

No. 765,255.

PATENTED JULY 19, 1904.

C. E. SCRIBNER & F. R. MCBERTY.
SERVICE METER FOR TELEPHONE EXCHANGES.

APPLICATION FILED MAR. 15, 1901.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

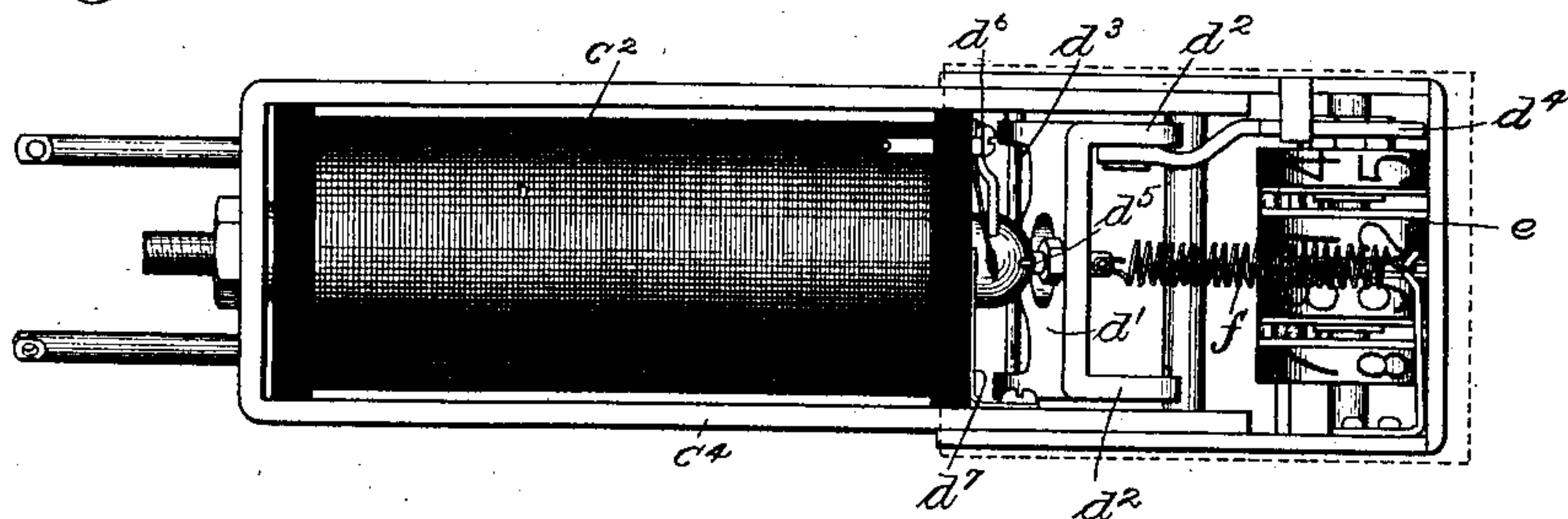


Fig. 2.

