L. P. COULTER.

ELECTRIC SWITCH.

APPLICATION FILED MAR. 14, 1907.

949,263.

Patented Feb. 15, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

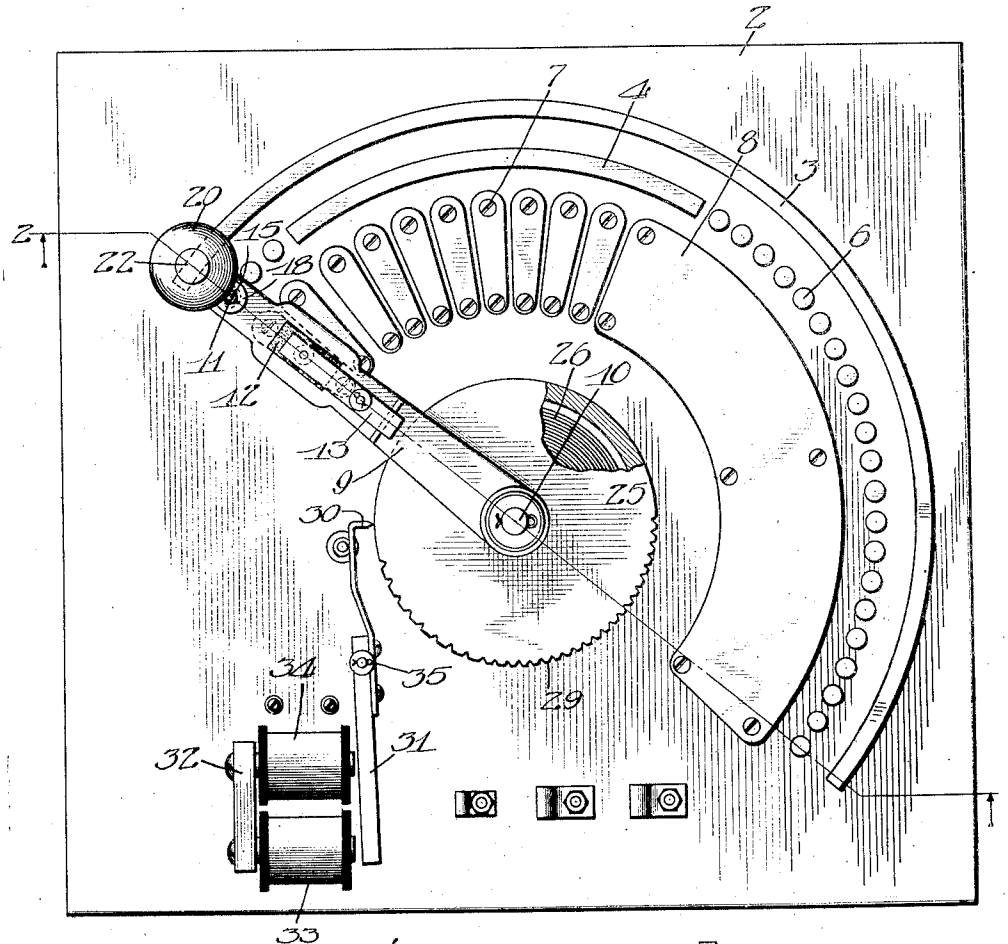
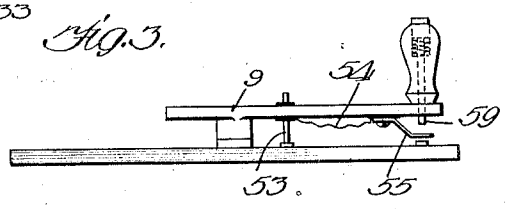


Fig. 3.



