

No. 697,990.

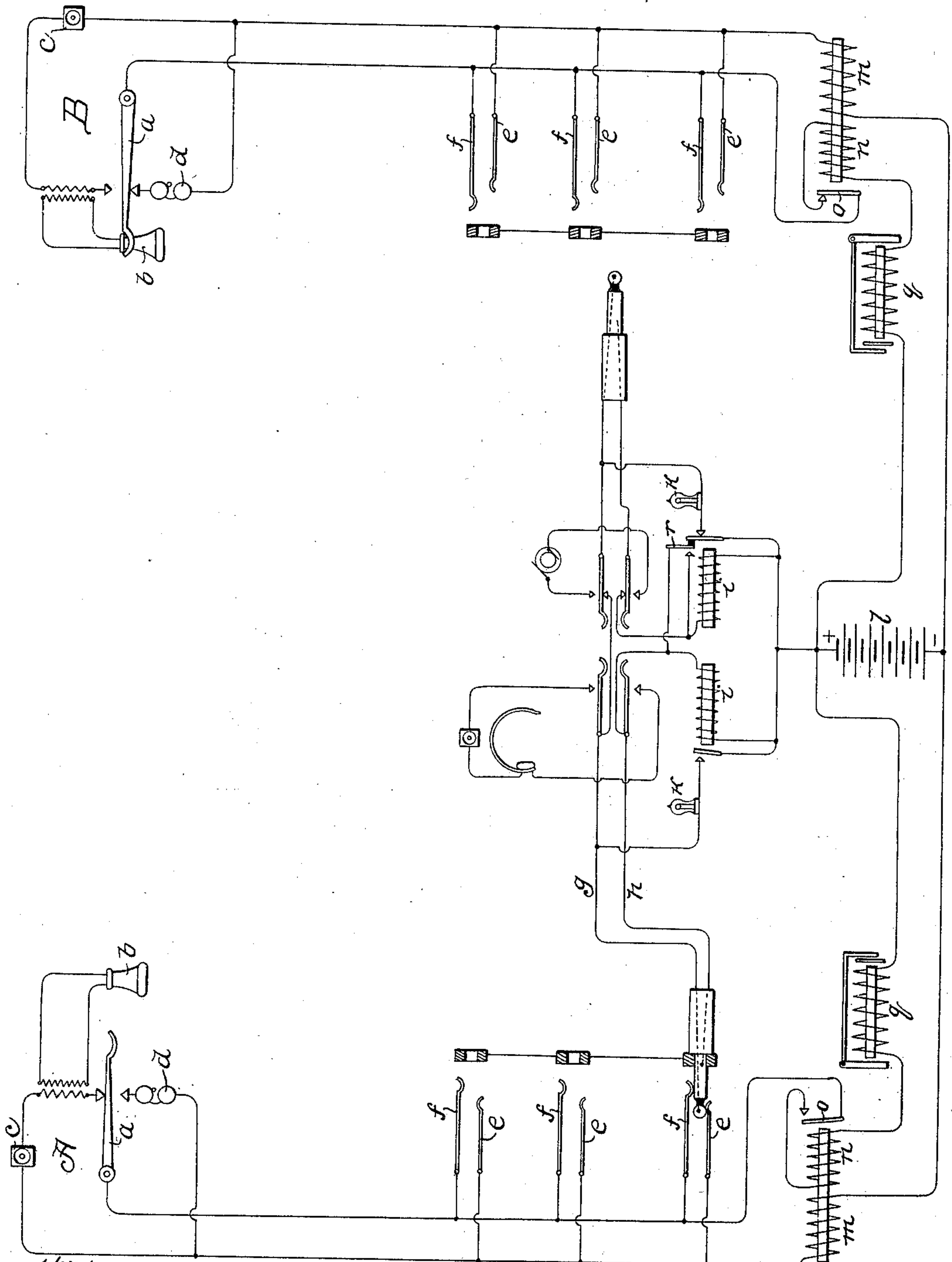
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CLEARING-OUT SIGNALING APPARATUS.

