

(No Model.)

3 Sheets—Sheet 1.

G. P. SÉLIGMANN-LUI.  
TOLL COUNTER FOR TELEPHONE LINES.

No. 561,619.

Patented June 9, 1896.

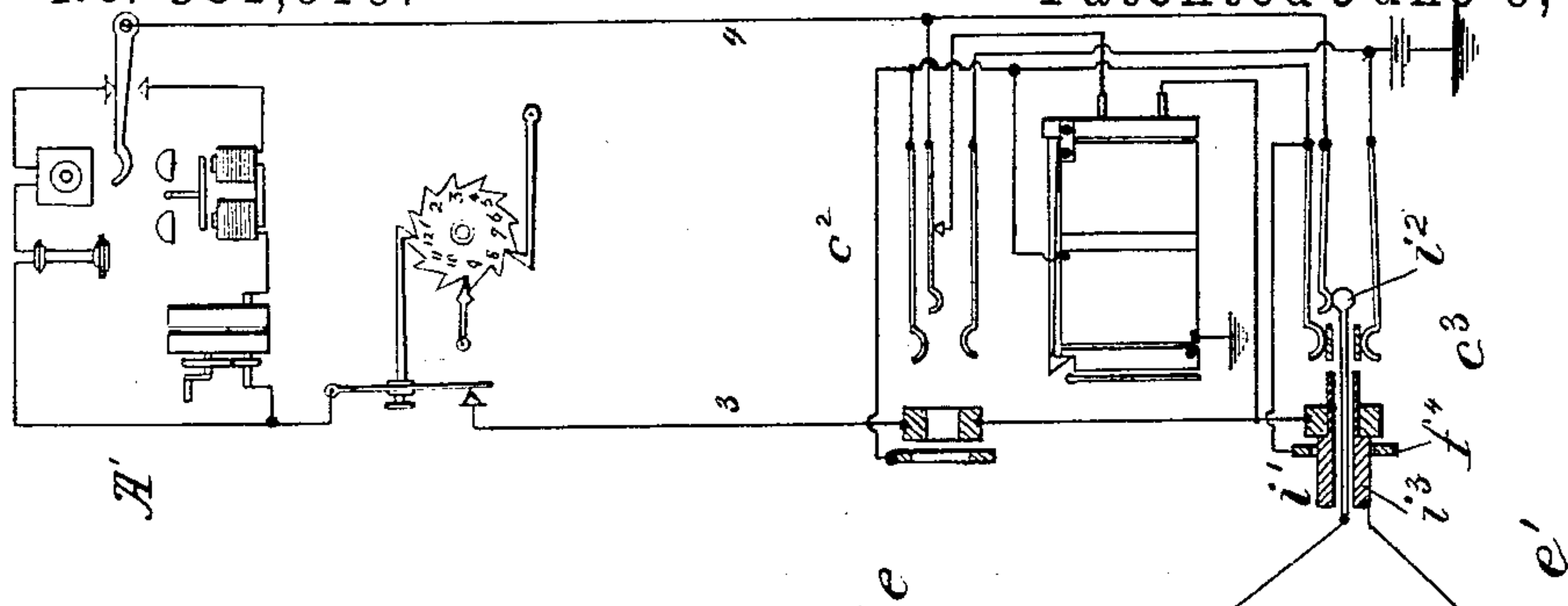
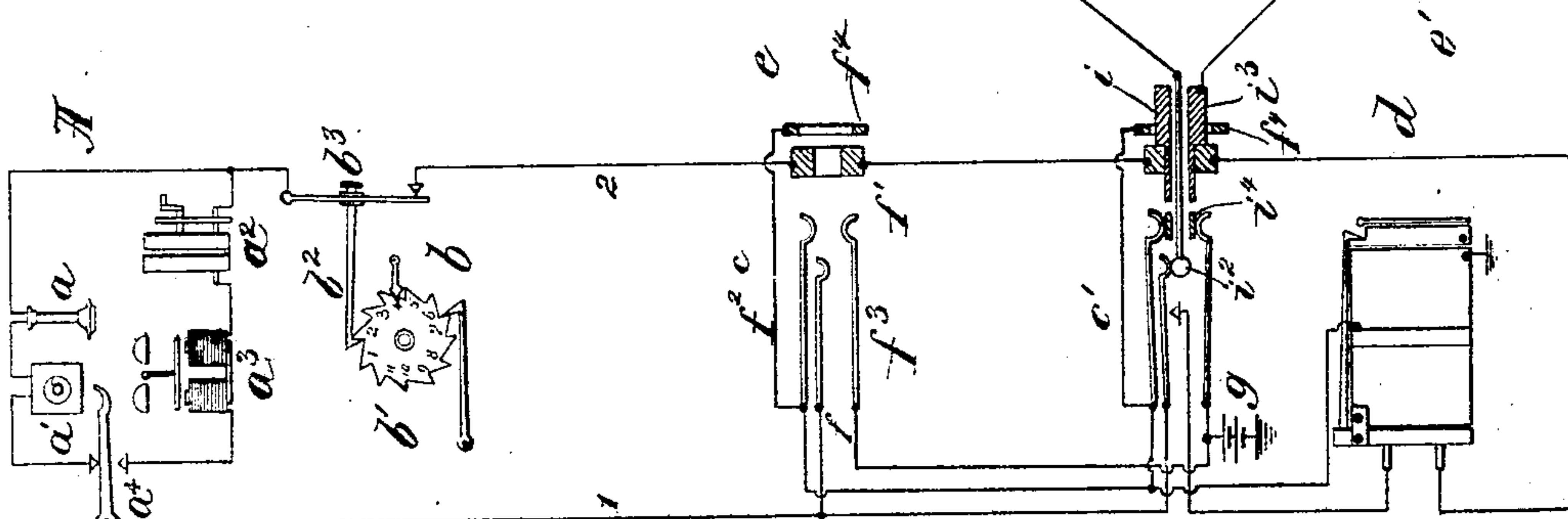
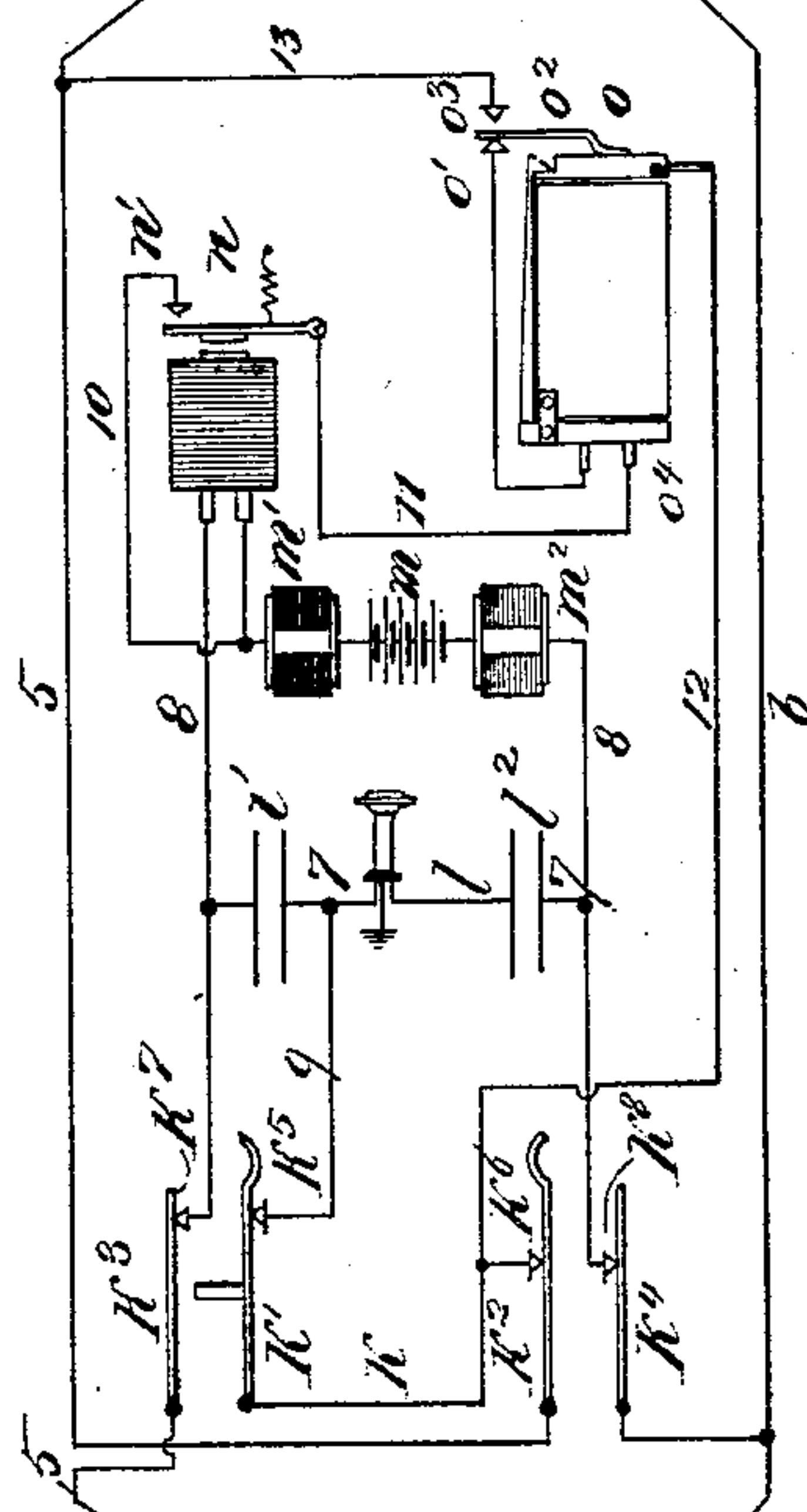


