

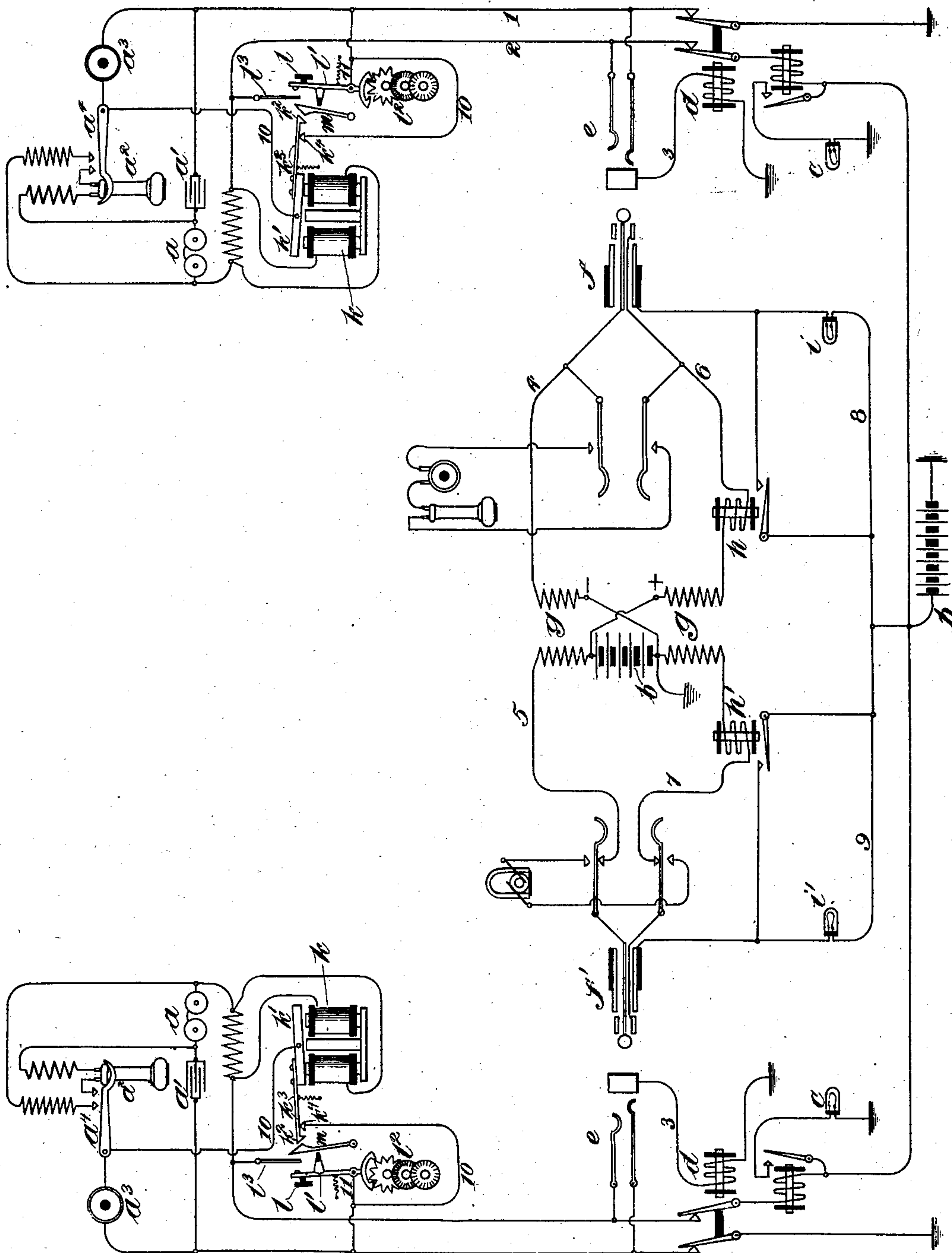
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SERVICE METER FOR TELEPHONE LINES.

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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. 755,054, dated March 22, 1904.

Application filed April 2, 1900. Serial No. 11,100. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SCRIBNER, residing at Chicago, and FRANK R. MCBERTY, residing at Evanston, in the county of Cook and State of Illinois, citizens of the United States, have invented a certain new and useful Improvement in Service-Meters for Telephone-Lines, of which the following is a full, clear, concise, and exact description.

10 This invention is a service-meter or toll-collecting appliance for registering or making a charge for each use of the telephone in originating a connection.

15 In general the objects of our herein-described improvements are to compel the user of the telephone to operate the register or do any other required act for making a charge for the use of the line in order to place the telephones or accessory appliances in operative condition and to make the necessity for such special acts dependent upon the action of the attendant at the central office in making connection from the line to another or to the line from another, so that the subscriber may be relieved of the special act and no charge may be made when the line in question is used in response to calls from other stations.

