F. F. KINNEY.

REGISTER MECHANISM FOR INDICATING INSTRUMENTS.

APPLICATION FILED APR. 5, 1909.

961,358. Patented June 14, 1910.

Fig. 1.

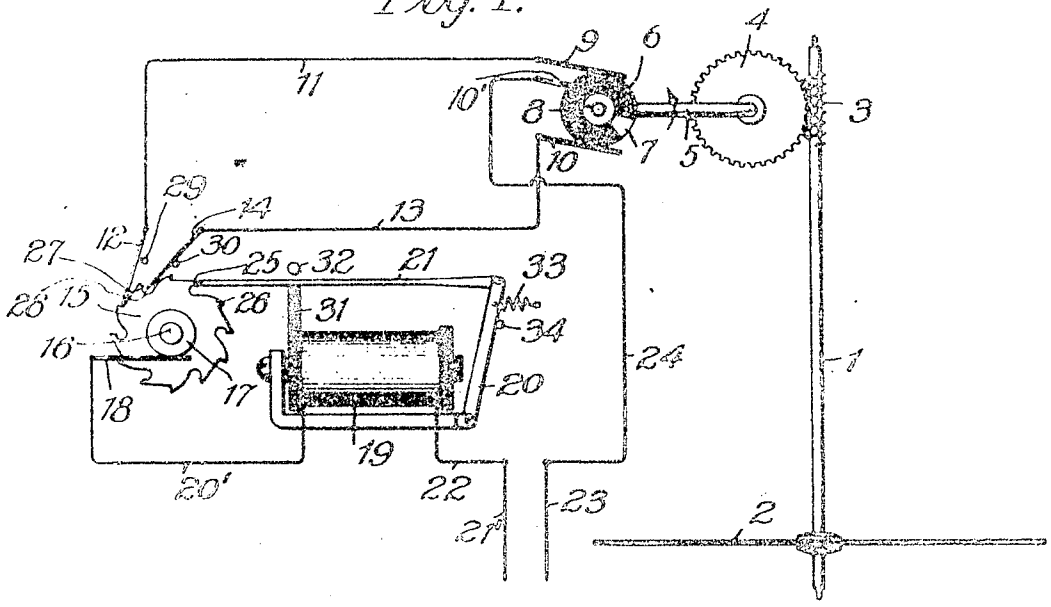


Fig. 2.

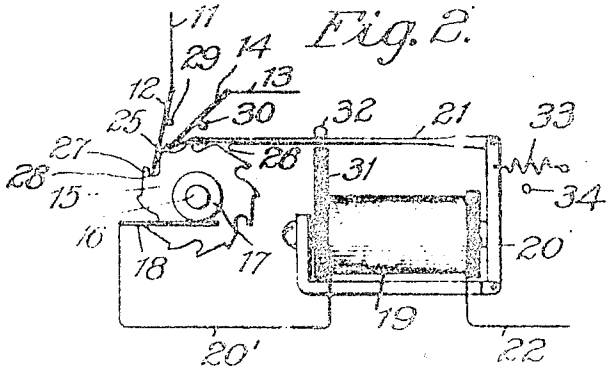
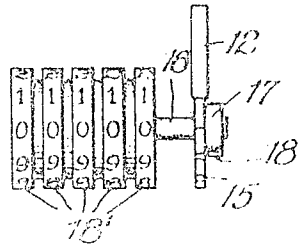


Fig. 3.



UNITED STATES PATENT OFFICE.

FRANK F. KINNEY, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO MINERALLAC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

REGISTER MECHANISM FOR INDICATING INSTRUMENTS.

961,358. Specification of Letters Patent. Patented June 14, 1910.

Application filed April 5, 1909. Serial No. 488,028.

To all whom it may concern:

Be it known that I, FRANK F. KINNEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Register Mechanisms for Indicating Instruments, 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.

My invention relates to electrically operated register mechanisms for indicating instruments.

Although primarily intended for use in connection with electrical measuring instruments, it is obvious that the register mechanism may be applied to various kinds of summation instruments in which the movable part is actuated proportionately to the amount of the particular force or agent to be measured.

