

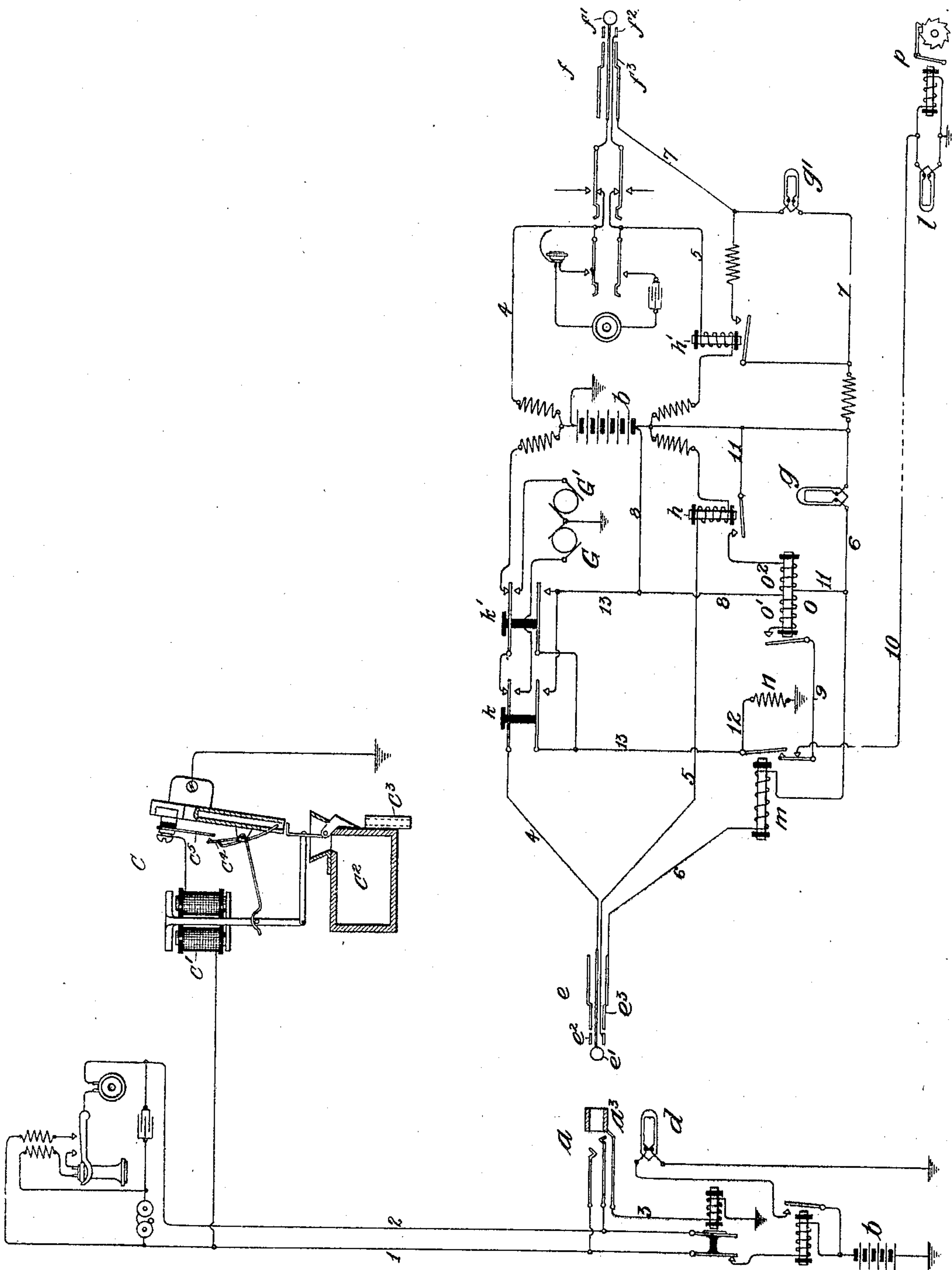
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F. R. McBERTY.  
APPARATUS FOR TELEPHONE SWITCHBOARDS.

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NO MODEL.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 764,752, dated July 12, 1904.

Application filed October 24, 1902. Serial No. 128,562. (No model.)

*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 Apparatus for Telephone-Switchboards, of which the following is a full, clear, concise, and exact description.

My invention relates to switchboard apparatus for telephone-exchanges; and its object is to provide means whereby the failure of the operator to perform a certain required act at its proper time will result in the actuation of a signal or alarm device, so that the timely performance by the operator of her duties may be made more certain.

