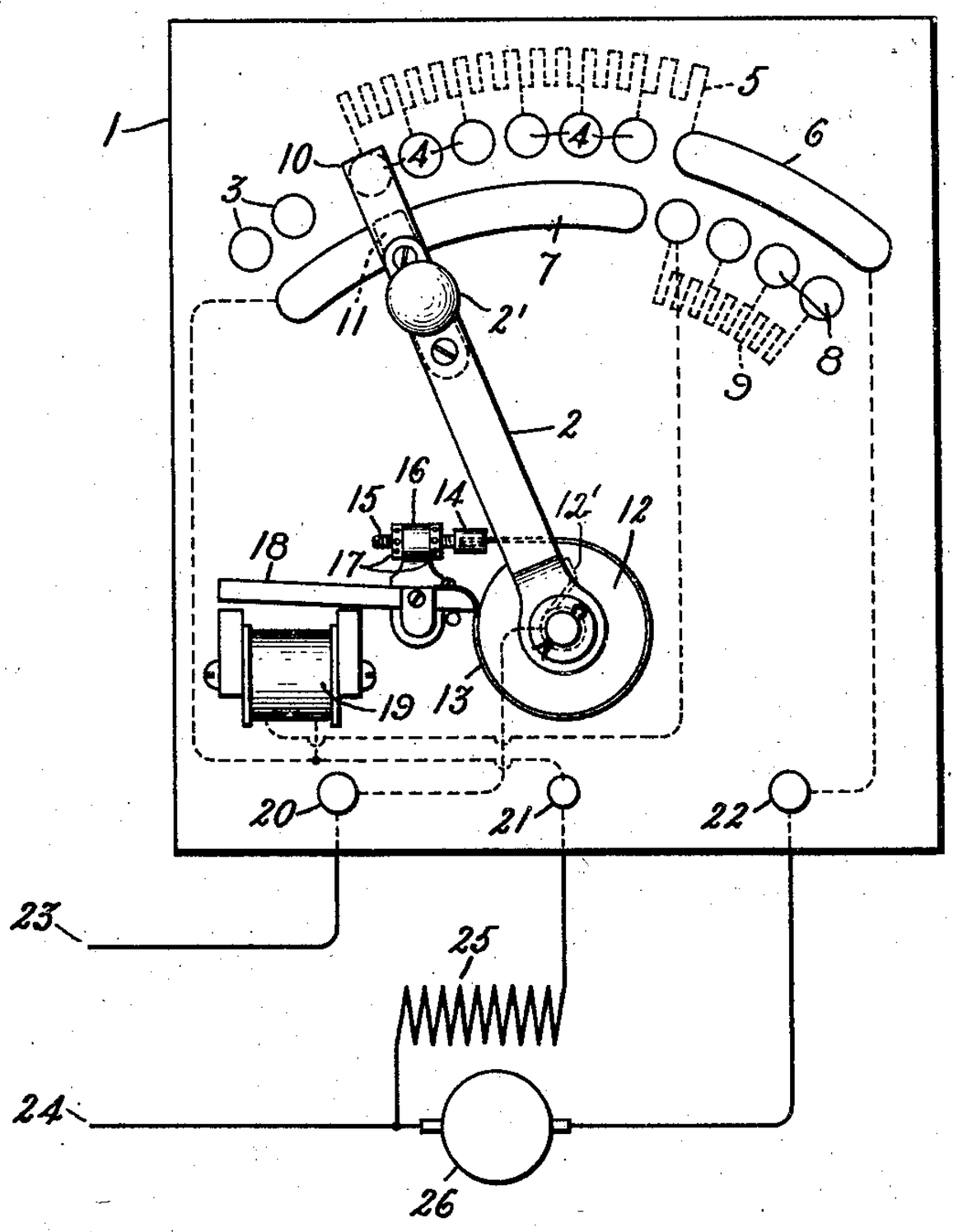
No. 793,494. PATENTED JUNE 27, 1905.

W. C. YATES.

CONTROLLER.

APPLICATION FILED NOV. 28, 1904.



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No. 793,494. Patented June 27, 1905.

UNITED STATES PATENT OFFICE.

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CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 793,494, dated June 27, 1905.

Application filed November 28, 1904. Serial No. 234,466.

To all whom it may concern:

Be it known that I, WILLIAM C. YATES, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Controllers, of which the following is a specification.

This invention relates to rheostatic controllers for electric motors, with particular reference to combination starting and speed-regulating rheostats for shunt-wound motors.