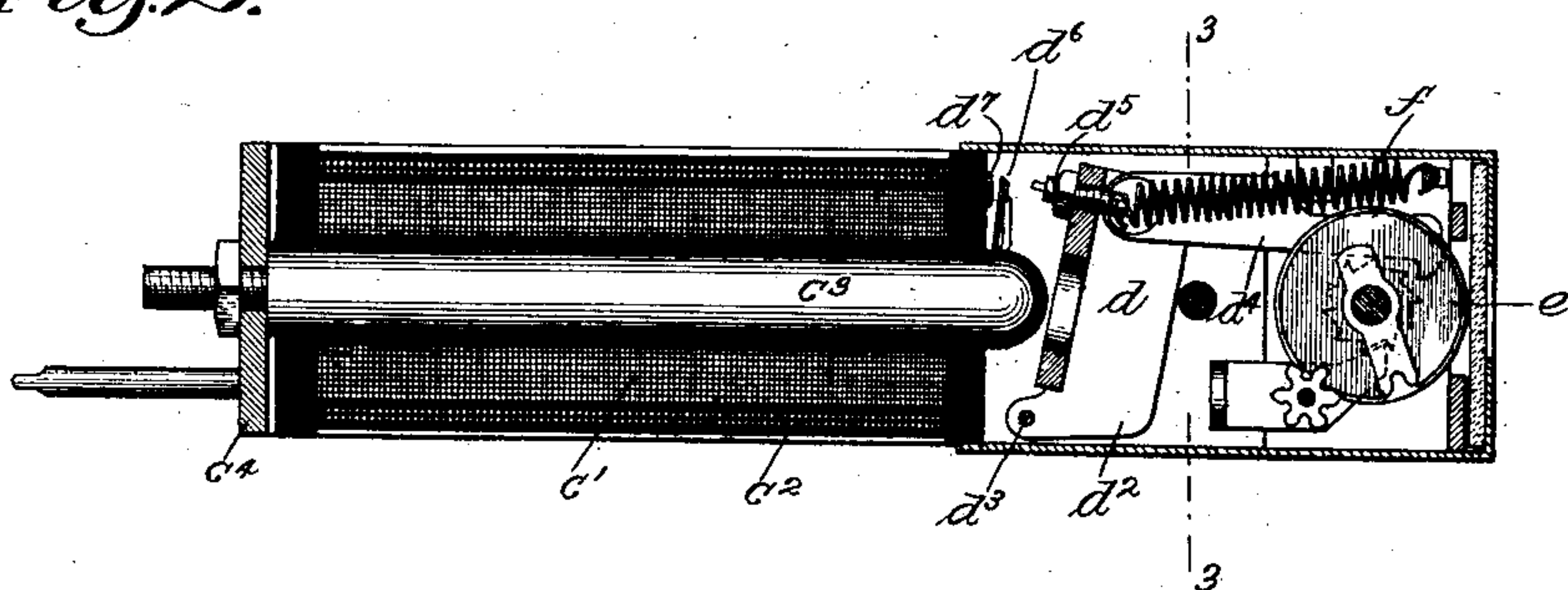


Fig. 3.

