

O. C. DENNIS.  
ELECTRIC SERVICE METER.  
APPLICATION FILED JUNE 20, 1907.

966,809.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 1.

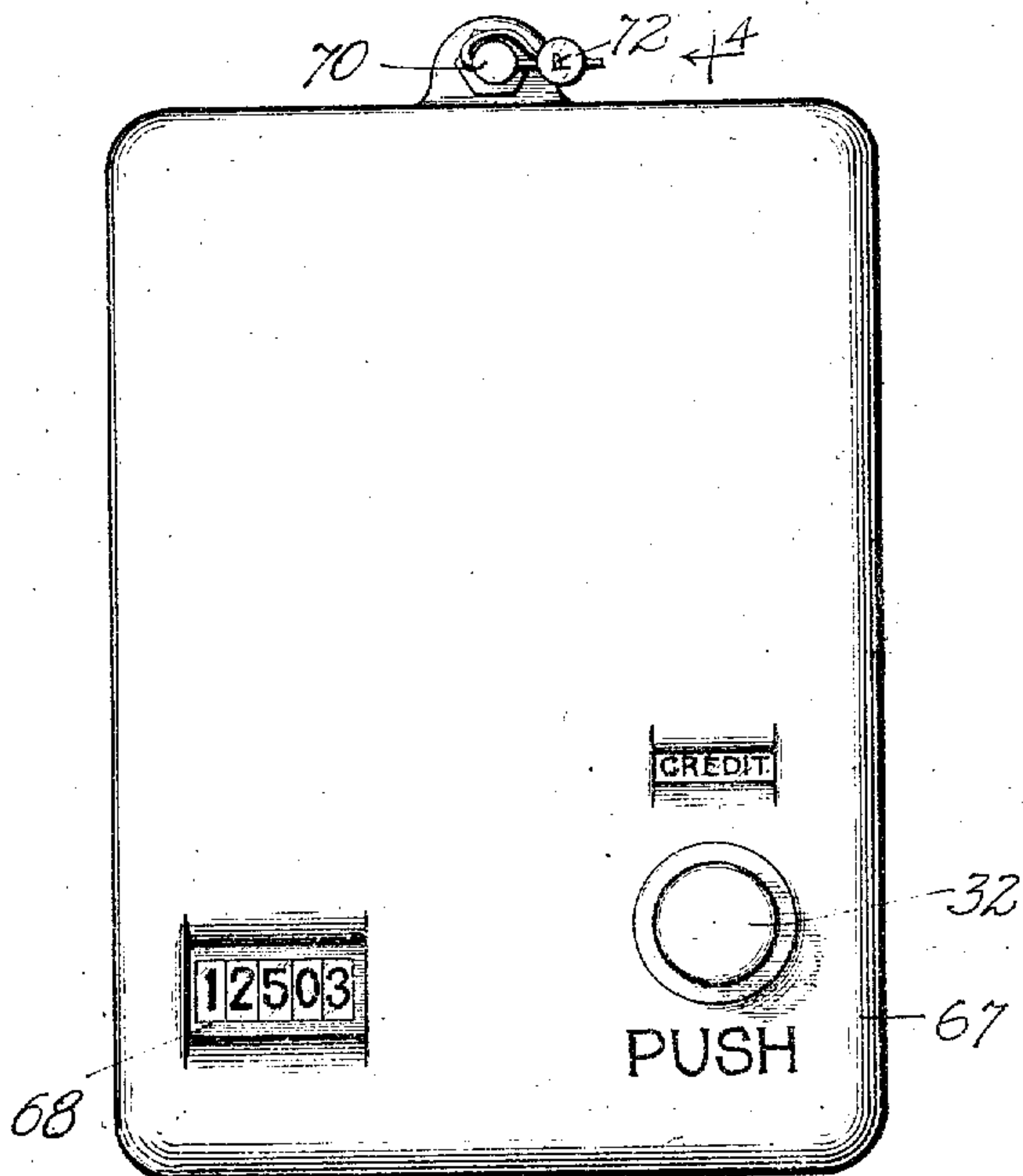


Fig. 1.

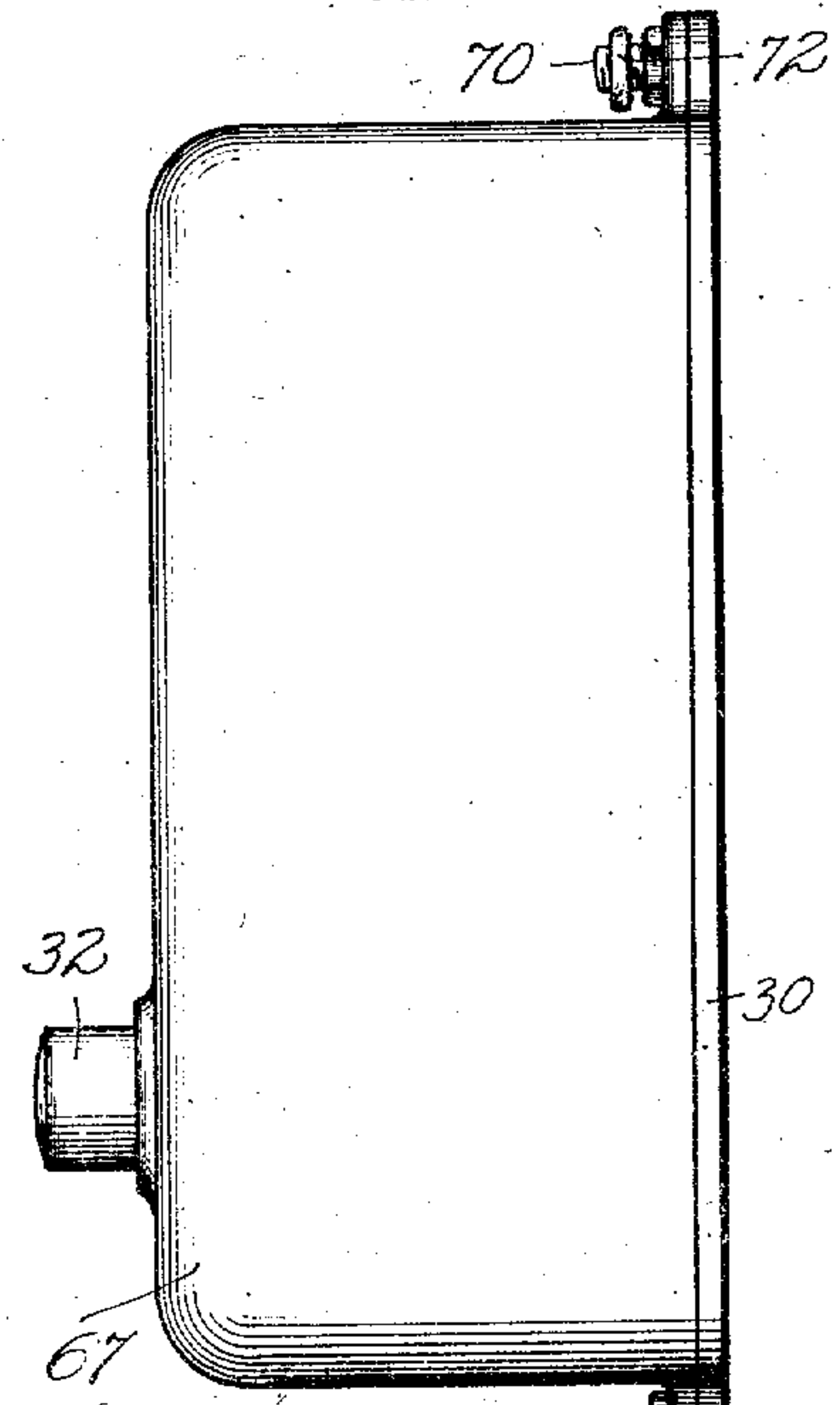


Fig. 2.