For the purpose of best illustrating my invention, I have shown the same in connection with the movable armature of an electrical measuring instrument. It is well known that in the ordinary form of these devices, the registering or indicating mechanism is directly connected to and driven by the armature through suitable gearing. According to my invention, the indicating mechanism may be situated at any distance from the meter itself, and is actuated by electromagnetic means, whose circuit is primarily controlled by the rotation of the armature, the adjustment being such that the actuations of this indicating mechanism are proportional to the amount of rotation of the armature. The circuit of the electromagnet is controlled by two circuit closers, one of which is directly operated by the meter armature, while the other is operated by the electromagnet, and serves at the same time as the actuating member of the indicating device. In the particular embodiment herein illustrated, this second circuit closer consists of a ratchet wheel having associated therewith properly arranged spring contacts for closing and opening the energizing circuit of the electromagnet. The armature of this magnet actuates, when attracted, the ratchet wheel, at the same time breaking the circuit when the end of the stroke has been reached, even though the contacts of the first circuit closer should remain together. It might very readily happen that the armature would stop at the time just when the contacts of the circuit closer, which is directly connected with the armature, remained in closing position. Now, were it not for the circuit closer operated by the electromagnet, the circuit would, under such condition, remain closed through the winding of the magnet until the meter had been started up again, which might not occur for hours, and perhaps for days. Such an arrangement would never find a place in actual use. This objection is completely overcome by the novel mechanism which I have devised, and one form of which is shown in the drawings, wherein—

Figure 1 is a general view of my invention used in connection with an electric meter; Fig. 2 is a view showing the armature in its attracted position, after having actuated the ratchet wheel one step; Fig. 3 is a front view of the numeral wheels, showing the ratchet wheel which actuates the same.

The shaft 1 carries the armature disk 2, of conducting material, such as copper. I have not deemed it necessary to show the field magnets that act upon this armature, for the reason that this is a detail which is well understood by those conversant with electric meters. Although the armature as shown is one that is commonly used in alternating current meters, I would have it understood that my invention is by no means limited to this species of meters. The shaft 1 is provided with the worm 3, which engages with the gear wheel 4 fixed upon one end of the shaft 5. The other end of this shaft carries the disk 6 of insulating material, having the metallic segment 7, which is electrically connected with the collector ring 8. A pair of brush arms 9 and 10 engages the periphery of the disk to make contact with the segment 7 as the disk is rotated by the armature. A contact member 10′ bears upon the collector ring 8 as the same is rotated. A conductor 11 connects the brush arm 9 with the spring contact 12, while the conductor 13 connects the brush arm 10 with the spring contact 14. The spring contacts 12 and 14 are associated with the ratchet wheel 15, made of a suitable conducting material, and firmly fixed

upon the shaft 16. Beside the ratchet wheel 15 is situated the collector ring 17, in electrical connection therewith. A contact member 18 is arranged to bear upon the collector ring 17. A series of properly arranged numeral wheels 18 are mounted upon the shaft 16, to be actuated by the ratchet wheel 15. For the sake of simplicity and clearness, I have not attempted to show all of the details that are found in counters having decimally arranged numeral wheels for the reason that such details are well known in the art. Thus, for instance, I have not shown the carry-over devices that are associated with the numeral wheels.

The ratchet wheel 15 is actuated by the electromagnet 19, whose armature 20 has connected therewith the arm 21, whose free end is arranged to rest against one of the teeth of the ratchet wheel when the armature is in its withdrawn position, in order to be ready to actuate the ratchet wheel when the electromagnet is energized. One end of the magnet winding is connected to the contact member 18, through the conductor 20′, while the other end of the winding is connected to the leading-in wire 21′, through the conductor 22. Contact member 10′ is connected to the other leading-in wire 23, through the conductor 24.

