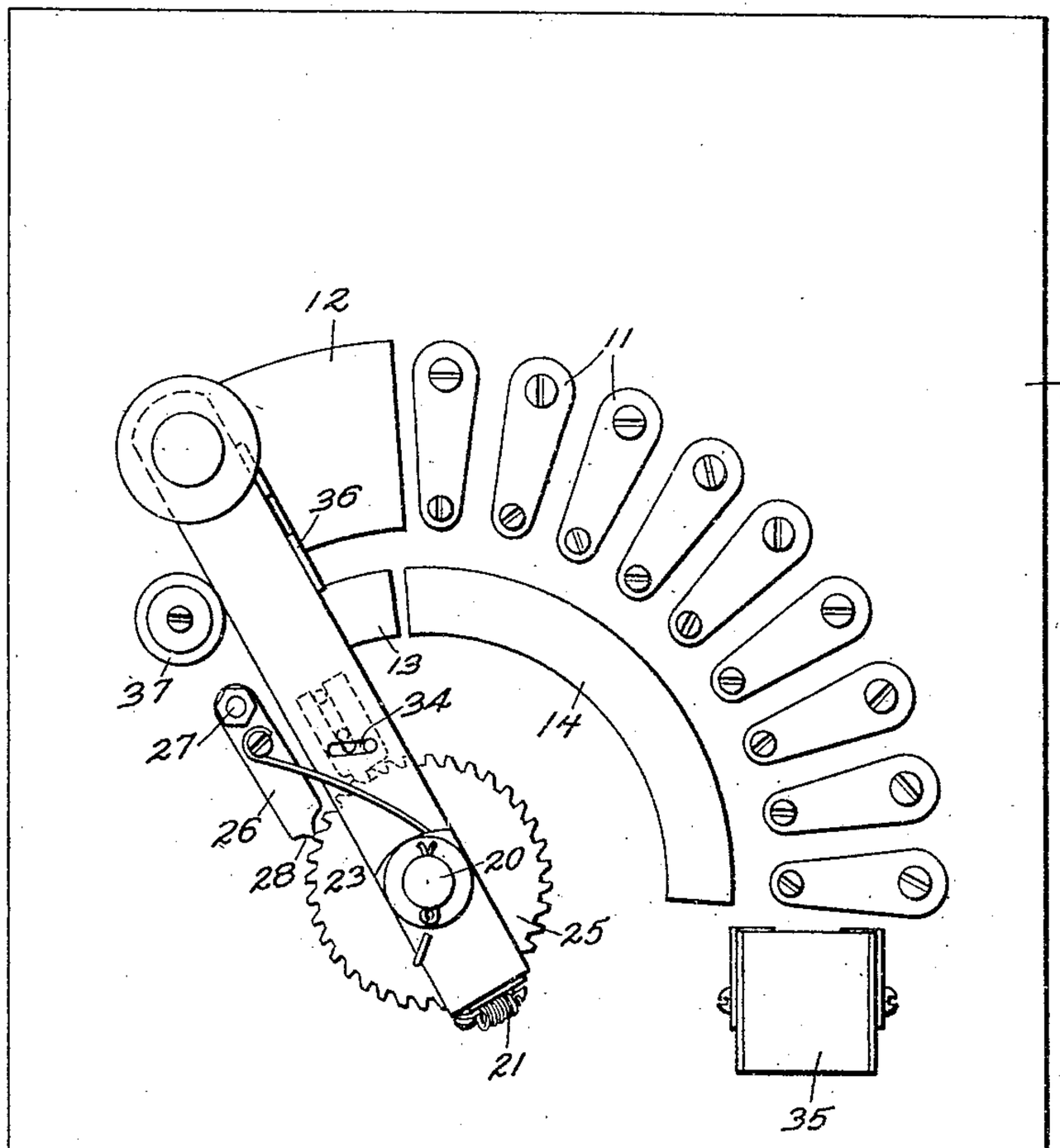
No. 840,889. PATENTED JAN. 8, 1907.

W. C. YATES & P. H. ZIMMER.

STARTING RHEOSTAT.

APPLICATION FILED APR. 26, 1906.