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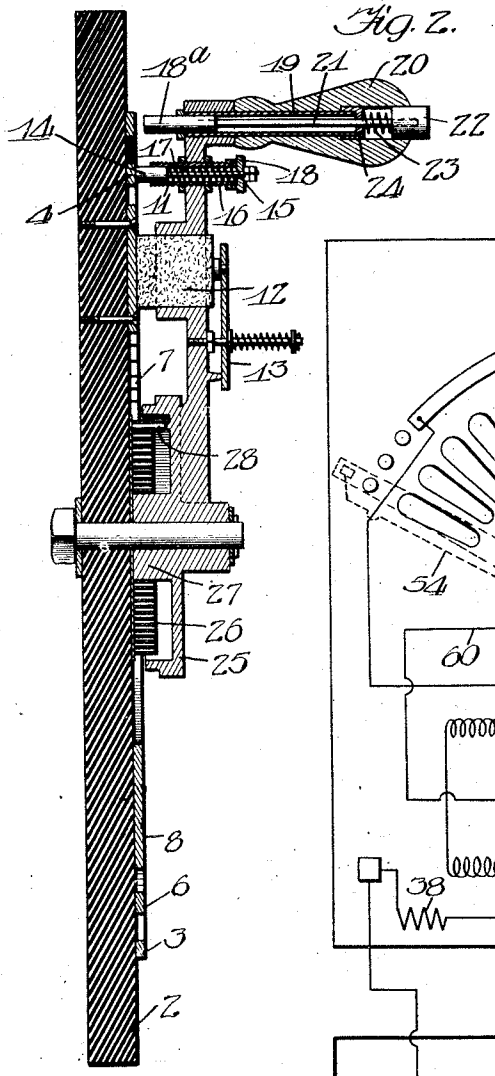
3 SHEETS—SHEET 2.

Fig. 2.



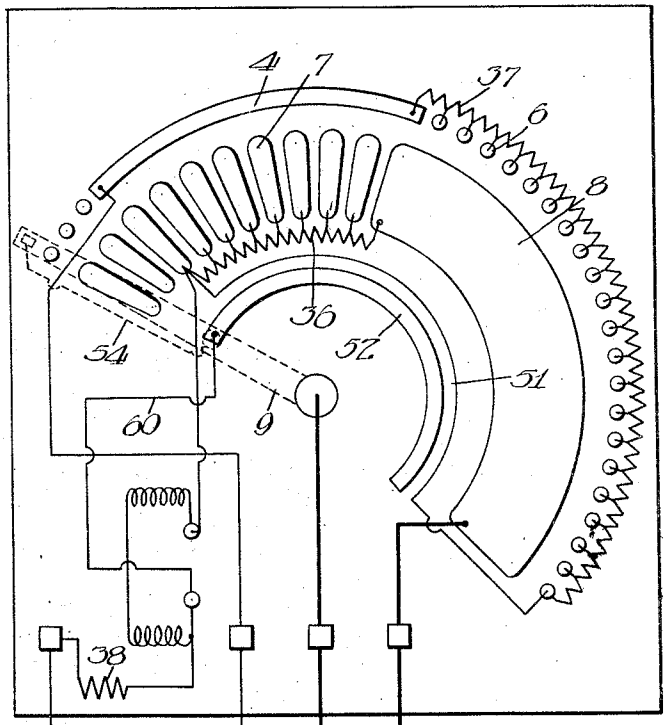
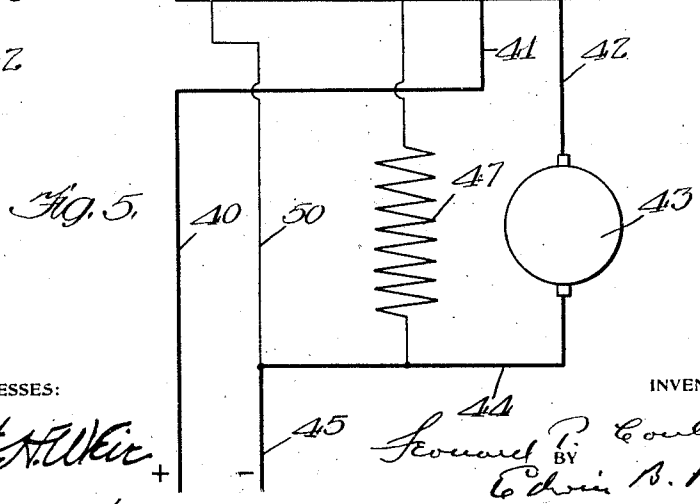


Fig. 5.



