No. 864,446. PATENTED AUG. 27, 1907.

H. W. CHENEY.

CONTROLLING MECHANISM.

APPLICATION FILED JUNE 30, 1906.

2 SHEETS—SHEET 1.

Fig. 2

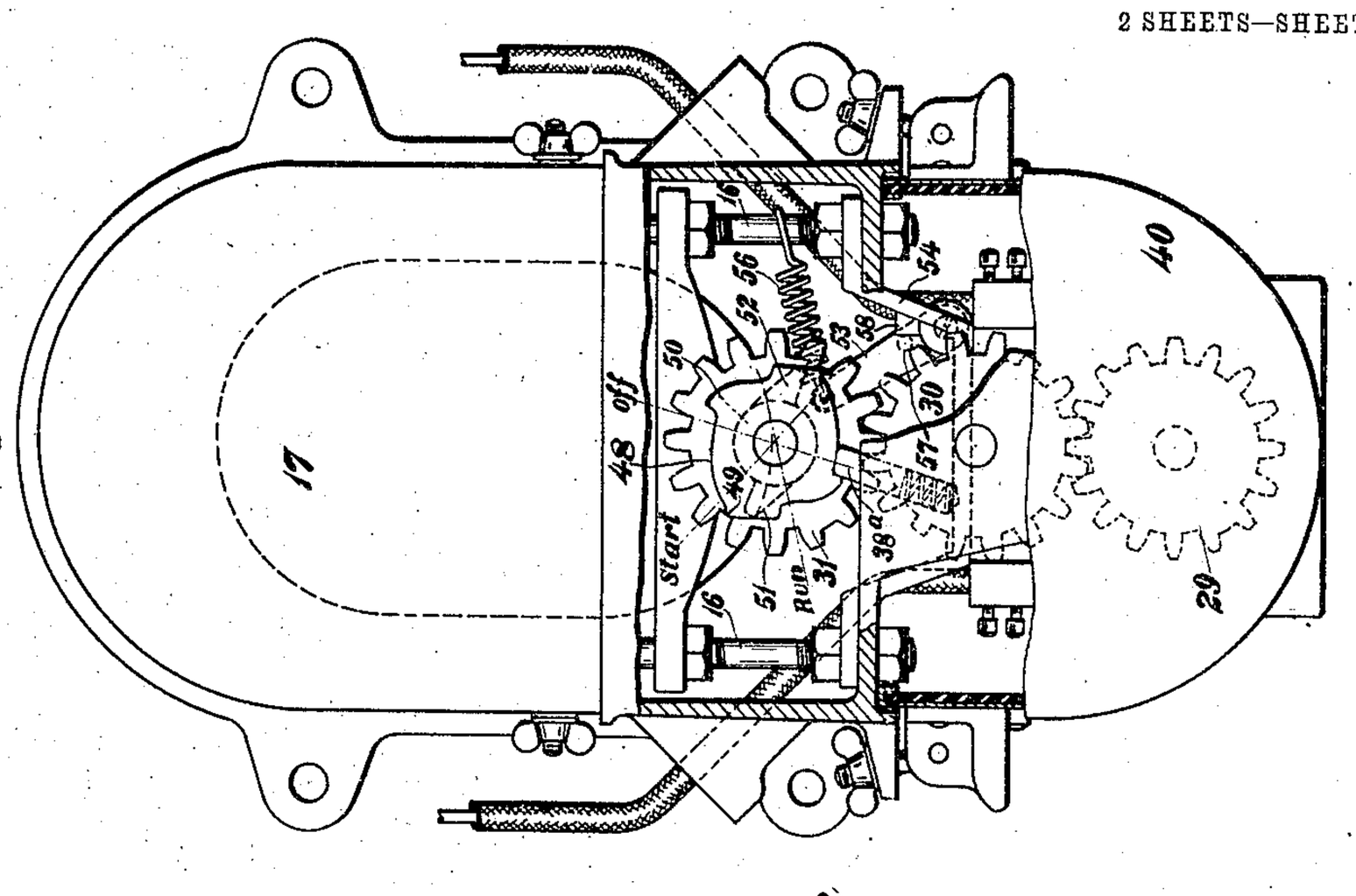
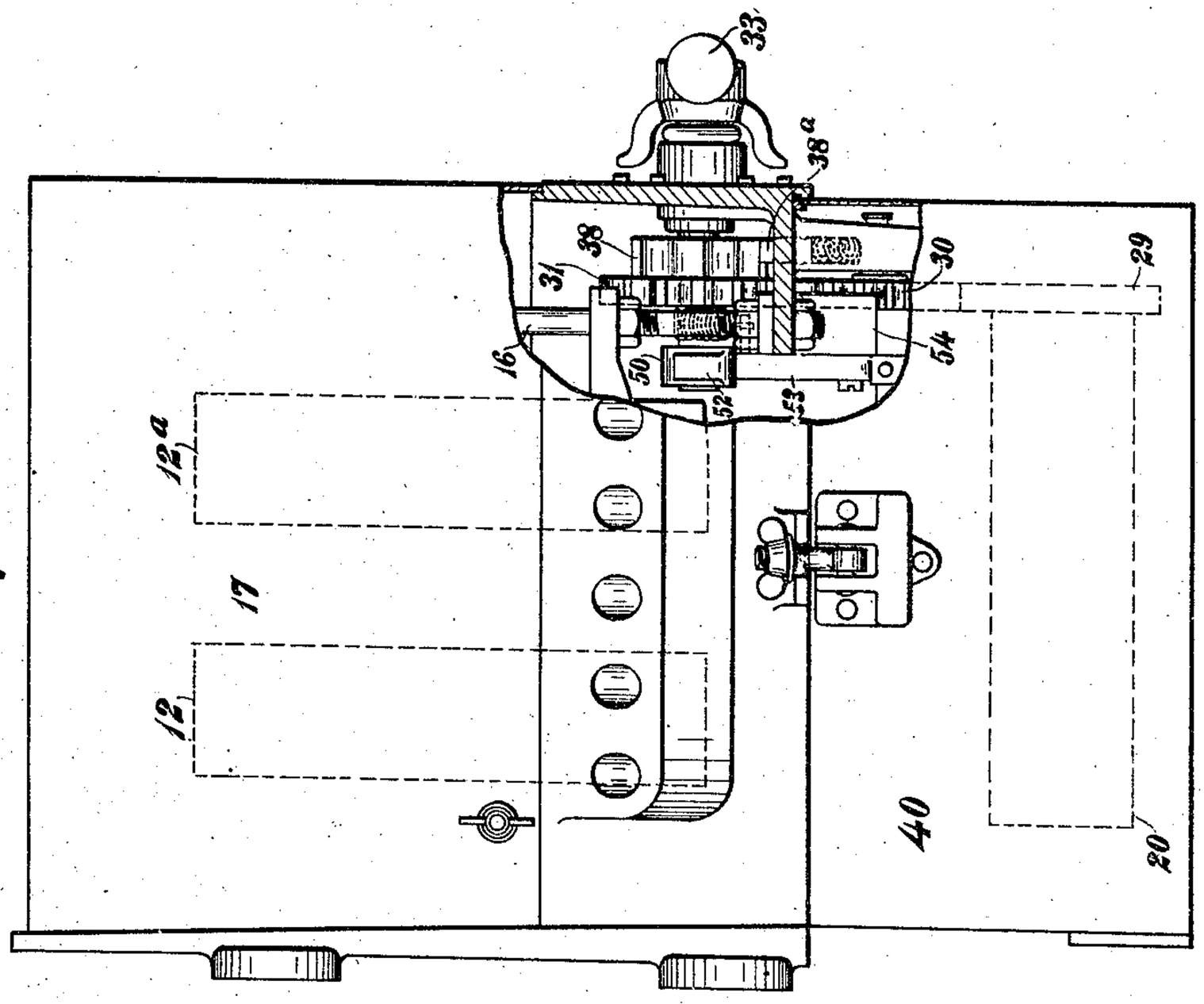


