

No. 669,900.

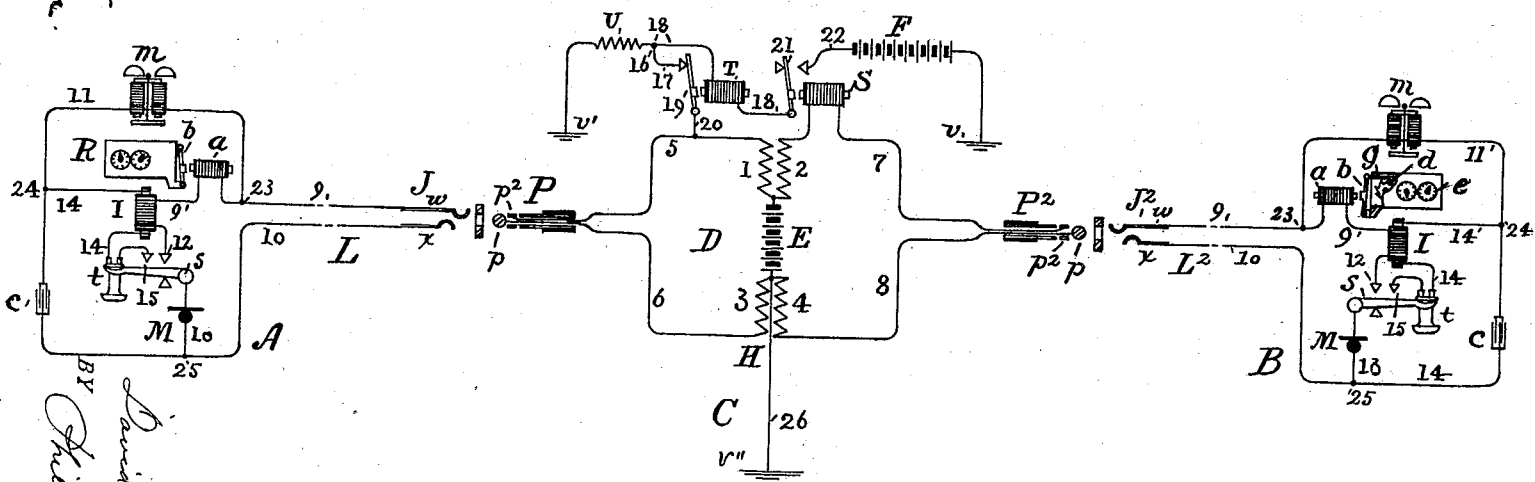
D. S. HULFISH.

Patented Mar. 12, 1901.

TELEPHONE SERVICE METER AND CIRCUIT.

(No Model.)

(Application filed Dec. 18, 1900.)



WITNESSES:

Harry J. Torrance
W. R. Colburn

INVENTOR.

David S. Hulfish

ATTORNEY.

Thos. J. Hannon

UNITED STATES PATENT OFFICE.

DAVID S. HULFISH, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

TELEPHONE SERVICE-METER AND CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 669,900, dated March 12, 1901.

Application filed December 18, 1900. Serial No. 40,271. (No model.)

To all whom it may concern:

Be it known that I, DAVID S. HULFISH, residing at Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Telephone Service-Meters and Circuits, of which the following is a specification.

In the development of the telephone-exchange business various kinds of service have been devised to meet the demands of widely-varying conditions, which may be roughly divided into two general classes—*i. e.*, that of unlimited service, for which the highest charge is made, by which the patron is entitled to use the line as frequently as is desired, and, secondly, that of limited service, for which a lower price is made, by which the subscriber is entitled to use the line a certain number of times during the period for which the contract exists.

In equipping the substation-circuits for the limited class of service it has been found desirable to attach thereto a device termed a "service meter or register" for the purpose of registering the number of times the line has been used for conversation; and the present invention relates to improvements in such service-meters and circuits; and I have provided a service-meter automatic in its action for registering outgoing calls resulting in complete connections which are responded to, requiring no assistance from the subscriber or the operator, which counts progressively the number of completed connections, which will not register when a ringing current is sent to line, and which is accessible for the inspection of the subscriber.