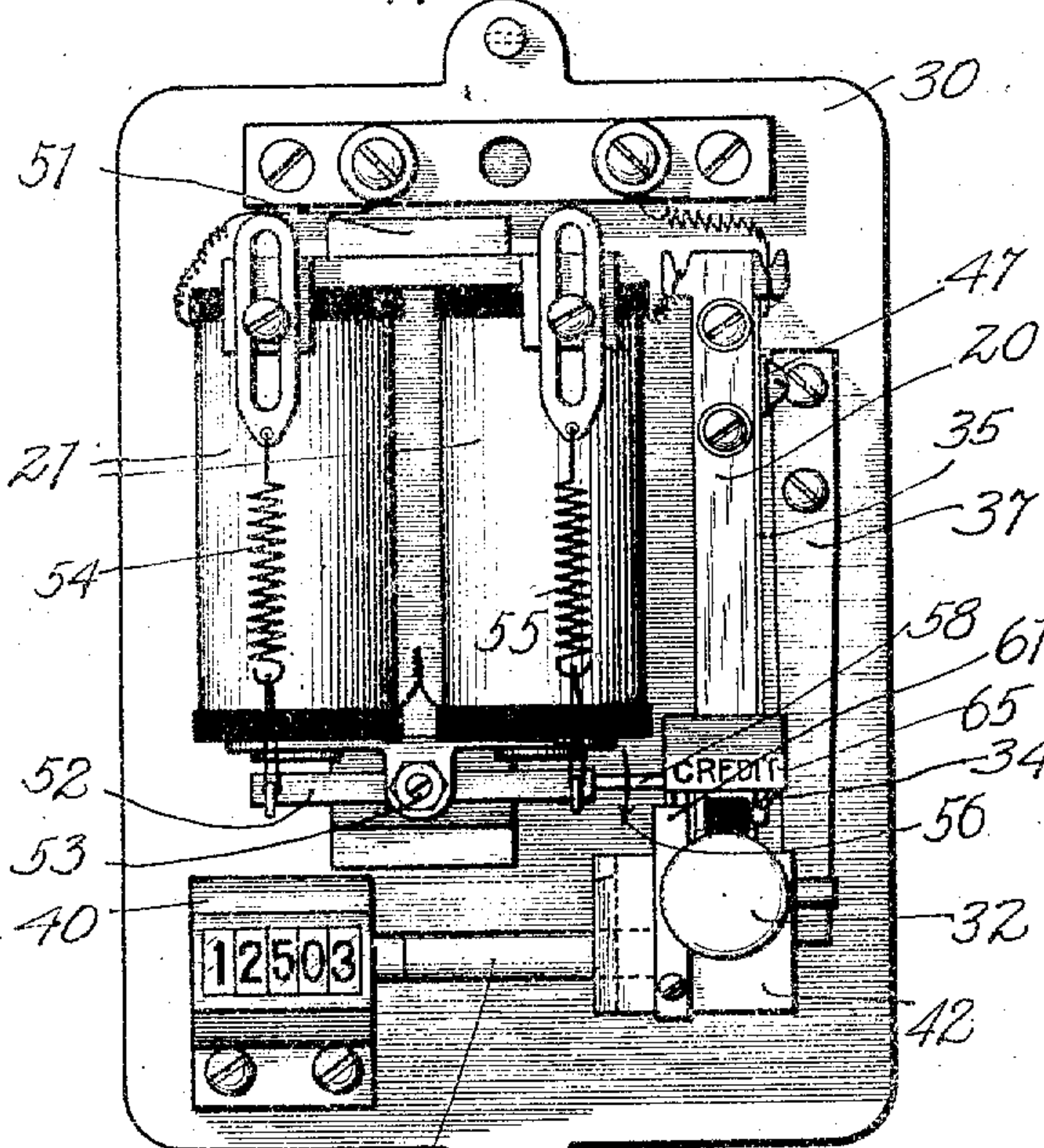


Fig. 3.

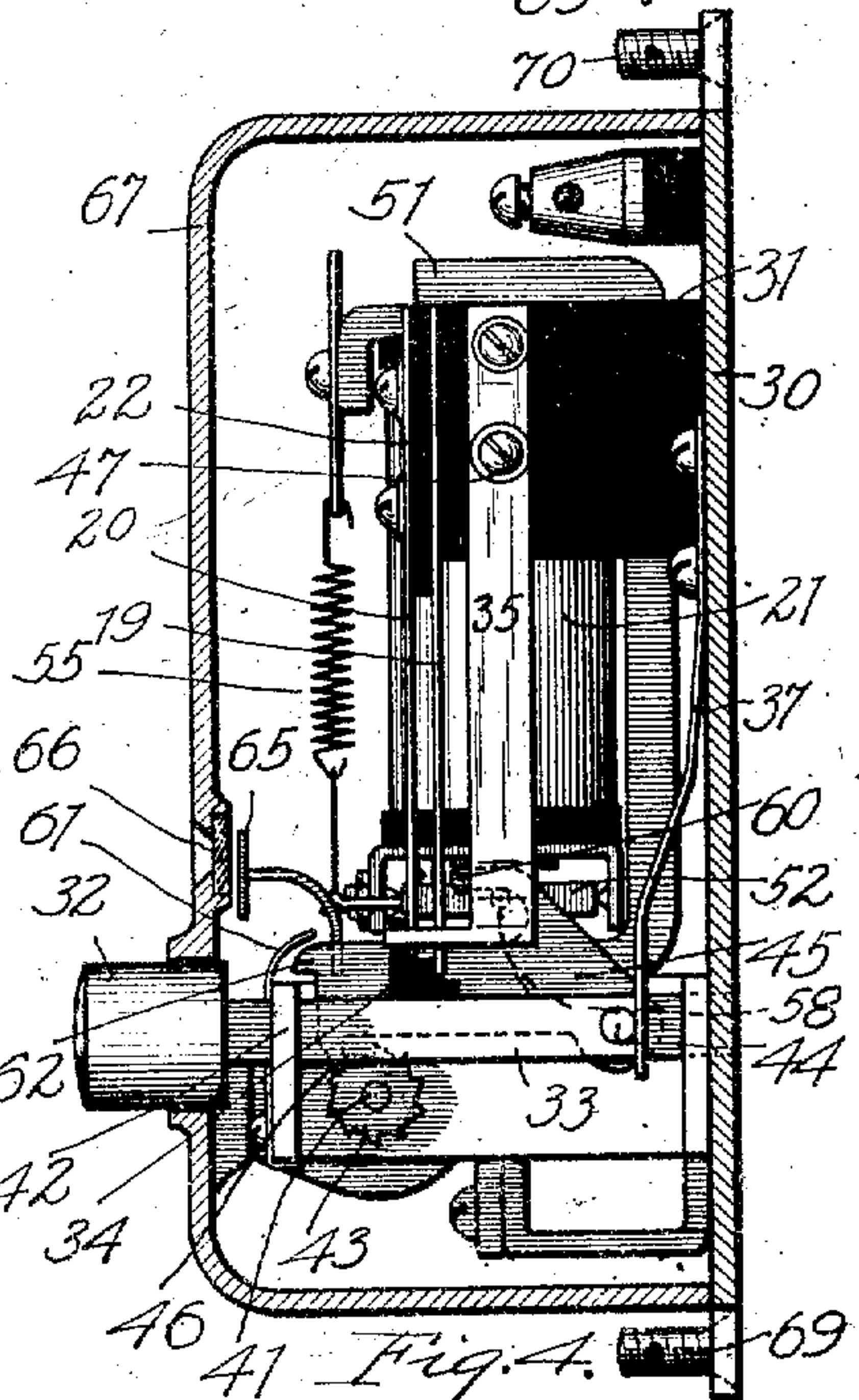


Fig. 4.

Witnesses: 41  
Leonard W. Novasider.  
George C. Higham.