My invention was designed more particularly for use in connection with toll systems where the operator has toll-keys before her to be actuated in the course of a connection. For example, in a well-known system a coin-collecting device is provided at the substation of the telephone-line, in which the preliminary or tentative deposit of a coin by the subscriber is required to call the central office, the subsequent disposition of the coin being dependent upon apparatus under the control of the operator. If the connection desired is obtained, the operator actuates a toll-key, which brings about the operation of mechanism in the substation toll-box to deposit the coin in a permanent receptacle; but if the desired connection cannot be completed or if for any other reason no charge is to be made the operator depresses another key, and thereby causes the mechanism of the toll-box to release the coin and direct the same into a return-chute, from which it may be taken back by the subscriber. A system of this character is described in patent to Albert M. Bullard, granted January 15, 1901, No. 665,874. It has been found, however, that frequently the operator, who is dealing with ordinary lines, as well as toll-lines, forgets to actuate either of the toll-keys, especially the key which brings about the deposit of the coin, so that the coin is left in the coin-chute undisposed of when the connection is taken

down. It has been my purpose to prevent this by providing an alarm-signal or other device which will be automatically actuated in case the operator fails to actuate her toll-key, and the apparatus which I have devised for this purpose may be useful also as a check when applied to various systems to insure the timely actuation of any key or device, such as the key which in this system controls the toll apparatus.

I will describe my invention more particularly in connection with the accompanying drawing, illustrating a telephone-line extending from a pay-station to a central-office switchboard, together with the operator's connection-switches and accessory apparatus, the system being organized and equipped in accordance with my invention.

A telephone-line extends in two limbs 1 2 from the usual substation apparatus to the spring-jack terminal *a* at the central office, the limb 1 being continued by way of the armature and back contact of the usual cut-off relay through the winding of the line-relay and thence to the free pole of the grounded central battery *b*. The toll device *c* at the substation is provided with the usual polarized magnet *c'*, connected in a ground branch from the limb 1 of the telephone-line, the circuit of said branch being controlled by coin-actuated contacts *c<sup>4</sup> c<sup>5</sup>* in the usual manner. The deposit of a coin completes the circuit of the limb 1 to earth to bring about the actuation of the line-relay and its controlled line signal-lamp *d* at the central office. Coin-distributing mechanism is arranged to be operated by the polarized magnet *c'*, whereby the coin may be thrown either into the cash-box *c<sup>2</sup>* or into the return-chute *c<sup>3</sup>*, according to the direction of current applied to the magnet *c'*. Said magnet is intended to be operated only by special current from generators *G G'* at the central office applied by the keys *k k'*, said magnet being unresponsive to current from the battery *b*. The operator's connection-switch at the central office comprises, as usual, the terminal spring-jack *a* and a plug *e*, forming the terminal of the link conductors



of a plug-circuit, the plug being adapted to be inserted in the spring-jack of any line to make temporary connection between said line and the plug-circuit. I have shown two plugs united by the link conductors of the plug-circuit, whereby any two lines may be connected together by inserting the respective plugs in the spring-jacks of said lines. The tip and ring contacts of each plug are united, respectively, with the corresponding contacts of its mate by the link conductors 4 5 of the plug-circuit, which include the windings of a repeating-coil in the usual manner, the central battery  $b$  being connected in a bridge of the conductors 4 5 between the windings of said repeating-coil. The third contacts  $e^3 f^3$ , respectively, of the plugs form the terminals of conductors 6 7, which are branched from the free pole of the battery  $b$  and include the supervisory signal-lamps  $g g'$ . Shunts are provided, as usual, for the supervisory signal-lamps, said shunts being controlled by the supervisory relays  $h h'$ , respectively, which are included in the link conductor 5 between the free pole of the battery and the ring-contacts  $e^2 f^2$  of plugs  $e$  and  $f$ , respectively. The test-ring or third contact  $a^3$  of the spring-jack of each line is connected to earth, as usual, by a conductor 3, which includes the winding of the usual cut-off relay. The closing of the connection-switch, therefore, completes a local circuit from the battery  $b$  by joining the conductors 6 3 or 7 3, as the case may be. The apparatus so far described is well known in the art.

I have provided a signal  $l$ , associated with the local circuit, which is established in closing the connection-switch, and means are provided for automatically actuating this signal when the connection-switch is opened unless the toll-key shall have been actuated while the connection-switch was closed. The signal  $l$ , which I have shown as an incandescent lamp, is included in a local circuit formed by conductors 8 9 10, leading from the free pole of battery  $b$  to earth, said circuit being controlled at the contacts of two special relays  $m o$ . The relay  $o$  is provided with two windings, one of which (marked  $o'$ ) is included in the conductor 8, which is adapted to be connected to the conductor 9 by the contacts of said relay when the same is excited by current in the other winding,  $o^2$ . Said winding  $o^2$  is included in a shunt 11 around the supervisory signal-lamp  $g$ , controlled by the supervisory relay  $h$ . Conductors 9 10 are normally united at the contacts of the relay  $m$ ; but said relay when excited is adapted in drawing up its armature to first connect conductor 9 with conductor 12, which leads to earth, through a resistance  $n$  and a moment later break the connection with conductor 10. When relays  $m$  and  $o$  are both excited, therefore, the circuit of conductor 10 will be open and the circuit 8 9 12 established in the locking-winding

$o'$  of relay  $o$ . If while the relay  $o$  remains excited the relay  $m$  should become deenergized, it will be seen that the circuit 8 9 10 will be established, so that the lamp  $l$  will receive current. I have shown an electromagnetic counting device  $p$  connected in multiple with the signal  $l$  to be actuated when the signal is excited. Conductor 13, which is normally open at contacts of keys  $k k'$ , extends from the conductor 8 to the conductor 12, forming a short circuit of the locking-winding  $o'$  of relay  $o$ . Either of the keys  $k k'$  is adapted when depressed to complete the circuit 13.

