

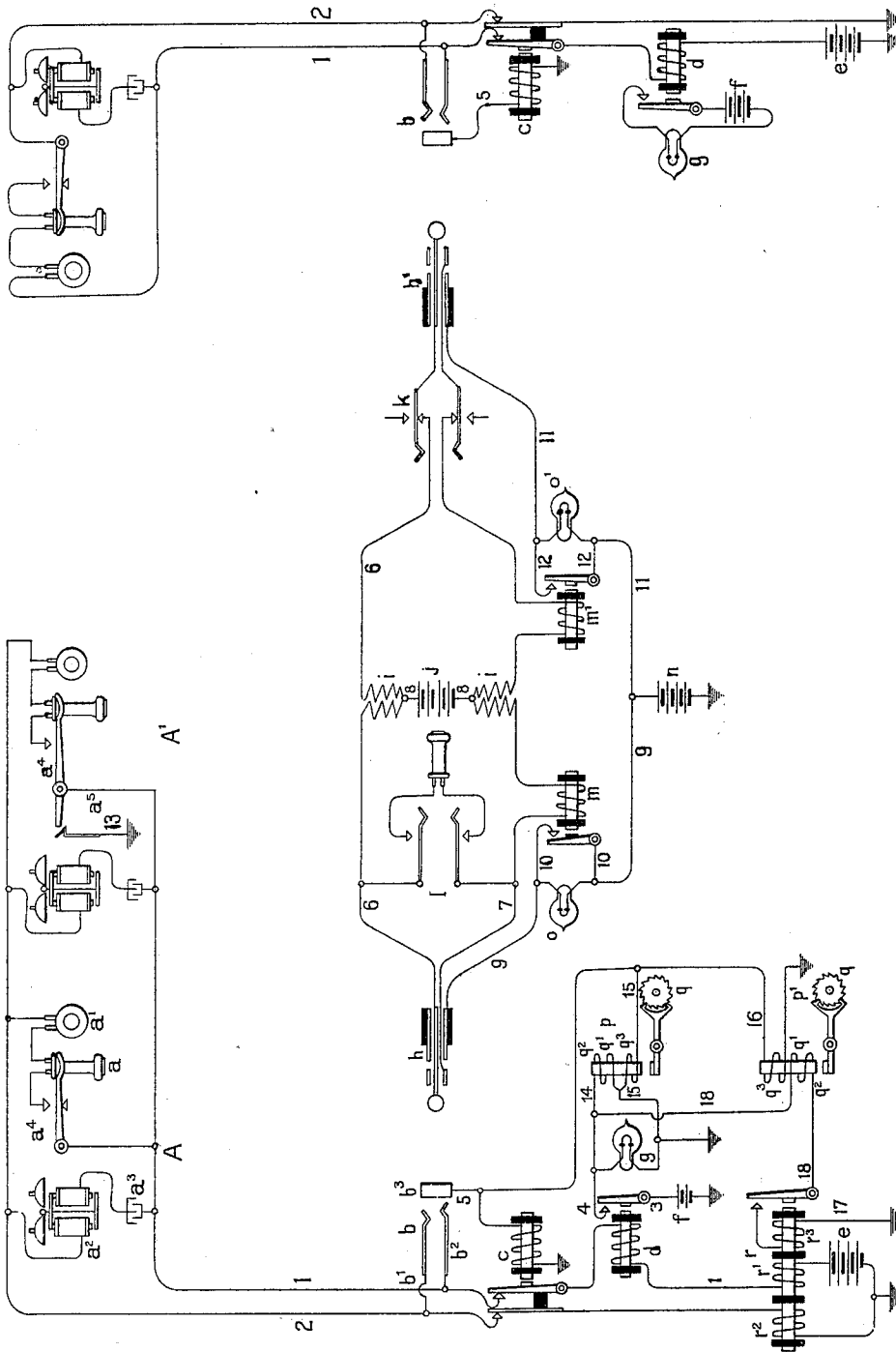
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C. E. SCRIBNER.
CONNECTION REGISTER FOR TELEPHONE LINES.

