

No. 690,453.

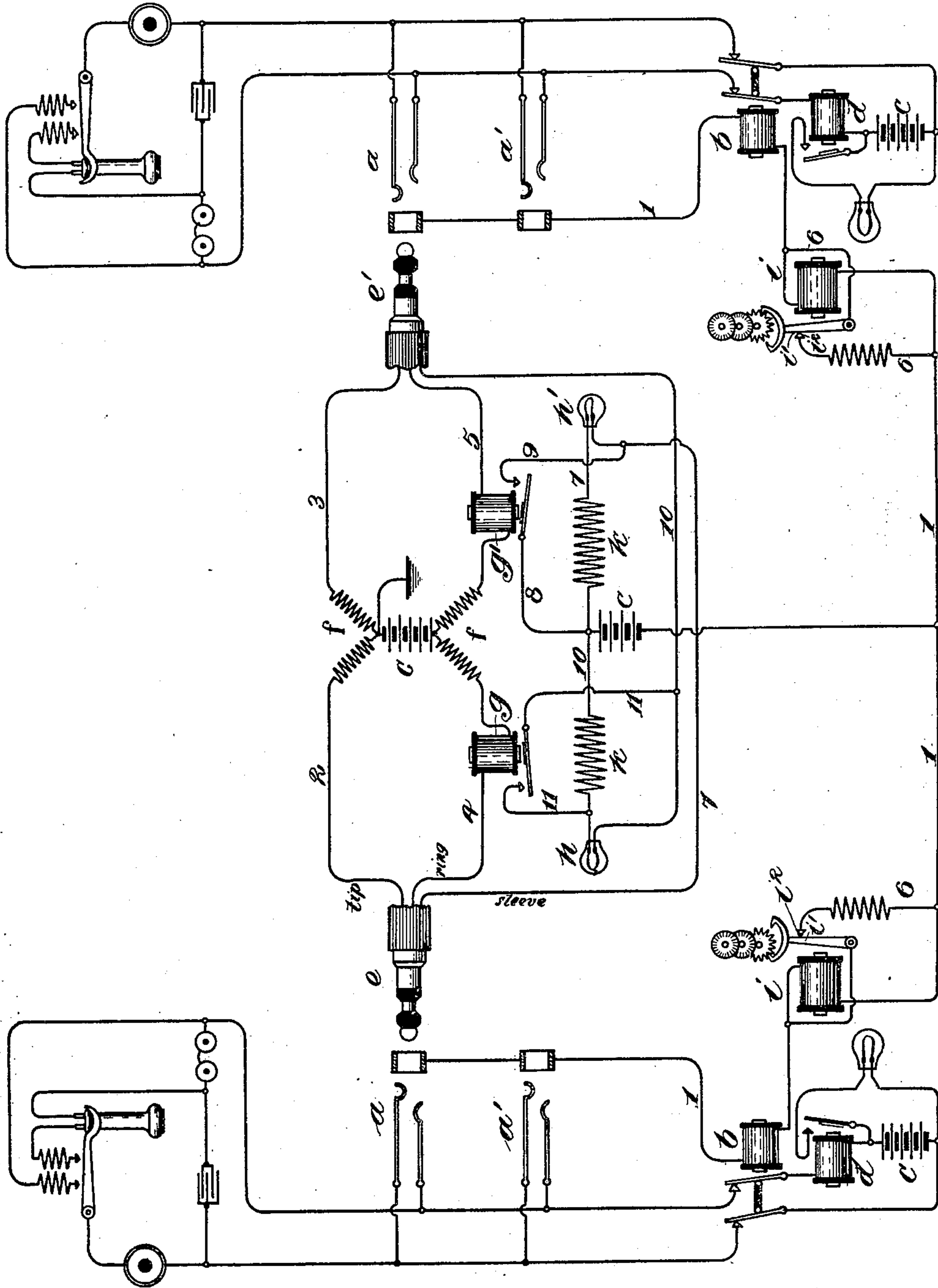
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F. R. McBERTY.

