is also connected in a branch between these conductors, its circuit including, however, the contact-points $p^3 p^4$ of the relay. At station B a different arrangement of circuits is shown, the contact-points $p^3 p^4$ being disposed to close the circuit through the bell when the tongue p^2 comes to bear upon the stud p^9 . The bell b^2 at station B is thus normally not in connection with the line, but receives a pulsatory current from the line during the operation of relay b^3 .

The system herein shown is arranged for the automatic transmission of all the necessary signals between the substations and the central station. The circuit-controller a^3 and bell a^2 at station A and the circuit-controller b^3 at station B are constructed with so high resistance that the currents from battery g through the signals e and e' are insufficient to operate the signals, while at the same time the relays and bell receive insufficient current to actuate them. When a telephone is removed from a switch-hook at the substation, however, as, for example, at substation A, the battery g finds circuit through the comparatively low resistance path, including the telephone a and microphone a' , and the signal e is caused to display its indicator. The attendant at the switchboard perceiving this signal inserts plug h in spring-jack d , thus continuing the line-circuit 1 2 to the corresponding conductors 5 6 of the plug-circuit.

By the insertion of plug h in the spring-jack d the circuit through signal e and battery g is interrupted and the indicator of the signal returns to its normal concealed position. At the same time, however, a circuit is created for battery k through the clearing-out signal o in the plug-circuit to the line conductors, and thence through the telephone branch at the substation, and signal o is operated. Having learned from subscriber at station A with what line connection is desired, as, for example, with station B, the operator inserts plug h' of the pair into spring-jack d' , which forms the terminal of that line. The circuit of battery k is thus completed to the conductors 3 4 of line to station B and the current finds circuit at the substation through relay b^3 . The armature of the relay is drawn up and its tongue p^2 is thrown into vibration, closing a circuit from lines 3 4 through bell b^2 periodically, and thus ringing the signal-bell.

When the subscriber at station B has removed his telephone from the switch-hook,

the circuits are in condition to permit of communication between the two subscribers. A constant current is set up in both line-circuits 1 2 and 3 4 through their respective tele-
 5 phones and microphones *a a'* and *b b'*, the two signals *o* and *o'* being operated by the current through them. The operation of microphone *a'* produces undulations in the current in the line-circuit 1 2, which undulations, being pre-
 10 vented from transmission through the bridge-wire 7 by the presence of the retardation-coils *l* in that circuit, are transferred to line-circuit 3 4 and affect the telephone *b* connected there-with.

15 When either subscriber replaces his telephone upon the switch-hook, the current through the corresponding clearing-out signal *o* or *o'* is interrupted, and the signal, by returning to its normal position, notifies the operator of this act of the subscriber. When both tele-
 20 phones have been replaced on their switch-hooks, the operator may assume that conversation between the subscribers is completed and may withdraw plugs *h* and *h'* from the
 25 spring-jacks.

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

1. In combination, an electromagnet in an
 30 electric circuit together with a source of current and means for closing the circuit, a tongue adapted to be thrown into vibration when the said magnet attracts its armature, switch-contacts actuated by the vibrating
 35 tongue to open or close a subsidiary branch or circuit, and an electric bell in the subsidiary branch or circuit, substantially as described.

2. The combination with a telephone-line,
 40 of a bell at the substation, a source of current in circuit therewith, and mechanism adapted to periodically break and close the circuit through the bell a limited number of times while the magnet remains continuously
 45 excited, substantially as described.

3. The combination with a telephone-line, of a bell at the substation, and a source of current in circuit therewith, a circuit-controller or relay adapted to periodically break
 50 and close the circuit of the bell a limited number of times while the magnet remains con-

tinuously excited, and means for actuating the circuit-controller, substantially as described.

4. The combination with a telephone-line, of a bell at the substation, an electromagnetic
 55 relay or circuit-controller thereat adapted to periodically break and close the circuit of a source of current through the bell a limited number of times, and means for closing current through the magnet of the relay when
 60 connection is made with the line at the central station, substantially as described.

5. The combination with a telephone-line, of a bell at the substation thereof, an electro-
 65 magnetic relay or circuit-controller adapted to periodically break and close the circuit of a source of current through the bell a limited number of times, the magnet of the relay being connected with the telephone-line at the
 70 substation, and means for closing a source of current to the line when connection is made therewith, to operate the relay, substantially as described.

6. The combination with a tongue or pendulum adapted to vibrate, of an electromagnet
 75 adapted when excited to set the tongue or pendulum into vibration, switch-contacts controlled by the tongue or pendulum, and an electric bell in circuit with the switch-contacts, substantially as described. 80

7. The combination with a telephone-line, of a relay comprising a magnet, a flexible
 80 weighted tongue carried by the armature thereof, and switch-contacts adapted to be actuated by the tongue, when the latter is
 85 thrown into vibration by the movement of the armature, a bell in a circuit controlled by said switch-contacts, and means for closing a source of electric current to the line when connection is made therewith at the central station,
 90 the magnet of the relay being connected with the line to receive current therefrom, substantially as described.

In witness whereof we hereunto subscribe our names this 8th day of November, A. D. 95
 1894.

CHARLES E. SCRIBNER.
 FRANK R. McBERTY.

Witnesses:

ELLA EDLER,
 LUCILE RUSSELL.