Apr. 3, 1923.

1,450,899

H. W. CHENEY

SWITCH

Filed Sept. 27, 1920 2 sheets-sheet 1

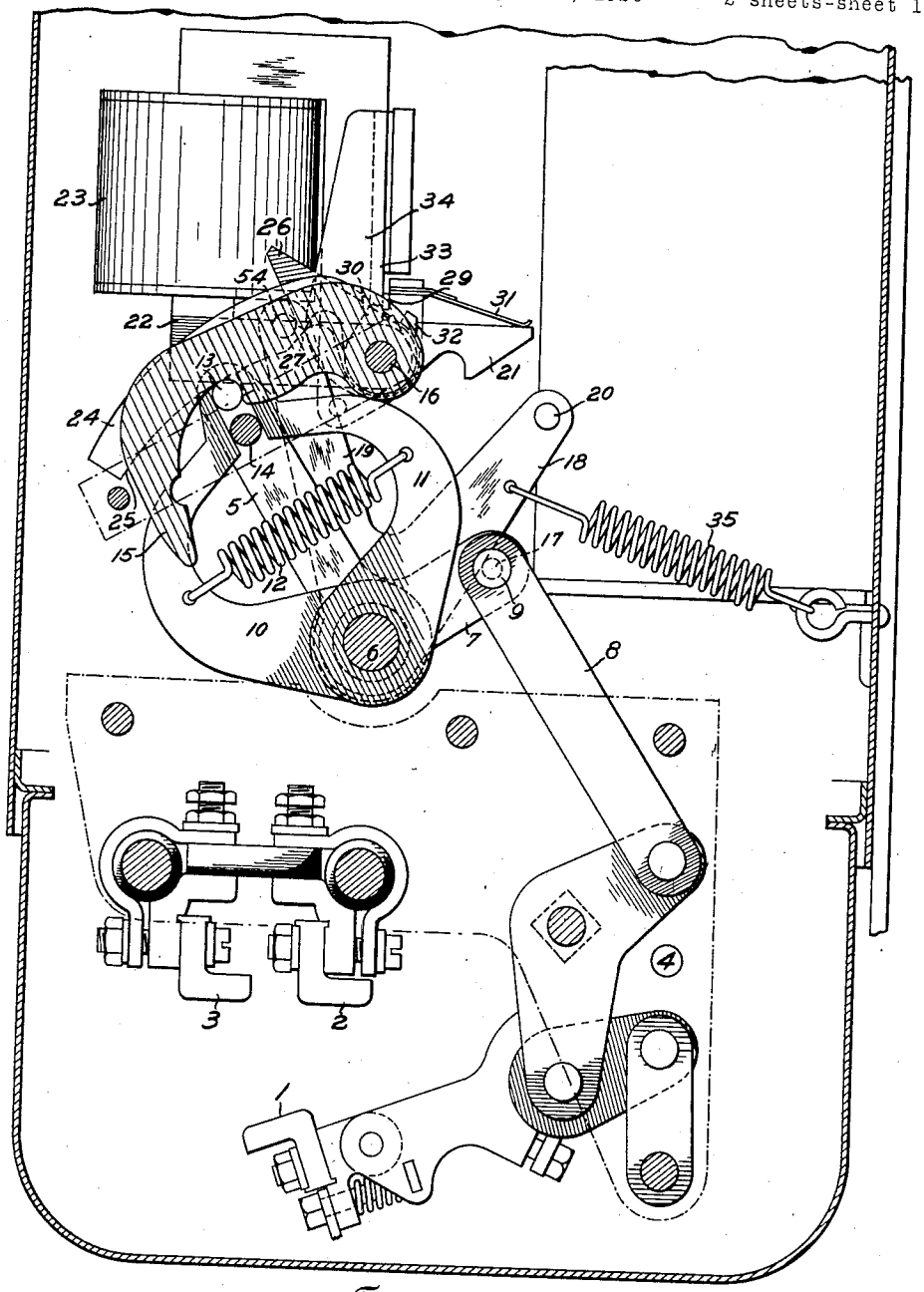


Fig. 1

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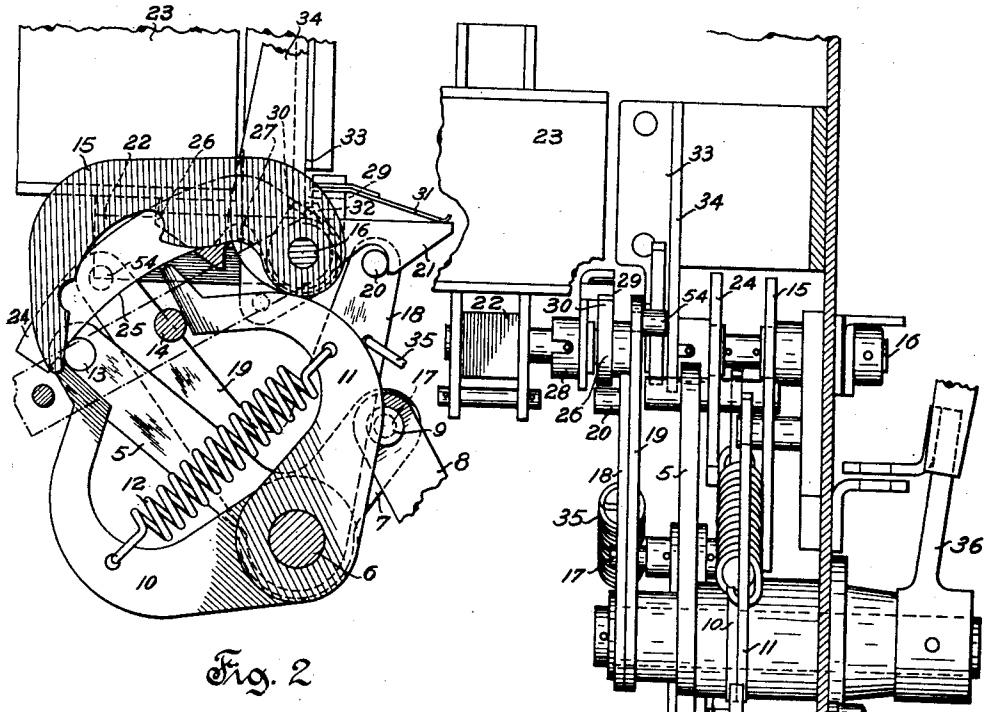


Fig. 2