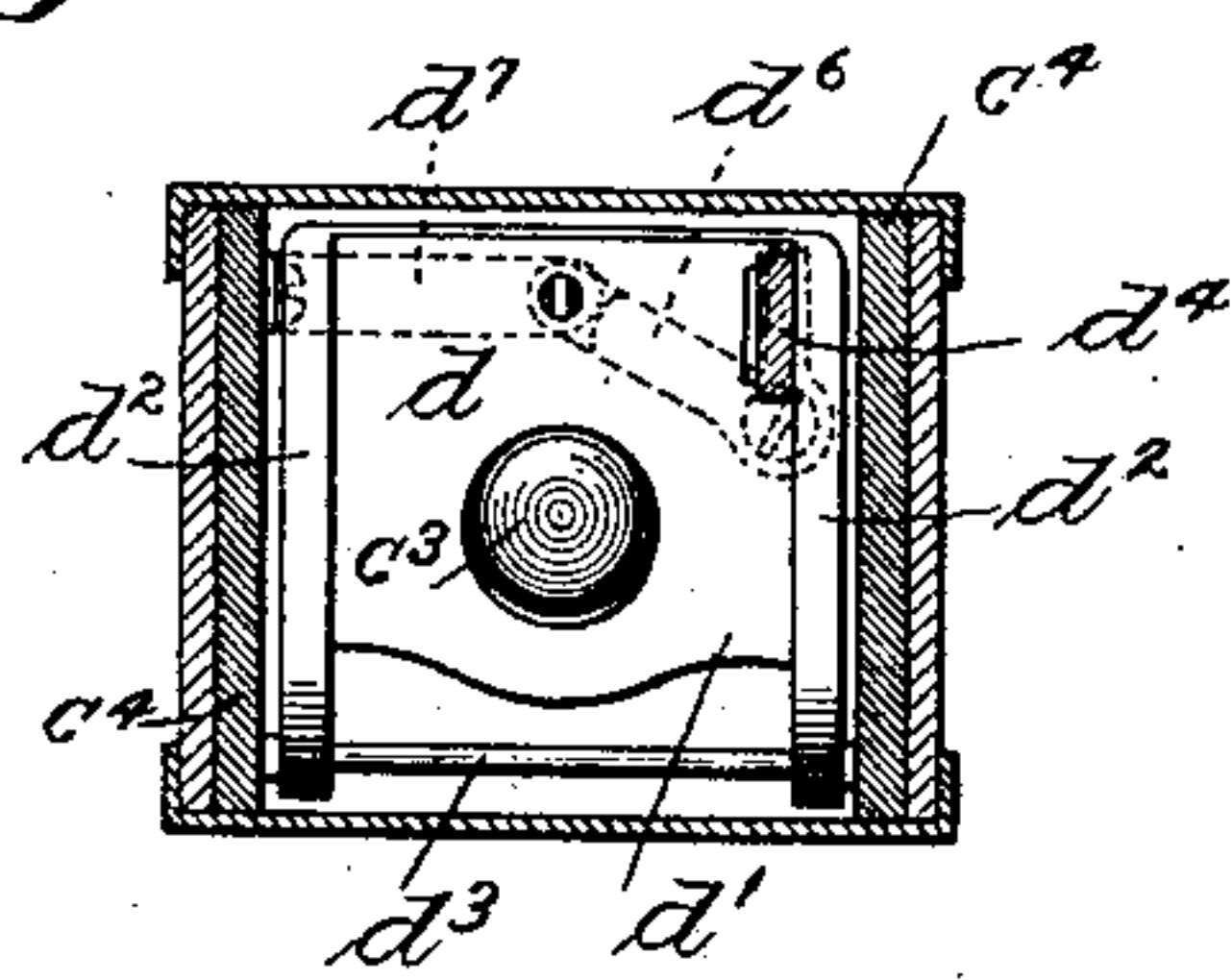
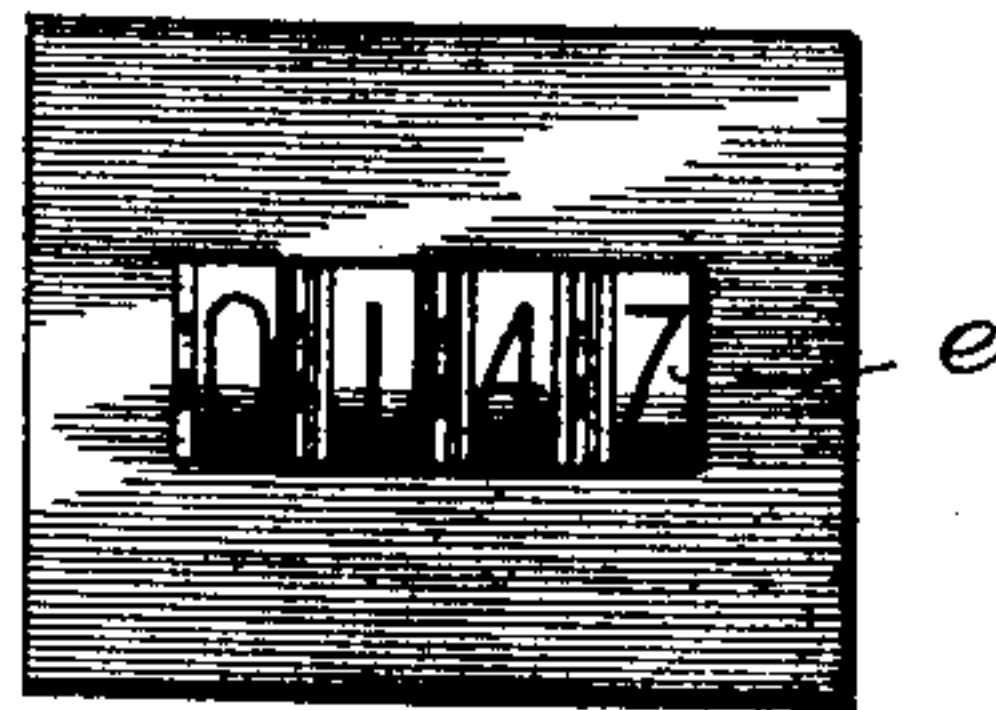


Fig. 4.