The operation of my invention will now be apparent: As the armature is rotated under the influence of the magnetic field created by the field magnet windings of the meter, the disk 6 will be rotated and the metallic segment 7 will come alternately under the brush arms 9 and 10. Let us assume that the segment 7 is in contact with the brush arm 9, while the other parts are in the position in which they are shown in Fig. 1. Circuit may now be traced as follows: from the positive wire 23 to the conductor 24, contact member 10′, collector ring 8, segment 7, brush arm 9, conductor 11, spring contact 12, through the ratchet wheel 15, collector ring 17, contact member 18, conductor 20′, through the winding 19 of the electromagnet, conductor 22 and the return wire 21′. This will energize the electromagnet, and the armature 20 will be drawn up into the position in which it is shown in Fig. 2. During this movement of the armature, the arm 21, by virtue of its engagement with the tooth 25 of the ratchet wheel, will move the latter into the position in which it is shown in Fig. 2. The arm 21 will now rest upon the tooth 26, with its free end still against the tooth 25, so that it forms a positive lock against any further forward movement of the ratchet wheel. As a precaution against backward movement of the ratchet wheel, the spring contacts 12 and 14 are so arranged that when the armature is in its withdrawn position, as shown in Fig. 1, the spring contact 12 will rest with its free end against one of the teeth. When the position of the ratchet wheel is such that the spring contact 12 rests in one of the cutaway portions 28, then the spring contact 14 will perform this locking function in the same manner. In this way, the spring contacts 12 and 14, besides acting as collecting devices, may perform the duty of locking dogs for the ratchet wheel. As soon as the arm 21 has reached the limit of its travel, the tooth 27 will pass from under the spring contact 12, thus breaking the circuit through the electromagnet before the segment 7 will have passed from under the brush arm 9. In order that the spring contact 12 may not come into engagement with the next tooth after its disengagement from tooth 27, alternate ones of the teeth are cut away at 28, in order to accommodate the free end of the spring arm 12 when the parts are in the position as shown in Fig. 2, or the free end of the spring contact 14 when the parts are in the position as shown in Fig. 1, where the armature is in its withdrawn position. A stop 29 holds the free end of the spring contact 12 about midway in the cutaway portion 28, as shown in Fig. 2, while a stop 30 prevents the spring contact 14 from closing the circuit through the next succeeding tooth after it has broken engagement with the preceding tooth, as shown in Fig. 1. The insulating piece 31 forms a support for the arm 21 when the armature is in its withdrawn position. With the arm 21 as shown in Fig. 2, the stop 32 prevents the arm from being raised out of contact with the ratchet wheel. As soon as the electromagnet is deenergized, the armature is retracted by the spring 33 against the stop 34. The parts are so proportioned that every time the ratchet wheel is actuated by the electromagnet, the corresponding actuation of the indicating wheels 18 will be proportional to and representative of the amount of rotation of the armature, since the last preceding actuation of the ratchet wheel. In this way, the numeral wheels may be made to indicate ampere hours or watt hours. Or, if the invention be applied to measuring instruments other than electrical, as, for instance, gas meters or water meters, the connections may be such that each step by step movement of the indicating wheels will represent so many cubic feet of gas or so many gallons of water. Of course, it is not necessary that the ratchet wheel be connected with indicating members such as the numeral wheel 18. Any other suitable kind of indicating device may be used in connection with the ratchet wheel 15, as, for instance, a pointer moving over a properly graduated dial.

It will be apparent, from the above, that the circuit closer which is driven directly by the armature and has for its moving part the disk 6, is altogether relieved of the task

of breaking the circuit through the electromagnet. For this reason, the brush arms 9 and 10 need but make very light contact with the segment 7. Otherwise, were the circuit broken between the segment 7 and the brush arms 9 and 10, the inevitable sparking at the moment of breaking would soon destroy the parts. The ratchet wheel 15, however, breaks the circuit so suddenly when the arm 12 snaps off the engaging tooth into the cutaway portion 28 of the next succeeding tooth, that the sparking is but slight and of brief duration. In the case of the disk 6, its movement might sometimes be so slow that if the circuit had to be broken by the segment 7 and the associated contacts 9 and 10, the sparking would be so prolonged that the parts would be destroyed by a single interruption of the circuit. As for the ratchet wheel 15, however, its operation is always the same step by step movement, no matter how slow or how fast the movement of the disk 6.

Although I have set forth my invention by illustrating and describing a specific embodiment thereof, I would have it understood that many of the details may be varied without departing from the scope of my invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination with the rotatable member of a measuring instrument, of a circuit-closer operated by said member, an electromagnet provided with an armature, a disk adapted to be actuated by said armature when the electromagnet is energized, a pair of permanently separated contacts associated with said disk to engage the same and form therewith a second circuit-closer, an energizing circuit for said electromagnet controlled by said circuit-closers, and an indicating device operated by said disk proportionately to the amount of actuation of said rotatable member.

