

Feb. 23, 1926.

H. W. CHENEY

1,574,417

SWITCH

Filed Oct. 29, 1919

2 Sheets-Sheet 1

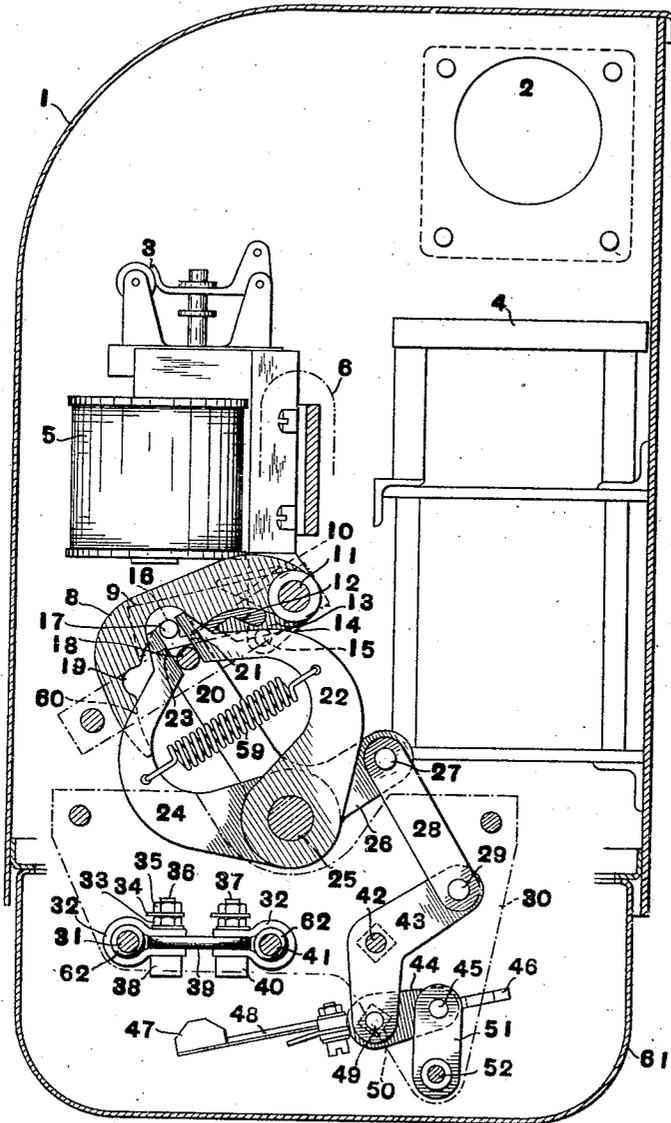


Fig. 1

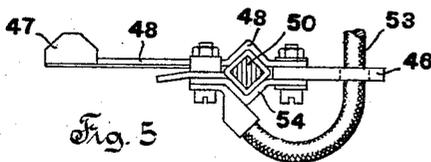


Fig. 5

Inventor

H. W. Cheney

by

J. P. DeWitt

Attorney

Feb. 23, 1926.