(Application filed Feb. 14, 1898.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
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CONNECTION-REGISTER FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 642,880, dated February 6, 1900.

Application filed February 14, 1898. Serial No. 670,273. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, 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 Connection-Registers for Telephone-Lines, (Case No. 458,) of which the following is a full, clear, concise, and exact description.

My invention concerns the recording of uses of telephone-lines. It applies particularly to so-called "party-lines," wherein a single line conductor or pair of line conductors is connected with telephones at different stations, being designed to record separately the uses of the line initiated at the different stations thereof.

In making a charge for the use of a telephone based on the number of times the telephone is used it is customary to record for each station only connections originated at that station. It is desirable to make the required record automatically in the manipulation of the telephone or of the apparatus associated with it or the line with which it is connected. Such automatic recording apparatus may be made to take cognizance of and record connections which have reached any desired stage of completion; but inasmuch as the recording apparatus should be preferably applicable to existing switchboards without material change in the apparatus or circuits thereof I have considered it sufficient to record calls which have been answered by the operator in the central office. In fulfilment of this plan I have described in another application, Serial No. 659,467, filed November 22, 1897, (Case No. 454,) a connection-counter designed for association with the relay-switchboard of modern type, wherein the line to each station is provided with means at the substation for closing the line during the use of the telephone and with a relay at the central office responsive to current thus determined in the line, a secondary signal controlled by the relay, and an electromagnetic switch for disconnecting the relay and other appliances from the line in the act of making connection with it in response to the call.

The before-mentioned connection-counter comprises counting mechanism and two electromagnetic helices suitably disposed for actuating the mechanism, one of the helices being in a circuit in which current is determined by the operation of the line-relay in the act of calling and the other of which is in a circuit wherein a current is produced in the act of making connection with the line, the joint action of the two helices being essential to the operation of the counting mechanism. It sometimes becomes further necessary, however, to provide means for making separate records of answered calls originated at different stations connected with the same line conductors. The present invention is addressed to this requirement.

It consists in the combination, with the conductors of a party-line circuit, the magnet for controlling the line-signal, and the circuit, closed in the act of making connection with the line, of two independent counting devices, each having two actuating-helices whose joint action is required to effect a record, the circuit connections of the helices being such as described in the before-mentioned application, an electromagnet controlling the circuit of one of the helices of one counting device; the magnet having windings differentially disposed in the line-circuit, and means at one of the stations for determining the operation of one only of said differential windings, whereby one counting device is caused to register all answered calls originated at both stations, while the other device is permitted to record only calls originated at one of the stations. Obviously the number of calls of the former station may be obtained by subtracting from the total number of calls originating at both stations the number initiated at the second-mentioned station. The invention may be used also in connection with party-lines for counting connections originated at one station only of the line. In that case one of the recording devices may be omitted, the differential magnet in the line-circuit and the counting device whose circuit is controlled thereby being alone used, together with the special appliance at the sub-

station from which the connections are to be recorded for rendering one winding of the differential magnet inoperative.

The invention is illustrated in the attached drawing, wherein it is shown applied to a party-line terminating in connecting and signaling apparatus of a relay-switchboard.

The apparatus usually provided at substations adapted for automatically operating signals in connection with a relay-switchboard comprises in addition to the usual telephones a a' a polarized call-bell a^2 , a condenser a^3 in circuit with the call-bell, and a switch a^4 , which closes the line-circuit through the telephone when the receiving-telephone is taken for use. Line conductors 1 and 2 lead to the terminals of the apparatus at two stations A and A'. These line conductors are connected with the terminal contacts of a spring-jack b in the switchboard and are extended therefrom through switch-contacts of a cut-off relay c to earth, the magnet-winding of a line-relay d and a battery e being interposed in line conductor 1. The line-relay controls the local circuit 3 4, the former conductor containing a battery f and the latter a signal-lamp g .