The invention is combined with substation-circuits of the common battery or relay type, the registering device being located at the substation end of each such circuit. It consists of a mechanical consecutive counter of any suitable design having a wheel-train actuated and controlled by the armature of an electromagnet whose helices are included in one conductor of the secondary or main circuit the terminal of which is normally open at the hook-switch. The potential means for operating the service meter or registering device are located in the linking or plug-connecting cord-circuits at the central station

and are adapted to become operative when the telephone at the called-for station is removed from its hook-switch, which when thus released automatically closes the organized circuit at that point. The battery in common battery or relay circuits is in a bridge between the conductors of the cord-circuits, with the winding of the repeating-coil at each pole thereof, and when the answering-plug of a cord-circuit is inserted into the switch-socket of a calling line current from the battery circulates through the microphone of the subscriber (who is supposed to have taken his telephone-receiver down) and also through the helices of the register-electromagnet; but the armature of the said magnet being adjusted to respond to a much stronger current only is not attracted; but when the said organized circuit is closed at the called-for substation, as referred to, an electromagnet in one conductor of one division of the cord-circuit in the calling side thereof operates to momentarily introduce additional current from a second source of current-supply through the circuit, including the helices of the said register-magnet, and cause the attraction of its armature, and the consequent recording of a unit, by the register. When the register-armature is thus attracted by the energy of a sufficient current, it will not return to its position of rest when the current is reduced to that primary amount to which the armature is not adapted to respond to, but is held attracted by the smaller current and falls away when the answering-plug is detached from its socket or upon the opening of the circuit at the hook-switch at the calling substation.

The drawing which illustrates the invention is a diagram and represents two circuits L and L^2 , extending from the substations A and B to the central station C , at which D represents a linking or connecting-plug cord-circuit.

The substation-circuits are represented upon the switchboard at the central station with suitable switch-sockets J , only one being represented here, however, whose contact-springs w and x are the terminals of the respective line conductors 9 and 10, the former including at the substation the helices of the

register-electromagnet *a* and the secondary of the induction-coil I and is united with the hook-switch stop 12, the primary of said coil being connected at one end through the telephone-receiver coil to the hook-switch stop 15 and at the opposite end to conductor 14, which includes the condenser *c*, and connects at point 25 with the second line conductor 10, which terminates at the hook-switch *s*, having the microphone M in its circuit. The call-bell *m* is in a shunt-circuit 11, which connects point 23 on conductor 9 with point 24 on conductor 14.

R is the service-meter or registering device and consists of a mechanical consecutive counter of any suitable pattern, shown, however, as similar to the counter employed in gas-meters, having a simple wheel-train, with dials and pointers *e*, adapted to be rotated by a ratchet-wheel *d*, provided with a detent *g*, attached to the armature *b* of the electromagnet *a*.

The respective windings 1 2 and 3 4 of the repeating-coil H of the cord-circuit D are connected to the opposite poles of the common battery E and to the sleeves of the plugs P and P² by the conductors 5 and 7 and to the tips of said plugs by the conductors 6 and 8, the battery having a branch conductor 26 to ground *v*'. The conductor 7 has in its circuit the helices of an electromagnet S, whose armature 21 is connected by conductor 18 to ground *v*' and includes in series therewith the helices of the electromagnet T, whose resistance may be ten ohms, and the coil V with a resistance of about one thousand ohms. A branch wire 17 connects the back-stop of the armature 19 of electromagnet T with point 16 on conductor 18, and the said armature is connected to conductor 5 by the wire 20, while the conductor 22 extends between the front stop of the armature 21 and ground *v* and has in circuit the battery F, which has a greater potential than battery E.

In the diagram all parts not necessary to illustrate the invention have been omitted, and in describing the operation thereof suppose that a call has been received from the substation A at the central station C and that the plug P has been inserted into the switch-socket J and that current from battery E is circulating, via conductor 6, tip *p* of plug P, spring *x* of socket J, conductor 10, hook-switch *s*, stop 12, conductor 9, helices of electromagnet *a*, spring *w* of socket J, sleeve *p*² of plug P, and conductor 5, to the opposite pole of battery, but as the armature *b* of the register-magnet *a* is adjusted to be attracted by a much stronger current than that flowing from the battery E it is not affected thereby. When the operator has ascertained the substation wanted, she inserts the complementary plug P² into the switch-socket J² of the desired line and sends a ringing-current out, which operates the call-bell *m*, all in a well-known manner, and as the telephone *t* at the substation B is upon its hook-switch *s* and