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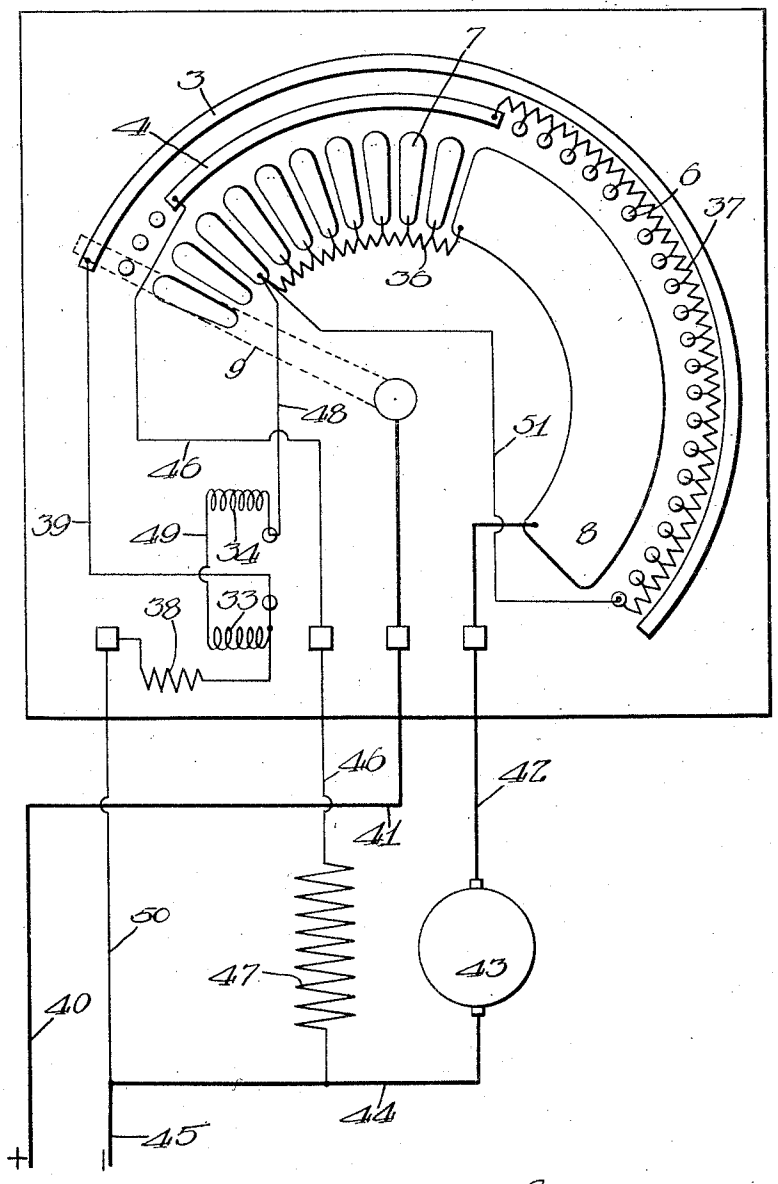
3 SHEETS—SHEET 3.

Fig. 4.



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ELECTRIC SWITCH.

949,263. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed March 14, 1907. Serial No. 362,359.

To all whom it may concern:

Be it known that I, LEONARD P. COULTER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Electric Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in electric switches, and is especially applicable to motor controllers, which are provided with a low voltage release device arranged to hold a switch in any intermediate position of its travel to which it may be moved by the operator.

One of the objects of my invention is to provide means by which the low voltage device may be rendered inoperative, at the will of the operator, while the switch is being moved, so that the switch may be moved freely without interference.

For the purpose of disclosing my invention I have illustrated in the accompanying drawings one embodiment of the same.

In said drawings:—Figure 1 is a front elevation of a controller embodying my invention. Fig. 2 is a section thereof taken on the line 2—2 of Fig. 1. Fig. 3 shows a modified form of handle which may be used. Fig. 4 is a diagrammatic view of the circuit arrangement of the device illustrated in Fig. 1. Fig. 5 is a diagrammatic view used in connection with the handle shown in Fig. 3.