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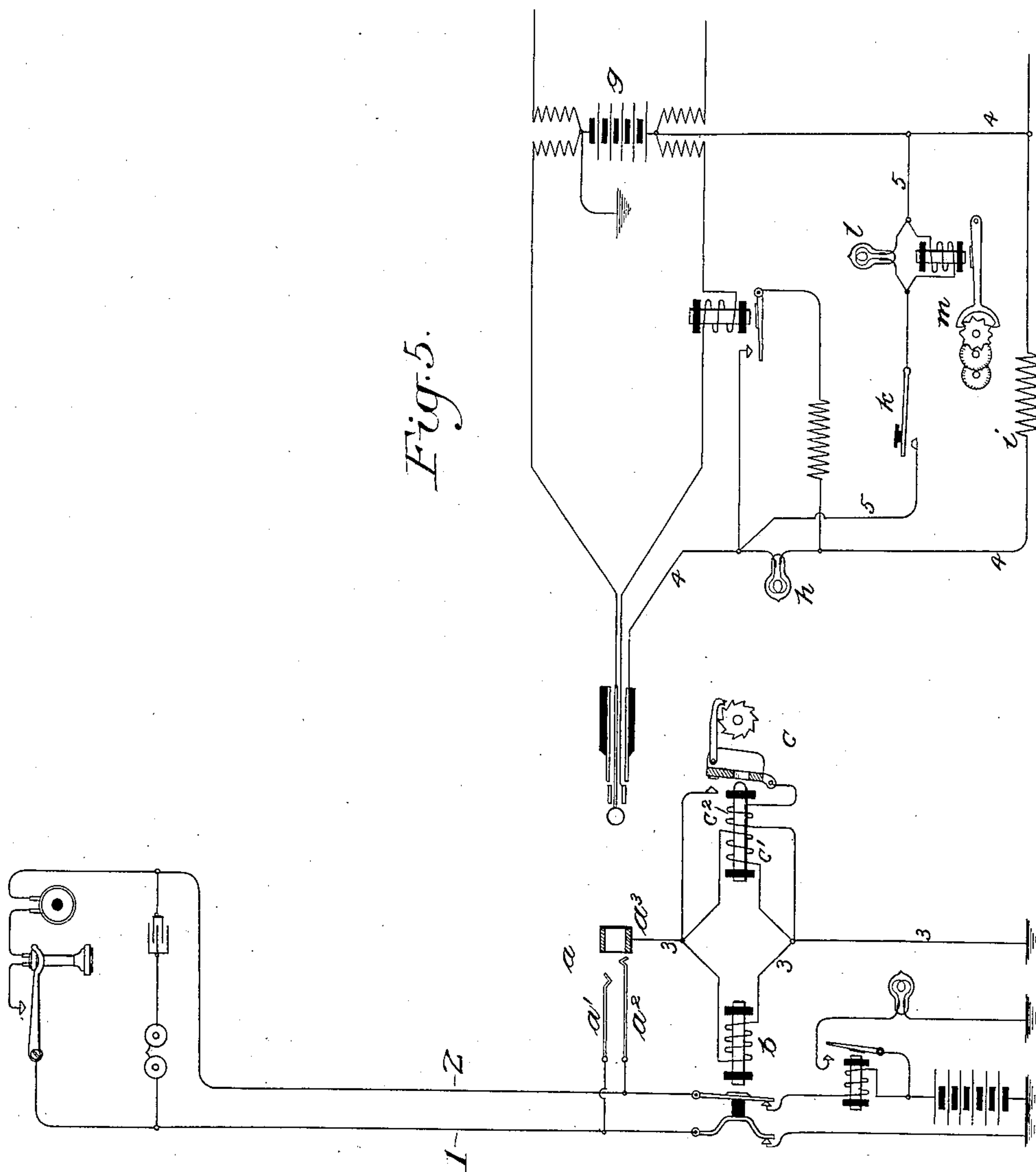
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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SERVICE-METER FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 765,255, dated July 19, 1904.