Fig. 1



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(No Model.)

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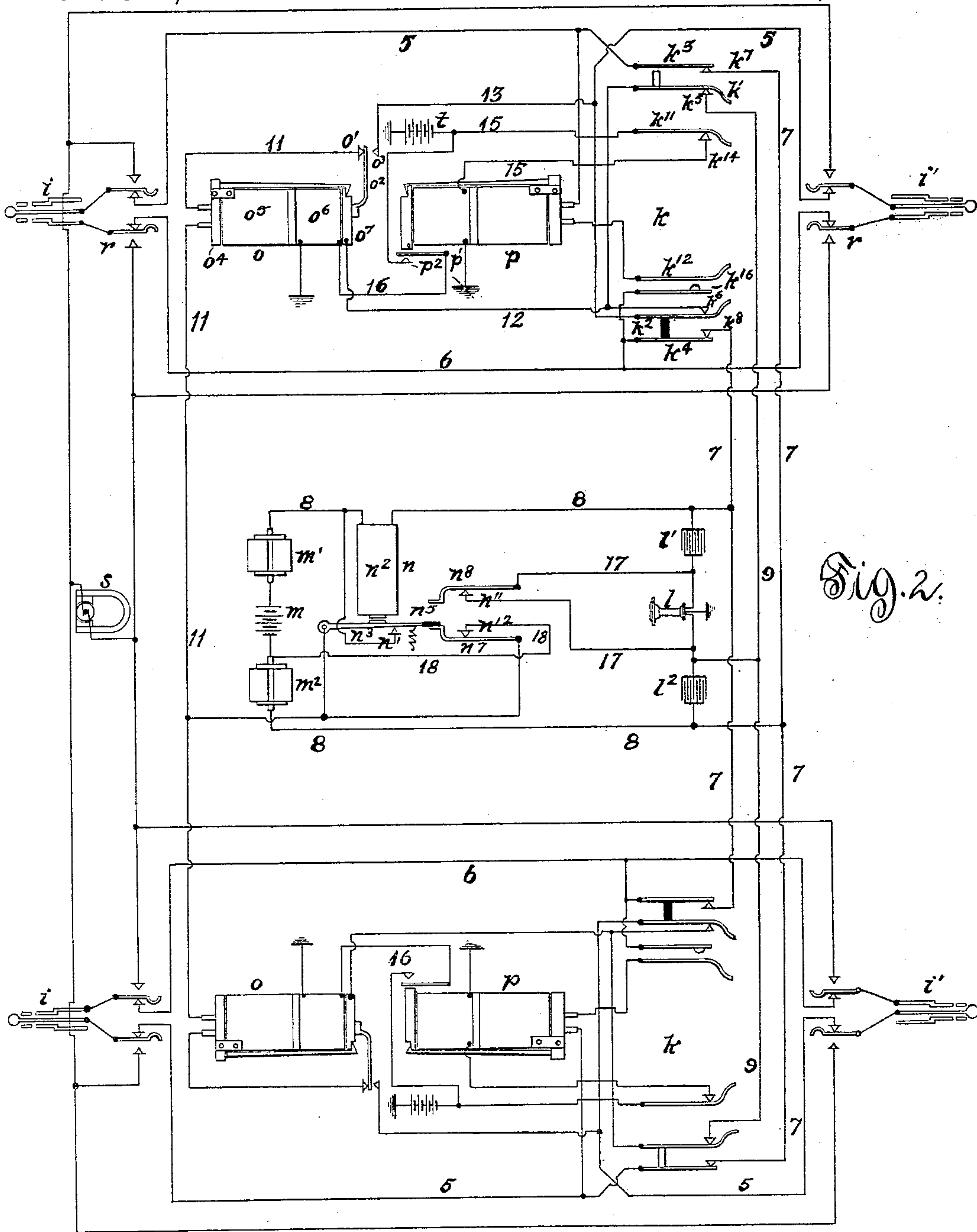


Fig. 2.