20 Our invention comprises in general a register or similar appliance adapted for manual operation by the user of the telephone, mechanism either electrical or mechanical for determining the operative condition of the telephone at the station, an electrically-controlled device controlling the action of this mechanism to make the telephone operative independently of the mechanism or through its agency independently of the manually-operated register, and different means at the central office applied, respectively, in making connections to a line in response to an originated call or to the line in response to a call from a different line, such means being in the one case adapted to prevent and in the other to permit the use of the telephone.

45 In a specific form which we find especially suitable for use we provide a service-meter and a push for manually operating it at the subscriber's station and a polarized electro-

magnet connected with the line controlling a short circuit about the substation-transmitter, 50 an answering-plug at the central office for making connection with the line in response to the call, and a calling-plug for making connection in response to an order from a different line and means for applying different polarities of current to the answering and calling plugs, the current through the answering-plug being arranged to operate the polarized relay to close the shunt or short circuit and the current through the calling-plug being 60 arranged to throw the polarized relay into its alternate position to open the shunt, and mechanism operated in actuating the register to render the shunt controlled by the relay inoperative or otherwise to suspend the control of the polarized magnet over the telephones at the substation.

The above-described form of our invention is illustrated diagrammatically in the attached drawing. This diagram represents circuits 70 of a telephone-line between a telephone-substation and a central office, switching apparatus of the usual sort at the central station, and the essential elements of our improved service-meter at the substation.

75 The telephone-lines and central-office switching apparatus are adapted for the well-known central-energy system, in which the signals are automatically operated and the substation-transmitters are excited by current from a central source. The apparatus at the substation consists of a polarized call-bell a , condenser a' , receiving and transmitting telephones a^2 and a^3 , respectively, and a telephone-switch a^4 . The line-circuit is permanently completed through the bell and condenser. 80 The telephone-switch is arranged to close a low-resistance path in shunt of these appliances through the telephones when the receiving-telephone is taken from the switch. 90 The line conductors 1 and 2 from the substation are led in the central office to the poles of a central source b of energy, the controlling-magnet of a visible signal c being interposed in the line conductor 2. The direct 95 connection of the line conductor with this cen-

tral source is controlled by the switch-contacts of a cut-off relay d . The line is connected with a spring-jack e in the switchboard. The ring of the spring-jack forms also the terminal of a local conductor 3, which includes the magnet of the cut-off relay.

Plugs f and f' are furnished in the switchboard for uniting lines. A complete circuit for telephone-currents between these plugs is formed by conductors 4 5 and 6 7, which lead in pairs to the poles of the source b of current through the windings of a repeating-coil g . The conductors 6 and 7 traverse magnet-windings of supervisory relays h and h' , which control, respectively, secondary supervisory signals i and i' . Special contact-pieces of the plugs f and f' , which register with the contact-rings of the spring-jacks, form the terminals of conductors 8 and 9, respectively, leading from the source of current b . These conductors include the secondary supervisory signals i and i' , the means by which the relays h and h' control the signals consisting in shunts of the signal-lamps traversing the switch-contacts of the relays.

The circuit herein shown for the pairs of connecting-plugs is in general that which is usual in the so-called "relay-switchboard," but is especially adapted to the control of service-meters in accordance with our invention by reversing the normal connection of the source b of current with the answering-plug, so that the answering-plug applies to the line a current of different polarity from that produced in the line by the insertion of the calling-plug in a spring-jack.

We come now to the description of our improved service-meter. The polarized electromagnet k has its magnet-windings connected in the branch of the line leading through the telephones. This magnet has an armature k' , carrying a latch or catch k^2 . The armature carries also the movable contact of the pair of contact-pieces $k^3 k^4$, which control a short circuit 10 about the transmitting-telephone a^3 . The winding of the magnet is preferably shunted by a comparatively high non-inductive resistance to diminish its impedance to telephone-currents.

A manual push l is placed near the telephones controlling a lever l' , which through the agency of an escapement or verge is arranged to communicate motion to a train of counting-wheels l^2 , the counting mechanism being preferably advanced through one tooth of the escapement in each complete oscillation of the push l . This push acts also to impart motion to a pivoted lever m , which is adapted when thrust forward to enter beneath the catch k^5 and while in place beneath it to raise the catch sufficiently to break connection between contact-anvil k^4 and point k^3 , carried by the armature k' .

In the path of movement of the push l is placed a contact-spring l^3 , arranged to bear

upon a contact-point carried by the lever l' . The contact-point and the contact-spring l^3 form the ends of a normally open short circuit 11 of the apparatus at the substation.