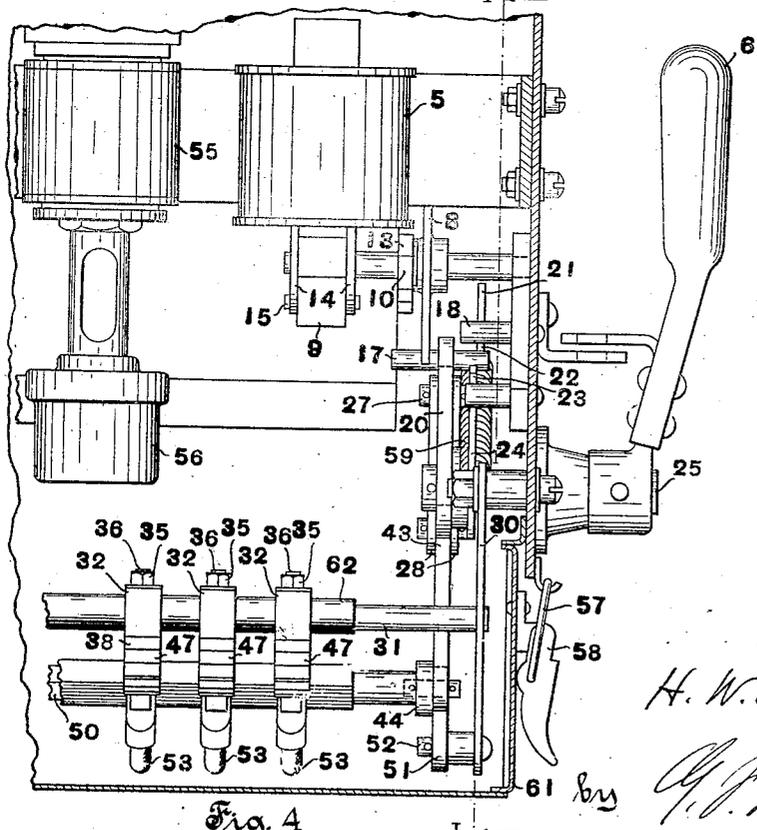
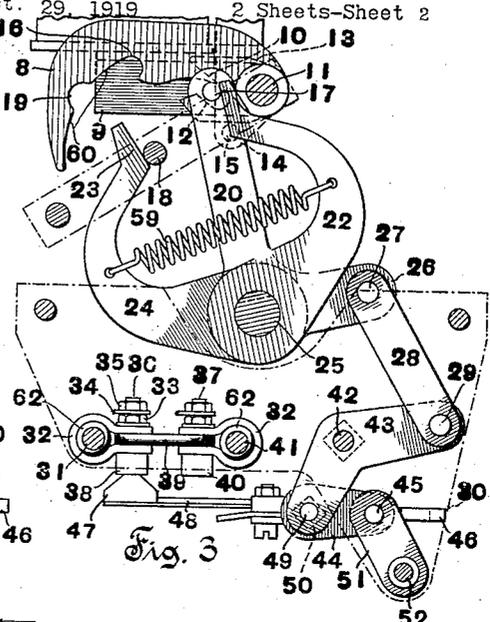
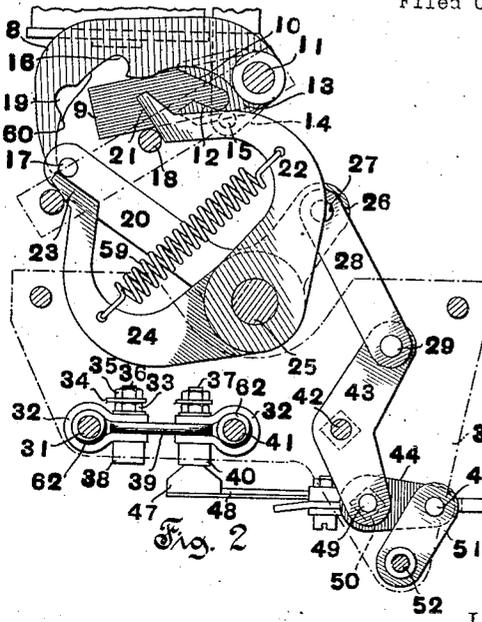
1,574,417

H. W. CHENEY

SWITCH

Filed Oct. 29, 1919

2 Sheets-Sheet 2



Inventor  
H. W. Cheney  
by  
G. J. DeWitt  
Attorney

Fig. 4

# UNITED STATES PATENT OFFICE.

HERBERT W. CHENEY, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE.

## SWITCH.

Application filed October 29, 1919. Serial No. 334,887.

*To all whom it may concern:*

Be it known that HERBERT W. CHENEY, a citizen of the United States of America, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Improvement in Switches, of which the following is a specification.

This invention relates to switches or controllers and is particularly applicable to motor controllers or switches involving two circuit closing positions, one of which, in motor controllers, is usually a starting position and the other a running position.

One of the objects of this invention is the provision of a switch or controller having a simple and efficient operating and controlling mechanism, and particularly an operating mechanism requiring small forces to operate the same.

Another object is the provision of a structure in which use is made of butt contacts and more particularly a structure of this type involving two or more relatively stationary contacts in combination with one or more movable contacts, each one of which latter is adapted to make contact with either one of a pair of the relatively stationary contacts. Another object of the invention is the provision of an operating mechanism for the movable contact or contacts whereby the desired movements will be secured.

Still another object of the invention is the provision of a simple and efficient contact structure. Other objects will appear hereinafter as the description of the invention proceeds.

The novel features of this invention will appear from the specification and the accompanying drawings forming a part thereof and disclosing one embodiment of said invention, and all these novel features are intended to be pointed out in the claims.