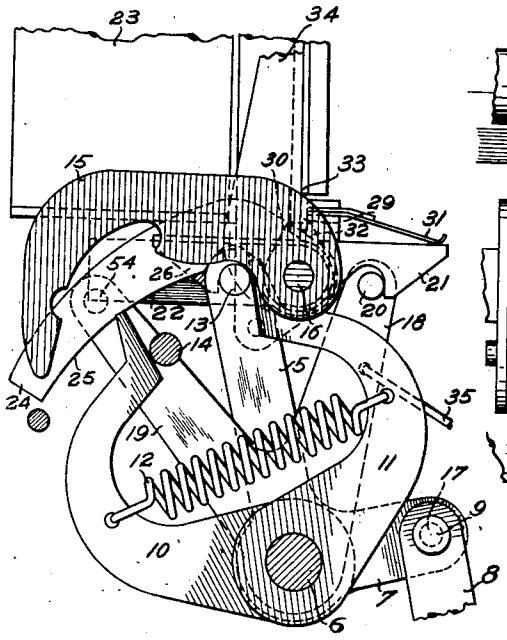


Fig. 3

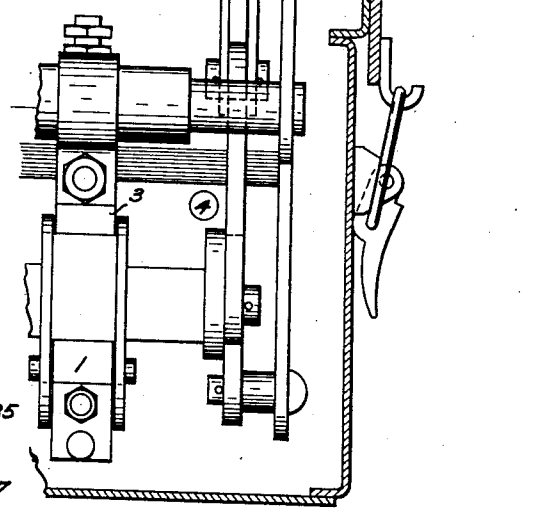


Fig. 4

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Patented Apr. 3, 1923. 1,450,899

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 September 27, 1920. Serial No. 413,086.