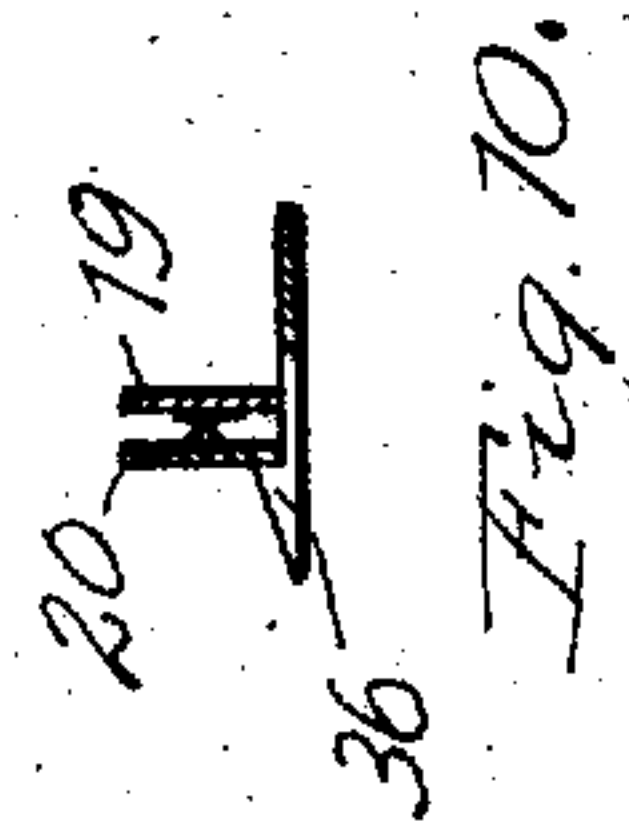
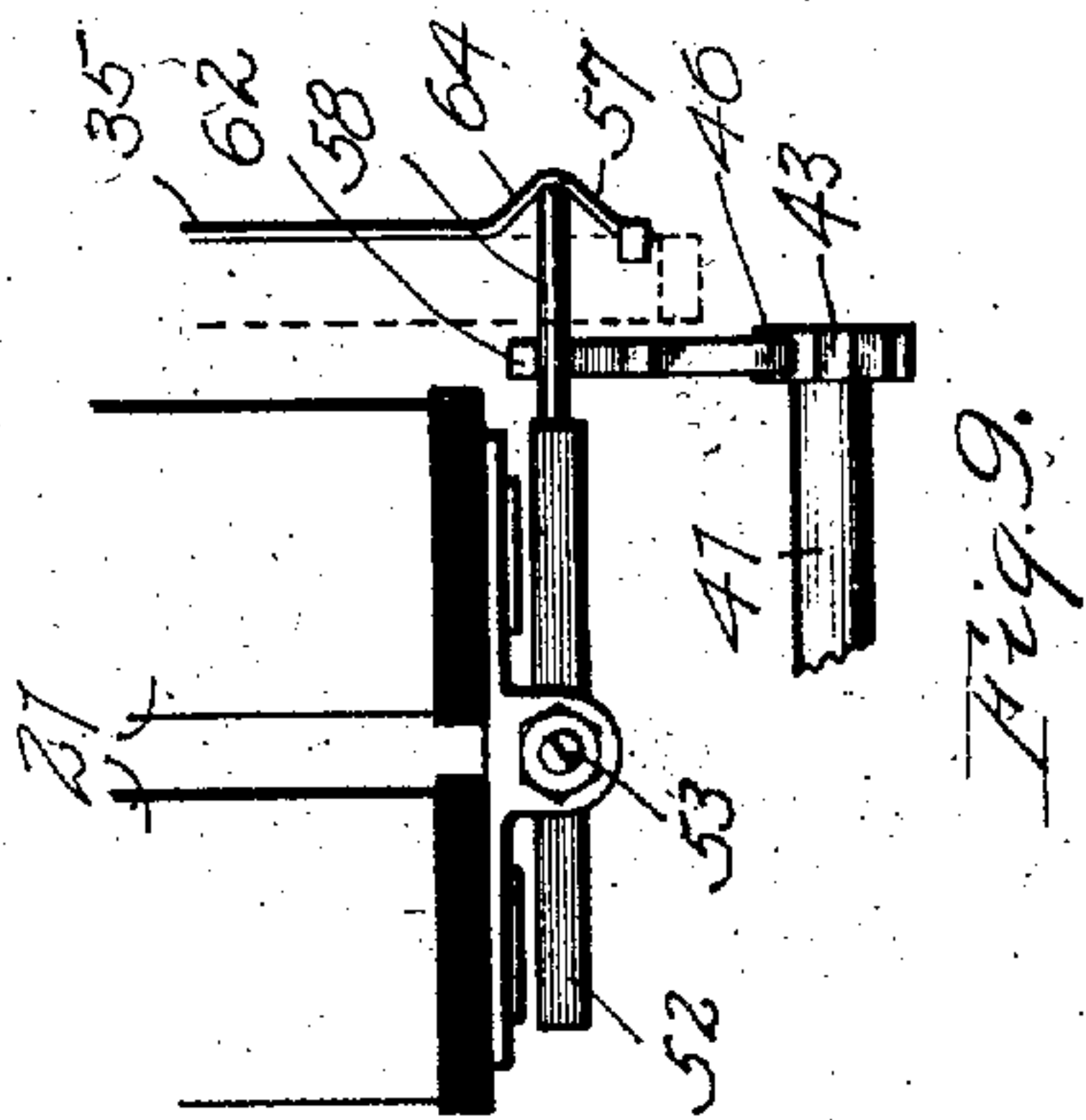
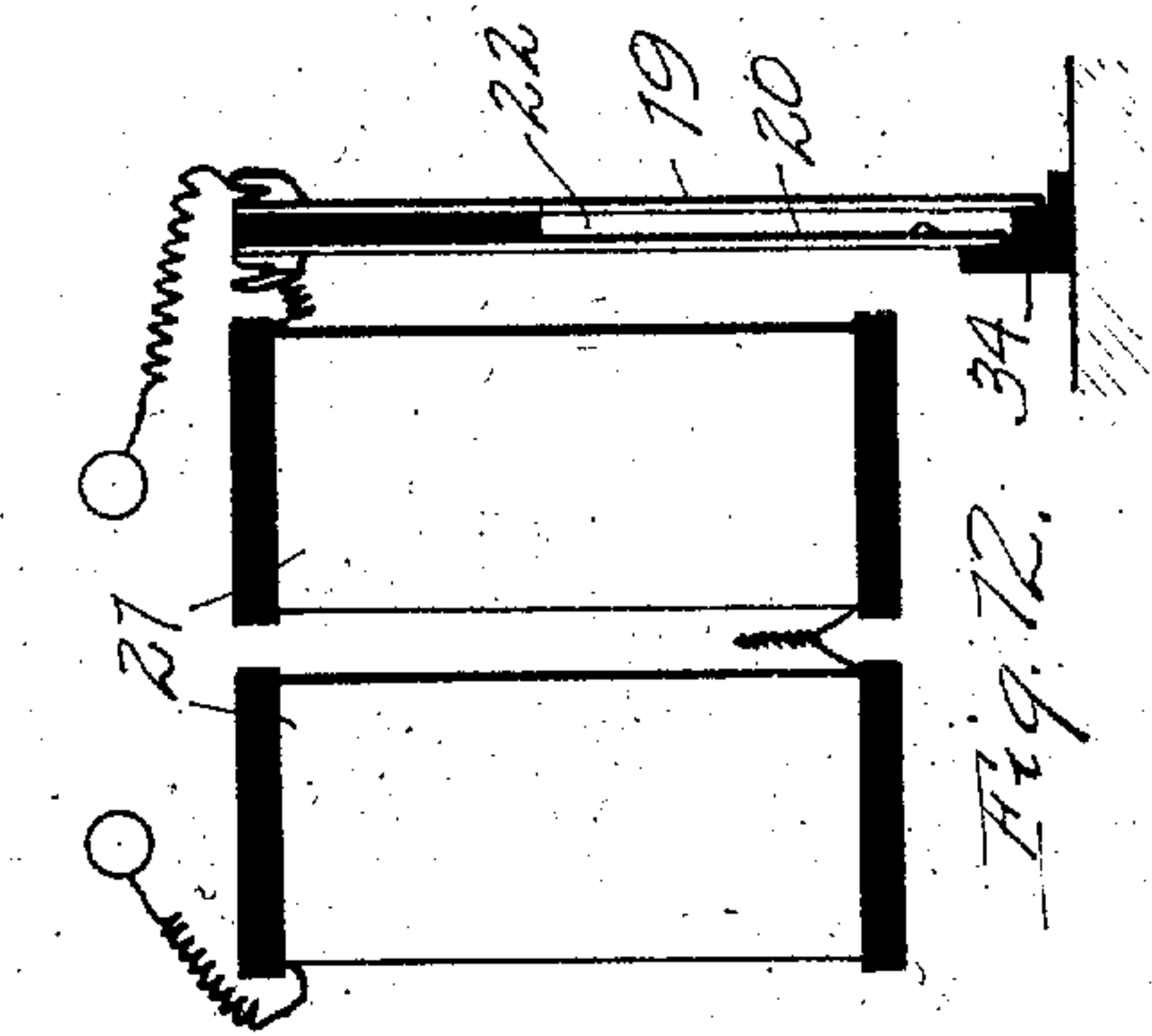
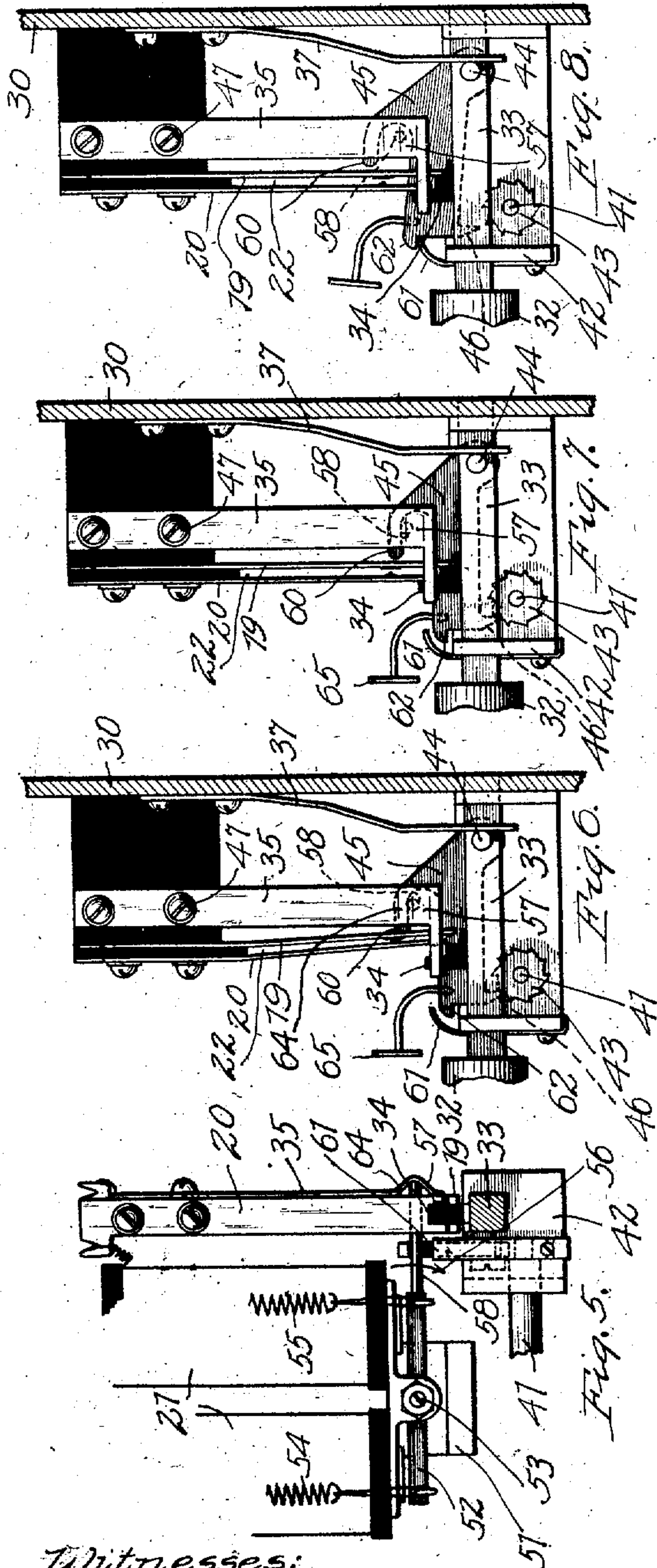
Inventor  
O. C. Dennis  
By Charles A. Brown  
Attorney