2. The combination with the rotatable member of a measuring instrument, of a circuit-closer operated by said member, an electro-magnet provided with an armature, a rotatable disk adapted to be actuated by said armature when the electro-magnet is energized, a pair of permanently separated contacts associated with said disk to form therewith a second circuit-closer, an energizing circuit for said electro-magnet controlled by said circuit-closers, and numeral-wheels operated by said second circuit-closer proportionately to the amount of actuation of said rotatable member.

3. The combination with the rotatable member of a measuring instrument, of a circuit-closer operated by said member, an electromagnet provided with an armature, a ratchet wheel operated by said armature when the electromagnet is energized, a pair of spring contacts associated with said ratchet wheel and arranged to come into and out of engagement with the teeth thereof as the ratchet wheel is operated, an energizing circuit for the electromagnet controlled by said circuit-closer and said ratchet wheel with its associated contacts, and a series of numeral wheels connected with said ratchet wheel and actuated thereby proportionately to the amount of actuation of said rotatable member.

4. The combination with the rotatable member of a measuring instrument, of a commutator provided with a metallic segment connected with said rotatable member to be operated thereby, a pair of brush-arms engaging said commutator, an electromagnet having an armature, a ratchet wheel operated by said armature when the electromagnet is energized, a pair of spring contacts associated with said ratchet wheel and arranged to come into and out of engagement with the teeth thereof as the ratchet wheel is operated, the teeth of said ratchet wheel being such that said spring contacts engage the same alternately, an electrical connection between each of said spring contacts and said brush-arms, an energizing circuit for said electromagnet, one side of said circuit being permanently connected with said metallic segment while the other side is permanently connected with one end of the winding of said electromagnet, the other end of said winding being connected with said ratchet wheel, whereby the circuit through said electromagnet is closed alternately across said connections, and an indicating device actuated by said ratchet wheel proportionately to the amount of actuation of said rotatable member.

5. The combination with the rotatable member of a measuring instrument, of a circuit-closer operated by said member, an electromagnet provided with an armature, a ratchet wheel operated by said armature when the electro-magnet is energized, said ratchet wheel being provided with teeth of which alternate ones have cutaway portions, a pair of spring contacts associated with said teeth so that when one contact engages a tooth to close the circuit the other contact is clear of the ratchet wheel by resting in one of said cutaway portions, whereby the circuit is closed alternately through said contacts, an energizing circuit for said electromagnet controlled by said circuit-closer and said ratchet wheel with its associated contacts, and an indicating device actuated by said ratchet wheel proportionately to the amount of actuation of said rotatable member.

6. The combination with the rotatable armature of an electric meter, of a commu-

tator driven thereby, an electro-magnet provided with an armature, a disk adapted to be actuated by the magnet-armature when the electro-magnet is energized, circuit-connections whereby said commutator and said disk control the circuit of the electro-magnet, and an indicating device operated by said disk proportionately to the amount of actuation of the meter-armature.

7. The combination with the rotatable armature of an electric meter, of a commutator driven thereby, an electro-magnet provided with an armature, a disk adapted to be actuated by the magnet-armature when the electro-magnet is energized, a shaft upon which said disk is rigidly mounted, circuit-connections whereby said commutator and said disk control the circuit of the electro-magnet, and a set of numeral-wheels actuated by said shaft proportionately to the amount of actuation of the meter-armature.

8. The combination with the rotatable armature of an electric meter, of a rotatable contact-member driven thereby, an electro-magnet provided with an armature, a second rotatable contact-member adapted to be actuate by the magnet-armature when the electro-magnet is energized, circuit-connections whereby said contact-members control the circuit of the electro-magnet, and an indicating device operated proportionately to the amount of actuation of the meter-armature.

9. The combination with the rotatable member of a measuring instrument, of a circuit-closer operated by said member, an electromagnet provided with an armature, a second circuit-closer adapted to be operated by said armature when the electromagnet is energized, said second circuit-closer comprising three contact members, two of said contact members being permanently separated and adapted to alternately engage the third contact member, an energizing circuit for said electromagnet controlled by said circuit-closers, and an indicating device actuated by said second circuit-closer proportionately to the amount of actuation of said rotatable member.

In witness whereof, I have hereunto signed my name this 2nd day of April, A. D. 1900.

FRANK F. KINNEY.

Witnesses:
A. A. THOMAS,
FRANK F. THELEN.