In the drawings Fig. 1 is a side elevation of a motor controller of the potential type, embodying the invention, some of the elements being in section, which section is taken on the line I—I of Fig. 4, and the parts being shown in the open circuit position in Fig. 1, and in the starting position in Fig. 4.

Fig. 2 shows the operating mechanism of the controller illustrated in Fig. 1, the parts being in the position which they as-

sume when the operating handle is thrown to starting position.

Fig. 3 is a view similar to Fig. 2 but showing the parts in the position which they assume when the operating handle has been thrown to running position.

Fig. 4 is a front elevation of the controller illustrated in Fig. 1, parts being broken away and parts being in section.

Fig. 5 is a detail of a movable contact element.

The controller is provided with an operating handle 6 fastened to a main shaft 25, which latter carries an operating arm 20 here shown as provided with a projection 26 serving as a crank for moving the double link 28 pivoted thereto at the pin 27. The links 28 are pivoted at the other end to one end of the bell crank lever 43 which bell crank is mounted on a shaft 42, journaled in any suitable manner as, for example, in the end plates 30, indicated in dot and dash lines on Fig. 1. The other end of the bell crank 43 carries a shaft 50, here shown as of square cross section. The shaft 50 has rounded ends 49, journaled for pivotal movement in the lower arm of the bell crank, as viewed in Fig. 1. A lever 51 is mounted for movement about a pivot 52 and is connected to the lower arm of the bell crank 43 and the shaft 50 associated therewith by means of a link 44. The link 44 is rigidly associated with the shaft 50 but is freely pivoted at 45 to the lever 51.

The square shaft 50 carries one or more movable contacts 47 fastened thereto by means of the clamping members 48, 54. Flexible leads 53 may be electrically connected to each movable contact member 47 by suitable terminals and these leads may be kept in the desired spaced alinement by means of a cleat 46.

The movable contact or contacts are adapted to cooperate with relatively stationary contacts 38, 40. These contacts are mounted upon an insulating support 39. If more contacts are necessary or desirable, additional supports may be added or the support 39 may be lengthened. Contacts 38, 40 are each provided with a threaded shank 36, 37 respectively, passing through openings in both the insulating support 39 and the U-shaped clamps 32. The clamps 32 are adapted to be slipped over rods 31,

41 supported in any suitable manner as in the end plates 30. The clamps 32 may be insulated from the rods 31, 41, by members 62. The contacts, insulating support and clamps may be fastened to the rods by tightening a nut 33 associated with each contact. Conductors 34 may be electrically connected to each contact and fastened thereto by nuts 35.

The operating arm 20 is biased to circuit opening or off position by means of a centering dog, the elements 22, 24, of which are drawn toward each other by means of the spring 59, and are pivotally mounted on shaft 25. The dog acts upon the operating arm 20 through the jaws 21, 23 and the pin or projection 17 carried by said operating arm. A stationary pin 18 is provided for holding one of the elements of the dog when the other is being moved.

Latch means 8 is freely pivoted on shaft 11 and has a notch 16 therein adapted to cooperate with pin 17 on the operating arm 20 so that the latter cannot be moved in a clockwise direction from the position shown in Fig. 1. The latch means is also provided with a cam surface 60, preferably eccentric with the operating arm 20 so that when the latter is moved in a counter-clockwise direction the latch means will be lifted. A notch 19 is provided in the cam surface 60 for a purpose to be hereinafter set forth.

Holding and controlling means is provided for retaining the operating mechanism in its running position after the same has been moved there by an operator, comprising, in the instance shown, a low voltage magnet 5 having an armature 9 co-operating therewith. The armature 9 is fixed to the shaft 11 and its downward motion is limited by means of the pin 15 mounted in the brackets 14 between which the armature 9 swings. The holding means further comprises a latch member 13 having a slot therein the surfaces 10, 12 of which are at an angle with the general direction of motion of the pin 17 on the operating arm 20.

The controller may, if desired, be provided with an overload coil 55 adapted to actuate contacts 3 to cause deenergization of the low voltage magnet 5. A dash pot 56 may be provided for causing the overload coil to act with a time element.

Where the control of the motor is to be by variation of the potential supplied thereto, an auto-transformer 4 mounted in the same casing 1 as the switch or controller may be provided. The various leads may be brought into the casing through an opening 2 therein.