To all whom it may concern:

Be it known that HERBERT W. CHENEY, a citizen of the United States, 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. More particularly the invention relates to a controller of the type, generally speaking, disclosed in applicant's copending application Serial No. 334,887 filed October 29, 1919, except that the controller in the present instance is designed for use in handling much larger currents, whereby new problems arise.

One of the objects of this invention is the provision of a controller in which a heavy pressure on the contacts is involved and yet in which the use of a comparatively small operating magnet is required.

Another object is the provision, in a controller having "off," "starting" and "running" positions, of means whereby energy is stored in a tripping device when the controller is operated from "off" to "starting" position.

Another object is the provision in a controller of means for holding the armature of an under-voltage trip magnet in a position to be held by said magnet while the actuating means of the controller is in certain positions and freeing said armature so that it may effectively operate when the actuating means is in running position.

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, the casing having been broken away to clearly show the parts. The parts of the mechanism in this figure are shown in the "off" or open circuit position.

Fig. 2 is a detail view of a portion of the actuating mechanism of the controller shown in Fig. 1, showing the parts in the starting position.

Fig. 3 is a view similar to Fig. 2 but showing the parts in the running position.

Fig. 4 is a fragmentary front elevation of a controller such as illustrated in Fig. 1, a longitudinal portion of the casing being broken away in this instance.

The controller is provided with movable contacts 1 and stationary contacts 2, 3, the contacts 2 being in this instance the starting contacts and the contacts 3 the running contacts. The immediate operating mechanism 4 for the movable contacts is disclosed and claimed in applicant's case previously referred to and will therefore not be described in detail here.

The controller is provided with an actuating arm 5 rigidly associated with the shaft 6, which shaft may be swung by means of an operating lever 36 (see Fig. 4). The actuating arm 5 is provided with a projection 7 acting as a crank for the connecting rod 8 associated therewith by a pivot 9. The actuating arm 5 is normally biased to the position illustrated in Fig. 1 by means of a centering dog having the jaws 10, 11, urged towards each other by means of the spring 12. The dog acts upon the pin 13 carried by the actuating arm 5 and also the stationary pin 14 carried by any suitable stationary member, as the housing of the controller.

The pin 13 also co-operates with the latch 15 loosely pivoted on the shaft 16, the general purpose of this latch being to prevent improper and undesired operation of the controller, this being accomplished in a manner fully set forth in applicant's copending application and forming no part of the present invention.

The pivot 9 is provided with an extension 17 adapted to engage a lever 18 rotatable about the shaft 6, when the crank 7 moves in a counter-clockwise direction. The lever 18 is biased in a clockwise direction by means of the spring 35. The lever 18 has rigidly associated therewith, a trip lever 19, the purpose of which will be hereinafter described. The lever 18 is provided with a

pin 20, which, when the lever 18 is moved in a counter-clockwise direction will be engaged by the latch 21 loosely mounted on the shaft 16.

The controller is here shown as provided with an under voltage magnet 23 having a co-operating armature 22, the latter being rigidly associated with the shaft 16. The armature 22 is maintained in the position illustrated in Fig. 1, that is, in a position where it may be held by the magnet when the latter is effectively energized, by means of a lifting lever 24 having the surface 25 here shown as substantially concentric with the shaft 6, and co-operating with the pin 13 on the actuating arm 5.

A main latch 26, loosely mounted on the shaft 16, is provided for engaging the pin 13 and thus holding the controller in running position when the parts have the relation illustrated in Fig. 3. In this figure it will be observed that the pin 13 is underneath a notch 27 in the lifting lever 24, whereby the said lever is free to move in a downward direction and it is thus also possible for the armature 22 to drop away from the magnet 23 when the latter is de-energized or the voltage drops a predetermined amount.