SERVICE METER FOR TELEPHONE LINES.

(Application filed Apr. 9, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SERVICE-METER FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 690,453, dated January 7, 1902.

Application filed April 9, 1900. Serial No. 12,147. (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 Service-Meters for Telephone-Lines, (Case No. 85,) of which the following is a full, clear, concise, and exact description.

10 This invention concerns the recording or counting for each line the connections initiated by the user of the line and attaining response at the called station. The type of mechanism is that described in my application, Serial No. 618,535, filed January 9, 1897, (Case No. 50.) The special features of the invention herein described are designed to permit the use of such connection-counting or service-metering mechanism in relay-switchboards of the well-known type.

15 In a relay-switchboard each line is provided with a cut-off relay for severing the normal connections of the line with the individual line-signal. The magnet of this relay forms part of the local circuit terminating in contact-pieces of the spring-jacks of the line, with which contact-pieces another portion of a battery-circuit is closed through an inserted plug and a conductor attached thereto. The conductor terminating in the plugs includes a signal-lamp controlled by a magnet in the path of the current flowing to the subscriber's station, the current being determined by the position of the telephone-switch at the station, by which the operator is enabled to supervise established connections. Such a supervisory signal is associated with each of a pair of connecting-plugs, the circuit of each lamp normally terminating in the local contact-piece of a plug to which it belongs. In the present invention the connection-counter or service-meter of each line is included in the portion of the local circuit with the magnet of the cut-off relay, and the service-meter is adapted to respond to a current of greater strength than that required by the cut-off relay for its operation. The resistance of the conductor of the local circuit terminating in the answering-plug, which is designed to form with the conductor, including the service-me-

ter and the cut-off relay, a closed local circuit during a connection, is controlled by a relay in the path of current through the calling-plug to the called substation, the controlling agency being arranged to diminish the resistance of the conductor mentioned when the telephone at the called station is taken for use. I preferably place the supervisory lamp of the calling-plug in this local conductor and control the lamp through the agency of a shunt operated by the supervisory relay in the path of current to the called line. The response of the called subscriber then through the same agency shunts the supervisory lamp and brings about the increase of current in the local circuit of the service-meter which is required to effect its operation. The supervisory lamp associated with the answering-plug should then be placed in the local conductor terminating in the calling-plug and may be controlled by a like shunt, including the switch-contacts of the supervisory relay, in the path of current to the call-originating line. This reciprocal connection of the supervisory lamps each in a circuit closed through the plug with which the other lamp is associated I believe to be novel and constitutes a feature of the invention. To the end that the temporary replacement of the telephone on its switch at the called station may not effect a second operation of the service-meter I apply a normal shunt about the magnet of the service-meter, closed in a normal resting contact of the armature thereof, of such value that when the shunt-circuit has been broken the ordinary current adequate for operating the cut-off relay shall be sufficient for the excitement of the service-meter also.

The invention is illustrated in the drawing which forms a portion of this application in conjunction with the usual and well-known circuits of the relay-switchboard.

The apparatus at the substations of lines entering a relay-switchboard is commonly arranged to maintain an open circuit of the line with respect to sources of unvarying electromotive force until the telephone is taken from its hook for use. During the use of the telephone the switch is permitted to close a cir-

cuit of comparatively low resistance through the telephones. The line conductors from the substations are connected with spring-jacks a and a' in a telephone-switchboard, and
 5 normal extensions from them are led through the switch-contacts of a cut-off relay b to the poles of a common source c of current. The extension of one line conductor of each line traverses the magnet-winding of a line-signal
 10 or signal-controlling relay d . The magnet-winding of the cut-off relay b forms part of a conductor 1, connected at one terminal with a pole of the common battery c and at its other terminal in multiple with local insulated contact-rings of the spring-jacks a and a' . Plugs
 15 e and e' are furnished for uniting lines, the like line-contacts of which are united by a plug-circuit 23 and 45, inductively completed through the repeating coil f , and having a
 20 bridge connection, including the common battery c . The conductors 4 and 5 of the plug-circuit include the magnet-windings of supervisory relays g and g' , which control supervisory lamps h and h' , of which the former
 25 is associated with the answering-plug e and the latter with the calling-plug e' . A calling-key for applying a source of calling-current to a called line through the calling-plug e' and a listening-key for connecting the oper-
 30 ator's telephone with the circuit are to be assumed.