Fig. 1



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3

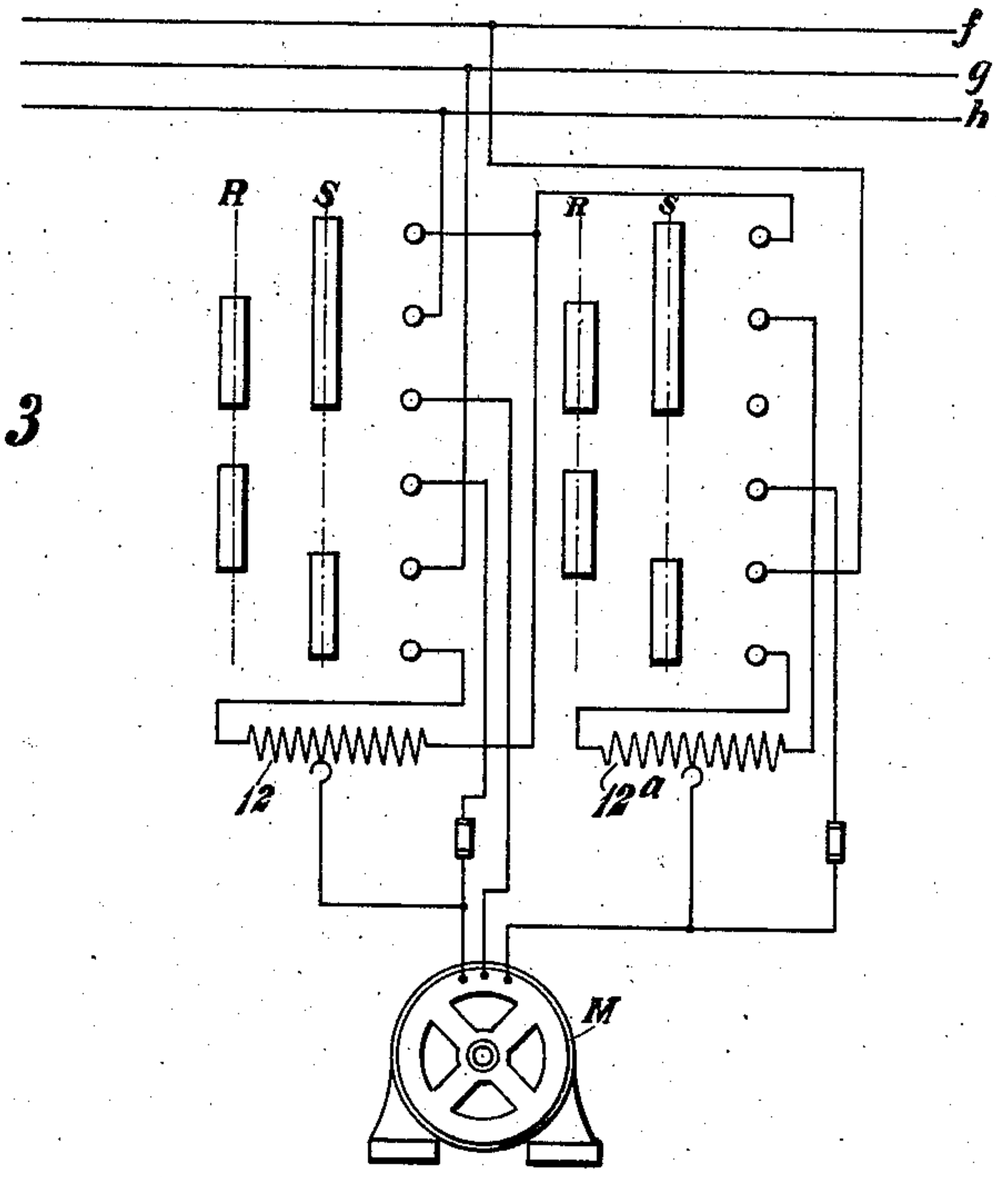
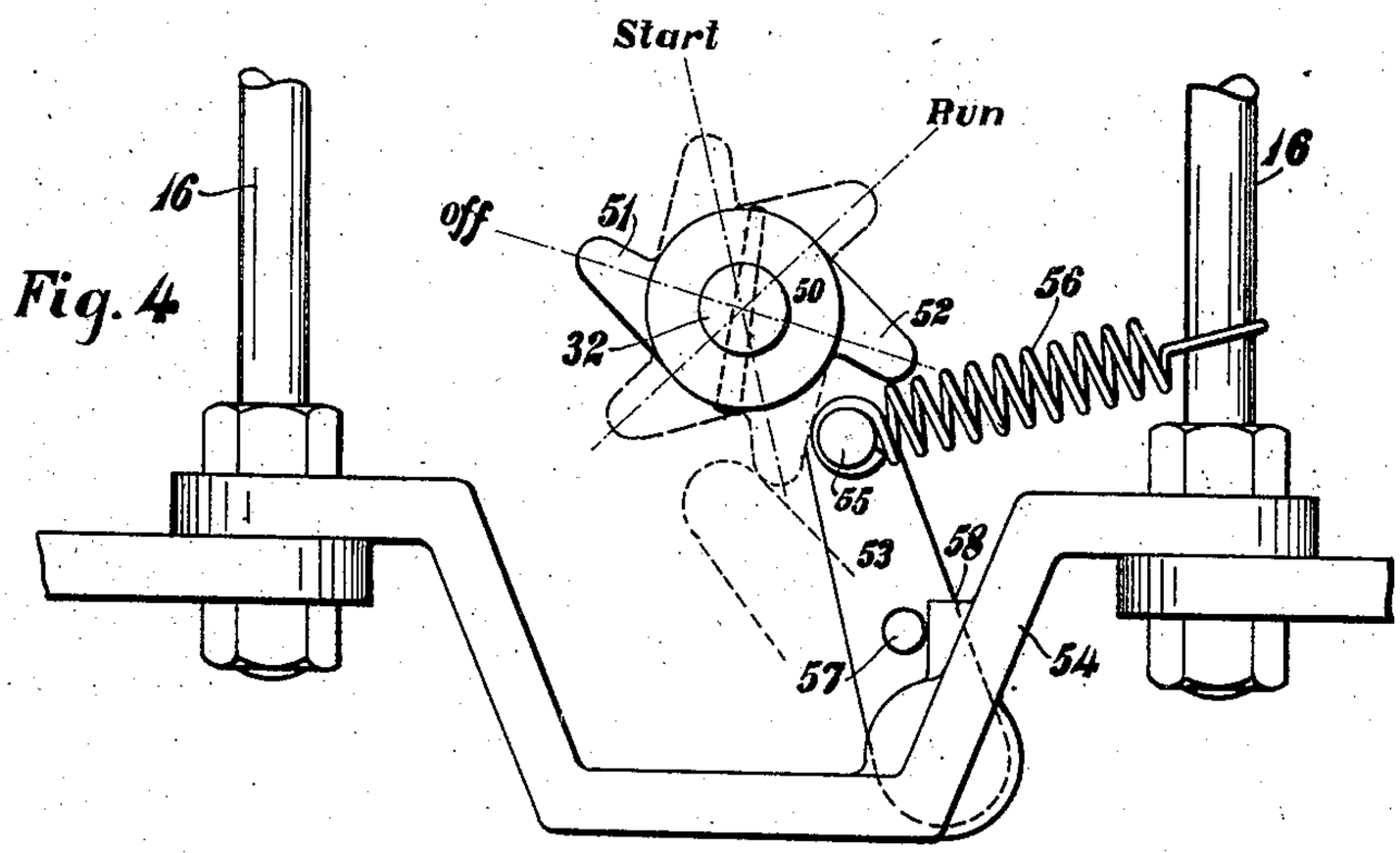