In the embodiment of my invention illustrated in Fig. 1, upon a base 2, preferably formed of slate or like insulating material, a contact member 3 is mounted, in the form of a semicircular segment of brass. A second arc shaped segmental contact 4 is mounted on the base and in a continuation of the arc of the segment 4, a plurality of contact buttons 6 are also secured upon the base to which the field resistance of the motor is attached. The armature resistance is connected with a series of contact segments 7 circularly mounted upon the base 2 and one terminal of the armature of the motor is arranged to be connected with an arc shaped contact segment 8 mounted on a base in a continuation of the arc formed by the contact segments 7. A controller arm 9 pivotally mounted upon a stud 10 secured to the base 2 is provided with a brush 11 arranged to sweep over and engage the segment 4, and contact buttons 6, and a carbon brush 12 arranged to sweep over and engage contact segments 7 and 8. The brush 12 is preferably held in close engagement with the contact segments by a spring arm 13 mounted upon the arm 9. In Fig. 2 the construction of the brush 11 is more fully illustrated. It will be noted that this brush consists of a copper pencil 14 mounted upon a rod 15 and operating in a sleeve 16 secured upon the arm 9. A coil spring 17 interposed between a cap 18 of the sleeve, and the pencil 14 maintains the pencil in close engagement with the contact segment 4 and the buttons 6. In addition to the above contacts, I provide a third contact, on the arm 9, which while normally out of operative position may be moved into engagement with the segment 3 at the will of the operator. This contact comprises a copper contact pencil 18^a operating in a metal cylinder 19 arranged in a central opening in a handle 20. One end of the cylinder 19 is secured to the arm 9 and in addition to providing a cylinder for the contact 18^a, stiffens the handle 20. The contact 18^a is mounted upon the lower end of a rod 21 which extends through the cylinder 19 and is provided at its upper end with a push button 22 by which the contact 18^a is operated. A coiled spring 23, interposed between the button and a nut 24 secured on the upper end of cylinder 19 maintains the contact in its normal or raised position. The switch arm 9 is provided with drum 25 in which is arranged a flat spring 26 having one end thereof connected to the hub 27 of the switch arm and the opposite end connected to a stud 28, mounted upon the base 2. The spring 26 has a tendency to maintain the arm in the "off" position. The outer periphery of the drum 25 is provided with a series of notches 29 adapted to receive a pawl 30 mounted upon the armature 31 of a low voltage device 32. The low voltage device 32, illustrated in the drawing, comprises a pair of magnets 33 and 34, which when they are energized attract the armature 31 and force the pawl 30 into the notches formed on the drum 25. The armature 31 is pivotally mounted upon the base 2 by a stud 35.

In the diagrammatic view illustrated in Fig. 4 it will be noted that one terminal of the armature of the motor, is connected with one end of the segment 8 and that the armature resistance 36 is divided into sections connected with the contact segments 7. One terminal of the field of the motor is connected with the segment 4 and the field resistance 37 is divided into sections connected with the contact buttons 6. The switch arm 9 is connected with one side of the main line and the winding of the magnets 33 and 34 are connected with the first of the segments 7 on one side, and through a resistance 38 with one side of the main line. A short circuit for these magnets is provided by the conductor 39 which is connected at one end to the segment 3.