966,809.

O. C. DENNIS.  
ELECTRIC SERVICE METER.  
APPLICATION FILED JUNE 20, 1907.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 2.



Witnesses:  
Leonard W. Novander.  
George C. Higham.

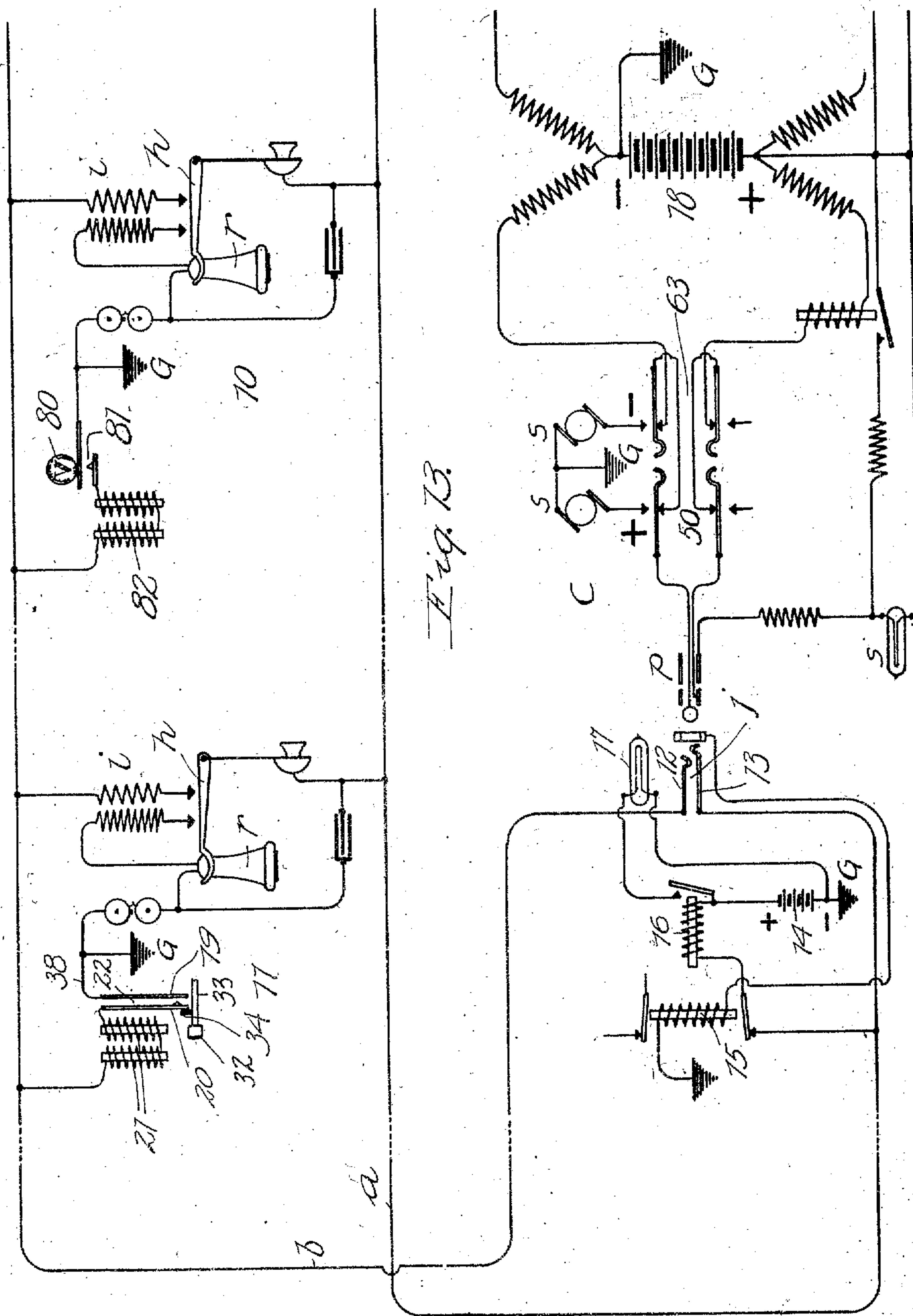
Inventor  
O. C. Dennis  
By Charles A. Brown  
Attorney

