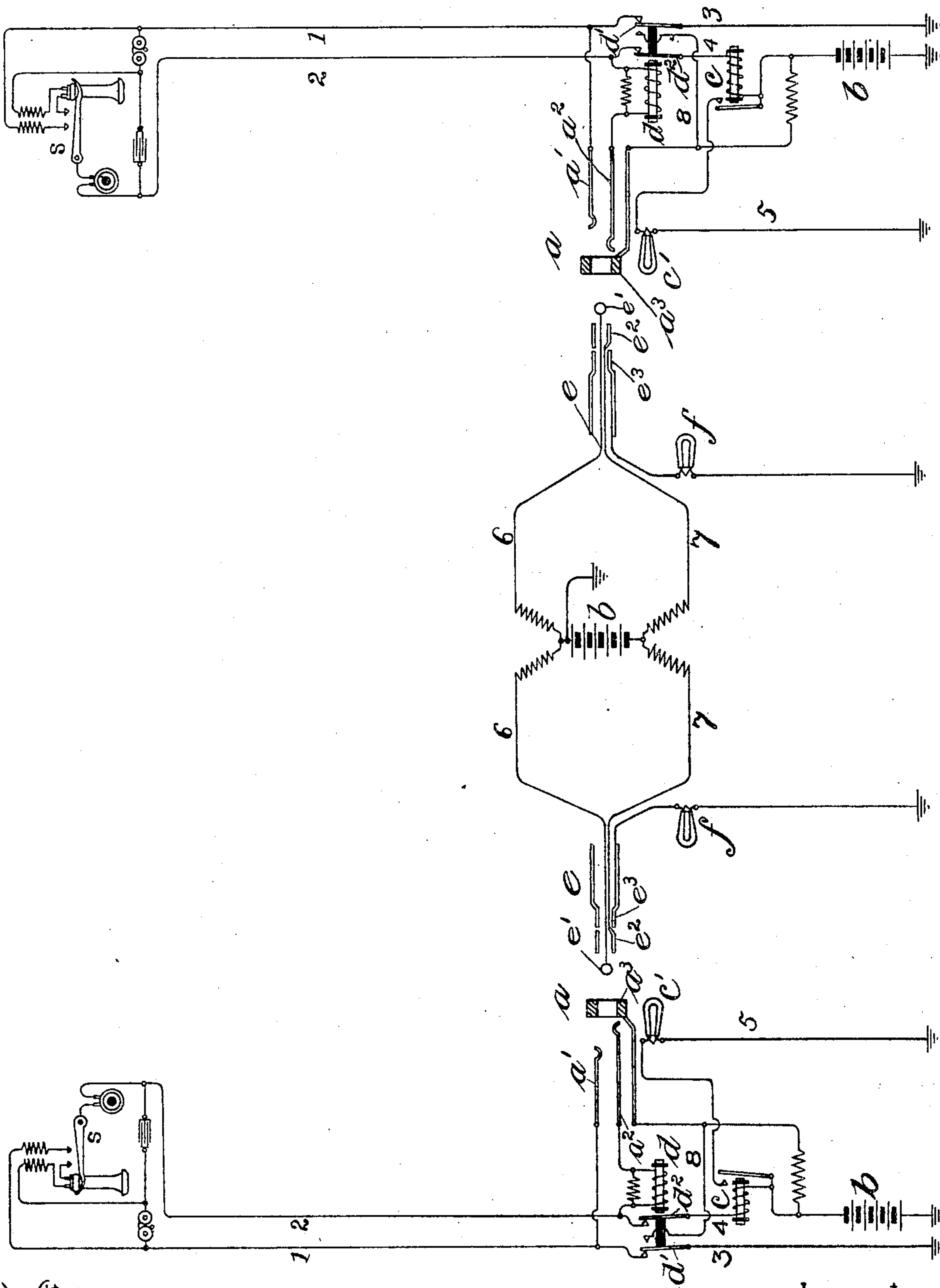


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F. R. McBERTY.
TELEPHONE EXCHANGE APPARATUS.

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Witnesses:

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TELEPHONE-EXCHANGE APPARATUS.

No. 795,533.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Apparatus, of which the following is a full, clear, concise, and exact description.

My invention relates to telephone-exchange systems, and has for its object to provide improved and simplified apparatus for controlling the automatic signals at the central office.

In accordance with my invention the line-signal apparatus at the central office is included in one branch of the line controlled by the contacts of a cut-off relay, the magnet of which relay is included in another branch, which is normally open, extending to a spring-jack or other connection-terminal for the line. When a circuit such as the operator's plug-circuit including a battery is brought into connection with the line by way of the terminal switch thereof, the cut-off relay is thus included in the path of current controlled by the substation-switch and being excited acts to disconnect the branch containing the line-signal apparatus.

A further feature of the invention lies in the provision of circuits and apparatus for bringing a supervisory signal temporarily under the control of the aforesaid cut-off relay, whereby a special supervisory relay in the operator's circuit is rendered unnecessary.

I will explain my invention by reference to the accompanying drawing, and the features or combinations which I regard as novel will be pointed out in the appended claims.

The drawing represents in diagram two telephone-lines extending from substations to a central-office switchboard, the system being organized and equipped for automatic control of signals in accordance with my invention.