Fig. 1



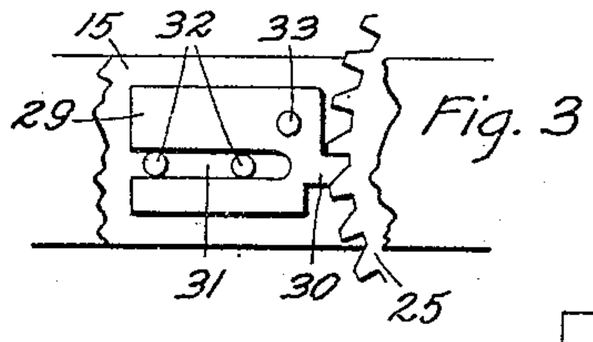


Fig. 3

Fig. 2

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UNITED STATES PATENT OFFICE.

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STARTING-RHEOSTAT.

No. 840,889. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed April 26, 1906. Serial No. 313,794.

To all whom it may concern:

Be it known that we, WILLIAM C. YATES and PAUL H. ZIMMER, citizens of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Starting-Rheostats, of which the following is a specification.

This invention relates to devices for controlling electric circuits, and has for its object the provision of a device of this character in which means are provided whereby a quick-break movement from contact to contact is given to the controlling-arm, together with means whereby the arm may be automatically returned to the "off" position.

In certain types of rheostats it is desirable to provide a snap action between the controlling-arm and the contact, especially in cases where there is a considerable drop of potential between adjacent contacts, so that the contacting parts will not be injured by imperfect contact or insufficient contacting area. A device of this character is also desirable and, in fact, essential where reactance is varied step by step, as in the arrangement shown in application filed by Howard Maxwell, Serial No. 301,029. In the cutting out of reactance step by step it is undesirable and sometimes dangerous to short-circuit the section or sections thereof, and it is therefore essential that means be provided whereby the controlling element makes a quick break with the contact and moves quickly to the next contact, the entire circuit being broken at each step.

In carrying out our invention, therefore, we provide a rheostat with mechanism whereby a step-by-step movement is given to a controlling-arm as it advances over the contacts, the operating-arm itself being advanced by a continuous motion. We also provide means in connection with a starting-rheostat whereby the step-by-step contacting mechanism is maintained in the running or short-circuiting position and on failure of voltage will be automatically returned to the starting position.

Our invention further consists in the features of construction and in the arrangement and combination of elements herein set forth, and particularly pointed out in the claims annexed hereto.

In the drawings, in which we have illustrated one form of our invention, Figure 1 is a plan view of a rheostat embodying our improvements. Fig. 2 is an elevation thereof, and Fig. 3 is a detail of the locking mechanism.

Referring to the drawings, 10 represents the usual insulating-base, of slate or soapstone, provided with a series of contact studs or segments 11, arranged in the arc of a circle and forming the terminals of starting-resistance, (not shown,) all of which, together with the dead contact 12, may be of the usual construction. Segments 13 and 14 may also be provided for some types of rheostat; but it should be understood that the particular form of rheostat or the contacts therefor form no part of our invention. The controlling mechanism comprises two arms—a controlling-arm 15 and an operating-arm 16, the former being provided with spring-pressed brushes 17 and 18 for engaging the contact-segments and the latter being provided with an operating-handle 19. The two arms are concentrically pivoted about the stud 20, so as to move independently of each other. The spring 21 draws the arms together, so that they have a tendency to occupy positions one above the other. The arm 16 has a U-shaped bend 22 at its pivoted end, so as to leave a space for a coiled spring 23 between the portions which bear on the stud 20. This spring has one end secured to the arm at 24, the opposite end being secured to some fixed portion of the base, as hereinafter shown. Between the two arms 15 and 16 a toothed wheel 25 is mounted on the stud 20. This wheel may be keyed to the stud 20, or it may be rotatable thereon, it simply being essential that it move independently of the arms 15 and 16. The teeth of this wheel are preferably ratchet-shaped—*i. e.*, having one face radial and the other beveled—and a pawl 26, pivoted to the base at 27, is adapted to engage the same. The pawl is spring-pressed toward the teeth in any desired manner, and for purposes of illustration we have shown this pawl spring-pressed by means of the spring 23. The pawl 26 has its engaging face shaped at 28 to conform to the beveled face of the ratchet-tooth and is positioned so as to prevent movement of the ratchet-wheel in a clockwise direction. As shown in the draw-

ings, however, we allow a very slight movement equal to the pitch of the teeth, the pawl upon starting riding upon the top of the teeth, but upon a slight movement dropping between the teeth and locking the wheel in place. Mounted to slide upon the arm 15 is a dog 29, having a projecting tooth 30 adapted to fit between the teeth of the ratchet-wheel 25. This dog is provided with a slot 31 and pins 32 to act as a guide. A pin 33 projects upward from the dog through a slot 34 in the arm 16. This slot is arranged at an angle with the bar 16, so that one end is nearer the stud 20 than the other. A no-voltage release-magnet 35 is arranged to engage an armature 36, secured to the operating-arm 16 to hold the same in running position.