(Application filed Jan. 11, 1901.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## CLEARING-OUT SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 697,990, dated April 22, 1902.

Application filed January 11, 1901. Serial No. 42,914. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. DAVIS, 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 Clearing-Out Signaling Apparatus, (Case No. 10,) 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 telephone-exchange systems, and has for its object the provision of improved clearing-out signaling means.

The invention in its preferred embodiment contemplates the provision of a telephone-exchange system wherein there are clearing-out signaling devices, two for each cord-circuit, which jointly serve to convey a clearing-out signal, while they act, respectively, to indicate certain conditions of use of the calling and called subscribers' telephone-lines. The signals that I prefer to employ are small electric lamps controlled by suitable relays. By means of the invention the relay that controls the calling subscriber's indicator is operated immediately upon the insertion of the answering-plug to prevent the signal-lamp controlled thereby from glowing. The called subscriber, however, not having answered, his telephone switch-hook is in its normal position, in which condition of use the relay controlling his supervisory signal is not operated, so that the lamp controllable thereby is caused to glow immediately upon the insertion of the connecting-plug within the called subscriber's jack. When the called subscriber removes his telephone from its switch-hook, the relay controlling his supervisory signal is actuated and the lamp ceases to glow. The receivers at the subscribers' stations now both being removed from their switch-hooks, both relays are simultaneously in an operated position, so that during the conversation neither supervisory signal glows.

In accordance with my invention I provide a supplementary switching appliance controlled by the called subscriber's supervisory relay that serves to place the relays simultaneously in circuit with a source of current,

the relays being preferably included in parallel relation, so that both relays will be restored to their normal condition simultaneously. To this end the relays in addition to being included in parallel circuit with each other are also preferably included by means of the said auxiliary switching appliance in bridge of the telephone-circuit, so that the relays cannot be restored to their normal idle condition until both receivers at the connected subscribers' stations have been restored to their switch-hooks, whereupon both supervisory signals will simultaneously glow to convey a positive clearing-out signal. Prior to the actuation of the switch controlled by the called subscriber's supervisory relay each relay is included in series with its associated telephone-circuit, while the battery for controlling the operation of the relays is included in bridge between the telephone-lines, by which arrangement each relay is adapted for immediate operation upon the elevation of the corresponding subscriber's-telephone switch-hook. The said auxiliary switch controlled by the called subscriber's relay forms a short path for the telephonic circuit between the connected stations, the relays then being included in bridge, as before stated, of the telephonic circuit.

I will explain my invention more fully by reference to the accompanying drawing, which illustrates the preferred embodiment thereof as applied to a telephone-exchange.

In the drawing I have illustrated two telephone-stations A and B, each provided with a telephone switch-hook *a*, a telephone-receiver *b*, a transmitter *c*, and a signal-receiver *d*. The system illustrated herein is a common battery system, and therefore the substations are in this instance not provided with magneto-generators; but I do not wish to be limited to such a system. Each telephone-line extends by its limbs to the exchange and is there connected with the tip-line springs *e* and the sleeve-line springs *f*, three jacks of a multiple switchboard being here illustrated. Two plugs are preferably employed, having tips and sleeves connected by a tip-strand *g* and a sleeve-strand *h*. Relays or electromagnets *i i*, that control the



supervisory signals  $k$ , are normally included in the sleeve-strand, while a common battery  $l$  is included in bridge between one side of a telephone-line and the correspondingly opposite side of the cord-circuit, the latter connection being located between the relays.