Each line consists of two limbs or conductors 1 2, leading from the usual substation apparatus to the line-springs a' a'' , respectively, of the spring-jack or connection-terminal a . The usual automatic telephone-switch s is provided at the substation controlling the bridge of the line conductors which includes the telephone transmitting and receiving apparatus. At the central office the usual central battery b is included, together with the line-relay c , in a branch 3 4 of the line-circuit, said branch being controlled at the normally closed contacts d' d'' of a cut-off relay d . The line-

relay c controls at its front contact a local circuit 5, containing the incandescent lamp e' , which serves as a call-indicator. The magnet of the cut-off relay d is included in the line conductor 2 between the spring a'' of the jack and the connection of the branch 3 4, which contains the line-signal-controlling apparatus. The magnet of the cut-off relay may be permanently shunted by a non-inductive resistance.

A pair of plugs $e e$ is illustrated, each plug having the usual tip, ring, and sleeve contacts e' e'' e''' , respectively, the tip and ring contacts of each plug being united with the corresponding contacts of its mate by conductors 6 7, which include the windings of the usual repeating-coil. The battery b is connected, as usual, in a bridge of the plug-circuit between the windings of the repeating-coil. While three batteries (marked b) are shown in the drawing, it is understood, of course, that in accordance with the usual practice a single battery may be employed, which may be connected as indicated.

A supervisory signal f , which may be an incandescent lamp, is connected in a ground branch from the third contact or sleeve e''' of each plug. The test-ring or third contact a''' of the jack with which the contact e''' of the plug is adapted to register is connected through a resistance with the free pole of the grounded battery b and is also connected by a conductor 8 to a front contact of the armature d' of the cut-off relay.

The operation of the system is as follows: The subscriber transmits a call in the usual way by removing his telephone-receiver from its hook, whereby a bridge of the line is automatically closed by the switch s and the line-relay c receives current and brings about the illumination of the line signal-lamp e' . When the operator responds to the call by inserting an answering-plug e in the spring-jack a , the battery b is applied to the line over the conductors 6 7 of the cord-circuit and the magnet of the cut-off relay d , which is interposed serially in the conductor 2, is excited and draws up its armatures, cutting off the branch 3 4, which contains the line-signal apparatus, and connecting the grounded wire 3 with the third contact a''' of the jack by way of the conductor 8. When the plug is inserted in the jack, the supervisory lamp f associated with that plug is brought under the control of the cut-off relay d of the line

whose jack is plugged into, said cut-off relay being arranged to close the shunt 8 3 about the lamp when excited. As long as the subscriber at the substation is using his telephone the supervisory lamp *f* will be shunted out; but when he replaces his telephone on its hook the circuit through the magnet of the cut-off relay is opened, so that said relay allows its armature to fall back, breaking the shunt 8 3, and so causing increased current to flow through the supervisory lamp to cause its illumination.

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

1. The combination with a telephone-line extending from a substation to a central station, of line-signal apparatus in the circuit of said line at the central station, a switch at the substation for controlling said line-signal apparatus, and a cut-off relay in said line-circuit when the same is switched under the control of said substation-switch, said relay controlling the continuity of the circuit through the line-signal apparatus.

2. The combination with a telephone-line extending between a substation and a central station, and a circuit-controlling switch therefor at the substation, of a normally closed branch of said line at the central station containing line-signal apparatus responsive to said circuit-controlling switch, a normally open alternative branch of said line also at the central station containing a cut-off relay controlling the connection with said line of said normally closed branch, and switch devices at said central station adapted to close said normally open branch through a source of current for the operation of said relay and to bring the same under the control of the substation-switch, substantially as set forth.

3. The combination with a telephone-line extending from a substation to a central office, of a line-signal device and a battery in a branch of the line at the central office, a telephone-switch at the substation controlling the line-circuit, a connection-terminal for the line at the central office, a central-office circuit including a battery adapted to be brought into connection therewith, and a cut-off relay having switch-contacts for disconnecting the line-signal apparatus, said relay being serially included in the line between said connection-terminal and the branch containing the line-signal device and brought under the control of said substation-switch upon the connection of said central-office circuit with the line.

4. The combination with a telephone-line

extending from a substation to a central office, of a branch at the central office containing the battery and a line-signal device, a telephone-switch controlling the circuit at the substation, a connection-terminal for the line at the central office, a loop-circuit containing a battery adapted to be brought into connection with the line at said terminal, a cut-off relay included in the line-circuit to be operated by the current from the battery in said loop-circuit, said cut-off relay controlling the connection of the line-signal apparatus, and a supervisory signal temporarily associated with the line during connection, controlled by the cut-off relay.

5. The combination with a telephone-line extending from a substation to a spring-jack at a central-office switchboard, of a battery and a line-signal device in a branch of the line at the central office, a telephone-switch controlling a bridge of the line at the substation, a plug and plug-circuit at the central office for making connection with the line at the spring-jack thereof, a battery in a bridge of the plug-circuit, a cut-off relay controlling the branch which contains the line-signal device, included in the line between the spring-jack and the branch containing said line-signal device, a supervisory signal in a local circuit established in registering contacts of the plug and spring-jack, and a shunt for said supervisory signal controlled by switch-contacts of the cut-off relay.

6. The combination with a telephone-line extending in two limbs from a substation to a central-office battery, of a substation-switch controlling the line-circuit, a line-signal in the line-circuit at the central office, a spring-jack for the line at the central office and branch conductors leading from the line conductors thereto, a cut-off relay serially included in one of said branch conductors and controlling the connection of said line-signal with the line, a plug for making connection with said spring-jack, circuit-conductors connected with said plug, and a battery in a bridge of the said conductors adapted to be applied to the line upon the closure of said plug and jack to operate the cut-off relay, said relay being thereupon brought under the control of the substation-switch.

In witness whereof I hereunto subscribe my name this 19th day of February, A. D. 1902.

FRANK R. McBERTY.

Witnesses:

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