The mechanism and circuits so far described are those which are usual in a relay-switchboard. In applying my invention to
 35 such a switchboard the actuating-magnet of the service meter or register i is interposed in the conductor 1. This register has a magnet and an armature therefor, a train of counting-wheels actuated or controlled by an
 40 escapement or other suitable device moved by the armature, and a pair of switch-contacts arranged to move simultaneously with the armature, one of the contacts being, preferably, carried thereon. These contacts i' i'' control
 45 a shunt 6 about the magnet of the meter. A conductor 7 is led from the pole of battery c opposite to that with which the conductors 1 are connected to the local contact-sleeve of the answering-plug e , and the conductor in-
 50 cludes the supervisory lamp h' of the calling-plug. About the lamp is a shunt-circuit 8 and 9, controlled by the switch-contacts of a supervisory relay g' , the circuit being closed when the relay is excited. A similar con-
 55 ductor 10 is led from the same pole of battery c to the local contact-piece of calling-plug e' through the supervisory lamp h . This conductor includes also a resistance-coil k . The shunt 11 of the lamp is controlled by the su-
 60 pervisory relay g . An incoming call from a substation—for example, from that represented at the left of the sheet in the drawing—is signaled to the operator by the lighting of the secondary signal-lamp of the call-
 65 ing-line. The operator answers the call by inserting the answering-plug e in a spring-jack of the calling-line. Having learned the

identity of the line with which connection is required, the operator inserts the calling-plug e' in a spring-jack of the line wanted and by
 70 means of the calling-key rings the bell at the station. The insertion of the answering-plug in the spring-jack of the calling-line completes a local circuit 7 1. The resistance of the signal-lamp h' in this circuit is such as to
 75 permit the passage of sufficient current in the local circuit formed to excite the cut-off relay b , but not to permit the passage of sufficient current to excite the service-meter i while the shunt 6 about the latter is complete. The
 80 lamp h' is lighted by the current traversing it. The insertion of the calling-plug e' in a spring-jack of the line called for likewise completes a local circuit 10 1, including the cut-off relay of the line, whereby the normal con-
 85 nections of that line also are broken and the answering-lamp h is excited. Inasmuch as the telephone is off the hook at the calling-station, however, the supervisory relay is excited and the shunt about the answering-
 90 lamp is closed. The resistance-coil k in the circuit therewith prevents the current in the local circuit from increasing to a sufficient volume to operate the service-meter of the called line, however. When the telephone at
 95 the called station is taken for use in response to the ringing of the bell, the relay g' is excited and closes a short circuit about the lamp h' . The current in the circuit thus formed is so greatly increased that the arma-
 100 ture of the service-meter is attracted and breaks the shunt 6 about the magnet of the meter, at the same time effecting the registration of the call on the counting-train. If now the telephone at the called station be
 105 replaced on its switch, the short circuit of the lamp will be broken; but the introduction of the resistance of the lamp into the local circuit of the service-meter will not diminish the current in the circuit to a suffi-
 110 cient extent to release the armature of the service-meter, which will therefore remain attracted without further control of the supervisory relay of the called line until the answering-plug is withdrawn from the answer-
 115 ing-jack of the calling-line.