966,809.

O. C. DENNIS.  
ELECTRIC SERVICE METER.  
APPLICATION FILED JUNE 20, 1907.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 3.



Witnesses:  
Leonard W. Novander,  
George C. Higham.

Inventor  
O. C. Dennis  
By Charles A. Brown  
Attorney



# UNITED STATES PATENT OFFICE.

OLIVER C. DENNIS, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO  
WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF  
ILLINOIS.

ELECTRIC SERVICE-METER.

966,809.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed June 20, 1907. Serial No. 379,857.

*To all whom it may concern:*

Be it known that I, OLIVER C. DENNIS, 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 Electric Service-Meters, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

In the operation of telephone exchange systems it is common practice to provide subscribers with coin-collecting apparatus in which the insertion of a suitable coin is a prerequisite to obtaining connection with the central office and thence interconnection with the desired subscriber. The various objections to the use of such apparatus, together with other causes, have created a demand for a satisfactory service meter.

It is the object of my invention to provide a service meter which may be located at the subscriber's station and which will overcome the difficulties and objections inherent to service meters which have heretofore been proposed and used to some extent.

In accordance with my invention I provide in the circuit of the strictly telephonic instruments a supplementary switch. This switch is normally open, so that a calling subscriber can signal the central office only when the supplementary switch is closed. This supplementary switch is inaccessible to the subscriber and can be operated only by means of an actuating device, such, for example, as a button or lever. The actuating device directly controls the operation of a register, so that it is impossible for the subscriber under ordinary conditions to close the supplementary switch without at the same time mechanically operating the register to indicate a call. The supplementary switch having been actuated, the subscriber is enabled to signal the operator, who, responding to the call, endeavors to establish an interconnection with the subscriber wanted. If the connection is made and answered, the operator restores the metering apparatus to its normal condition by sending suitable current over the line, thereby actuating an electromagnet controlling the restoring or releasing mechanism. If, on the other hand, the connection is not made, or the called subscriber fails to answer, it is usually the prac-

tice not to charge the calling subscriber with a call.

In accordance with my invention the central station operator is provided with means for sending current of different character or direction over the telephone line in such manner that the operative connection between the switch-actuating button and the register will be broken, or so modified that the succeeding actuation of the supplementary switch will not be accompanied by an actuation of the register. The operation in this respect corresponds with the idea of giving the subscriber a credit for every call which is registered in his meter but which does not result in a through connection. The operation of the apparatus is such that this credit may be wiped out by the next succeeding call, and it is only after the credit has been applied that the continued actuation of the register is resumed.

The preferred embodiment of my invention provides also an indicator to show when the subscriber has been credited with an unanswered call.

My invention provides means for accomplishing all of these results without sacrificing simplicity in construction or certainty of operation.

Another advantage presented by the service meter of my invention resides in the fact that the register is positively and mechanically actuated by the subscriber himself. The central station operator is concerned only with the restoration of the mechanism.

Another advantage which is peculiar to the preferred embodiment of my invention resides in the fact that the service meter may be connected upon a party line circuit in which certain other stations are equipped with coin-collecting apparatus of a well-known type. The central station operator answering the calls which originate upon such a party line, is enabled to control the coin-collecting apparatus with the same switching mechanism and in the same manner as in controlling the service meter of my invention. Thus, for example, if a call originating on such a party line is answered, it will become the duty of the operator to restore the service meter to its normal condition, or to direct the coin which has been deposited in the slot of a coin-collecting device into the retaining box, depending, of



course, upon whether the call has originated from a meter station or from a coin-collecting station.

My invention provides means whereby a given operation, corresponding with the connection of current of a given character with the line, will actuate either device, whichever one may have been used, in originating the call. So, also, a single other and different operation will return the coin to the depositor in one case, or establish the credit condition in the service meter, in that case. It is unnecessary, therefore, for the central station operator to take account of the various classes of substations upon a single line. Her operations will be the same no matter whether the call originates from a pay-station or from a metered station, both of which may be located upon a single party line.

These and other advantages will more fully appear from the detailed description of the apparatus of my invention, which I shall describe by reference to the accompanying drawings, in which:

Figure 1 is a front elevation of the complete service meter; Fig. 2 is a side elevation of the same; Fig. 3 is a front elevation of the mechanism, from which the casing has been removed; Fig. 4 is a view, partly in elevation and partly in cross-section, taken on line 4-4 of Fig. 1; Fig. 5 is a front elevation of certain details of construction; Figs. 6, 7 and 8 are detail views, largely in side elevation, showing various steps in the operation of the apparatus; Fig. 9 is a front elevation of certain of the operating mechanism, certain parts having been removed in order to more clearly illustrate the parts shown; Figs. 10 and 11 are details showing the operation of the latch mechanism; Fig. 12 illustrates somewhat in detail and Fig. 13 diagrammatically and generally the circuit connections of the preferred embodiment of my invention.

Referring first to Fig. 13, those skilled in the art will understand that the diagram shows a two-party telephone line extending by its limbs *a* and *b* from a central office *C* to the subscribers' stations 10 and 11. The telephone line limbs are connected, respectively, with the tip spring 12 and the sleeve spring 13 of the spring-jack *j*. The line limb *a* is normally connected with the battery 14 by way of the back contact of the relay 15, this connection leading also through the winding of the line relay 16. The negative pole of the battery 14 is connected to ground, so that the grounding of the line limb *a* will actuate the line relay to display the signal 17. When the operator inserts the plug *p* of her cord circuit, she closes circuit from the positive pole of the battery 18 (which may be the same as the battery 14), through the supervisory lamp *s*

and the winding of the cut-off relay 15. When thus energized the armature of the cut-off relay is attracted to break the circuit through the line relay, whereupon the line signal is restored in the usual manner. At the substation 11, at which is located the service meter of my invention, means are provided in order that the subscriber may close a low resistance path to ground the sleeve side of his line. This low resistance path from the sleeve side of the line to ground will not be closed, however, by removing the receiver *r* from the hook switch *h* since such path is normally open at the contact springs 19 and 20. This ground branch may be connected to the tip side *b* of the line by means of a supplementary switch comprising the switch springs 19 and 20. This circuit to ground passes also by way of the windings 21 of an electromagnet whose function I shall more fully describe. It is the apparatus connected in the branch from the tip side of the line to ground and the means for operating this mechanism with which my invention is more particularly concerned. The operation of a system constructed in accordance with my invention depends upon the fact that the branch to ground is normally open at the switch springs 19 and 20, and that it is essential to close this switch before a subscriber can signal the central office. A subscriber cannot close the supplementary switch 22, however, without properly actuating the register, which comprises a part of the service meter of my invention. With this preliminary explanation of the method of connection in the circuit, I shall now refer to the construction and manner of operating the service meter *per se*.