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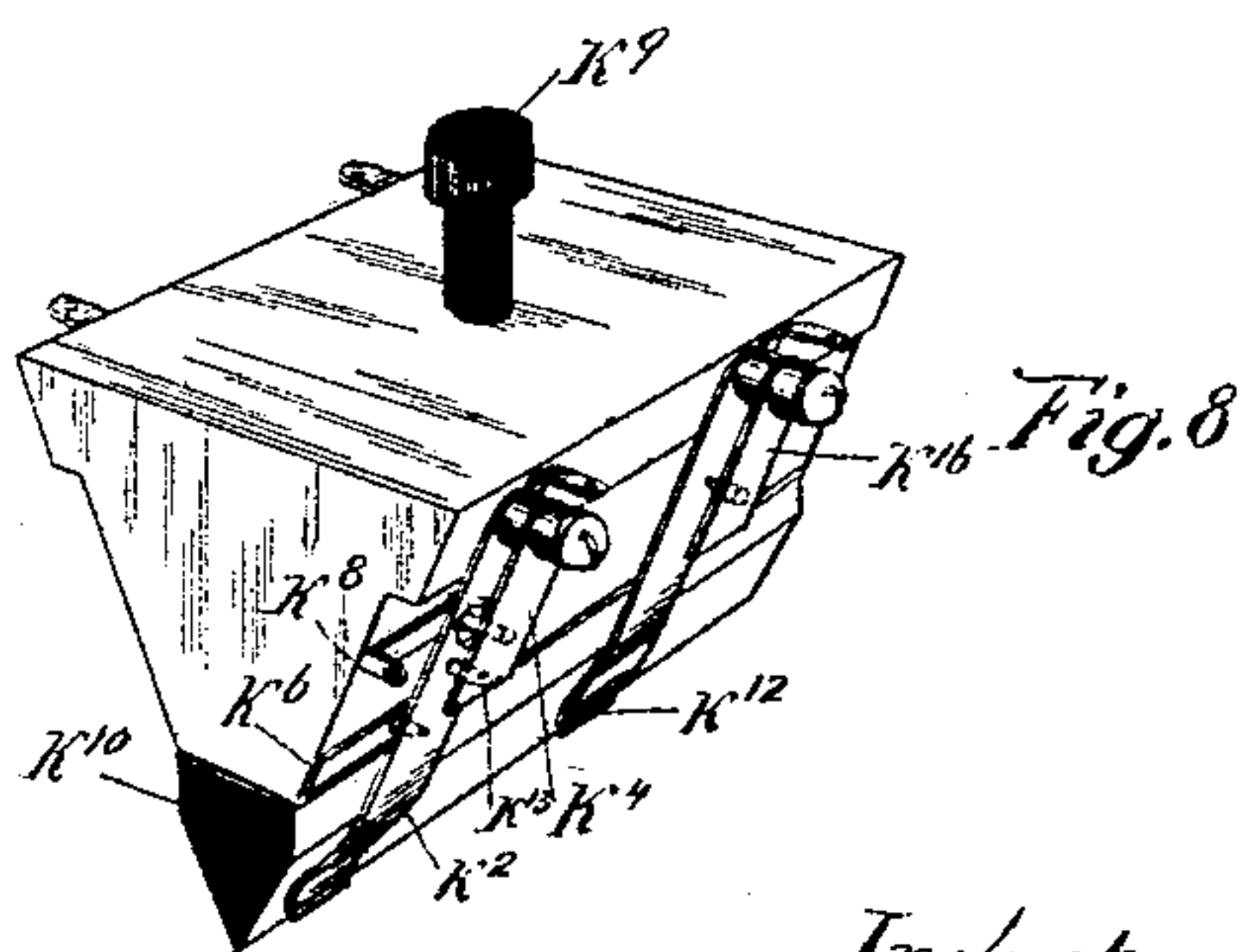
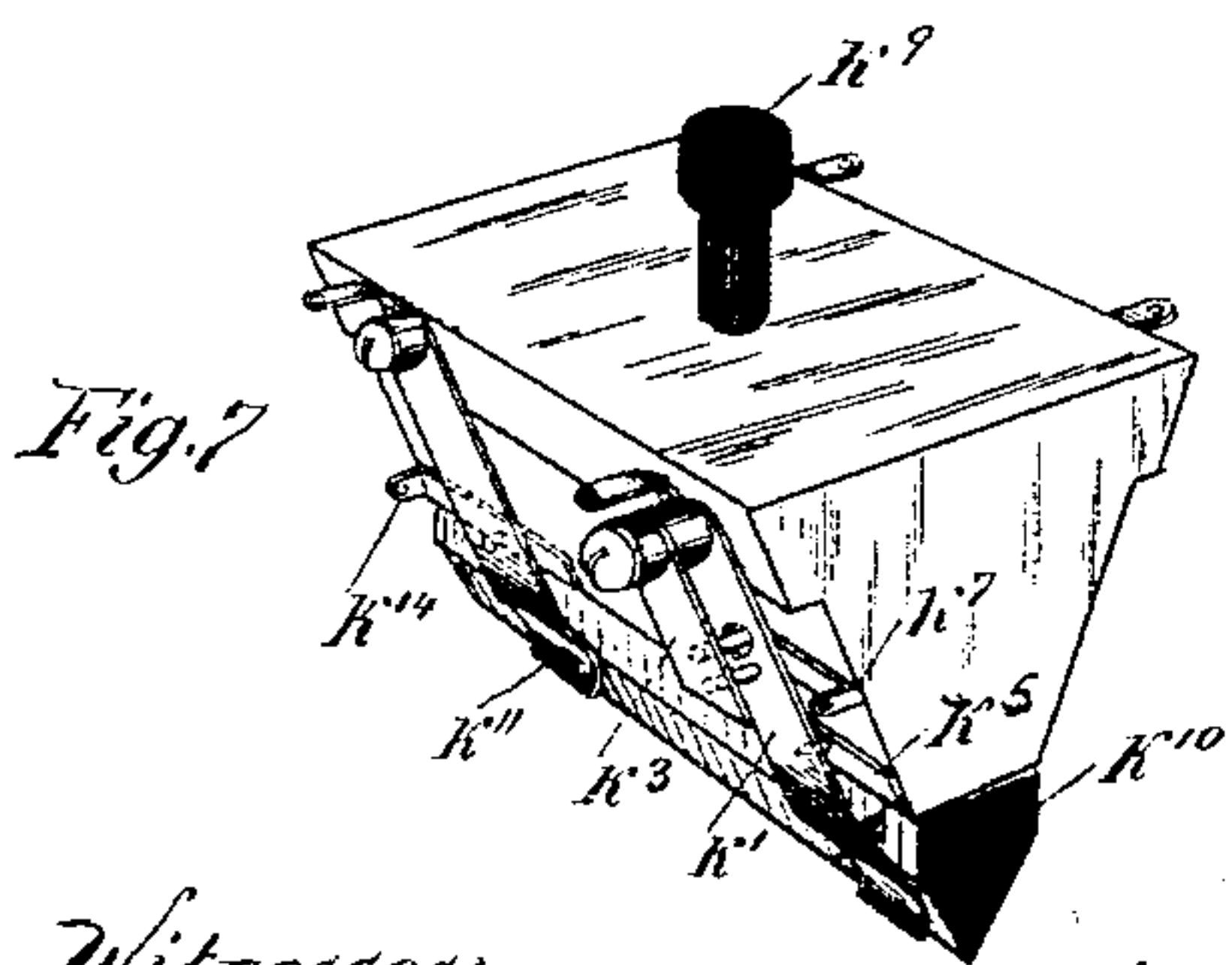
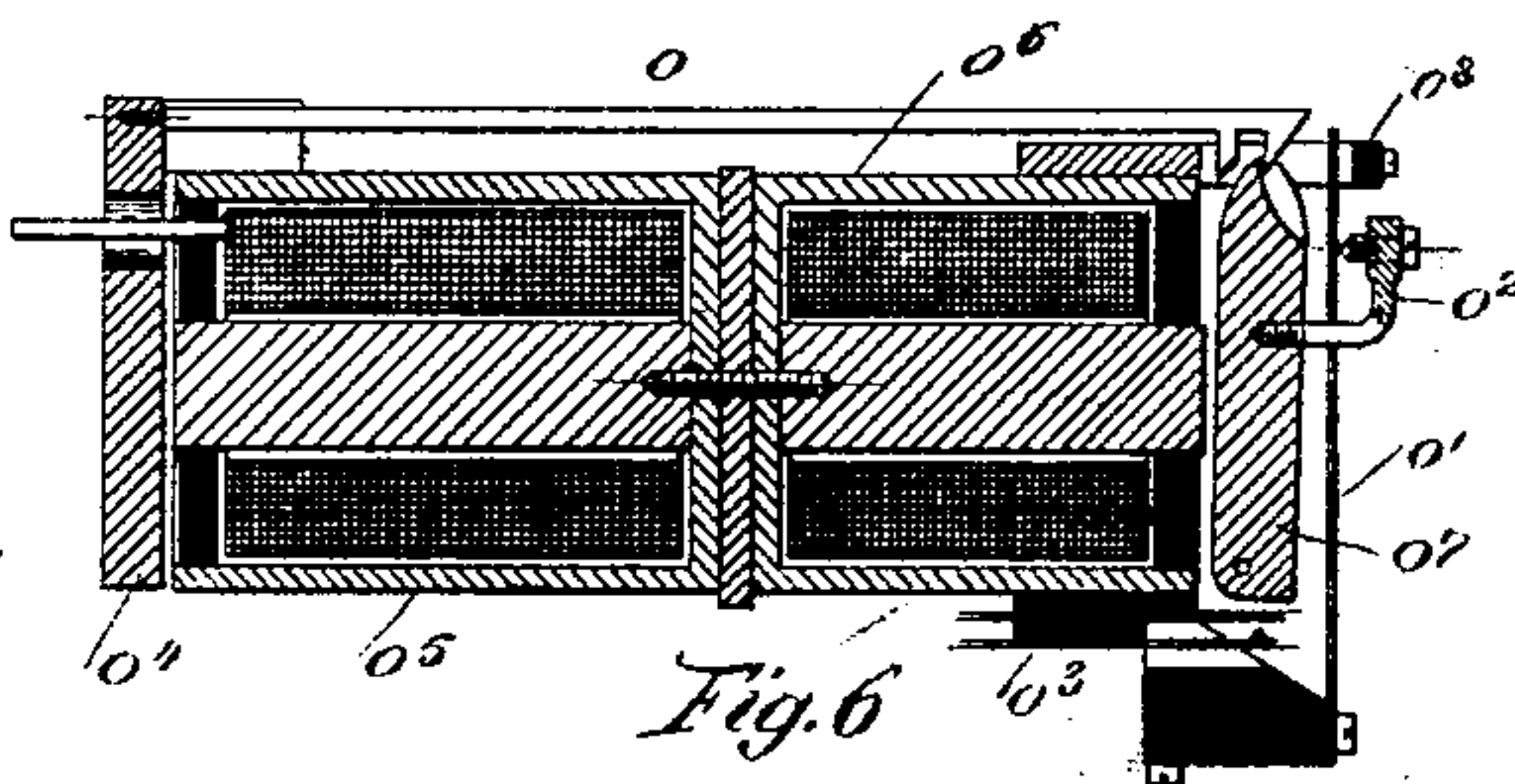