In operation, assuming that the switch arm 9 has been moved to the first of the live contacts 7, then a circuit for the motor will be closed from one side 40 of the line, by conductor 41, through the switch arm 9, through the first of the contacts 7, through the armature resistance 36, contact segment 8, conductor 42, through the armature 43 of the motor, by conductor 44, back to the opposite side 45 of the line. At the same time circuit will be closed from the switch arm 9, through the contact brush 14, to segment 4, by conductor 46, through the field winding 47 of the motor and by conductor 44 back to the opposite side 45 of the line. Also a third circuit is established from the arm 9, by conductor 48, through the winding of the magnet 34, conductor 49, through the winding of the magnet 33, resistance 38, conductor 50, back to the opposite side 45 of the line. With the above circuits established, the motor is started with all the armature resistance in circuit and the low voltage device 32 energized to cause the pawl 30 to engage the notches 29 on the drum 25. In event the operator desires to leave the arm in this position it will be held by the pawl 30, against the action of the spring 26. Assuming, however, that the operator desires to move the arm 8 to a position where the motor is operating with all the armature resistance cut out of circuit, in order that the handle may move freely and not be retarded by the pawl 30, the operator presses upon the push button 22, causing the brush 18^a to engage the segment 3. This closes a short circuit around the winding of the magnets 33 and 34 as follows: from the arm 9 to the segment 3, by conductor 39, through the resistance 38 and by conductor 50, to the opposite side of the line. The low voltage device being thus short circuited, the pawl 30 releases the drum 25 and switch arm 9 may be moved freely to the desired position. When the switch arm has moved to the position desired by the operator, by releasing the push button 22 the short circuit around the magnets 33 and 34 is again opened and the magnets are energized to cause the pawl 30 to engage the notches 29 and hold the arm in the position to which it has been moved. By a continued movement of the arm 9 in a clock-wise direction, after the armature resistance has been cut out, the resistance 37 may be inserted in the field circuit, and the field thus so weakened that the speed of the motor will be materially increased. A shunt around the fields is provided by the conductor 51, which takes up the discharge of the motor when the circuit is opened.

In Fig. 5, I have illustrated a diagrammatic view of the circuit arrangement used in connection with the handle illustrated in Fig. 3. I have only shown in Fig. 3 the construction of the handle applicable to the shunting of the coils 33 and 34, and have not shown the remaining brushes, arranged to make contact with the armature and field segments of the controller, as these may be constructed as previously described. In this form of my invention instead of completing the circuit through the handle, an independent conductor is provided. The circuit arrangement for the armature and field of the motor is the same as has been previously described. Instead, however, of providing a segment 3, I provide a small semi-circular segment 52, which is arranged to be continually engaged by a brush 53 mounted upon the arm 9 and suitably insulated therefrom. This brush is connected by conductor 54 with an insulated contact 55 carried on the underside of the arm 9 and arranged to be engaged by a contact 59 operated by a push button in the same manner as is the contact 18^a of the device already described. The motor circuits are all similar to the motor circuit described in connection with Fig. 4. The short circuit for the winding of the magnets 33 and 34, however, is from the main 40 by way of conductor 41, through the arm 9 to the contact 59, thence by contact 55, through the conductor 54, to the contact 53, segment 52, conductor 60, through the resistance 38, back to the opposite side 50 of the line.

It will be seen from the above that I have provided a means for rendering inoperative the retaining device for holding the arm of a controller in any intermediate position to which it may be moved, whereby the arm may be freely moved back and forth.

It will be understood that while I have described specifically a particular embodiment of my invention, I do not wish to be limited thereto any more than I have set forth in the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is—

1. In combination, a manually operable switch arm, an electromagnet for holding

said arm in any position to which it may be moved, and means for controlling said electromagnet at will.

2. In a switch, the combination with a manually operated switch arm, of a retaining magnet for said switch arm for holding the same in any position in which it may be moved and means for rendering said retaining magnet inoperative, at will, to permit a free movement of said arm.

3. In a switch, the combination with a manually operated member of a retaining magnet for holding said member in any position to which it may be moved and a switch operated at will for short-circuiting said retaining magnet to permit a free movement of said member.

4. In a controller, the combination with a resistance controlling arm, of a retaining device for holding said arm in any position to which it may be moved, a low voltage device for operating said retaining device and means in conjunction with said arm for rendering said voltage device inoperative, at will, to permit a free movement of said arm.

5. In a controller, the combination with a resistance controlling arm of a low voltage magnet for retaining said arm in any position to which it may be moved, and means associated with said arm for rendering said magnet inoperative, at will, to permit a free movement of said arm.

6. In a controller, the combination with a resistance controlling arm of a retaining magnet for holding said arm in any position to which it may be moved and means operative at will from said arm for rendering said retaining magnet inoperative to permit a free movement of said arm.

7. In combination, a movable element, an electromagnet for retaining said element in any position to which it may be moved, and means operative from said element for rendering said electromagnet inoperative to permit a free movement of said element.