This device is mounted upon a suitable base plate 30. The springs 19 and 20 of the supplementary switch 22 are mechanically mounted upon but insulated from a suitable standard 31 which is carried by the base plate. The plunger or button which operates these springs is shown at 32. This button forms the exposed end of a sliding plunger 33. The plunger in turn carries an actuating stud 34 of suitable insulating material. It is this stud which directly engages the switch springs 19 and 20. The standard 31 carries also a spring latch 35. Fig. 11 shows what is the normal position of the hook 36 of the latch spring with respect to the contact springs 19 and 20. When the plunger 33 is depressed, the stud 34, engaging the ends of both of the switch springs, depresses them until the hook of the latch snaps over the switch spring 20 to retain it in its alternative position. The switch spring 19 has at the same time been depressed, thus temporarily preventing electrical connection, but the removal of the pressure from the button will permit the



restoration of the plunger 33 to its normal position by virtue of the pressure of the spring 37, and upon this return movement of the plunger, the spring 19 will follow up the actuating stud 34 in its return toward the normal position. The spring 20 will be retained, however, in its actuated position, whereupon electrical connection will be made between the two springs, this connection being maintained by the latch spring 35 which has become hooked over the depressed switch spring 20. It is the establishment of the electrical connection between these two springs which permits the subscriber by removing his receiver from the switchhook *h* to establish a connection between the line limb *a* and ground over a circuit through the primary winding of the subscriber's induction coil *i*, the electromagnet windings 21, the switch springs 20 and 19, and the wire 38. It is the closure of this circuit which actuates the line signal and attracts the operator's attention. When such a circuit to ground is established, and this is the only low resistance circuit which a subscriber can establish to ground, the line signal will be actuated and the operator will make the required connection. My invention provides mechanism whereby the closure of this switch to ground must necessarily cause the proper actuation of the register. In the preferred embodiment of my invention this register is in the form of a small Veeder cyclometer 40 provided in the usual manner with a ratchet to prevent it from running in the reverse direction. The actuating shaft 41 extends from this cyclometer to the stamping 42 which forms the guide for the plunger 33 as well as a bearing for the end of the shaft 41 upon which the small ratchet wheel 43 is mounted. Upon the plunger 33 there is pivoted at 44 an irregularly shaped pawl 45. This pawl has a lip at 46 which engages with the teeth of the ratchet wheel 43. The depression of the plunger in order to establish connection between the springs 19 and 20 necessarily causes, therefore, a partial revolution of the ratchet wheel 43, the movement of the plunger being such that one number will be turned up in the register.

My invention provides for the certain actuation of the register in the fact that the exact position of the hook of the latch spring 35 can be adjusted through the play of the hole through which the fastening screw 47 is passed. The position of the hook of the latch spring is so adjusted that the plunger must be pushed just far enough to turn up one number and permit the actuation of the ratchet of the register before the hook snaps over the top of the spring 20. In order that a subscriber cannot make electrical connection in the supplementary switch 22 until the register has actually been operated, I pro-

vide for the simultaneous depression of the springs 19 and 20 as previously described, by means of the stud 34. It is not until after the latch has engaged the spring 20 and the subsequent return of the plunger to its normal position, that contact is made by the spring 19, and the apparatus is so adjusted that the engagement of the spring 20 by the latch spring 35 means necessarily that the register has been properly operated, as previously described.

It will be apparent that the springs 19 and 20 will remain in their operated condition, due to the engagement of the spring 20 by the latch spring 35, until the switch has in some manner been restored to its original condition. The restoration of this supplementary switch is under the control of the operator at the central office. If after the subscriber asks for a connection and the operator calls the required subscriber and he in turn answers his call, then under the usual method of operating, the central office operator will actuate a switch, as, for example, that shown diagrammatically in Fig. 13 at 50, to connect the positive terminal of a source of current of 110-volts *S* with the tip side of the line. The other side of this source of current will become grounded, so that a circuit may be traced over the tip side of the line, through the windings 21 of the electromagnet and the closed contacts of the supplementary switch 22 to ground. The electromagnet windings are provided with the same letters of reference in the apparatus drawings as in the diagrammatic drawing of Fig. 13. These windings, it will be seen, are mounted upon the cores of an electromagnet which is polarized by the permanent magnet 51. The armature 52 of this electromagnet is pivoted at 53 and provided with adjustable retracting springs 54 and 55. These retracting springs hold the armature in a neutral or intermediate position. It is because of the polarization of this electromagnet that a positive current impulse flowing through the electromagnet windings from the line to ground, will energize the cores in such a direction that the armature will be actuated in the direction of the small arrow head 56. The retracting springs 54 and 55 are so adjusted that the current due to the 24 or 40 volt line battery 14 or 18 is insufficient to actuate the armature. As best shown, perhaps, in Fig. 5, the latch spring 35 is provided with a cam surface at 57, this cam surface being engaged by the lever 58 which projects from the armature 52. It will be apparent that the slight rotation of the armature in the direction of the arrow 56 due to the flow of the heavy current from the 110 volt source, will cause the lever, co-operating with the cam surface 57, to disengage the latch spring 35 from the contact spring 20, whereupon the supplementary



switch will be returned fully to its normal condition. The subscriber cannot initiate another call without again causing an actuation of the register. One of the principal advantages of my invention resides in the fact that the subscriber must positively and mechanically actuate the register in initiating a call. The positive actuation of the register is not dependent upon some act to be performed by the operator at the central station or by the subscriber at some subsequent stage of the establishment of a connection. The advantages in having the subscriber actuate the register in initiating a call and even before the operator establishes connection with the line, will be apparent to those skilled in the art, particularly since the operator is enabled to restore the service meter and telephone set to its normal condition at any time during the connection with the called subscriber, or, in fact, after the conversation has been completed.

Manifestly a different mode of operation and result are required in order that the subscriber shall not be charged for those calls which do not result in answers from the called subscriber. My invention provides means whereby the operator in such cases may throw the mechanism of the service meter into an abnormal condition such that the succeeding call may be made without actuating the register. The means for accomplishing this result comprises in part a hook-like extension 60 upon the pawl, which engages the teeth of the ratchet wheel 43. When a negative current impulse of sufficient strength is passed through the windings 21 of the electromagnet, the armature is thrown in a direction the reverse of that indicated by the arrow 56, and on account of the engagement of the lever 58 with the hook 60, the pawl 45 will be raised so that the lip will be withdrawn from a position in which it may engage the teeth of the ratchet wheel, this alternate position being shown in Fig. 8. The opening between the hook 60 and the main part of the pawl 45 is of such width that the customary movement of the armature 52 in the direction of the arrow 56 is not interfered with. A small spring catch 61 engages a projection 62 at the end of the pawl 45, so that after the flow of the negative current impulse through the coils of the electromagnet the pawl will be retained in its alternate position. The length of the face of the extension 62 is such that when the plunger is again depressed in the initiation of another call, the pawl 45 will be carried upon the end of the spring catch 61 until after the tooth of the ratchet wheel has been passed. When, however, the plunger has been depressed enough to cause the spring 20 to be latched by the hook of the spring latch 35, the pawl will be released from the spring catch 61 and thus restored

to a condition in which its normal operation will take place as previously described. With this preliminary description of the mechanism the operation of the system will be clear.