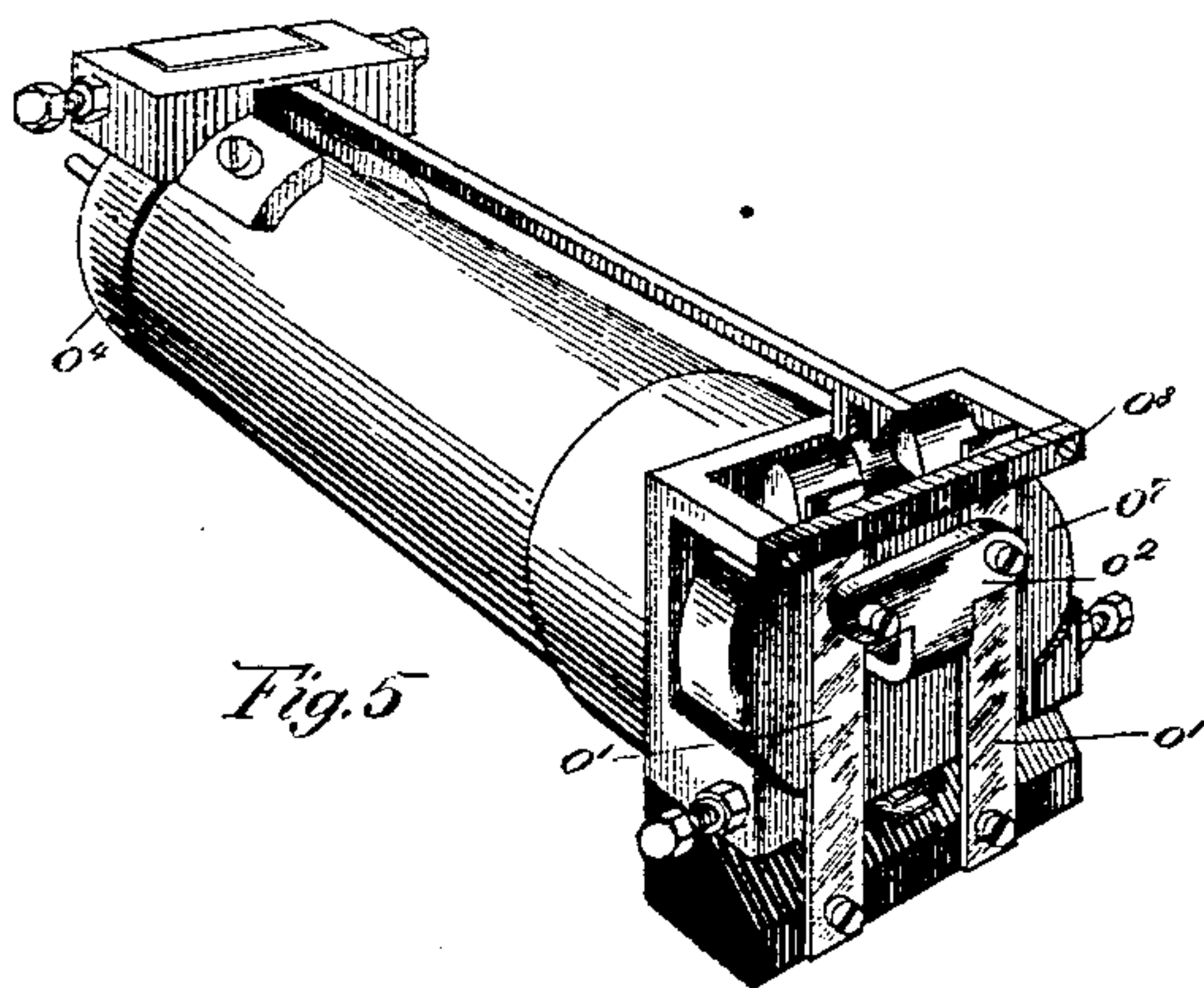
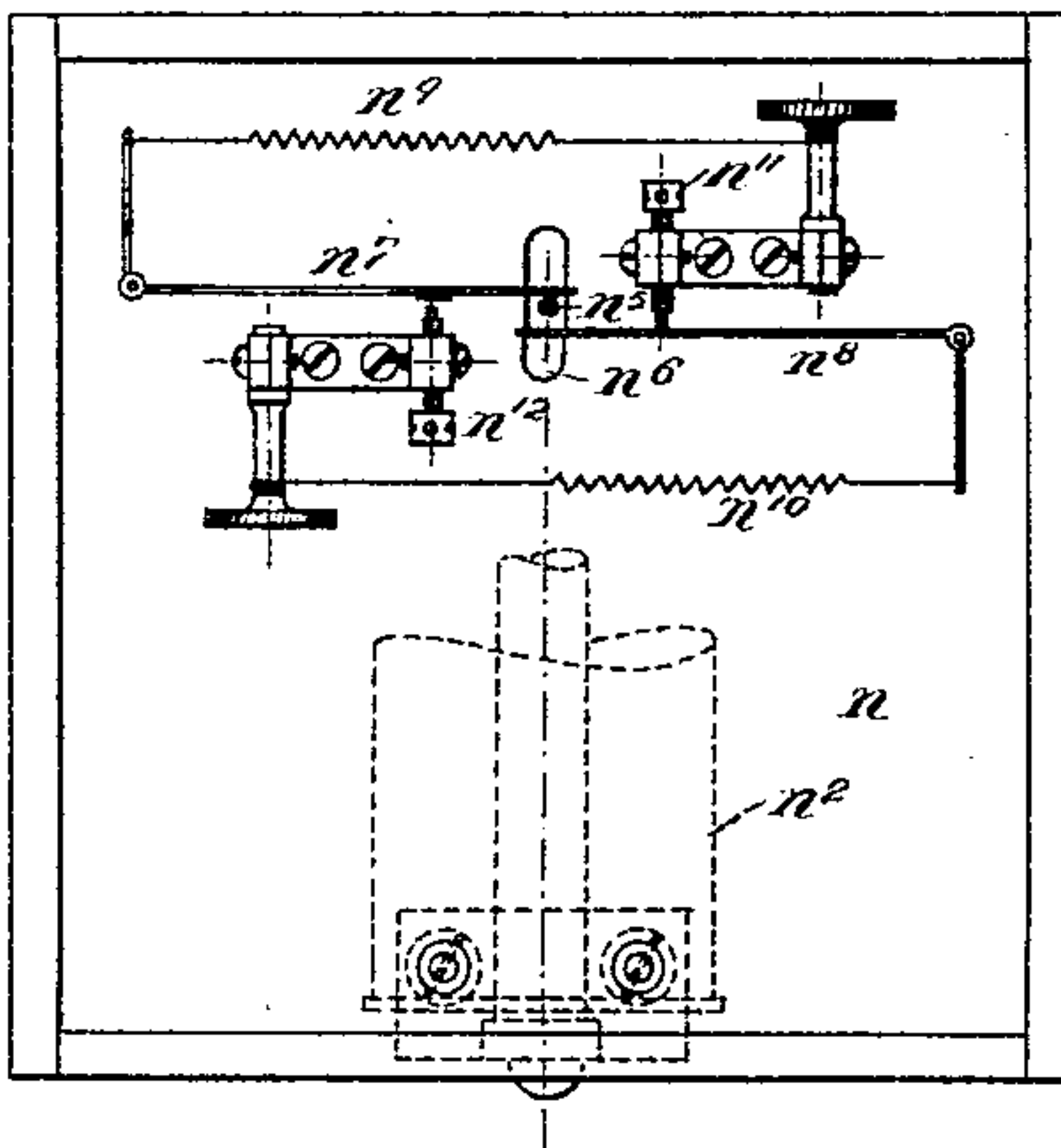
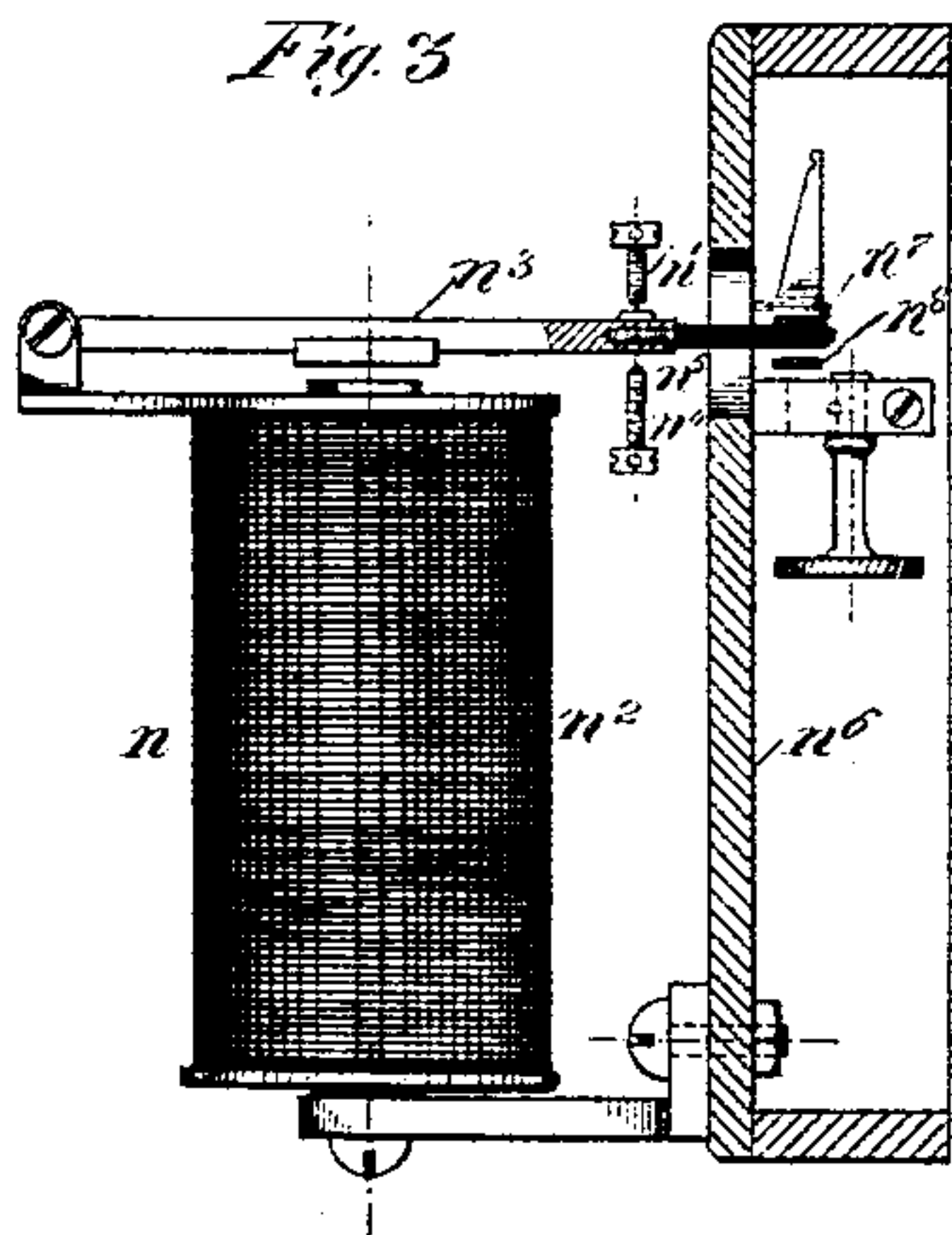
(No Model.)