Fig. 4



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UNITED STATES PATENT OFFICE.

HERBERT W. CHENEY, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

CONTROLLING MECHANISM.

No. 864,446. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed June 30, 1906. Serial No. 324,128.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Controlling Mechanisms, of which the following is a full, clear, and exact specification.

My invention relates to starting controllers for electric motors and more particularly to fool-proof potential starters for polyphase induction motors.

In my copending application Serial No. 264,162, filed June 7, 1905, there is described a potential starter for induction motors. My present invention is an improvement on the structure set forth in said prior application, and its object is to prevent the starting controller from being left in starting position. It has sometimes happened that these controllers when under the charge of inexperienced or careless operators have been left in starting position indefinitely instead of being moved to running position as soon as the motor has gained sufficient speed. As the auto-transformer windings are not proportioned to carry current continuously but only for the brief period during starting, the result has often been that the auto-transformer windings have been burned out.

In one aspect my invention consists of a starting controller biased toward "off" position when in starting position, but unbiased when in running position.

In a more specific aspect my invention consists of a controller comprising a rotatable drum having "off", starting, and running positions, fixed contacts coöperating with the drum, and a spring so arranged that it tends to return the drum to "off" position when the latter is in starting position but exerts no influence on the drum when the latter is in running position.

Other features of my invention will appear hereinafter and will be particularly pointed out in the claims.

Figure 1 is a side view of my controller, with the casing partly broken away to show the operating mechanism. Fig. 2 is a front view of the controller, also with the casing partly broken away. Fig. 3 is a diagram showing the connections of my controller when applied to a three-phase induction motor. Fig. 4 is an enlarged view of the handle returning device, *per se*.

The details of the starting controller proper will not be fully described herein because they form no part of the present invention and are unnecessary to an understanding thereof. For what does not appear in the following description reference is made to my aforesaid copending application.

The three-phase induction motor M is supplied with current from the three-phase mains *f*, *g* and *h*. When the controller is in starting position the auto-transformer windings 12 and 12^a, which are within the casing 17, are each connected between two of the mains, the main *h* being connected to one terminal of each winding. One of the terminals of motor M is connected to those two terminals of the windings 12 and 12^a which are connected in common to the mains *h*, and the other two motor terminals are connected to intermediate points on the auto-transformer windings 12 and 12^a respectively. The windings 12 and 12^a thus constitute in effect a single V-connected auto-transformer, the main *h* and the middle terminal of the motor being connected to the middle of the V. When the controller is in running position, the auto-transformer windings 12 and 12^a are entirely disconnected and the motor terminals are connected to the three mains respectively.

In the controller shown there is but one starting position between running and "off" positions, but it is obvious that any desired number of such starting positions may be employed.

The normal operation of the controller is continuously in the same direction, a movement through 180^c constituting a complete operation. The controller drum 20 which is immersed in oil in the oil tank 40 is moved by the operating handle 33 through gear wheels 29, 30 and 31. The two opposite halves of the controller drum are identical in structure. Each half coöperates in turn with each of the two sets of contact fingers during successive operations of the controller, the sets of contact fingers being on opposite sides of the drum.

The controller is provided with a notch plate 38 which coöperates with a spring-pressed pawl 38^a. There are notches in this notch plate at the "off" and running positions, which notches are so arranged that they form ratchet teeth to allow only forward movement of the controller from these positions. At the starting positions there are no notches in the notch plate, but instead there are raised places between which and the "off" positions there are smooth eccentric surfaces 48. When the controller is in either starting position, one of these eccentric surfaces in cooperation with the spring-pressed pawl or plunger 38^a tends to move it backward to "off" position. The operator is enabled to feel when the controller is in starting position by reason of the knobs 49 on the notch plate, which necessitate a heavier pull on the handle 33 in order to pass beyond the starting position to the running position. On the same shaft 32 on which are mounted the notch plate 38, gear 31, and operating handle 33 is a collar 50 having projections 51 and 52. In the path through which these projections must travel is the end of a lever 53 pivoted on a bent

bar 54 supported from bolts 16. Extending from the end of lever 53 and perpendicular to the plane in which it moves is a pin 55, between which pin and one of the bolts 16 is a tension spring 56. By reason of this spring the lever 53 is biased toward the position in which it is shown in full lines in Figs. 2 and 4. The lever 53 is prevented from moving too far to the right by means of a pin 57 which strikes against a shoulder 58 on bar 54.