In the use of this apparatus in initiating a connection with another line the taking of the receiving-telephone from its support for use permits the telephone-switch to close the circuit of the line, and thus furnishes a path for current in the line from the central source b which excites the line-signal c and calls the attention of the operator. On seeing the call-signal thus displayed the operator inserts the answering-plug f of a pair of plugs into the answering-jack e of the calling-line. This act of the operator closes the local circuit 3 8 and causes the cut-off relay to sever the normal connections of the line with the battery b . At the same time the battery b becomes connected with the line conductors 1 2 through a different path—namely, conductors 4 and 6 of the plug-circuit—and in the reverse direction to its former mode of connection with the line. The current in the path thus formed circulates in the proper direction to maintain the armature k' of the service-meter in the position illustrated in the drawing, thus keeping the short-circuit 10 about the transmitter closed at contact k^4 . When the operator is ready to receive the call, she addresses the usual inquiry, "What number?" to the user of the telephone and instructs him to press the registering-push before replying. The subscriber is able to hear the inquiry and the instruction, since his receiving-telephone is not included within the shunt controlled by the relay k ; but in order to use his transmitting-telephone he is compelled to press the push l . The movement of this push operates the register or otherwise effects the required collection or charge for the use of the telephone. It also presses the lever m beneath the catch k^2 and breaks the shunt about the transmitting-telephone, leaving the apparatus at the substation in perfectly operative condition. The operator having received the order may make connection with the line required in the usual way, and during conversation in the united lines may supervise the connection by means of signals i and i' . If the user of the telephone wishes to again call the attention of the operator, he may oscillate the switch-hook of his telephone to operate the supervisory signal i in the switchboard. When, on the other hand, the line provided with the service-meter is called for from another station, connection is made with this line by means of the calling-plug f' and the spring-jack e of the line wanted. Then the source b is connected with the line 1 2 in the reverse direction to that of which the effect has just been described, the polarized relay k is caused to separate the switch-contacts $k^3 k^4$, and thus to break the shunt about the transmitting-telephone, leaving the telephones in operative

condition without requiring any special act on the part of the user of the telephone.

The connections of the answering and calling plugs with the battery being reversed, a subscriber is not compelled to actuate his register when he is called up by some other subscriber, but only when he initiates a call. The connections of the calling-plug with any line connects the battery *b* with that line in a manner such that current flows in a direction to actuate the polarized magnet *k* and maintain the short-circuiting contacts *k*³ *k*⁴ separated, but when an answering-plug is connected with a line the connection of the battery is reversed, the magnet *k* at the substation does not respond, and the short-circuiting contacts must be separated by the subscriber by the operation of his service-meter.

The purpose of the shunt 11, controlled by contacts *l*³ and lever *l'*, is to prevent the user when making a second call from pressing in and holding the button *l* to avoid the necessity for registering the subsequent call. Such an act by maintaining the short circuit of the line would prevent his use of the telephone and would also interfere with the transmission of call-signals to obtain the attention of the operator. Hence in order to obtain subsequent connections the user of the telephone must call the operator by means of the telephone-switch. The operator will then withdraw the answering-plug *f* from the spring-jack of the calling-line, whereby the cut-off relay will be permitted to connect the source of current *b* with the line in the normal direction, which will cause the magnet *k* to release the lever *m*, after which the reinsertion of plug *f* in the spring-jack of the calling-line will put the relay *k* in position to close the short circuit of the transmitting-telephone and will compel the registration of the new call, as already traced.

We are aware that our invention may be carried out in a number of different ways. The mode of control exercised by the central office over the device for compelling the operation of the service-meter may be varied to a considerable extent, and also the said device itself is capable of considerable modification. Our invention is defined in the following claims:

1. The combination with a telephone-line and the telephone apparatus thereof at the substation and means for making connection with the line at the central office, of a polarized electromagnet at the substation and mechanism controlled thereby for rendering the telephone apparatus inoperative, and means for applying to the line at the central office current of either polarity for operating said magnet, substantially as described.

2. The combination with a telephone-line, of the telephone apparatus thereof and a polarized magnet controlling the operation of said telephone apparatus, an answering-plug and a

calling-plug for making connection with the line in the central office, and sources of current of different polarity connected with the said plugs; whereby the operative condition of the telephone apparatus is determined by the plug with which connection is made to the line, as described.

3. The combination with a telephone-line and the telephones at the substation thereof, a service-meter or toll-charging device at the substation and means for manually operating said meter, mechanism adapted to render the telephonic apparatus inoperative, and a magnet controlling said mechanism, an answering-plug for making connection with the line at the central office, and a source of current connected therewith adapted to excite the magnet to prevent the use of the telephone when a call is answered, and a device operated manually in the actuation of the meter for rendering said telephones operative, as described.