Application filed March 15, 1901. Serial No. 51,263. (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-Exchanges, of which the following is a full, clear, concise, and exact description.

Our invention relates to a service-meter for telephone-exchanges, and has for its object to provide an improved connection counter or registering device and circuits therefor whereby each use of the telephone may be registered and charge made accordingly.

We will describe our invention particularly by reference to the accompanying drawings, and the features or combinations which we regard as new will be pointed out in the appended claims.

Figure 1 is a plan view of a connection-register constructed in accordance with our invention. Fig. 2 is a longitudinal section thereof. Fig. 3 is a cross-section on line 3 3 of Fig. 2. Fig. 4 is an end view of the register, and Fig. 5 is a diagram of the circuits with which our improved connection-register is adapted to be associated.

Similar characters of reference are used to indicate the same parts throughout the drawings.

The connection-register of our invention is of the general type in which a counting-train is actuated by the movement of the armature of an electromagnet, the winding of the magnet being included in a circuit with a source of current and means for controlling the circuit. In the register of our invention, however, the magnet is provided with two windings, the main winding being preferably of high resistance and adapted for connection directly in the operating-circuit and the auxiliary winding being preferably of low resistance in a shunt about the high-resistance winding, said shunt being controlled by switch-contacts closed by the armature of the register in its operation.

Fig. 5 shows a telephone-line extending

from a substation to a central-office switch-board, having at the substation of the line the usual telephonic and signaling apparatus, with a switch-hook controlling the circuits through the same, and at the central office the type of line-signaling apparatus which characterizes the so-called "common-battery relay-board," this being well-known in the art and requiring no detailed description.

A spring-jack *a* is provided for the telephone-line, said spring-jack having two line-springs *a'* *a''*, connected, respectively, with the limbs 1 2 of the line, and a third contact or test-ring *a'''*, which is connected to ground by a conductor 3 through the winding of the cut-off relay *b*. The main winding of the connection-register is in the system shown of high resistance, preferably five hundred ohms, and is connected in a permanent shunt of the cut-off relay in the conductor 3. The auxiliary winding *c'* of the register is preferably of low resistance and is connected in shunt of the main winding *c*. The third contact of the operator's answering-plug, which engages with the test-ring *a'''*, forms the terminal of a conductor 4 of the plug-circuit, which is connected to the free pole of a grounded battery *g* in the usual manner. A supervisory signal-lamp *h* and a resistance *i* are included in this conductor, so that unless the lamp and resistance be shunted, as heretofore explained, the current traversing the conductor 3 will be insufficient to excite the connection-register, although sufficient to cause the operation of the cut-off relay *b*.

A shunt-conductor 5 is provided about the lamp *h* and resistance *i*, with a switch *k* controlling said shunt. This shunt conductor contains a responsive device of low resistance which will serve to indicate the operation of the connection-register, being unresponsive when the current in the circuit is cut down by the high-resistance winding of the connection-register, but being adapted to respond when the high-resistance winding is shunted by the low-resistance winding *c'*. This responsive device may be, for example, an incandescent lamp *l*. We have shown another responsive

device—that is, a connection-register—in parallel with the lamp l , so that when the connection-register c is operated the lamp l will be lighted and a record made by the register

5 *m.* The central-office operator or attendant brings about the operation of the service-meter c by closing the switch k upon the completion of a connection.

The system shown in Fig. 5 as a whole has
10 been made the subject of a separate patent by Charles E. Scribner, one of the present applicants, No. 681,860, dated September 3, 1901.