The spring-jack is provided with a contact-thimble b^3 in addition to the line-contacts b' b^2 , which forms the terminal of a conductor 5, extending to earth and traversing the magnet-winding of cut-off relay c .

The switchboard is furnished with pairs of plugs h and h' , each adapted for use with any spring-jack b . The tip contact-pieces of the plugs are united by a conductor 6, while the ring-contacts are similarly united by a conductor 7. In each of these conductors two windings of an induction-coil i are interposed serially. The points of junction of the two windings in each conductor are united through a bridge 8 of the plug-circuit containing a battery j . The conductors 6 and 7 traverse the switch-contacts of the usual calling-key k for looping a generator of signaling-current into circuit with calling-plug h' and are connected with switch-springs of a listening-key l for bringing the operator's telephone into a bridge of the plug-circuit. The conductor 7 of the plug-circuit includes the magnet-windings of two relays m and m' , one between each plug and the central bridge of the plug-circuit. These relays are designed to respond to currents in the lines to the substations with which the plugs are connected and to control supervisory signals associated with the plugs through the following agencies: The sleeve-contact of plug h , which registers with the ring b^3 of a spring-jack, into which it is inserted, forms the terminal of a conductor 9, leading to the free pole of a grounded battery n . This conductor includes a supervisory signal-lamp o , which is associated with the plug h in the switchboard. The switch-contacts of relay m control the continuity of a shunt 10 about

this signal-lamp. Similarly the contact-sleeve of plug h' forms the terminal of wire 11, containing a signal-lamp o' , referring to plug h' , and the relay m' determines the continuity of a shunt 12 about the signal o' .

The above-described apparatus constitutes the usual mechanism of a relay-switchboard for signaling from a substation to the switchboard, for interconnecting lines, and for supervising the connections in the switchboard. The essential features of these operations may be briefly traced. The removal of a receiving-telephone from its switch at a substation permits current to flow in the line from battery e , which excites the relay d , and thus brings about the display of the secondary line-signal g . Responding to this call the operator inserts plug h into the spring-jack b of the calling line, whereby a current is permitted to flow from battery n , which excites the cut-off relay c and severs the connection of the line conductors with the line-relay and with the earth. The operator learns the order of the calling subscriber for the line with which connection is required and makes connection with the line by means of plug h' , ringing the bell a^3 at the called station by means of key k . After connection between the lines has been effected the operator may observe the signal-lamps o and o' , the former of which is adapted to indicate the position of the switch at the calling station and the latter of which will show the position of the switch at the called station. Thus she is enabled to infer the condition of use or disuse of the lines from the position of the switches at the substation as denoted by signals o and o' .

I now come to the description of the instrumentalities by which I aim to record the calls originated at each of the substations A and A' of the party-line, which are answered by the attendant at the switchboard, and to trace their automatic operation in connection with the switchboard.

At one of the stations A', I provide in connection with the switch a^4 a spring a^5 , which is adjusted to make momentary contact with a moving part of the switch while the latter oscillates from its position of rest to its alternate position when relieved from the weight of the telephone. The spring a^5 forms the terminal of a grounded conductor 13.

At the central office I associate with the line two counting or recording devices p and p' . Each of these consists of a train q of counting-wheels or other suitable recording mechanism, a verge for actuating the wheels, and a magnet q' for imparting movement to the verge. The magnet q' is provided with two windings q^2 and q^3 . The retractile force acting on the armature should be so adjusted with respect to the magnetic effect of either winding that the armature may remain inert when one winding alone is actuated, but shall be drawn up when both are excited, and the

armature should be so adapted in any suitable way that having been drawn into contact with the pole of the magnet it will be held as long as either winding is actuated. The required operation may be readily attained by allowing the armature a wide range of movement, as indicated in the drawing.