The lower half 61, see Figs. 1 and 4, of the casing is detachable and may be held to the main portion thereof by means of the toggle device 57, 58. The casing 61 may or may not contain oil as desired.

The operation of the controller illustrated is as follows: Assuming that the electrical connections are such that when the movable contacts 47 are connected to the contacts 40 the connected motor will be supplied with starting potential, the handle 6 will be thrown in a counter-clockwise direction from the position shown in Fig. 1 to that shown in Fig. 2, in order to start the motor. This motion is resisted by the jaw 23 of the dog acting against the pin 17, the jaw 21 remaining in its initial position, being stopped there by the fixed pin 18. Counter-clockwise movement of the operating arm 20 causes similar movement of the projection 26, this motion being transmitted to the bell crank 43 which rotates in the same direction. By reason of its connection with the link 44 the lower end of the bell crank 43 causes said link to move, in general, to the right, thus also shifting the contact 47 to the right from its position as shown in Fig. 1. While the contact 47 and the link 44 are thus being shifted to the right the pivot-end 45 of said link 44 is being pulled downward by the clockwise rotation of the lever 51. This causes a clockwise rotation of the link 44 and consequently a similar rotation of the shaft 50 associated therewith, resulting in an upward movement of the contact 47 bringing the latter into engagement with the contact 40.

While the operating arm 20 moved from its position in Fig. 1 to the position in Fig. 2 the pin 17 acted upon the cam surface 60 of the latch means 8 raising the latter about its pivot 11 to the position shown in Fig. 2. If the handle 6 is now moved rapidly in a clockwise direction the operating arm 20 will move into the position shown in Fig. 3, the pin 17 passing underneath the projection formed by the notch 16, the inertia of the latch means 8 being sufficient to prevent the latter from dropping down soon enough to cause the notch 16 to engage the pin 17. As the operating arm 20 moves into the position shown in Fig. 3 the pin 17 enters the slot in the latch member 13 and engages the surface 10 of said slot, thus raising the latch member and consequently also the armature 9 by reason of the rotation of the shaft 11. As the latch member 13 is thus rotated in a clockwise direction, the surface 12 of the slot therein comes into cooperative position with an opposite face of the pin 17 and as the low voltage magnet 5 has now been energized by any suitable electrical connections, and the armature is being held in the position shown in Fig. 3 by the said magnet, the surface 12 will prevent counter-clockwise motion of the operating arm 20, although biased in that direction by the jaw 21, when the handle 6 is released by the operator. Weakening of magnet 5 to a predetermined extent will clearly permit pin 17

to force latch member 13 downward and so permit return of the operative arm to off position.

5 While the operating arm 20 moves from the position shown in Fig. 2 to the position shown in Fig. 3, it passes through the off position and consequently brings the contacts 47 back to the position indicated in Fig. 1; from that position the contacts 47  
10 will be moved to the left and simultaneously in an upward direction into engagement with the contacts 38, the action of the link mechanism being similar to that already described in connection with the movement  
15 from the off to the starting position.

It will be noted that by reason of the provision of the novel type of operating mechanism for the movable contacts it is possible to use a contact having a single  
20 contact face for cooperating with two relatively stationary contacts, thus simplifying and cheapening the movable contact mechanism and avoiding the use of either two  
25 butt contacts on the movable member, one of which engages a relatively stationary contact in one circuit closing position and the other of which engages a corresponding relatively stationary contact in another circuit  
30 closing position, or the use of a knife blade type of movable contact, which, particularly in switches and controllers handling heavy currents, is open to the objection that friction between the knife blade contacts and the relatively stationary contact clips becomes so large as to render the necessary  
35 operating mechanism and manual force actuating the same prohibitively large. The present invention combines the advantages of a sliding butt contact construction with a simplicity superior to the knife blade construction, without the disadvantages of  
40 either. By reason of the butting contacts small forces only are necessary to disengage the same and bring the same into engagement.  
45

It will be further noted that the distance the movable contact 47 moves away from any given relatively stationary contact is not dependent upon the distance between the relatively stationary contacts and in this manner prevention of arcing may be readily taken care of.

The contact surfaces are kept clean for, as may be seen from an inspection of either  
55 Figs. 2 or 3, after contact 47 has engaged either contact 38 or 40, slight relative rubbing motion between the two is possible by reason of the horizontal component given the movable contact by the bell crank 43.