It has become a common practice to provide rheostatic controllers with a series of contact-studs connected to a resistance at intervals and a pivoted switch-arm which can be moved over the contacts to establish the proper electrical connections. If the resistance is to be used for starting a motor only—that is, if it is to limit the current admitted to the armature while the latter is coming up to speed and is to remain in circuit for only a very short interval—its capacity is small, and it would therefore be burned out if permitted to remain in circuit. The switch-arm of a starting-rheostat is therefore provided with a retracting-spring which returns the arm to the "off" position if the operator releases it before all the resistance is cut out. If the resistance is to be used in regulating the speed of a motor, it is of considerably higher capacity, as it may be desired to run the motor continuously with all or any part of the resistance in circuit. When the switch-arm is in contact with a stud connected to the regulating resistance, it is not desired to return the arm to the off position when released by the operator, as this may be a desired running position, and it is therefore common to provide a retaining device to hold the arm in any one of the regulating positions. However, if the motor-circuit is broken or if the voltage across the line falls abnormally the switch-arm should be released, so as to permit the retracting agency to return it to the off position. The retaining device should therefore be an electrically-operated one responsive to the line conditions.

My invention relates to a combination motor-starting and speed-regulating rheostat having a spring-retracted switch-arm coöperating with contacts connected to resistance and an electroresponsive retaining device arranged to hold the arm while in any of the running positions, but to be inoperative so long as the starting resistance is connected in circuit.

My invention comprises a release-coil operating the retaining device connected in series with the field-winding of the motor when the switch-arm is in a running position, but disconnected from circuit when the arm is in any other position.

The novel features of my invention will more fully appear in the following description, which is to be taken in connection with the accompanying drawing, and will be definitely indicated in the claims appended hereto.

The drawing shows a front view of the preferred embodiment of my invention.

Referring to the drawing, 1 indicates a base-plate of soapstone or other insulating material on which is pivoted a switch-arm 2. Dead-studs 3, studs 4, connected at intervals to a resistance 5, and a segment 6 are arranged in the arc of a circle with the pivot of the switch-arm 2 as a center. Close to these contacts and concentric therewith are a segment 7 and a series of studs 8, connected at intervals to a resistance 9. The resistance 5 is the starting resistance and is connected to the segment 6, as well as the studs 4. The capacity of this resistance is small, and it would be burned out if allowed to remain in circuit for more than a comparatively short interval. The resistance 9 is not connected to the segment 7. This is the speed-regulating resistance and will not be overheated if allowed to remain in circuit indefinitely. The switch-arm 2 has an operating-handle 2′ secured thereon, and two contact-springs 10 and 11 are secured to its under side and adapted to engage the two rows of studs and segments. Secured to the switch-arm 2 is a disk 12, which is encircled by a flexible steel band 13. One end of the band 13 is secured to the head 14 of a screw 15, which is adjustable in a standard 16 on the base-plate 1 by means of adjusting-nuts 17, which also serve to lock the screw in any

adjusted position. The other end of the band 13 is fastened to the pivoted armature 18 of a retaining-magnet 19, mounted on base 1. The arrangement of these parts is such that when the magnet 19 is energized armature 18 is attracted and turns on its pivot, thus tightening the band 13 on the disk 12 until it grips the disk tightly enough to hold the switch-arm against the tension of a retracting-spring 12′, coiled about the pivot of the switch-arm and tending to return it to the position in which the spring-contact 10 is in engagement with the dead-studs 3. This means for holding the arm in any regulating position to which it is moved against the tension of the retracting-spring is substantially the same as that shown in the patent to Hammer, No. 645,809.

At the bottom of the base-plate 1 are three binding-posts 20, 21, and 22. 23 and 24 indicate positive and negative mains, respectively, from a source of electric supply, the former of which is connected to the binding-post 20 and the latter to one side of the field 25 and armature 26 of a shunt-wound electric motor. The other side of the armature 26 is connected to binding-post 22, which is connected to the segment 6, and the other side of the field 25 is connected to binding-post 21, which is connected to the segment 11 and to one terminal of the retaining-coil 19, the other terminal of which is connected to the first stud of the regulating series 8.