8. In a switch, the combination with a pivoted arm having a rack attached thereto, a pawl arranged to engage said rack, an electro-magnetic device for moving said pawl in engagement with said rack, and means operated from said arm for rendering said magnet inoperative.

9. In a switch, the combination with a pivoted arm, of means tending to move said arm to its initial position, a rack, a pawl arranged to engage said rack and hold said arm in any position to which it may be moved, an electro-magnetic device for operating said pawl, and means operated from said member for rendering said electro-magnetic device inoperative.

10. In a switch, the combination with a pivoted arm, a segmental rack carried by said arm, a spring tending to move said arm to its initial position, a pawl arranged to engage said rack and hold said arm in any position to which it may be moved, an electro-responsive device for operating said pawl, and means operated from said arm for rendering said electro-responsive device inoperative.

11. In a motor controller, a switch arm, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm in being moved forward over the same passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a low voltage device adapted to hold said switch arm in a position on said contacts in which it may be left by the operator, and means for rendering said low voltage device inoperative at will to permit free movement of said switch arm.

12. In a motor controller, a switch arm, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm in being moved forward over the same passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a low voltage retaining device for holding said switch arm in any position on said contacts in which it may be left by the operator, and a switch carried by said switch arm and adapted to be operated at will to render said low voltage device inoperative to permit free movement of the switch arm.

13. In a motor controller, a switch arm, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm in being moved forward over the same passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a ratchet wheel connected to said switch arm, a pawl adapted to engage said ratchet wheel, an electro-magnet for throwing said pawl into engagement with said ratchet wheel, and means rendering said magnet inoperative at will.

14. In a motor controller, a switch arm, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm in being moved forward over the same passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a ratchet wheel connected to said switch arm, a pawl adapted to engage said ratchet wheel, an electro-magnet for throwing said pawl into engagement with said ratchet wheel, and a switch carried by said switch arm adapted to be actuated at will to render said magnet inoperative.

15. In a motor controller, a switch arm, a spring tending to move said arm to its initial position, a series of circumferentially arranged contacts adapted to be engaged by said switch arm, an armature resistance connected to said series of contacts, a contact segment concentric with the series of contacts, a rack on said arm, a pawl arranged to engage said rack and hold said arm in any position to which it may be moved, an electroresponsive device for normally holding said pawl in engagement with said rack, and a switch carried by said arm adapted, when operated, to render said electroresponsive device inoperative.

16. In a motor controller, a switch arm, a spring tending to return said arm to its initial position, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm, in being moved forward over the same, passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a contact segment concentric with the series of contacts, a rack carried by the switch arm, a pawl, an electroresponsive device adapted to normally hold said pawl in engagement with said rack, and a push button switch carried by the handle of the switch arm adapted, when depressed, to contact with the contact segment to short circuit the electroresponsive device, whereby the arm may be moved to any desired position.

17. In a motor controller, a switch arm, a spring tending to return said arm to its initial position, a series of contacts connected to an armature resistance, a second series of contacts connected to a field resistance, said series of contacts being so arranged that the switch arm, in being moved forward over the same, passes first over the first mentioned set of contacts and afterward over the second mentioned set of contacts, a contact segment concentric with the series of contacts, a rack carried by the switch arm, a pawl, an electroresponsive device adapted to normally hold said pawl in engagement with said rack, and a switch carried by said handle adapted, when depressed to render the electroresponsive device inoperative, comprising a contact, a stem on said contact, a push button on said stem extending above the handle, and means to normally hold the switch out of contact with the contact segment.

18. In a motor controller, a switch arm, a spring tending to return said arm to its initial position, a series of contacts, a contact segment concentric with said series of contacts, a rack on said arm, a pawl adapted to normally engage said rack, an electromagnet controlling said pawl and a switch in the handle of the arm adapted to de-energize the electromagnet at will, comprising a spring pressed push button normally extending above the handle, a stem secured to said button and a contact secured to said stem.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

LEONARD P. COULTER.

Witnesses:
J. H. WHITEHEAD,
C. R. HAMMOND.