The operation of our device is as follows: The parts being in the position shown in Fig. 1, to start the motor the operating-arm 16 is moved to the right by means of the handle 19. The two arms 15 and 16 move together for a short distance, the friction between the two and the dog being sufficient to keep them together, there being nothing to positively hold them apart. The wheel 25 likewise rotates with the arms for a similar reason. After a short movement, which in practice is sufficient to bring the arms within a distance from the first of the segments 11 equal to the distance between the successive segments, the pawl 26 drops between the teeth of the wheel, locking the latter in place. The arm 15, being locked to the wheel, is also stationary. The arm 16, however, is free to move independently for a limited distance. As it moves forward the pin 33, passing through the slot 34, gradually draws the dog 29 out of engagement with the teeth of the ratchet-wheel, the construction being preferably such that this disengagement takes place when the operating-arm is moved independently a distance equal to the distance between the contacts 11. At this point the dog is released from the teeth of the ratchet-wheel, and the arm 15 quickly follows the arm 16 with a snap action in response to the tension of the spring 21. In this way the controlling-arm 15 snaps over from contact to contact as the arm 16 moves continuously over the same. When the running position is reached, the arm 16 is held by the magnet 35, the controlling-arm being also locked by the teeth of the ratchet-wheel in this position. Upon failure of voltage the arm 16 is released and in response to the tension of the spring 23 returns to the off position in contact with the stop 37. The arm 15 and the ratchet-wheel 25 are likewise returned, the latter ratcheting past the pawl 26, the spring tension on which is relieved as the arm 16 returns.

In the foregoing we have described a particular mechanism whereby our invention may be carried out; but it should be understood that the arrangement is merely typical and that the details of our device may be greatly modified without departing from the spirit of our invention, the scope of which is set forth in the claims annexed hereto.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. A starting-rheostat comprising a variable impedance, a controlling-arm therefor biased to the starting position, and means for giving said arm a quick break between successive increments of the impedance.

2. A starting-rheostat comprising a series of contacts, a controlling-arm therefor biased to the starting position, means for giving said arm a quick break between adjacent contacts, and a no-voltage magnet for maintaining the arm in running position.

3. A starting-rheostat comprising a series of contacts, a controlling-arm adapted to successively e gage the same, an operating-arm, means for giving said controlling-arm a quick-break movement between adjacent contacts as the operating-arm is moved continuously over the contacts, and a no-voltage magnet for maintaining the controlling-arm in running position.

4. A starting-rheostat comprising a series of contacts, an operating-arm biased to the starting position thereof, a controlling-arm biased toward said operating-arm, means for giving said controlling-arm a step-by-step movement as the operating-arm is moved continuously toward running position, and a no-voltage magnet for retaining the latter in running position.

5. A starting-rheostat comprising a series of contacts, an operating-arm biased to the starting position thereof, a controlling-arm biased toward said operating-arm but normally locked in predetermined positions, means controlled by the movement of said operating-arm for unlocking at intervals the controlling-arm and allowing it to follow the operating-arm in response to its bias, and a no-voltage magnet for retaining the operating-arm in running position.

6. A starting-rheostat comprising a series of contacts, an operating-arm biased to the starting position thereof, a controlling-arm biased toward said operating-arm and pivoted concentrically therewith, a rotary member locked against movement with said arms toward running position, means for locking said controlling-arm to said member in predetermined positions, means controlled by the movement of the operating-arm toward running position for unlocking the controlling-arm and allowing it to follow the operating-arm in response to its bias, and a no-voltage magnet for retaining the latter in running position.

7. A starting-rheostat comprising a series of contacts, an operating-arm biased to the starting position thereof, a controlling-arm

biased toward said operating-arm and pivoted concentrically therewith, a ratchet-wheel and a pawl for locking the same against movement with said arms toward running position, a pawl arranged to lock the controlling-arm to the ratchet-wheel, means whereby a predetermined movement of the operating-arm toward running position releases the controlling-arm allowing it to follow the operating-arm in response to its bias, and a no-voltage magnet for retaining the latter in running position.

In witness whereof we have hereunto set our hands this 25th day of April, 1906.

WILLIAM C. YATES.
PAUL H. ZIMMER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.