If for any reason the called subscriber fails to answer, or if the called line is busy, the central office operator, instead of actuating the key 50 to send a positive impulse over the tip side of the line, will actuate the alternate key 63, thus connecting the negative pole of the grounded source of 110 volt current with the tip side of the line, and this current traversing the electromagnet windings 21 will throw the armature 52 in a direction the reverse of that indicated by the arrow 56, thus throwing the pawl 45 into its alternate position where it will be caught by the light spring catch 61. The lever 58 will at the same time engage the cam surface 64 of the spring latch 35, thus causing it to disengage the spring 20 and permitting this spring to return to its normal position, thus opening the supplementary switch 22. The flow of this negative current impulse, therefore, puts the mechanism of the service meter into such condition that the next succeeding actuation of the button will not cause an actuation of the register. The operation of the device corresponds with the theory that when a subscriber actuates his button and therefore the register in initiating a call which is not answered, he will be credited with one call, so that the next succeeding call may be initiated without charge upon his register. In order to indicate to the subscriber the fact that the operator has properly credited him, I provide upon the pawl 45 a target 65, the face of this target being divided into two sections, as best indicated in Fig. 3, the lower section bearing the word "Credit" and the upper section being blackened. Under normal conditions, as best indicated in Fig. 4, the black section of the target rests below the window 66. When the operator sends out a negative current impulse to give the subscriber a credit for the next succeeding call, the pawl 45 is thrown into its alternate position where it is held by the spring catch 61, and in this position the lower section of the target bearing the word "Credit" is brought into register with the window 66, as shown in Fig. 1. The subscriber seeing this credit sign will know from experience that he may initiate another call without actuating the register and charging himself accordingly. The cover 67 surrounds the mechanism but is provided with an opening through which the button 32 projects in order to be accessible to the subscriber. The cover is preferably provided, also, with a window at 68, so that the subscriber may keep track of the registration. The cover may be locked in position in any desired manner. To pre-



vent the subscriber having access to the mechanism of the instrument, I have shown at 69 and 70 small bolts, the nuts of which are locked in position by the seals 71 and 72.

5 In addition to the simplicity of the service meter, and the fact that it is located at the subscriber's station where he may keep track of its operation, and the certainty of its being properly actuated upon the initiation of  
10 every call, my invention is of particular value when used in conjunction with a well-known form of coin collecting apparatus for use at telephone stations. Fig. 13 indicates diagrammatically at substation 10 the circuit  
15 of this coin collecting apparatus. The deposit of a coin, indicated at 80, is required to close the switch 81, and the subscriber is unable to signal the central office until this switch is closed. The operator by throwing  
20 a heavy positive current impulse between the tip side of the line and ground actuates the mechanism associated with the electromagnet 82 to guide the coin to the closed receptacle, which is accessible only to the agents  
25 of the operating company. If for any reason the call is not answered or completed, the operator sends out a negative current impulse which throws the mechanism associated with the electromagnet 82 in a reverse  
30 direction, which causes the return of the deposited coin to the telephone subscriber.

It will be apparent, therefore, that the service meter of my invention may be associated with a substation which is connected  
35 upon a party line, the other stations of which may be equipped with service meters of my invention or with coin collecting devices of the type indicated. My invention thus provides the advantage to an operating  
40 company of being able to provide a subscriber upon a party line either with a service meter or a coin collector, as he may prefer, and this without regard to the type of apparatus with which the other subscribers upon the same line are provided.  
45 A given party line may thus have either type of apparatus or both, and the central office equipment required for answering the calls from these lines is no more complicated  
50 nor different than is required for answering the calls of the well-known coin collector stations of the prior art.

Having thus described my invention, I claim and desire to secure by Letters Patent:

55 1. In combination, a telephone line leading from a substation to an exchange, of a supplementary switch at the substation for closing the line circuit, a register, means for actuating said register upon the closure of  
60 said supplementary switch, and means in a separate circuit from the talking circuit controlled from the central office to permit the closure of said switch without actuating said register.

85 2. In a telephone metering system, a tele-

phone line, talking apparatus associated with the line, a register connected to the line, manual means for operating the register, and an electrical circuit independent of the talking apparatus for disconnecting the  
70 manual operating means of the register.

3. In a telephone service meter, the combination with a circuit for signaling the central office, of a normally open supplementary switch in said circuit comprising two switch  
75 springs, a register, a plunger and associated mechanism for actuating said register, means for depressing both of said switch springs substantially to a corresponding degree upon the depression of the plunger, a latch for  
80 catching and retaining one of the switch springs upon the actuation of the register whereby the restoration of the plunger permits the other switch spring to make contact with the one retained by said latch. 85

4. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a latch for maintaining the closure of said switch when actuated, a register operated by said switch to  
90 record the number of actuations thereof, an electromagnet at the substation in a circuit controlled by the central office operator, and mechanism actuated upon the energization of said electromagnet to release said latch  
95 and to break the operative association between said switch and said register.

5. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a register operatively associated with said switch to record  
100 the number of closures thereof, an electromagnet at the substation in a circuit separate from the talking circuit and controlled by the central office operator, mechanism actuated upon the energization of said electro-  
105 magnet to break the operative association between said switch and said register, and mechanism for restoring the operative relationship between said register and said switch upon the unrecorded closure of said switch. 110

6. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a latch for maintaining the closure of said switch when actuated, a register operated by said switch to  
115 record the number of actuations thereof, an electromagnet at the substation in a circuit including said switch and controlled by the central office operator, and mechanism actuated upon the energization of said electromagnet to release said latch. 120

7. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a latch for maintaining the closure of said switch when actuated, a register operated by said switch to  
125 record the number of actuations thereof, an electromagnet at the substation in a circuit 130



including said switch and controlled by the central office operator, and mechanism actuated upon the energization of said electromagnet to release said latch and to break the operative association between said switch and said register.

8. In a device of the class described, the combination with a telephone line leading from a substation to an exchange, of a normally open switch in the signaling circuit at the substation, manually operated mechanism for closing said switch, a register normally operated upon the actuation of said switch closing mechanism to record the number of such closures, a latch for maintaining the closure of said switch, an electromagnet at the substation in a circuit including said switch and controlled by the central office operator, an armature serving upon energization of said electromagnet to release said latch and to operatively disconnect said register from the switch closing mechanism, and means for automatically reestablishing said connection between the switch closing mechanism and said register upon the unrecorded actuation of the switch closing mechanism.

9. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a latch for maintaining the closure of said switch when operated, a register operatively associated with said switch to record the number of closures thereof, an electromagnet at the substation in a circuit controlled by the central office operator, mechanism actuated upon the energization of said electromagnet to release said latch and to break the operative relation between said switch and said register, mechanism for restoring the operative association between said switch and said register upon the unrecorded closure of said switch, and means for releasing said latch without affecting the operative association between said switch and said register.

10. In a service meter for telephone lines, a normally open switch at the substation for signaling the central office, a latch for maintaining the closure of said switch when operated, a register operatively associated with said switch to record the number of closures thereof, an electromagnet at the substation in a circuit controlled by the central office operator, mechanism actuated upon the energization of said electromagnet to release said latch and to break the operative relation between said switch and said register, and means for releasing said latch without affecting the operative association between said switch and said register.

11. In combination, a party telephone line leading from a plurality of substations to an exchange, a normally open switch in the signaling circuit at each substation, a register at each substation, mechanism at each substation for closing the associated switch and

conjointly therewith, causing the actuation of the associated register, an electromagnet at each substation in circuit with the associated switch, a latch at each substation for maintaining the closure of the associated switch, mechanism for releasing each latch upon the energization of the associated electromagnet in either direction, and mechanism at each substation actuated upon the energization of the associated electromagnet in one direction only to remove the register from the control of the switch closing mechanism.

12. In combination, a party telephone line leading from a plurality of substations to an exchange, a normally open switch in the signaling circuit at each substation, a register at each substation, mechanism at each substation for closing the associated switch and conjointly therewith, causing the actuation of the associated register, an electromagnet at each substation in circuit with the associated switch, a latch at each substation for maintaining the closure of the associated switch, mechanism for releasing each latch upon the energization of the associated electromagnet in either direction, mechanism at each substation actuated upon the energization of the associated electromagnet in one direction only to remove the register from the control of the switch closing mechanism, and means for restoring the control of the register by the switch actuating means automatically by virtue of an unrecorded actuation of said switch actuating means.