The operation of the system is as follows: When the answering-plug  $e$  is inserted in the spring-jack  $a$  of a telephone-line in response to a call, the local circuit 6 3 is completed, and the telephone at the substation being off the hook the circuit of the battery  $b$  through the link conductors 4 5 and over the telephone-line will also be completed, so that the supervisory relay  $h$  will be excited to close the shunt 11, which contains the winding  $o^2$  of magnet  $o$ . Relay  $m$ , however, should operate a moment before relay  $o$ , and I have shown the spring-jack and plug so constructed that the contacts  $e^3 a^3$  will come together to close the circuit 6 3 before the ring-contact  $e^2$  of the plug strikes the longer spring of the jack to complete the circuit of conductor 5. Relay  $o$  being excited will close its contact and establish the local circuit 8 9 12, so that said relay will stay excited independent of current in the shunt 11. If now the operator should withdraw the plug  $e$  from the spring-jack without having actuated one of the keys  $k k'$ , the relay  $m$  on being deenergized would complete the connection between conductors 9 10 before breaking the connection of the ground-conductor 12. The signal-lamp  $l$  and counting device  $p$  would thus receive current for their actuation, whereby the chief operator would be informed that the connecting operator has failed to actuate her toll-keys. The counting device and signal may be made common to all the plug-circuits of one operator, so that a record of her omissions may be kept. It is intended, however, that after the subscriber has finished the conversation and hung up his telephone, the operator before withdrawing the plug shall depress one or the other of the keys  $k k'$  to actuate the toll device, and in doing this the short circuit 13 around the winding  $o'$  will be completed, so that the relay  $o$  will be deprived of current for its actuation and will allow its armature to fall back, breaking the connection between conductors 8 and 9 and blocking the operation of the signal and counter. The plug may now be withdrawn without bringing about the actuation of a signal  $l$  and counter  $p$ , since though conductors 9 10 may be connected when relay  $m$  becomes inert, still the circuit will be broken at the contacts of relay  $o$ .

It is evident that any responsive device may



be used in place of the signal and counter shown in the drawing, and it will also be evident that any equivalent device may be substituted for the toll-key shown, my invention being adapted to furnish a check upon any desired device. The terms used in the claims should therefore be understood accordingly.

I claim—

1. The combination with a connection-switch at a telephone-exchange switchboard, of a signal *l* and means for automatically setting the same, controlled in closing and opening the connection-switch, a key *k*, and a blocking device actuated in the operation of the key, adapted to prevent the setting of the signal; whereby the setting of the signal upon the opening of the connection-switch is dependent upon the non-actuation of said key.

2. The combination with a telephone-switchboard having a connection-switch and toll-key, of a signal, a circuit for said signal, a relay having normally closed contacts controlling the signal-circuit, a circuit for said relay established in closing said connection-switch, a second relay having normally open contacts also included in the circuit of said signal, means for exciting the second relay after the closure of the connection-switch, a locking-winding for said second relay closed by the same when excited, and means for neutralizing said locking-winding actuated in the operation of the toll-key.

3. The combination with a telephone-line and toll device therefor, of a central-office circuit and a switch for connecting said circuit with the line, a local switchboard-circuit including a relay *m*, also established by contacts of said switch during connection, a sig-

nal *l*, a second relay *o*, having a self-exciting circuit, said relay being excited to cooperate with the first relay when inert to display said signal, means for initially exciting relay *o*, a toll-key, and means controlled by the toll-key for breaking the self-exciting circuit of relay *o*, whereby the automatic display of the signal upon taking down the connection may be prevented by actuating the toll-key.

4. The combination with a telephone-line and a toll device therefor, of a spring-jack for the line, a plug and plug-circuit, a signal, a circuit for said signal, a self-locking relay adapted to close said signal-circuit, means for initially exciting said relay during the connection, means controlled by the plug and spring-jack for opening the signal-circuit, a key *k*, a source of current applied thereby for actuating the toll device, and means for de-energizing the self-locking relay, actuated in the operation of said key.

5. The combination with an electric responsive device *c'*, a connection-switch for establishing connection therewith, and a key *k* for effecting the actuation of said device, of a signal *l*, a circuit for the signal, switch-contacts actuated upon breaking connection at the connection-switch to complete said signal-circuit, and means for preventing the completion of said signal-circuit, actuated in the operation of key *k*.

In witness whereof I hereunto subscribe my name this 25th day of August, A. D. 1902.

FRANK R. McBERTY.

Witnesses:

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