3 Sheets—Sheet 3.

G. P. SÉLIGMANN-LUI.  
TOLL COUNTER FOR TELEPHONE LINES.

No. 561,619.

Patented June 9, 1896.



Witnesses:  
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Inventor:  
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# UNITED STATES PATENT OFFICE.

GUSTAVE PIERRE SÉLIGMANN-LUI, OF PARIS, FRANCE.

## TOLL-COUNTER FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 561,619, dated June 9, 1896.

Application filed August 18, 1894. Serial No. 520,739. (No model.)

*To all whom it may concern:*

Be it known that I, GUSTAVE PIERRE SÉLIGMANN-LUI, a citizen of France, residing at Paris, in the Republic of France, have invented certain new and useful Improvements in Toll-Counters for Telephone-Lines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to apparatus for counting or recording telephonic conversations, its object being to register each use of a subscriber's telephone-line, in which the subscriber is actually placed in position to communicate with the party called for.

Heretofore numerous attempts have been made to register or count the time or duration of use or the number of times of use of a telephone-line, with the object of establishing a fixed rate or "toll" for each use of the telephone. These prior systems have commonly failed to a greater or less extent, either because they registered only the use of the telephone without reference to the actual establishment of communication between subscribers or because, in order that cognizance should be taken only of connections in which the subscribers actually entered into communication, the automatic operation of the instrument has been discarded and the registration left optional with the subscriber. Thus, for example, each use of a telephone at a substation may be automatically counted or registered by means of suitable mechanism connected with the telephone-switch hook or other part which is necessarily moved in the use of the telephone, or mechanism may be placed either at the exchange or at the substation to register the completion of connection between two telephone-lines. In the first instance the counter would register the use of the instruments without reference to the actual establishment of communication between subscribers, as in case the subscriber called for were found busy or absent, and would also fail to discriminate between connections originating at the same substation

and those originating elsewhere directed to this substation. In the latter instance the apparatus might possess only the defect of registering each completed connection without reference to the subsequent transaction of business.

In my invention I have aimed to provide a registering or counting apparatus, a "toll-counter," adapted to be manually operated by a call-initiating subscriber, together with apparatus for compelling the subscriber to operate his counter after the establishment of the desired connection before communication with the distant station shall be possible. To this end I place at the substation a device which is arranged to alter the electrical condition of the telephone-line when the toll-counter is operated, and mechanism at the exchange controlled or actuated by means of the alteration of the electrical condition of the line, and arranged to prevent telephonic communication over the line until actuated in consequence of the operation of the toll-counter. In conjunction with this mechanism at the exchange, however, I provide means whereby the operator may establish telephonic communication with the line in order to receive calls for connections and to place the line in connection with the desired substation.