13. A line circuit leading from a substation to a central office, means whereby the central office may be signaled from the substation, register mechanism mechanically connected with said means and recording the initiation of such calls, and mechanism controlled from the central office for rendering said register mechanism inoperative by a circuit independent of the circuit through the substation talking apparatus.

14. In combination, a telephone party line extending from a plurality of substations to an exchange, of a switch at each substation for signaling the central office, mechanism located at each substation for recording the actuations of the associated switch, means located at each substation serving normally to prevent the closure of the associated switch without actuating the associated registering mechanism, normally inoperative electromagnetic mechanism at each substation controlled from the central station to render temporarily inoperative the associated registering mechanism, and means for placing in operative condition the associated electromagnetic mechanism upon the closure of the signaling switch at any substation.

15. In combination, a telephone set includ-



ing a hook switch for controlling the circuit through the telephone apparatus, a normally open supplementary switch, a plunger for actuating said supplementary switch, a spring latch for maintaining the closure of said supplementary switch when actuated, a register, a ratchet wheel for driving said register, a pawl carried on said plunger and adapted normally to engage and rotate said ratchet wheel upon the depression of said plunger, a polarized electromagnet, mechanism actuated by said electromagnet when energized in either direction to release said spring latch, mechanism actuated by said electromagnet when actuated in one direction only to throw said pawl into an abnormal and inoperative position where it will not be engaged by said ratchet wheel upon depression of the plunger, a spring catch for retaining said pawl in said abnormal position, means whereby the depression of the plunger disengages the pawl from said spring catch when detained thereby, all located at each of several substations, a line circuit leading from said substations, a central office, a line signal at the central office, the actuation of said line signal being effected by the concurrent closure of the hook switch and the supplementary switch at any substation, a circuit containing a source of current controlled from the central office and including any of the electromagnets whose associated supplementary switch is closed, whereby the central office operator may control the operation of the polarized electromagnet at any substation at which a call has been initiated, and a target at each substation serving automatically to indicate the condition of the associated pawl.

16. In combination, a telephone line leading from a substation to an exchange, a supplementary switch at the substation for closing the line circuit, a register, means for actuating said register upon the closure of said supplementary switch, and means in a circuit to ground from one line limb and controlled from the central office to permit the closure of said switch without actuating said register.

17. In a telephone metering system, a telephone line, talking apparatus associated with the line, a register connected to the line, manual means for operating the register, and an electrical circuit from the line to ground for disconnecting the manual operating means of the register without including the talking apparatus in such circuit.

18. In a telephone service meter, a register, manual means for operating the register, switch contacts adapted to close an electrical connection between the terminals of the meter, actuation of the manual means adapted to first operate the register and after such operation to close such switch contacts and means electrically operated for

disconnecting the manual operating means from the register.

19. In a telephone service meter, a register, manual means for operating the register, switch contacts adapted to close an electrical connection between the terminals of the meter, and an electromagnet in such connection, actuation of the manual means adapted to first operate the register and after such operation to close such switch contacts, such electromagnet adapted to be inert for small currents but responsive to increased currents to release such contacts.

20. In a telephone service meter, a register, manual means for operating the register, switch contacts adapted to close an electrical connection between the terminals of the meter, and an electromagnet in such connection, actuation of the manual means adapted to first operate the register and after such operation to close such switch contacts, such electromagnet adapted to be inert for small currents but responsive to increased currents to interrupt the mechanical connection between the manual means and the register.

21. In a telephone service meter, a register, manual means for operating the register, switch contacts adapted to close an electrical connection between the terminals of the meter, and a polarized electromagnet in such connection, actuation of the manual means adapted to first operate the register and after such operation to close such switch contacts, such electromagnet adapted to be inert for small currents but responsive to larger currents of one sign to release such contacts and also responsive to correspondingly large currents of opposite sign to interrupt the mechanical connection between the manual means and the register.

22. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter to operate the register and line signal, and means in such signaling circuit controlled from the exchange for interrupting the operating of the register without affecting the operating of the line signal.

23. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter, actuation of such manual means adapted to first operate the register and after such operation to operate



such line signal, means for mechanically locking the signaling circuit in closed condition, and means controlled from the exchange for releasing such locking means.

24. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter to operate the register and the line signal, means for mechanically locking the signaling circuit in closed condition, and means in the signaling circuit controlled from the exchange for releasing such locking means.

25. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter, actuation of such manual means adapted to first operate the register and after such operation to operate such line signal, means controlled from the exchange for interrupting the operating of the register without affecting the operating of the line signal, means for mechanically locking the signaling circuit in closed condition, and means controlled from the exchange for releasing such locking means.

26. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter to operate the register and the line signal, means in such signaling circuit controlled from the exchange for interrupting the operating of the register without affecting the operating of the line signal, means for mechanically locking the signaling circuit in closed condition, and means in the signaling circuit controlled from the exchange for releasing such locking means.

27. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter, actuation of such manual means adapted to first operate the register and after such operation to operate such line signal, means for mechanically

locking the signaling circuit in closed condition, and common means controlled from the exchange for interrupting the operating of the register without affecting the operating of the line signal and for releasing such locking means.

28. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter to operate the register and the line signal, means for mechanically locking the signaling circuit in closed condition, and common means in the signaling circuit controlled from the exchange for interrupting the operating of the register without affecting the operating of the line signal and for releasing such operating means.

29. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter, actuation of such manual means adapted to first operate the register and after such operation to close contacts adapted to operate such line signal, means for holding such contacts closed after the operation of such manual means, and means operated from the exchange for releasing such holding means and thereby opening such contacts.

30. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means connected with the meter, the depression of such operating means serving to operate the register and the return of such operating means to normal position serving to close contacts adapted to operate such line signal, means for holding such contacts closed after the operation of such manual means, and means operated from the exchange for releasing such holding means and thereby opening such contacts.

31. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actuations thereof, manual operating means con-



5 nected with the meter, contacts adapted when closed to close such signaling circuit, means for engaging and locking such contacts by the operation of such manual means, and means for closing such contacts in locked position when such manual means is returned to normal position.

10 32. In a telephone system, a telephone line extending by its limbs from a substation to an exchange, a line signal at the exchange adapted to be operated over one of the line limbs from the substation, a service meter at the substation, a register associated with the meter for indicating the number of actua-  
15 tions thereof, manual operating means connected with the meter, actuation of such manual means adapted to operate the register, contacts adapted when closed to close such signaling circuit, means for engaging  
20 and locking such contacts by the operation of such manual means, means for closing such contacts in locked position when such manual means is released and returned to normal position, and common means con-  
25 trolled from the exchange for releasing such locking means or releasing such locking means and interrupting the mechanical connection between the manual operating means and such register as desired.

30 33. In a device for vending service, a meter adapted to be actuated by the patron in obtaining service to render a charge for service, means under the control of the

vender to re-set the meter to receive a second actuation by the patron, and means under  
35 the control of the vender to cause said meter not to register a charge for service when actuated by the patron when next obtaining service.

34. In a device of the class described, the combination of a circuit leading from a cen-  
40 tral office to a subscriber's station, a switch at the subscriber's station, it being necessary for the subscriber to close the said switch in initiating a call, a mechanical detent for  
45 maintaining the closure of said switch, a register mechanism for advancing said register upon the closure of said switch, and electro-magnetic means controlled by the  
50 central office operator to release the detent or operatively to disconnect the register from the switch actuating mechanism.

35. In a telephone service meter, the combination with a call sending switch, of a call register, the operation of which is adapted  
55 to operate said call switch, and an electro-magnet under the control of the central office operator adapted to restore said switch to normal.

In witness whereof, I hereunto subscribe  
60 my name this 13th day of June A. D., 1907.

OLIVER C. DENNIS.

Witnesses:

LYNN A. WILLIAMS,  
GEORGE E. HIGHAM.