When the switch-arm 2 is in such a position that the spring-contact 10 is in engagement with the dead-studs 3, the armature-circuit of the motor is open, but the field 25 is energized, the circuit being from main 23 to binding-post 20, to switch-arm 2, contact 11, segment 7, to binding-post 21, field 25, and main 24. There is no resistance in this circuit, and the motor will therefore start up with a full field when the armature-circuit is closed. When the switch-arm 2 is turned to the position illustrated, current is admitted to the motor-armature 26, the circuit being from main 23 to switch-arm 2, contact-spring 10, to the first stud 4, through the resistance 5 to segment 6, to binding-post 22, armature 26, and main 24. As the arm is moved over the contacts 4 the starting resistance 5 is cut out until finally the normal current is admitted to the motor-armature and the contact-spring 11 sweeps over the segment 7, so as to maintain the same connections for the motor-field. During this movement the retaining-magnet 19 is not energized, as it will be seen that the coils of the magnet are not connected in circuit, and if the operator releases the switch-arm 2 it will be immediately returned to the off position by the spring 12′, which is put under tension as the arm is turned on its pivot. Therefore only the carelessness or the wilful act of the operator in moving the switch-arm too slowly or holding it in a starting position can burn out the starting resistance. When the switch-arm 2 reaches such a position that the spring-contacts 10 and 11 engage the segment 6 and the first contact-stud 8, respectively, the starting resistance 5 is all cut out, and the motor-armature 26 is connected directly across the lines. The connection of the motor-field 25, however, is changed as the spring-contact 11 moves off the segment 7 and onto the first contact-stud 8, the circuit in the latter position being as follows: from main 23 to switch-arm 2, to stud 8, electromagnet-coil 19, binding-post 21, field 25, to main 24. This, therefore, connects the retaining-magnet in series with the motor-field across the lines, and the magnet being energized attracts its armature, rocking the latter on its pivot, and thus tightening up the band 13 on the disk 12. Further movement of the switch-arm 2 serves to cut in the resistance 9 in series with the magnet 19 and motor-field 25, thus weakening the field and increasing the speed of the motor. When in any of these positions, if the circuit is opened or the voltage across the line falls the retaining-magnet 19 releases its armature, thus loosening up on the band-brake 13 and permitting the spring 12′ to return the switch-arm 2 to the off position.

I have illustrated and described herein the preferred embodiment of my invention; but it must be understood that various modifications, such as introducing armature-regulating resistance and others of like character, can be made therein without departing from the spirit of my invention, and all such modifications I aim to cover in the claims appended hereto.

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

1. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, a retaining-magnet which is deënergized while the switch-arm is in a starting position and which is connected in series with the motor-field when the switch-arm is in a speed-regulating position, and means operated by the magnet when connected in circuit for holding the arm in any position to which it is moved.

2. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, a starting resistance and a regulating resistance connected to said contacts, an electroresponsive device, means whereby the switch-arm in passing from the starting to the regulating position connects said device in series with the motor-field, and means operated by said device when connected in circuit for holding the arm in any position to which it is moved.

3. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, a starting resistance and a

regulating resistance connected to said contacts, means for connecting the motor-field across the lines when the switch-arm is in a starting position, an electroresponsive device, means operated thereby when energized for retaining the switch-arm in any position to which it is moved, and means for connecting said device in series with the motor-field when the switch-arm is moved to a regulating position.

4. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, an electroresponsive device, means for closing the circuit of the motor-field when the switch-arm is in a starting position, means whereby moving the switch-arm from a starting to a regulating position connects said electroresponsive device in series with a motor-field, a brake operating to hold the switch-arm in any position to which it is moved, and means whereby said electroresponsive device when connected in circuit operates said brake.

5. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, a magnet, a brake to hold the switch-arm in any position to which it is moved, a pivoted armature for said magnet arranged to operate said brake when attracted, and connections for closing circuit through the coils of the magnet and the motor-field in series when the switch-arm is moved from a starting to a regulating position.

6. A motor-starting and speed-regulating rheostat having a switch-arm, contacts coöperating therewith, a starting and a regulating resistance connected to the contacts, a magnet, a brake to hold the switch-arm in any position to which it is moved, a pivoted armature for said magnet arranged to operate said brake when attracted, means for connecting the motor-field across the lines when the switch-arm is in a starting position, and means whereby moving the switch-arm from a starting to a regulating position changes the connections to include said magnet in series with the motor-field.

7. A rheostat for electric motors, comprising a variable resistance and coöperating spring-retracted rheostat-lever, a magnet for locking the lever in different positions of resistance adjustment, a no-voltage release-coil for the magnet in the field-circuit of the motor, and means whereby said magnet is deënergized through a definite range of lever adjustment.

In witness whereof I have hereunto set my hand this 25th day of November, 1904.

WILLIAM C. YATES.

Witnesses:

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