60 In order to prevent an operator from throwing current on to a connected motor and then moving the controller a slight distance toward the off position, and back into the starting position, thus causing arcing between the movable and starting con-  
65

tacts, the notch 19 in the latch means 8 is provided. It will be seen that if the operating arm 20 is moved the fraction of the distance from the starting position shown in Fig. 2 to the off position whereby the  
70 latch means 8 will drop down so that the notch 19 will engage the pin 17, the operating arm 20 cannot be again moved in a counter-clockwise direction from that position, inasmuch as the latch means 8  
75 and the notch 19 then act as a latch pivoted at 11. The operating arm 20 is however free to move in a clockwise direction from this position to the off position. Comparatively rapid motion of the operating arm 20  
80 from off position to starting position will cause the pin 17 to throw latch means 8 upward so that notch 19 will not engage pin 17. The position of the notch 19 may be at any desired point but is preferably so  
85 chosen that when the pin 17 is in the notch 19 the contacts 47 will be outside of arcing distance.

It should be understood that it is not desired to limit the invention claimed to the exact details of construction herein shown and described, for obvious modifications may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

95 1. A switch comprising two sets of relatively stationary contact means having the centers of their effective contact surfaces spaced apart a given distance, movable contact means having an open circuit position  
100 outside of a semi-circle having a diameter equal to said distance and in a plane perpendicular to said surfaces, and means whereby said movable contact means is caused to execute a combined motion of translation and rotation in moving directly  
105 from said open circuit position into engagement with either of said relatively stationary contact means.

2. A double-throw switch comprising  
110 two sets of relatively stationary contact means, movable contact means having an open circuit position, and actuating means for said movable contact means whereby said movable contact means is caused to execute a combined motion of translation and rotation in moving directly from said  
115 open circuit position into engagement with either of said relatively stationary contact means, said actuating means having axes of operation all of which are disposed outside of the space between the axial general planes of said sets.  
120

3. A double-throw switch comprising two  
125 sets of relatively stationary contact means, a crank having its axis disposed outside of the space between the axial general planes of said sets, means associated with said crank for swinging the same, movable contact means, having an open circuit position,  
130

operable by said crank, and means whereby when said crank is swung said movable contact means is caused to execute a combined motion of translation and rotation in moving directly from said open circuit position into engagement with either of said relatively stationary contact means.

4. A double-throw switch comprising two sets of relatively stationary contact means, a crank having its axis disposed outside of the space between the axial general planes of said sets, means associated with said crank for swinging the same, movable contact means having an open circuit position outside of the contact-plane of either of said sets, operable by said crank, and means whereby when said crank is swung said movable contact means may be moved into engagement with one of said relatively stationary contact means directly from its open circuit position and then through said open circuit position to engagement with the other of said relatively stationary contact means.

5. A double-throw switch comprising two sets of relatively stationary contact means, a crank having its axis disposed outside of the space between the axial general planes of said sets, means associated with said crank for swinging the same, movable contact means, having an open circuit position outside of the contact-plane of either of said sets, said movable contact means being carried by and pivotally associated with said crank, means whereby when said crank is swung said movable contact means may be moved into engagement with one of said relatively stationary contact means directly from its open circuit position and then through said open circuit position to engagement with the other of said relatively stationary contact means.

6. A switch comprising a crank, means associated with said crank for swinging the same, a pivot carried by said crank, a contact mounted for rotation about the axis of said pivot, a lever having a stationary pivot, said lever extending from its pivot in a direction substantially opposite from that of a line from the axis of rotation of said crank to said pivot carried thereby, and a link connecting said contact and said lever.

7. A switch comprising a crank, means associated with said crank for swinging the same, a lever having a stationary pivot, a support journalled in said crank, a contact mounted on said support, and a link rigidly associated with said support and connected to said stationary-pivot lever.

8. A switch comprising a crank, means associated with said crank for swinging the same, a lever having a stationary pivot, a shaft journalled in said crank, a contact mounted on said shaft, and a link rigidly associated with said shaft and connected to said stationary-pivot lever.

9. A switch comprising a crank, means associated with said crank for swinging the same, a lever having a stationary pivot, a link for connecting said lever with a point on said crank located in a direction from the axis of rotation of said crank substantially opposite from the direction in which said lever extends from its stationary pivot, and a contact associated with said link.