A bushing 28 (see Fig. 4) rigidly associated with the shaft 16 is provided with a projection 29 adapted to engage a projection 30 on the latch 21, so that when the armature rotates in a counter-clockwise direction the projection 29 will rotate the latch 21 in the same direction thus releasing the lever 18. This lever is thus free to move in a clockwise direction under the influence of the spring 35, from its position shown in Fig. 3 to its position shown in Fig. 1. In moving to the latter position a pin 54 carried by the trip lever 19 strikes the under surface of the main latch 26, lifting the same and releasing the pin 13 so that the operating arm 5 is free to return to its off position (see Fig. 1) from its running position (Fig. 3).

A spring 31 carried by a projection on the bushing 28 is provided for normally maintaining the latch 21 in its engaging position illustrated in Fig. 1. The latch 26 is provided with a projection 32 adapted to limit the counter-clockwise rotation of said latch to the position shown in Fig. 2, by reason of the engagement of said projection with the flat vertical portion 33 of a bracket 34. The bracket 34 is here shown as utilized for aiding in the support of the shaft 16.

The operation of the controller is as follows:

Assuming the parts to be in the position shown in Fig. 1, the operating handle 36 may be moved to swing the actuating arm 5 in a counter-clockwise direction whereby the operating mechanism 4 will cause the movable contacts 1 to engage the stationary starting contacts 2. By the same motion the lever 18, and along with it the trip lever 19, will be moved in a counter-clockwise direction until the latch 21 engages the pin 20, the parts being then in the position shown in Fig. 2. The pin 54 on the trip lever 19 which in Fig. 1 was in a position to raise the latch 26, having now moved out of engagement with said latch permits it to drop down to the position shown in Fig. 2. If the actuating arm 5 is now moved quickly in a clockwise direction the mechanism 4 will operate to move the contacts 1 out of engagement with the contacts 2 and into engagement with the stationary running contacts 3. When this occurs, pin 13 is in a position to be engaged and held by the latch 26. By reason of the lost motion connection between the actuating arm 5 and the levers 18, 19, the actuating arm is free to move in the clockwise direction as stated, leaving the lever 19 held by the latch 21, the parts being then in the position shown in Fig. 3. Inasmuch as the pin 13 is underneath notch 27 in the armature-lifting lever 24, the armature is free to drop down, that is, swing in a counter-clockwise direction in case the magnet 23 is de-energized to a predetermined extent. As hereinbefore set forth such motion of the armature will cause release of the latch 21. The tripping lever 19 will then be free to move rapidly in a clockwise direction under the influence of spring 35 causing the pin 54 to deliver a hammer blow to the latch 26, thereby releasing the actuating arm 5 whereby the latter is free to return, under the influence of the centering dog, to the off position (Fig. 1).

From the foregoing description, it will be observed that a comparatively light armature and operating magnet are required for releasing the latch 21. The large amount of energy stored in the spring 35 by rotation of the operating arm to the starting position serves to release the main latch 26 with certainty even though there may be a very considerable tension on the same due to the bias of the pin 13 into the off position by reason of the generally heavy mechanism and large spring forces involved. The arrangement of parts, moreover, is such as to produce a very compact and sturdy structure.

It should be understood that it is not desired that the invention claimed be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. A motor starter having off, starting and running positions, movable contacts, means for moving said contacts into the starting position and then into the running position, means for holding said contacts in

the running position, means normally held in energy-stored condition for releasing said holding means with a hammer blow, and an under-voltage armature for releasing said hammer blow means.

2. A motor starter having off, starting and running position, movable contacts, means for moving said contacts into the starting position and then into the running position, means for holding said contacts in the running position, means normally held in energy-stored condition for releasing said holding means with a hammer blow, and means for putting said hammer blow means in energy-stored condition by motion of said contacts from off to starting position.

3. A motor starter having off, starting and running positions, movable contacts, actuating means therefor, means for holding said actuating means in running position, an under-voltage magnet and armature for releasing said holding means, and means associated with said actuating means for keeping said armature in a position to be held by said magnet while said actuating means is in off and starting position and freeing said armature when in running position.

4. A motor starter having off, starting and running positions, movable contacts, actuating means therefor, means for holding said actuating means in running position, means normally held in energy-stored condition for releasing said holding means with a hammer blow, an under-voltage magnet and armature for releasing said hammer blow means, and means associated with said actuating means for keeping said armature in a position to be held by said magnet while said actuating means is in off and starting positions and freeing said armature when in running position.