To be more specific, I provide with the toll-counter at the substation a key for opening or closing the line-circuit or a connection thereof when the toll-counter is operated, and at the exchange a relay, which may be controlled by the key at the substation to alter the line connections at the exchange in such manner as to prevent communication over the line until the relay is properly actuated—as, for example, by including a great or infinite resistance in the line-circuit. In combination with this device I employ the usual link-conductors for connecting lines together, and a key by which the operator may complete connections between lines regardless of the interposed obstacle. This key may preferably be the operator's listening-key, the obstacle created by the relay becoming effective only after the disconnection of the operator's telephone.

In one form of my invention the key connected with the counter at the substation is



constructed to open the normally continuous line-circuit momentarily when the counter is operated. The relay controlling the obstruction, or that device which is provided to prevent the transmission of telephonic current over the line, is included, together with a battery, in a bridge between the conductors of the plug-circuit, by means of which connection is made between the lines, and controls contact-points arranged to open or break the plug-circuit at some point when the relay-magnets are excited, but to close the break in the plug-circuit after they are momentarily demagnetized. The connection of the operator's telephone with the plug-circuit is controlled by the usual listening-key, which has, however, in addition to its ordinary switch-contacts, another set of switch-springs adapted to break the plug-circuit when the telephone is disconnected, the separable contacts of the listening-key and those controlled by the relay being in parallel branches of the plug-circuit, so that either pair may complete the plug-circuit while the members of the other pair are still separated. In the operation of this device the subscribers signals, the operator makes connection with the line, receives the order, tests and completes the connection with the line called for in the usual manner. Having ascertained the subscribers to be actually in position to communicate with each other, she orders the call-initiating subscriber to operate his toll-counter. The call-initiating subscriber must then perform this operation in order to momentarily open the line, whereby the relay is demagnetized and permits the contact-points which it controls to close the branch of the plug-circuit or to remove the obstacle in that branch thereof. The operator may then disconnect her telephone, leaving the connection complete between the substations. If, however, the subscriber shall have failed to operate his counter as directed, communication with his correspondent will be impossible, one branch of the plug-circuit being open at the listening-key and transmission of telephonic current through the other branch being prevented by the obstacle therein. The counter is thus called upon to register only actual conversations, and these only at the substation from which the call proceeds, while at the same time the subscriber is compelled to register each conversation which he initiates.

My invention comprises also certain minor features of construction and arrangement of the apparatus for preventing interference with the operator's test system from the battery included in the line.

My invention is illustrated in the accompanying drawings and may be more fully described in connection therewith.

Of the drawings, Figure 1 is a simplified diagram of the circuits and apparatus of my invention, divested of all mechanism not directly concerned in the operation of the counter. Fig. 2 is a diagram of the operator's

plug-circuit complete, comprising not only the apparatus involved in the operation of the counter, but the usual calling-keys, clearing-out annunciator, and testing apparatus, and my device for preventing interference with the test arising from the presence of the battery in the plug-circuit. Fig. 3 is a side elevation of the main relay. Fig. 4 is a front elevation of the same. Fig. 5 is a perspective view of an auxiliary relay adapted to be used in connection with the main relay shown in Figs. 3 and 4. Fig. 6 is a longitudinal sectional view of a portion of the auxiliary relay. Fig. 7 is a perspective view of the listening-key from one side, and Fig. 8 is a perspective view of the other side thereof.

I will first describe my invention with reference to the simplified diagram in Fig. 1.

The telephonic apparatus at the substation may be of the usual character, comprising a telephone  $a$  and transmitter  $a'$ , a generator  $a^2$  of signaling-current, and bell  $a^3$ , arranged in different branches of the line-circuit, and an automatic telephone-switch  $a^4$ , adapted to connect the telephonic or signaling apparatus into the line-circuit according to the position of the switch. Each substation is also provided with a counter  $b$ , which is represented as comprising only a registering ratchet-wheel  $b'$ , actuated by a pawl  $b^2$ , connected with a switch-key  $b^3$ , included in the line-circuit. The switch-key when depressed separates from its normal resting contact, thus opening the line-circuit, and at the same time causes the pawl to engage another tooth of the ratchet-wheel and thus in its return to rotate the latter through a small arc and to register or count one. The apparatus at the substation is connected by line-wires 1 and 2 with spring-jacks  $c$  and  $c'$  and with a self-restoring annunciator  $d$  upon a multiple switchboard at a telephone-exchange. The spring-jacks  $c$  and  $c'$  are assumed to be located upon different sections  $e$  and  $e'$  of the switchboard, the annunciator  $d$  being upon the section  $e'$ . Each spring-jack comprises a line-spring  $f$  and a thimble  $f'$ , which constitute the line-terminals of the jack and are connected with the conductors 1 and 2 of the line, and two local springs  $f^2$  and  $f^3$ , which constitute the normally separated terminals of a local circuit, including the restoring-magnet of annunciator  $d$  together with a battery  $g$ . Each spring-jack is also provided with a test-ring  $f^4$ , connected with the local spring  $f^2$ .

The operator's apparatus is shown only at switchboard  $e'$ , and there only one set of plugs is shown. These are plugs  $i$  and  $i'$ . Each of these plugs comprises a tip  $i^2$ , registering with the line-spring  $f$ , a sleeve  $i^3$ , making connection with the line-thimble  $f'$ , and a short insulated ring  $i^4$ , adapted to cross together the local springs  $f^2$  and  $f^3$  to complete the local circuit and reset the annunciator  $d$ . The tips  $i^2$  of the plugs are connected together by conductor 5 and the sleeves  $i^3$  by conductor 6.

The operator's listening-key  $k$  is connected



with conductors 5 and 6. This key, although represented only by its switch-springs, will be easily understood, being of common construction. It is shown in Figs. 7 and 8, but its connections may be most easily followed in the present figure. It comprises, essentially, four switch-springs  $k^1$ ,  $k^2$ ,  $k^3$ , and  $k^4$ , all of which rest upon corresponding anvils  $k^5$ ,  $k^6$ ,  $k^7$ , and  $k^8$ , from which they are adapted to be separated when the plunger of the key is thrust downward. The spring  $k^1$  carries a contact-stud which connects it with the spring  $k^3$  at the same time that these springs are lifted from their resting-anvils. The anvils  $k^7$   $k^8$  constitute the terminals of an operator's telephone  $l$ , and also of a battery  $m$ . Two condensers  $l'$   $l^2$  are included in the circuit with the telephone for the purpose of preventing flow of battery  $m$  through this instrument, and two retardation-coils  $m'$   $m^2$  are included in the battery-circuit 8 to prevent the shunting of telephonic current through it. The anvil  $k^5$  is connected between the telephone and condenser  $l'$  by a wire 9, in order that circuit may be complete from that side of the telephone to the tip of the plug  $i'$  while the telephone is in circuit for testing purposes. The magnet of the main relay  $n$  is included in the bridge 8, containing battery  $m$ .

I prefer that the main relay  $n$  should not control the continuity of the plug-circuit directly, but rather through the instrumentality of an auxiliary relay  $o$ , since by this means one main relay  $n$  can be used in connection with each operator's telephone, an auxiliary relay  $o$  of cheaper and simpler construction being provided for each plug-circuit. This relay  $o$  is shown herein as a self-restoring drop provided with contact-points  $o'$  and  $o^3$ , between which its shutter  $o^2$  vibrates. The construction of such instruments being well known the operation of this may be understood from the diagram, but the device will be fully explained in connection with Figs. 5 and 6. When the armature  $o^4$  of the magnet is attracted, the shutter  $o^2$  is released and closes upon contact-point  $o^3$ .

The resting-anvil  $n'$  of relay  $n$  is connected by conductor 10 with one side of battery  $m$ , while its lever is connected by a conductor 11 through the magnet of relay  $o$ . The other terminal of the latter extends to its forward stop  $o'$ , whence its circuit is normally complete through conductor 12 to contact  $k^6$ , thence through conductor 5, line 4, line 3, conductor 6, and conductor 8 to the other side of battery  $m$ . The resting-stop  $o^3$  of relay  $o$  is connected by conductor 13 with conductor 5 of the plug-circuit.