Many forms of line-signals may be employed in the system of my present invention. The form illustrated comprises a relay having oppositely or differentially wound coils  $m$   $n$ , which create equal opposing effects. The armature  $o$  of the relay normally includes the coils of the relay in series with the common battery  $l$ , that may be of forty volts, and a line-indicator or the electromagnet of a line-indicator  $q$ . When a subscriber removes his telephone from its switch-hook, a circuit is completed through the coils of the relay and the magnet of the line-indicator, whereby a calling-signal is manifested, which calling-signal is maintained as long as the coils  $m$  and  $n$  exert their opposing effects, the armature  $o$  then remaining in its normal position. When the operator inserts a plug in response to a signal or in connecting a called subscriber, current from the battery  $l$  is principally confined to a path that includes the helix  $m$ , the tip line-spring of the engaged jack, the tip of the plug inserted within said jack, and thence through the cord-circuit instrumentalities to the battery. The current by being confined principally to this path of comparatively low resistance, the magnet of the line-indicator being preferably of five hundred ohms produces a greater magnetizing effect in the coil  $m$  than in the coil  $n$ , whereby the armature  $o$  is attracted and circuit to the magnet of the line-indicator is broken. When a subscriber initiates a call, the operator inserts her answering-plug and actuates her listening-key to include her telephone in the circuit and ascertain the connection desired. When the answering-plug is thus inserted, the magnet  $i$  is included in the closed circuit that also includes the battery  $l$ , the calling subscriber's telephone-line and his telephone switch-hook with its engaging contact, thereby immediately cutting the lamp  $k$  out of circuit. The connecting-plug controls a similar circuit for the companion electromagnet  $i$  corresponding to the called-subscriber's line; but this electromagnet is not operated until the called subscriber removes his telephone from its switch-hook, so that until the called subscriber responds the signal  $k$  is included in a closed circuit to indicate to the operator that the called subscriber has not responded, which closed circuit is opened by the called subscriber's supervisory relay when the said subscriber removes his telephone. His supervisory relay is provided with a supplemental switching appliance  $r$ , that serves to shunt the magnets  $i$   $i$  from the sleeve-strand of the cord-circuit, so that the cord-circuit will contain no impedance. This switch  $r$  serves to complete a bridge connection that terminates at

one end by electrical connection with the sleeve-strand and at the other end with the tip side of the telephone-line, this bridge connection including the magnets in parallel and the common battery in series with the magnets.

The advantages of the system herein disclosed are apparent to those skilled in the art.

While I preferably shunt the coils of the magnets of the indicators from the cord-circuit, I do not wish to be limited to this particular way of removing the said coils.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise disclosure herein set forth; but,

Having described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. In a telephone-exchange system, the combination with a telephone-line extending from a subscriber's telephone-station to an exchange, of cord-connecting apparatus at the exchange for uniting subscribers for conversation, an indicator having its operating electromagnet included in circuit with the said telephone-line and serially in a cord-strand, a source of current, a telephone switch-hook at the subscriber's station adapted when relieved of the influence of the telephone-receiver to close circuit through said battery and magnet of the indicator to correspondingly operate the indicator, and a switch with suitable connections, operated by the electromagnet when thus included in circuit, serving to shunt the electromagnet from its series connection with the cord-circuit and maintain said magnet in circuit with the said source of current, whereby the signal may be maintained in the condition to which it has been brought while the electromagnet controlling the same is removed from the path of voice-currents, the telephone switch-hook at the subscriber's station, when actuated through the influence of the restored receiver, serving to open the circuit through the electromagnet of the indicator to restore the indicator, substantially as described.

2. In a telephone-exchange system, the combination with a telephone-line extending from a subscriber's telephone-station to an exchange, of cord-connecting apparatus at the exchange, an indicator having its operating-electromagnet included in circuit with the said telephone-line and serially in a conductor forming a part of the telephonic circuit, a source of current, a telephone switch-hook at the subscriber's station adapted when relieved from the influence of the telephone-receiver to close circuit through said battery and magnet of the indicator to correspondingly operate the indicator, and a switch with suitable connections, operated by the electromagnet when thus included in circuit, serving to shunt the electromagnet from the telephonic circuit and maintain the said magnet



in circuit with said source of current, whereby the signal may be maintained in the condition to which it has been brought, while the electromagnet controlling the same is removed from the path of voice-currents, the telephone switch-hook at the subscriber's station, when actuated through the influence of the restored receiver, serving to open the circuit through the electromagnet of the indicator to restore the indicator, substantially as described.