4. The combination with a telephone-line and transmitting and receiving telephones therefor, of a polarized relay and a shunt of the transmitting-telephone controlled thereby, an answering and a calling plug for making connection with the line either in response to a call or in compliance with an order from a different line, respectively, a source of current connected with the answering-plug adapted to operate the polarized relay to close the shunt, and a source of current connected with the calling-plug adapted to open the shunt, and independent means at the subscriber's station for opening the shunt, said means controlling a service-meter, substantially as described.

5. In combination with a telephone-line, means for calling the central office from the station thereof, and telephone apparatus at the station, of a device at the substation adapted to render an essential part of said telephone apparatus inoperative, and a magnet controlling said device, an answering and a calling plug for making connection with the line at the central office, a source of current applied through the answering-plug adapted to operate said magnet, an independent manually-operated device at the substation adapted to render the telephone apparatus operative, and a service-meter or toll-collecting appliance operated by said device, substantially as described.

6. The combination with a telephone-line and a receiving and a transmitting telephone thereof at the substation, and means for calling the office from the substation, of an electromagnet controlling the current through the transmitting-telephone, an independent manually-operated device also controlling the current through the transmitting-telephone, and a service-meter actuated by said device in its movement, an answering and a calling plug at the central office for making connection to the line, and a source of current automatically applied through said answering-plug in making connection with the line for actuating said

magnet to break the current through the transmitting-telephone, as described.

7. The combination with the telephones and the line-circuit thereof, of a magnet controlling the operative condition of the telephones, and means for applying current to the line at the central office to excite said magnet, a manually-operated push and a service-meter actuated thereby, mechanism adapted to break the control of said magnet over the telephone, said mechanism being actuated by the push, and means for retaining said mechanism in position for its actuation by the push during the excitement of the magnet, as described.

8. The combination with the telephones and the telephone-line, of the polarized magnet and the switch-contacts controlling the current through the transmitting-telephone, a catch carried by the armature of the magnet, a manually-operated push and a service-meter actuated thereby, and a lever also operated by said push adapted to be brought into engagement with said catch, and means controlled by said lever for destroying the control of the polarized magnet over the current through the telephone, substantially as described.

9. In combination in a service-meter for telephone-lines the following elements: telephone apparatus, a magnet controlling the circuit of the telephones, and means at the central office for exciting the magnet to render the telephone apparatus inoperative; a service-meter at the substation, a push for manually operating it, and switch-contacts of the push controlling the circuit of the line to render the line inoperative in all positions of the push save its normal, and a device independent of the magnet operated by said push controlling the condition of the telephone apparatus to make them operative; said magnet being adapted to retain said device in position when it has been actuated; whereby the user of the telephone is compelled to register an answered call, and is prevented from making subsequent calls without registering, as described.

10. The combination with a telephone-line extending from a substation to a central office, of a magnet connected with the line at the substation, and mechanism controlled by said magnet for rendering inoperative the telephone apparatus at the substation, whereby the use of such telephone apparatus may be

prevented, a source of current at the central office adapted to energize said magnet, to actuate said mechanism, means for connecting said source of current with the line, a toll device at the substation, and a releasing appliance actuated in the operation of said toll-counter, for restoring the operative condition of the substation-telephone apparatus, substantially as set forth.

11. In a connection-registering appliance, the combination with a relay device adapted to be connected to line, the armature of which is designed to be operatively actuated by current of predetermined character, of a controlling-circuit extending to the instrument served, adapted to be opened and closed by said relay, whereby said instrument may be rendered temporarily inoperative, a meter device and manually-controlled means for actuating the same and for restoring the controlled instrument to service, substantially as set forth.

12. In a connection-registering device of the class described, the combination with a polarized relay adapted to be connected to line, of a circuit-controlling armature therefor adapted to be actuated by current of given polarity, means controlled by said armature for temporarily rendering inoperative the associated or controlled instrument, a meter device and means for actuating said armature and meter device, where the instrument may be restored to service and a connection is registered, substantially as set forth.

13. In a connection-register for telephone-lines, the combination with a polarized electromagnet adapted to be connected in circuit with the telephone instrument, of an armature designed to respond operatively to current of a given polarity, a controlling-circuit governed thereby adapted to render the telephone instrument temporarily inoperative, a counting-train and means for jointly actuating the same and for restoring the instrument to service, substantially as set forth.

In witness whereof we hereunto subscribe our names this 9th day of February, A.D. 1900.

CHARLES E. SCRIBNER.

FRANK R. McBERTY.

Witnesses:

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DUNCAN E. WILLETT.