The windings c' and c'' of the connection-register are so proportioned to one another and
15 to the battery and the devices in the external circuit that when the shunt containing the winding c'' is closed the number of ampere-turns around the core of the magnet will be approximately the same as before the closure of the shunt. To so proportion these
20 windings in any given case is simply a question of engineering, depending upon the conditions met with, and is one of the important features of our invention. If the winding c''
25 instead of being wound upon the magnet-core should take the form of a mere resistance, such as described in the patent to Scribner before referred to, the chances of the connection-register failing to operate properly would
30 be increased, since its operation is dependent upon a mere margin of current. If, for example, the register in closing the shunt about its high-resistance winding should decrease the ampere-turns on the magnet to such an extent that it could not overcome the tension of
35 the opposing spring attached to the armature, the armature would be caused to flutter or vibrate instead of simply moving up and staying quietly and firmly in its attracted position.

40 Coming now to a description of the particular structural features of our improved connection-register, we will refer to Figs. 1 to 4 of the drawings. The windings c' c'' of the magnet are wound about a core c^3 , which is
45 provided with a projecting rounded or bullet-shaped end, as shown. The rear end of the core c^3 is united with a U-shaped pole-piece c^4 , the arms whereof extend forward on either side of the magnet-helix and form a frame-
50 work at the forward end in which the armature d is pivoted. The armature d is formed somewhat peculiarly, as shown, having side pieces d^2 d^2 bent at right angles with the transverse body d' . The portions d^2 d^2 are
55 extended at the bottom and are pivoted upon a cross-rod d^3 , these side pieces or flanges d^2 being parallel and close to the projecting ends of the pole-piece c^4 and serve to collect and direct the magnetic lines of force. The
60 transverse body portion d' of the armature is provided with a hole, as shown, in alinement with the rounded projecting end of the core c^3 . One of the flanges d^2 carries the hook d^4 , which is adapted to engage a ratchet of the
65 counting-train e , which is mounted in the for-

ward part of the framework, so that each time the armature is drawn up the counting-train will be advanced one step. The armature carries at its upper end a metallic contact-point d^5 , which is adapted when the armature is drawn up to close against a contact-spring d^6 , these two contacts forming the terminals of the shunt path, which includes the auxiliary winding c^2 about the main winding c' . The contact d^5 is preferably
70 mounted upon the end of a screw passing through the armature-lever d and forming an eye in which one end of the retractile spring f may be hooked. The other end of the spring is anchored to a hook carried by
75 the framework of the register. The spring f is a coiled spring of fine wire and is proportioned so that it will increase its pull upon the armature substantially in the same ratio as the magnetic attraction of the core c^3 in-
80 crease while the armature is approaching it, thereby securing a steady and positive action of the register-train. In order to protect spring f from current of such volume as to heat it and destroy its temper, we provide
85 means for short-circuiting the spring when the contact d^5 d^6 is closed, said means consisting of a contact-piece d^7 , against which the spring-mounted contact-anvil d^6 is adapted to be moved when the armature is attracted, the
90 piece d^7 being electrically united with the framework. Except for this short-circuiting contact the resistance of the armature-pivot, especially if loose or well lubricated, would be such that sufficient current would pass
95 through the spring to destroy its temper.

Having thus described our invention, we claim as new, and desire to secure by Letters Patent, the following:

1. In a service-meter for telephone-ex-
105 changes, the combination with a magnet-core, of an armature therefor, a registering-train operated by said armature in its movement, a magnetizing-helix of high resistance for the magnet-core, a second magnetizing-helix of
110 low resistance for said core, and switch-contacts operated by the armature, adapted to connect said low-resistance helix in shunt about the high-resistance helix, as described.

2. The combination with a register-circuit
115 of a telephone-exchange, a source of current in the circuit and a switch controlling the circuit, of a connection-register comprising a magnet-core having two windings, an armature, and a registering-train operated by said
120 armature, the main winding of said magnet being included in the registering-circuit controlled by said switch, and the second or auxiliary winding being connected in a normally open shunt of the main winding, a switch op-
125 erated by the armature of the register, adapted to close said shunt, and a responsive device l in the circuit, unresponsive to the flow of current in said circuit when the main winding alone of said register is connected in the cir-
130

cuit, but responsive to the increased current when the main winding is shunted by the auxiliary winding in the operation of the register, substantially as set forth.