To follow the operation of my invention assume that subscriber at station A desires to communicate with subscriber at station A'. The call-initiating subscriber rotates his generator, his telephone being still upon the switch-hook, and thus operates his annunciator  $d$  upon switchboard  $e'$ . The operator

then inserts plug  $i$  into her spring-jack  $c'$ , thereby continuing the circuit of lines 1 and 2 to conductors 5 and 6, whence it is completed through her telephone  $l$ , her listening-key  $k$  being in the position shown. The insertion of the plug  $i$  into jack  $c'$  raised the line-spring  $f$  from its resting-stop and thus disconnected the annunciator  $d$ , while at the same time the local circuit, including the restoring-magnet of this annunciator, was closed, whereby the indicator of the annunciator was reset. The test-rings  $f^4$  were also electrified to a difference of potential from the earth—that is, to a higher potential than the earth—by contact with the terminal  $f^3$  of battery  $g$ . The circuit of battery  $m$  was also completed through conductor 8 to the contacts  $k^3$  and  $k^4$  of the listening-key, thence over the lines, and through the telephone at the substation. By the flow of current in this circuit the magnet of relay  $n$  becomes excited and its lever is caused to assume the position shown in the drawings, opening the circuit through relay  $o$ .

The operator having received the order for the desired connection tests in the usual manner—that is, by applying the tip  $i^2$  of plug  $i'$  to the test-ring  $f^4$  of spring-jack  $c^3$  belonging to station A'. Having found the line not in use, she inserts the plug  $i'$  fully into the spring-jack tested and signals to substation A' by means of the usual signaling apparatus. (Not shown in the drawings.) When the subscriber at station A' has responded to the signal and removed his telephone from the hook, the subscribers are connected through a circuit which may be traced as follows: from station A over line 1 to conductor 5, through contacts  $k^3$   $k^7$ , a portion of conductor 7, including condenser  $l'$ , conductor 9, contacts  $k^5$   $k^1$ , contacts  $k^6$   $k^2$ , the remainder of conductor 5, to the tip of  $i'$ , thence over line 4, through the telephone at substation A', returning over line 3, conductor 6 of the plug-circuit, and conductor 2 of line to station A. The operator's telephone  $l$  is bridged across this circuit through the remainder of conductor 7 and contacts  $k^8$   $k^4$ . When the operator by listening at her telephone has assured herself that subscribers at stations A and A' are actually in position to communicate with each other, she may order subscriber at station A to operate his counter, after which she will disconnect her telephone. The subscriber must then depress the key  $b^3$  in order to open the line to interrupt the current from battery  $m$ , in which operation the wheel  $b'$  is turned through one tooth and caused to register the conversation. The interruption of current of battery  $m$  permits the magnet of relay  $n$  to become demagnetized. Its lever is thus released and falls back against contact  $n'$ , closing conductor 10 to conductor 11 through relay  $o$ , contact  $o'$ , and lever  $o^2$ , conductor 12, contacts  $k^6$   $k^2$ , conductor 5 of the plug-circuit to conductor 4 of line to station A', thence returning through conductor 3, conductor 6, con-



tacts  $k^4 k^8$  to battery  $m$ . The relay  $o$  is thus caused to release its shutter, and the latter closes against its resting-anvil  $o^3$ . By this means a short circuit is created from conductor 5 through conductor 13, contacts  $o^3 o^2$ , conductor 12 to spring  $k'$  of the listening-key  $k$ . The operator then depresses the plunger of her listening-key, whereby the telephone is disconnected and at the same time the contact-points  $k^2 k^6$  are separated, thus opening the listening-key branch of conductor 5 of the plug-circuit. The conductor 5 is now complete, however, through the springs  $k^3 k'$ , conductor 12, contacts  $o^2 o^3$ , and conductor 13, so that the subscribers are enabled to carry on conversation with each other.

It will be noted that if after being ordered to register the call-initiating subscriber had neglected to push his key  $b^3$  he would be entirely disconnected from his correspondent, the conductor 5 of the plug-circuit being open both at the contacts  $k^2 k^6$  of the listening-key and at the contacts  $o^2 o^3$  of the relay  $o$ . It is thus obvious that the subscriber is compelled to register his use of the telephone after he is assured that his correspondent is prepared to converse with him.

I will now describe in detail the different pieces of special apparatus required in my invention and afterward will trace the complete plug-circuit.

The relay  $n$  (shown in Figs. 3 and 4) comprises, essentially, the magnet  $n^2$  and relay-lever  $n^3$ . The latter plays between a fixed forward stop  $n^4$  and a rear contact or resting stop  $n'$ , fixed in the frame of the instrument. An insulated extension, preferably a pin  $n^5$  of hard rubber, projects from the forward extremity of the armature-lever  $n^3$  through an opening in a face-plate  $n^6$ . Upon this plate other contact-points are carried, adapted to be controlled by the movement of the pin  $n^5$ . The pin  $n^5$  as it vibrates is arranged to engage alternately the extremities of pivoted bell-crank levers  $n^7 n^8$ , which are normally pressed toward the pin by retractile springs  $n^9 n^{10}$ , respectively, and are held against stops  $n^{11} n^{12}$ . In the normal position of the relay-armature it rests against its anvil  $n'$ , and pin  $n^5$  lifts the lever  $n^7$  from its stop  $n^{12}$ , the lever  $n^8$  resting upon its anvil  $n^{11}$ .

In Figs. 5 and 6 is shown the auxiliary relay  $o$ , of which one is provided for each plug-circuit. This relay is substantially a self-restoring annunciator of slightly-modified construction, its shutter or forward armature serving to control contact-points in place of operating a signal-indicator. It is provided with a main magnet  $o^5$  and an auxiliary or restoring magnet  $o^6$ . The main magnet has a pivoted armature  $o^4$ , which carries an arm furnished at its extremity with a catch which engages an iron shutter  $o^7$ , which constitutes the armature of the restoring-magnet  $o^6$ . Before this shutter  $o^7$  two light springs  $o'$  are fixed vertically, held rigidly at their lower extremities and tending away from the shutter,

but normally bearing against a transverse bar  $o^8$  of insulating material. Upon the shutter is fixed a light cross bar or arm  $o^2$ , which is adapted to engage these two springs  $o'$ , making contact with both of them and thus crossing them together as long as the shutter is in its position of engagement with the catch. The shutter is also provided with the usual "night-bell spring"  $o^3$ . When the main magnet  $o^5$  is excited, armature  $o^4$  is attracted and releases the shutter  $o^7$ , which falls outward. The cross  $o^2$  between springs  $o'$  is thus removed and the circuit between the latter is broken, while at the same time the night-bell spring  $o^3$  is closed to the shutter. When the magnet  $o^6$  is excited, the shutter  $o^7$  is again drawn up into engagement with the catch and crosses springs  $o'$  together and disconnects the circuit of night-bell spring  $o^3$ .

The listening-key (shown in Figs. 7 and 8) is substantially the same as that in common use, with the addition of a contact-spring  $k^2$  and its anvil  $k^6$  on one side of the key. When the plunger  $k^9$  is depressed, the wedge  $k^{10}$ , connected therewith, is thrust between the curved extremities of switch-springs  $k' k^2$  and  $k^{11} k^{12}$  and lifts them. The metallic stud carried by spring  $k'$  then makes connection with spring  $k^3$  and lifts the same from its anvil  $k^7$ . The rubber stud  $k^{13}$  upon spring  $k^2$  engages spring  $k^4$  and lifts the latter from its anvil  $k^8$ . The spring  $k^{11}$  is lifted from its anvil  $k^{14}$  and spring  $k^{12}$  is closed upon its contact  $k^{16}$ .

In Fig. 2 two plug-circuits are shown connected with a single relay  $n$  and a single operator's telephone set  $l$ . Each pair of plugs is provided with a relay  $o$ , a listening-key  $k$ , and also with a clearing-out annunciator  $p$  of the self-restoring type.