10. A switch comprising a bell crank lever, means associated with one arm of said bell crank for moving the same, a lever having a stationary pivot, a support journalled in the other arm of said bell crank lever, a contact mounted on said support, and a link rigidly associated with said support and connected to said stationary-pivot lever.

11. A switch comprising a bell crank lever, means associated with one arm of said bell crank for moving the same, a lever having a stationary pivot, a shaft journalled in the other arm of said bell crank lever, a contact mounted on said shaft, and a link rigidly associated with said shaft and connected to said stationary-pivot lever.

12. A switch comprising a bell crank lever, means associated with one arm of said bell crank for moving the same, a lever having a stationary pivot, said lever extending in a direction from its stationary pivot substantially opposite from the direction of the other arm of said bell crank from its axis of rotation, a link for connecting said other arm of said bell crank with said stationary-pivot lever, and a contact associated with said link.

13. In combination, a switch operating mechanism having a circuit opening and a circuit closing position, means for holding said mechanism in circuit closing position comprising a cam member, a magnet and armature, means for actuating said cam member operatively associated with said mechanism, means for biasing said mechanism to the circuit opening position disposed to act directly on said cam actuating means, and means whereby when said cam is actuated by said mechanism the armature will be brought into cooperative relation with said magnet.

14. In combination, a switch operating mechanism having a circuit opening and a circuit closing position comprising an operating lever provided with a pin near one end thereof, means engaging said pin for biasing said lever to circuit opening position, a latch member for holding said lever in circuit closing position having a slot therein, one of the surfaces of which forms a cam whereby when said pin cooperates therewith the latch member will be raised, thereby causing the other surface of said slot to come into latching position with respect to another surface of said pin, a magnet and armature, and means whereby when said

latch member is operated by said pin said armature will be brought into cooperative relation with said magnet.

15. In combination, switch operating means having off, starting and running positions, a switch contact movable in unison with said operating means, means for preventing movement of said operating means from the off position into the running position, and means for preventing slow oscillation of said mechanism between the starting position and a position between the starting and off positions.

16. In combination, switch operating mechanism having off, starting and running positions, a switch contact movable in unison with said operating mechanism, means whereby said mechanism may be moved from the starting position to the running position and is prevented from being moved from the off position to the running position, and means for preventing the slow oscillation of said mechanism between the starting position and a position between the starting and off positions.

17. In combination a switch operating mechanism having off, starting and running positions, a switch contact movable in unison with said operating mechanism, and means for preventing slow oscillation of said mechanism between the starting position and a position between the starting and off positions.

18. In combination, a switch operating mechanism having off, starting and running positions, a switch contact movable in unison with said operating mechanism, and means for preventing slow oscillation of said mechanism between the starting position and a position between the starting and off positions while permitting rapid motion between the starting and off positions.

19. In combination, a switch operating mechanism having off, starting and running positions, means for permitting the movement of said mechanism from rest in said off position into complete starting position at a relatively high speed and for stop-

ping said mechanism short of complete starting position when said mechanism is moved at a predetermined lower speed.

20. In combination, a switch operating mechanism having off, starting and running positions, means for preventing movement of said mechanism into running position without first moving into starting position comprising a latch having a cut-away portion having walls the general planes of which are approximately at right angles to each other, one of said walls serving to engage said mechanism in off position and preventing movement to running position and the other of said walls constituting a cam surface eccentric to said operating mechanism and extending to the position said operating mechanism assumes when in starting position, the degree of said eccentricity being sufficient to hold said first named wall out of engaging position when said mechanism is in starting position.

21. In combination, a switch operating lever, having off, starting and running positions, latch means for cooperating with said lever comprising a pivoted member having a shoulder engaging said lever in off position and preventing movement to running position, and having a substantially circular surface begun at the bottom of said shoulder and extended for engagement with said lever when in starting position, said surface being eccentric with said lever thereby acting as a cam surface of gradual lift.

22. In combination, a switch operating lever, having off, starting and running positions, latch means for cooperating with said lever comprising a pivoted member having a shoulder engaging said lever in off position and preventing movement to running position, and having a cam surface eccentric to said operating lever whereby said latch means is lifted when said lever is in starting position, and a notch in said cam surface.

In testimony whereof, the signature of the inventor is affixed hereto.

HERBERT W. CHENEY.