3. In a telephone-exchange system, the combination with telephone-lines extending from subscribers' stations to an exchange, of cord-connecting apparatus at the exchange, indicators at the exchange having their electromagnets normally included serially in the cord-circuit, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a telephone switch-hook at each subscriber's station adapted to close circuit through the magnet of the indicator connected therewith, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the cord-circuit and maintaining them in closed circuit, whereby the signals may be maintained in the condition in which they have been placed, substantially as described.

4. In a telephone-exchange system, the combination with telephone-lines extending from subscribers' stations to an exchange, of cord-connecting apparatus at the exchange, indicators at the exchange having their electromagnets normally included serially in the cord-circuit, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a bridge connection between the sides of united telephone-lines including a source of current, a telephone switch-hook at each subscriber's station adapted to close circuit through the magnet of the indicator connected therewith and the said source of current, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the cord-circuit and including them in the same bridge with the source of current, whereby the signals may be maintained in the condition in which they have been placed, substantially as described.

5. In a telephone-exchange system, the combination with telephone-lines extending from subscribers' stations to an exchange, of cord-connecting apparatus at the exchange, indicators at the exchange having their electromagnets normally included serially in a cord-strand, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a bridge connection between the sides of united telephone-lines including a source of current, the said bridge connection being joined with the normal cord conductor between the said electromagnets, a telephone switch-hook at each subscriber's station adapted to close circuit

through the magnet of the indicator connected therewith and the said source of current, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the cord-circuit and including them in parallel relation with each other in the same bridge with the source of current, whereby the signals may be maintained in the condition in which they have been placed, substantially as described.

6. In a telephone-exchange system, the combination with telephone-lines extending from subscriber's telephone-stations to an exchange, of indicators at the exchange having their electromagnets included serially in the telephone-line uniting the substations, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a telephone switch-hook at each subscriber's station adapted to close circuit through the magnet of the indicator connected therewith, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the telephonic circuit and maintaining them in closed circuit, whereby the signals may be maintained in the condition in which they have been placed, substantially as described.

7. In a telephone-exchange system, the combination with telephone-lines extending from subscribers' stations to an exchange, of indicators at the exchange having their electromagnets included serially in the telephonic circuit between the subscribers, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a bridge connection between the sides of united telephone-lines including a source of current, a telephone switch-hook at each subscriber's station adapted to close circuit through the magnet of the indicator connected therewith and the said source of current, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the telephonic circuit and including them in the same bridge with the source of current, whereby the signals may be maintained in the condition in which they have been placed, substantially as described.

8. In a telephone-exchange system, the combination with telephone-lines extending from subscribers' stations to an exchange, of indicators at the exchange having their electromagnets included serially in a side of the telephonic circuit between the subscribers' stations, one of the said indicators being connected with the calling subscriber and the other with the called subscriber, a bridge connection between the sides of united telephone-lines including a source of current, the said bridge connection being joined with the side of the telephonic circuit containing the said electromagnets and between the said electromagnets, a telephone switch-hook at each subscriber's station adapted to close circuit



through the magnet of the indicator corresponding thereto and the said source of current, and a switch with its connections operated by the called subscriber's indicator-magnet for shunting the said magnets from the  
5 telephone-circuit and including them in parallel relation with each other in the same bridge with the source of current, whereby the signals may be maintained in the condi-

tion in which they have been placed, substantially as described.

In witness whereof I hereunto subscribe my name this 8th day of January, A. D. 1901.

WILLIAM M. DAVIS.

Witnesses:

HARVEY L. HANSON,  
HERBERT F. OBERGFELL.