5. A motor starter, movable contacts, a pivotally mounted actuating arm associated therewith having off, starting and running positions, a shaft, an armature rigidly associated with said shaft, a lever rigidly associated with said shaft said lever co-operating with said actuating arm and having a surface substantially concentric with the pivot of said actuating arm, said lever also having a notch whereby said lever may move with respect to said actuating arm.

6. In a controller, movable contacts, actuating means for said contacts, a shaft, a latch loosely mounted on said shaft, for holding said actuating means in circuit closing position, an under-voltage magnet, and an armature for said magnet rigidly mounted on said shaft.

7. In a controller, movable contacts, actuating means for said contacts, a shaft, a latch loosely mounted on said shaft, for holding said actuating means in circuit closing position, an under-voltage magnet, an armature for said magnet rigidly mounted on said shaft, and means released by effective movement of said armature for delivering a hammer blow to said latch for releasing the same.

8. In a controller, movable contacts, actuating means for said contacts, a shaft, a latch, loosely mounted on said shaft, for holding said actuating means in circuit closing position, an under-voltage magnet, an armature for said magnet rigidly mounted on said shaft, a second latch loosely mounted on said shaft, a trip lever operatively disposed with respect to said first latch held in energy-stored condition by said second latch, and means whereby effective movement of said armature causes release of said trip lever.

9. In a controller, movable contacts, a pivotally mounted actuating arm for said contacts, a shaft, a latch, loosely mounted on said shaft, for holding said actuating arm in circuit closing position, a trip lever mounted concentrically with said actuating arm, a second latch, loosely mounted on said shaft, for holding said trip lever in energy-stored condition, an armature rigidly mounted on said shaft, a lever rigidly associated with said shaft said lever having a surface substantially concentric with and co-operating with a portion of said actuating arm said lever also having a notch whereby said lever may move with respect to said actuating arm, and means whereby effective movement of said armature releases said second latch.

10. In a motor starter, movable contacts, a pivotally mounted actuating member associated therewith having off, starting, and running positions, a shaft, an armature rigidly associated with said shaft, an operating member for said shaft cooperating with said actuating member, one of said members having a surface substantially concentric with the pivot of said actuating member and a notch whereby said members may move with respect to each other so as to cause actuation of said armature.

11. In a controller, movable contacts, actuating means for said contacts, a pivotally mounted latch for holding said actuating means in circuit closing position, an under-voltage magnet, and an armature for said magnet pivotally mounted concentrically with said latch and movable relatively thereto.

12. In a controller, movable contacts, actuating means for said contacts, a pivotally mounted latch for holding said actuating means in circuit closing position, an under-voltage magnet, an armature for said magnet pivotally mounted concentrically with said latch and movable relatively thereto, and means released by effective movement

of said armature for delivering a hammer blow to said latch for releasing the same.

13. In a controller, movable contacts, actuating means for said contacts having a projection, a latch for engaging said projection for holding said actuating means in circuit closing position, an under-voltage magnet, an armature for said magnet, means released by effective movement of said armature for delivering a hammer blow to said latch for releasing the same, and means operable by said projection for moving said armature into cooperative relation with said magnet.

14. In a controller, movable contacts, pivotally mounted actuating means for said contacts, a latch for holding said actuating means in circuit closing position, means, for releasing said latch, pivotally mounted concentrically with said actuating means, and disposed to be put in energy-stored condition by movement of said actuating means, a latch pivotally mounted concentrically with said first named latch and extending in the opposite direction, for holding said releasing means in energy-stored condition, and means for tripping said second named latch.

15. In a controller, movable contacts, a pivotally mounted actuating lever for said contacts, a latch for holding said actuating lever in circuit closing position, a lever, operable to trip said latch, having a lost motion connection with said actuating lever, means for biasing said trip lever to tripping position, and a latch pivotally mounted concentrically with said first named latch for normally restraining said trip lever.

16. In a controller movable contacts, a pivotally mounted actuating lever for said contacts, a latch for holding said actuating lever in circuit closing position, a lever, operable to trip said latch, having a lost motion connection with said actuating lever and pivotally mounted concentrically therewith, means for biasing said trip lever to tripping position, and a latch for normally restraining said trip lever.

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

HERBERT W. CHENEY.