5 3. The combination with an electromagnet comprising a core c^3 having a projecting rounded end, a magnetizing-helix for said core, and a U-shaped pole-piece secured to the rear end of the core with its arms extending forward
10 on either side of the helix and forming a framework opposite the projecting rounded end of the core, of an armature d comprising a body portion d' having a hole therein substantially in alinement with the core and having the side
15 flanges d^2 d^2 adjacent and parallel to the projecting arms of the U-shaped pole-piece and pivotally supported by said arms, substantially as set forth.

4. The combination with an electromagnet,
20 of an armature therefor, a metallic framework in which said armature is pivoted, a retractile coiled spring of fine wire attached at one end to the armature and anchored at the other end to a portion of said metallic framework, a con-
25 tact-point carried by and electrically connected with the armature, a contact-anvil against which the said contact-point is adapted to close, an electric circuit controlled by said contact-point and anvil, and a contact-piece d' connect-
30 ed with the metallic framework and adapted to be closed against the aforesaid contact-anvil by the armature when the same is drawn up, whereby the coiled spring is short-circuited to prevent it from being heated by the
35 current, substantially as set forth.

5. The combination with an electromagnet comprising a core and a magnetizing-helix therefor, said core having a rounded project-
40 ing end, of a movable armature for said magnet having a hole therein in alinement with the core and adapted to fit over the rounded end thereof, a registering-train actuated by said armature in its movement, and a retractile
45 spring for the armature adapted to increase its pull upon the armature substantially in the same ratio that the magnetic pull upon the armature increases as the armature moves toward the core, whereby positive movement of the registering-train is secured, substantially
50 as set forth.

6. The combination with a telephone-line and a spring-jack therefor, a plug and plug-circuit for making connection with the line, of a circuit 3 4 closed in registering contacts
55 of the plug and spring-jack, a cut-off relay b in the portion 3 of the circuit, terminating in a contact of the spring-jack, a connection-register c comprising an electromagnet having

two windings, an armature and a registering-train operated by said armature, the main 60 winding of said magnet being connected in shunt of the cut-off relay, and the auxiliary winding being in a shunt of the main winding, a switch-contact operated by the register adapted to close the shunt containing said 65 auxiliary winding, and a switch k adapted to change the condition of the circuit to increase the flow of current therein, the connection-register being unresponsive to the normal flow of current in the circuit, but adapted to re- 70 spond to the increased current, the two windings of the connection-register being so proportioned to one another and to the other apparatus in the circuit that the number of ampere-turns on the magnet will be substantially 75 the same irrespective of the open or closed condition of the shunt containing the auxiliary winding, substantially as set forth.

7. In combination in an electric circuit divided at one point into two parallel branches, 80 one of said branches being normally open, of two responsive devices l and c in the circuit, the responsive device c having a magnetizing-winding in each of said parallel branches, the sum of the ampere-turns of both said wind- 85 ings being approximately equal to the ampere-turns of the winding in the permanently-closed branch when the latter alone is complete, and a switch for controlling the normally open branch, the device l being operated 90 only through the joint resistance of said windings, as described.

8. In combination in an electric circuit divided at one point into two parallel branches, one of said branches being normally open, of 95 two responsive devices l and c in the circuit, the responsive device c having a magnetizing-winding in each of said parallel branches, the sum of the ampere-turns of both said wind- 100 ings being approximately equal to the ampere-turns of the winding in the permanently-closed branch when the latter alone is complete, and switch-contacts in the normally open branch controlled by the magnet carrying said branches, the device l being operated only 105 through the joint resistance of said windings, as described.

In witness whereof we hereunto subscribe our names this 21st day of February, A. D. 1901.

CHARLES E. SCRIBNER.
FRANK R. McBERTY.

Witnesses:

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ELLA EDLER.