the conductor 9 open at the stop 12 none of the signaling-current reaches the electromagnet *a* of the register. When, however, the subscriber B removes his telephone *t* from its hook-switch, the latter rises and comes in contact with the stop 12, and thus closes the circuit through the battery E, current from which passes, via conductor 8, tip of plug P², spring *x* of switch-socket J², conductors 10 and 9, to spring *w* of socket J², sleeve of plug P², and conductor 7, helices of electromagnet S, to the opposite pole of the battery. The core of the magnet S is magnetized and attracts its armature 21 to its forward stop, and current then flows from battery F, conductor 22, armature 21, conductor 18, helices of electromagnet T to point 16 on the latter conductor, where it divides, a portion going to ground *v*', while the larger part continues by wire 17, armature 19, wire 20, conductors 5 and 9, helices of electromagnet *a*, secondary of coil I, hook-switch *s*, and conductors 10, 6, and 26 to ground *v*'. The current through the electromagnet *a* from the battery E is thus increased by the flow from the battery F, and its armature *b* is attracted, and the detent *c* pulls the ratchet-wheel over one tooth, causing the pointer on the unit-dial to advance to indicate the same. The electromagnets T and *a* are energized simultaneously and their armatures are attracted, the armature of the former, T, being, however, adjusted to operate sluggishly, if necessary, so that current from battery F will reach the latter, *a*, and energize the same before the armature 19 separates from its back-stop and cuts the current off, and the said armature remains attracted until the electromagnet S becomes demagnetized because of the opening of the circuit by the return of the telephone to the hook-switch at the substation B, and any subsequent removal of the telephone at the said substation, and the consequent operation of the electromagnet S, will not affect the electromagnet *a* at substation A so long as its armature is held attracted by current from battery E, and when the telephone is on its hook *s* at substation A the magnet *a* is on an open terminal, and therefore cannot be disturbed.

Having now described the invention, I claim—

1. The combination in telephone-circuits of a plurality of substation-circuits provided with telephones in normally open branches, a switch for closing the same, a service meter or register in one of the severed conductors, a call-bell in a shunt, and switch-sockets; with a linking plug-circuit for connecting two substation-circuits, having a common source of current-supply in a bridge between its conductors, an electromagnet in one division of the plug-circuit whose armature is adapted to complete a circuit including a second source of current-supply, with the second division of the plug-circuit, as set forth.

2. The combination of two telephone-circuits each provided with means at its station for

determining the path of current in the line during the use of the telephone, a service meter or register in a normally-severed conductor of the line, a call-bell, and switch-sockets;

5 with a linking plug-circuit for connecting said telephone-circuits having a common source of current-supply in series with the windings of a repeating-coil in a bridge between its conductors, an electromagnet in one division of
10 the plug-circuit whose armature is adapted to complete a local circuit and determine a momentary flow of current from a second source of current-supply to the second division of the plug-circuit, as set forth.

15 3. The combination of two telephone-circuits each provided with means at its station for determining the path of current in the line, during the use of the telephone, a service meter or register consisting of an electromagnet
20 in a normally-severed conductor of the line whose armature is arranged to operate a mechanical counting device, a call-bell, and switch-sockets; with a linking plug-circuit for connecting said telephone-circuits having a
25 common source of current-supply in a bridge between its conductors, and electromagnetic means in one division of the plug-circuit

adapted to determine a momentary flow of current from a second source of current-supply to the second division of the plug-circuit, 30 as set forth.

4. In an organized telephone-circuit, the combination of two substation-circuits normally open at the hook-switch but adapted to be completed by the same, an electromagnetic 35 service-meter in one of the severed conductors at the substations, and switch-sockets for the said circuits; with a linking plug-circuit connecting the said substation-circuits having a common source of current-supply in a bridge 40 between its conductors, electromagnetic means in one division of the plug-circuit adapted to switch current from a second source of supply into the second division of said plug-circuit, and operate the register, at 45 one of the substations, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 8th day of December, 1900.

DAVID S. HULFISH.

Witnesses:

LLOYD E. JEWELL,
SIDNEY T. COREY.