One winding q^2 of the magnet of counter p is included in a conductor 14, which is in shunt of the line-lamp g of the party-line. The other winding of the same magnet forms part of the conductor 15 in shunt of the magnet of cut-off relay c . One winding of the controlling-magnet of counter p' is in a conductor 16, which is likewise in parallel with the magnet of cut-off relay c , while the other winding of the magnet of the latter counter is in a circuit which is adapted to be brought into multiple with the line-lamp g , but whose continuity is controlled by other mechanism which is actuated only in the case of connections originated at the station A' . This mechanism consists in a relay r , having three windings r^1 , r^2 , and r^3 . The windings r^1 and r^2 are interposed in the line conductors 1 and 2, respectively, of the party-line, but are arranged differentially with respect to each other, wherefore, being equal, they permit the magnet to remain inert when both windings are traversed by current in the line-circuit. The winding r^3 forms part of the conductor 17, leading from earth and terminating in one switch-contact of the relay r . The other switch-contact of the relay forms the free terminal of a conductor 18, which traverses the second-mentioned winding of the magnet of counter p' , the conductors 17 and 18 forming the normally-broken shunt before referred to of the line-lamp g , including the winding of the magnet q of counter p' .

The circuit connections which are brought into play are different in the case of calls from the two stations. Hence I will trace the act of calling and obtaining an answer from the two stations separately.

The removal of the telephone from its switch at station A to initiate a call causes the line-relay d to close the local circuit 3 4 of the secondary signal g . The completion of the local circuit also permits current to flow from battery f through conductors 3, 4, and 14, whereby one winding of the magnet q' of counter p is excited. When in response to the call the plug h is inserted into the spring-jack, current finds circuit from battery n through wires 9 and 5 to excite the cut-off relay, and in parallel with the latter appliance through the conductor 15, including the other magnet-winding of counter p . Both windings of the magnet of counter p are thus for a moment excited, the armature of the counter is attracted, and the verge imparts movement to the train of wheels to register one use of the telephone-line. Meantime the counter p' remains inert. The calling-current permitted to flow through the telephone at station A traverses the windings r^1 and r^2 of

relay r differentially, so that the relay remains unexcited. Hence the local circuit through one winding of the magnet of counter p' remains open, notwithstanding that the local circuit of the lamp g is closed. When connection is made with the line in response to the call, the conductor 16, including one winding of the magnet of counter p' , receives current, being in closed parallel circuit with the magnet of cut-off relay c ; but current in this winding is insufficient to actuate the counter.

In the case of a call originated at station A' the telephone-switch in rising when relieved from the weight of the telephone makes momentary contact with spring a^5 , and thus closes a circuit from wire 2 to earth. The current from battery e then flows through line-conductor 1 to the station A' and then to earth. The winding r^1 only of relay r is traversed by this current, so that the relay r is excited and attracts its armature. Simultaneously the line-relay d is excited and closes the local circuit 3 4, containing the secondary signal, to display the call-signal. When the armature of relay r closes together the switch-contacts which it controls, the conductors 17 18, containing one magnet-winding of counter p' and a winding of relay r , are brought into multiple with the line-lamp and into connection with battery f , whereby both magnet-windings mentioned become excited. The latter maintains the continued excitement of relay r after the switch-lever of station A' has passed out of contact with the spring a^5 . Hence while the apparatus is in this condition current flows from battery f through conductor 4 to excite the line-signal, through conductor 14, including a magnet-winding of counter p , and through conductors 17 18, including a magnet-winding of counter p' . Then when connection is made with the line in response to the call current from battery n , reaching the conductor 5, traverses the magnet-winding of the cut-off relay, the other magnet-winding of counter p , and the second magnet-winding of counter p' . Thus when a call from station A' is answered both counters p and p' are actuated. Thus, in short, the use of the telephone at either station and the operator's response to the call cause the counter p to register the use of the line; but only the origination of a call at station A' , together with the operator's response to the call, can cause the actuation of the counter p' . Hence the number of the total initiated calls from the stations of the party-line may be read from the counter p , while the number of answered calls originated at station A' may be read from counter p' . Obviously the number of answered calls initiated at station A may be ascertained by subtracting the record of counter p' from that of counter p .