The principal circuits of the plugs  $i i'$  may be traced through the conductors, as before, with reference to Fig. 1. The tips are united through conductor 5, including the contact-springs of the listening-key, and the sleeves are united directly by conductor 6. The conductors 7 and 9, together with the connections from conductor 7 to the contact-points  $k^7$  and  $k^8$ , are common to all the pairs of plugs belonging to one operator. The conductors 11 of the different plug-circuits are individual, but are connected to a common point, the lever  $n^3$  of relay  $n$ . The remainder of the circuits are individual—that is, separate conductors are provided for each plug-circuit.

Each plug-circuit includes a pair of calling-keys  $r$ , each provided with contact-springs which are adapted to disconnect the remainder of the plug-circuit from one of the plugs and to connect the terminals of that plug with the poles of a generator  $s$  of signaling-current for signaling to a substation. The clearing-out annunciator  $p$  is connected by means of conductor 14 in a bridge between the conductors 5 and 6 of the plug-circuit, this bridge being completed through the contacts  $k^{12} k^{16}$  when the telephone is not in circuit. The local or restoring circuit 15 of the



clearing-out annunciator, including the battery  $t$ , is controlled by spring  $k^{11}$  and its contact  $k^{14}$ , which are closed together, and thus act to reset the annunciator when the operator's telephone is brought into connection with the plug-circuit. The night-bell springs  $p' p^2$  of the clearing-out annunciator  $p$  are included in a local circuit 16 of battery  $t$  through the restoring-magnet of relay  $o$ . By this device when the clearing-out annunciator is thrown at the completion of a connection the relay  $o$  is automatically restored to its normal condition.

Since the presence of battery  $m$  in the plug-circuit would interfere to some extent with the operator's busy test, unless a special device were provided to obviate this, I have arranged the contacts  $n^7 n^{12}$  and  $n^8 n^{11}$ , whose function it is to protect the telephone from discharges of the condensers  $l' l^2$ . It will be observed that ordinarily the condenser  $l'$  is charged from battery  $m$  through the circuit 8. Under this condition if the test-plug were applied to a grounded test-ring the condenser would discharge through the telephone to earth and would produce in the telephone a click which might be mistaken for a busy test. The spring or lever  $n^8$  of relay  $n$  is therefore arranged to be normally closed upon its anvil  $n^{11}$ , and in this position it closes a short circuit 17 about the telephone  $l$ . The lever  $n^7$  is normally separated from its anvil  $n^{12}$ , but is adapted to close thereon in the first movement of lever  $n^3$  and before lever  $n^8$  has separated from its anvil, and springs  $n^7 n^{12}$  control a circuit 18 from the other pole of battery  $m$  to the conductor 9, the circuit being through conductor 18, contacts  $n^7 n^{12}$ , conductor 11, magnet of relay  $o$ , contacts  $o' o^2$ , conductor 12, contacts  $k' k^5$ , and conductor 9. The telephone is thus normally protected by a short circuit 17, and the condenser  $l'$  is discharged through the instrumentality of contacts  $n^7 n^{12}$  before the short circuit 17 has been broken at contacts  $n^8 n^{11}$ . Thus all interference with the test from battery  $m$  is obviated.

It will be understood that I do not desire to limit myself to a specific form for the mechanism which I have herein described. Many modifications may be made without departing from the spirit of my invention. Thus the utility of my invention is obviously not limited to counting the number of times which a telephone-line is in use, but may be employed to register or record the duration or time of a conversation or for any other purpose in which it is desired that the subscriber shall operate a particular instrument before he shall be enabled to communicate with his correspondent. It is also plain that the actual breaking of the plug-circuit in order to prevent the transmission of telephonic current between the substations before the operation of the counter is unnecessary, it being sufficient to interpose in the plug-cir-

cuit or in any branch connected therewith any of the well-known devices for preventing the transmission of current over an extended branch of a circuit.

I therefore claim, broadly, as new and desire to secure by Letters Patent—

1. The combination with a telephone-line of apparatus for normally preventing the transmission of telephonic current through the telephone-line, a key at the terminal station of said line included therein adapted to be operated by the subscriber to move said apparatus in position to permit the transmission of telephonic current through the telephone-line, and a recording device which is operated when the key is actuated; substantially as and for the purpose specified.

2. The combination with a telephone-line, of apparatus at the central station for normally preventing the passage of telephonic currents over said line, a circuit-controlling device at the terminal station for operating said apparatus at the central station to thereby permit the passage of telephonic currents, and a recording instrument at the terminal station, operated by said circuit-controlling device.

3. The combination with a telephone-line uniting two stations, of a registering instrument at one of the stations, and a relay intermediate between the two stations adapted in its normal position to interpose in the line-circuit a device to prevent the transmission of telephonic current between the stations, the relay being electrically connected with a key adapted to be actuated in the operation of the register, said key controlling the relay to permit the transmission of telephonic currents in the line when the key is operated, substantially as described.

4. The combination with a telephone-line uniting two stations, of a manually-operated registering instrument at one of the stations, a relay adapted to normally interpose in the line-circuit a great resistance but to complete the line-circuit as to telephonic currents in its alternate position, and a key connected with the registering instrument adapted to be actuated thereby, controlling said relay, substantially as described.

5. The combination with two telephone-lines extending from substations to a central station and united thereat by a plug-circuit or "link-conductors," of a registering instrument at one substation, a relay at the central station normally interrupting the plug-circuit, the relay being electrically controlled by a key connected with the register to close the line-circuit when the register is operated, substantially as described.

6. The combination with two telephone-lines extending from substations to a central station, of a plug-circuit uniting the lines at the central station, a manually-operated registering instrument at one of the stations, a switch at the central station controlling the continuity of one



of two parallel branches of the plug-circuit, a relay controlling the continuity of the other parallel branch, said relay being controlled by a key adapted to be actuated in the operation of the register, whereby the subscriber, after having ascertained that his correspondent at the distant substation is in position to communicate with him, may be compelled to operate his register in order to converse with the subscriber at the distant station, substantially as described.

7. The combination with telephone-lines extending from substations to a central station, of a plug-circuit uniting two lines into a complete circuit, a manually-operated register at one of the stations, an operator's listening key or switch for connecting the operator's telephone with the line, a switch upon the listening-key controlling the continuity of one of two parallel branches of the plug-circuit, and a relay controlling the continuity of the other parallel branch thereof, said relay being adapted to be electrically controlled by a key actuated in the operation of the register to close the corresponding branch of the plug-circuit, substantially as described.

8. In combination with telephone-lines extending from substations to a central station and united there by a plug-circuit, a manually-operated register at one of the stations; a switch controlling the continuity of one of two parallel branches of the plug-circuit, an automatic relay controlling the other branch connected together with a source of electric current with the telephone-line and adapted to complete the branch of the plug-circuit which it controls when its magnet is momentarily demagnetized, and a key actuated in the operation of the register to momentarily

open the line-circuit, substantially as described.

9. The combination with a number of plug-circuits, of a single main relay and a source of current connected therewith, an auxiliary relay in each plug-circuit controlling the continuity thereof and controlled by the main relay, and means for connecting the main relay with any plug-circuit, substantially as described.

10. In combination with a number of plug-circuits, an operator's telephone and a battery and main relay in parallel branch circuits, a listening-key for each plug-circuit adapted to connect the telephone and battery in a bridge between the conductors of the corresponding plug-circuit and provided with switch-springs arranged to open the plug-circuit when the telephone is disconnected, and an auxiliary relay for each plug-circuit controlled by the main relay and adapted to close a normally open branch of the plug about the said contacts of the listening-key, substantially as described.

11. The combination with a telephone-line, of a plug-circuit adapted to be connected therewith, an operator's telephone adapted to be connected with the plug-circuit, a battery and a relay in a parallel circuit with said telephone, and a short circuit about said telephone controlled by said relay; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GUSTAVE PIERRE SÉLIGMANN-LUL.

Witnesses:

G. DE MESTRAL,

EDWARD P. MACLEAN.