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

1. The combination with the telephone-line 120 and spring-jacks thereof, and a plug and switch cord-circuit for making connection with the line, a cut-off relay for severing the normal connections of the line, having its actuating-magnet in a local circuit closed in
 125 registering contact-pieces of a spring-jack and a plug therein, a service-meter having its actuating-magnet in the same local circuit adapted for operation by a current greater than that required to operate the cut-off re-
 130 lay, a resistance in the local circuit and a switch for shunting the resistance, a normal shunt of the service-meter and switch-contacts at the armature of said meter adapted

to break the shunt; whereby the cut-off relay is operated when the local circuit is completed and the service-meter is operated when the resistance is shunted and remains excited, as described.

2. The combination with a telephone-line, spring-jacks thereof and a pair of plugs and a switch cord-circuit for making connection from the line to another, said lines being provided with switches at their stations for determining the flow of current in the lines in the use of the telephones, of a cut-off relay for the line for severing normal ground connections thereof, a local circuit closed in registering contact-pieces of the answering-plug and spring-jack including said cut-off relay, a service-meter having its actuating-magnet in the local circuit, a supervisory-signal lamp in the portion of the local circuit terminating in the answering-plug, a supervisory relay in the path of current to the called line, and a shunt of the supervisory lamp controlled thereby, the cut-off relay being adapted to operate upon current through the supervisory lamp, and the service-meter being adapted to operate only when said lamp is shunted, as described.

3. The combination with telephone-lines and spring-jacks thereof, the stations of said lines being provided with switches for determining the flow of current in the lines, an answering-plug and a calling-plug with a switch cord-circuit for uniting lines, a source of current in the switch cord-circuit, and a supervisory relay in the path of current therefrom to the calling-plug, a conductor for each line leading from a battery to normally open contact-pieces in the spring-jacks of the corresponding line, a cut-off relay and a service-meter for each line having their magnets in the said conductors of the lines, the service-meter requiring for its operation a current greater than that required by the cut-off relay, and a conductor from the other pole of said battery to contact-pieces of each of said plugs adapted to register with the local contact-pieces of the spring-jacks, the conductor terminating in each plug being adapted to supply to the circuit through a cut-off relay of the line with which it is connected a current sufficient to operate the cut-off relay only, and means controlled by the said supervisory relay for increasing the current in the conductor to the answering-plug, as described.

4. The combination with telephone-lines

adapted for the automatic control of signals, spring-jacks for the lines and plugs and a switch cord-circuit for uniting lines, a source of current in a bridge of the switch cord-circuit, and a supervisory relay in the path of current from the bridge to each of the plugs, a local circuit for each line closed in registering contacts of the spring-jack and plug, a cut-off relay and a service-meter in the local circuit of each line, the service-meter requiring for its operation a current greater than that required by the cut-off relay, a secondary signal in the conductor of the local circuit leading through each plug, the secondary signal in the conductor to the answering-plug being associated with the calling-plug and controlled by a shunt through switch-contacts of the supervisory relay of the called line, the said shunt being adapted to produce sufficient current in the local circuit of the answering-plug to operate the service-meter, a secondary signal associated with the answering-plug in the circuit to the calling-plug controlled by a shunt through switch-contacts of the relay for the calling-line, the resistance of said conductor leading through the calling-plug being always sufficient to prevent the operation of the service-meter, substantially as described.

5. The combination with two telephone-lines, a spring-jack for each line, an answering and a calling plug for making connection from one of the lines to the other, a switch cord-circuit for the plugs, and supervisory relays in the switch cord-circuit, each responsive to current through one of the plugs, a local circuit for each line closed through registering contacts of the spring-jack of the line and the plug therein, the local circuit to the calling-line being controlled by the supervisory relay of the calling-plug, and the local circuit of the called line being controlled by the supervisory relay of the answering-plug, and electromagnetic mechanism in the portion of the local circuit permanently associated with each line; whereby the said mechanism of either line is controlled by the supervisory relay associated with the other line, as described.

In witness whereof I hereunto subscribe my name this 11th day of January, A. D. 1900.

FRANK R. MCBERTY.

Witnesses:

ELLA EDLER,

DUNCAN E. WILLET.