The invention is defined in the following claims:

1. The combination with a telephone-line having two stations, with a telephone and tele-

phone-switch at each station and a source of current in the line, of a magnet having two windings, said windings being located differentially in the two conductors of the line, an armature for the magnet and switch-contacts thereof, a connection-counter for the line, and a local circuit including an actuating-magnet of the counter controlled by said switch-contacts, and a switch-contact of the telephone-switch at one of the stations and circuit connections therefor adapted to render one of said differential windings inoperative; whereby said counter is actuated only in consequence of the use of one of the telephones, as described.

2. The combination with a telephone-line having two stations, each provided with a telephone and a telephone-switch, of a relay having two windings, said windings being placed differentially in the line-circuit, together with a source of current, a connection-counter for the line, and a local circuit including an actuating-magnet of the counter controlled by the switch-contacts of said relay, a winding of the relay connected with said local circuit, and a switch-contact for the telephone-switch at one of the stations and circuit connections thereof adapted to short-circuit one of said differential windings; whereby connections originated at one station only are recorded.

3. The combination with a telephone-line having two stations with a telephone and telephone-switch at each station, of a relay-magnet with differential windings, said windings being in the different line conductors of the line together with a source of current, a connection-counter for the line, a local circuit including an actuating-magnet of the counter controlled by the contacts of said relay, a winding of the said relay connected with said local circuit and a switch-contact for the telephone-switch at one of the stations adapted to make contact with the switch as the switch moves from one position to the other, and circuit connections therewith adapted to short-circuit one of said differential windings, means for making connection with the line, and a device made operative in making such connection to break the current through the said local circuit, substantially as described.

4. The combination with a telephone-line having two stations, each provided with a telephone and telephone-switch, of a relay having differentially-disposed windings included in the different line conductors, respectively, a connection-counter and a local circuit including an actuating-magnet of said counter controlled by the contacts of said differentially-wound relay, a winding of said relay included

with a source of current in a circuit also controlled by the switch-contacts of the differentially-wound relay, and a switch-contact at one of the stations for the telephone-switch with circuit connections thereto adapted to short-circuit one of said differential windings; a second relay having a magnet disposed in one or both of the line conductors, a second connection-counter, and a local circuit including said last-mentioned connection-counter controlled by said second-mentioned relay; means for making connection with the line, and a device made operative in such act adapted to break both local circuits; whereby one connection-counter records all connections originated at either station, and the other counter records connections originated at one station only, as described.

5. The combination with a telephone-line, having two stations, with a telephone and telephone-switch at each station, a signal-relay having its magnet together with a source of current in the line, a local circuit controlled by said signal-relay, including a secondary signal; two connection-counters for the line, each having a magnet with two windings, one winding of each counter-controlling magnet being in a branch of the local signal-circuit; means for making connection with the line, a cut-off relay, a local circuit including the magnet of the cut-off relay, and means for closing the said circuit in making connection with the line, the remaining windings of said counter-controlling magnets being connected with said local circuit of the cut-off relay, to receive current when the said circuit is completed; a relay-magnet having differential windings, one included in each of the line conductors, the switch-contacts of the relay being interposed in the branch of the signal-circuit including a winding of one of the counters, a third winding of the relay, and a local circuit including the said winding controlled by the same switch-contacts; and a contact-piece of the telephone-switch at one station, with circuit connections thereto adapted to short-circuit one of said differential windings; whereby answered connections originated at both stations are recorded by one counter, and answered connections originated at one of the stations are recorded by one of said counters, as described.

In witness whereof I hereunto subscribe my name this 31st day of January, A. D. 1898.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
PEARLE CLENDENING.