When the controller is in either starting position, both the spring 56 and the spring-pressed pawl 38ª tend to return it to "off" position. It is obvious that if desired, the spring 56 may be omitted, or the notch plate may be so made that the pawl 38ª does not tend to move it backward from the starting position, but the preferred modification is as described above, where both devices are used to bias the controller to "off" position when it is in a starting position.

When the controller is in either of its "off" positions, the parts are as shown in Figs. 1 and 2, or 180° therefrom, the position of the collar 50 being more plainly shown in full lines in Fig. 4. When the controller is moved forward into starting position, the projection 52 engages the end of lever 53 and moves the same toward the left, the position of the projection 52 and the lever 53 when the controller is in starting position being shown in dotted lines in Fig. 4. The spring 56 now tends to move the controller backward to "off" position and will do so if the hand of the operator is removed from the handle 33. The spring pressed pawl 38ª in its engagement with the eccentric surfaces 48 of the notch plate 38 assists in this. When the motor has started and gained sufficient speed, the operator continuously holding the handle 33 during this starting, the controller is moved forward into running position. During the movement of the controller from starting to running position, the projection 52 slides off of the end of lever 53 and allows said lever to return to its normal position shown in full lines. The position of the projections 51 and 52 when the controller is in running position is shown in long dashes in Fig. 4. The controller while in this running position is free from any tendency to backward movement, and is locked against such movement by pawl 38ª. The handle 33 may now be released by the operator. The controller can only be moved forward from running position, which movement will place the controller again in an "off" position, this "off" position being 180° removed from the former "off" position and the fingers 51 and 52 having exchanged places. The same series of operations may now be repeated, the finger 51 acting during this operation as the finger 52 did in the one before.

It is evident that many substitutions and modifications can be made in the particular structure herein shown and described and I intend to cover in my claims the broad features of my invention including all such obvious modifications and substitutions.

What I claim is:—

1. A controller biased to "off" position when in starting position but unbiased when in running position.

2. A controller for electric motors, comprising fixed and movable contacts, the latter being biased to "off" position when the controller is in starting position but unbiased when the controller is in running position.

3. In a controller, contact fingers, a rotatable drum cooperating therewith, said drum having "off", starting and running positions. and a spring which tends to move said drum to "off" position when the latter is in starting position, but exerts no influence on said drum when the latter is in running position.

4. In a controller, a rotatable drum, fixed contacts with which said drum coöperates, and means whereby said drum is biased to "off" position when in certain operative positions, but when in certain other operative positions is unbiased.

5. A controller for electric motors, comprising a rotatable drum, fixed contacts coöperating therewith, said drum being biased to "off" position when in any starting position, but unbiased when in running position.

6. A controller for electric motors comprising a rotatable drum, contact fingers coöperating therewith, means for preventing backward movement of said drum from the "off" or running positions and a spring which has no tendency to move the drum when the latter is in "off" or running positions but tends to move said drum to "off" position when the latter is in any other position.

7. A controller for electric motors, comprising a rotatable drum, contact fingers coöperating therewith, means for preventing backward movement of the controller from certain positions and a spring which tends to move the controller to "off" position when the latter is in any position from which it may be moved backward.

8. A controller for electric motors, comprising a rotatable drum, contact fingers coöperating therewith, a collar movable with said drum, a projection from said collar, a spring-pressed lever in the path of said projection and arranged to engage it when the controller is in starting position whereby the controller is returned to "off" position if then released, but to be out of engagement with it when the controller is in running position.

9. A controller for electric motors comprising a rotatable drum, contact fingers coöperating therewith, a collar movable with said drum, projections from said collar, a spring-pressed lever in the path of said projections and arranged to be engaged by one of them when the controller is moved into starting position, but to be released from said engagement when the controller is moved into running position, whereby the drum while in starting position is biased toward "off" position.

10. A controller for electric motors, comprising a rotatable drum normally movable always in the same direction, means for preventing backward movement of said controller from "off" or running position and means tending to move said controller backward to "off" position when it is in other than "off" or running position.

11. A controller for induction motors, comprising a rotatable drum having a starting position in which the motor is connected to the mains through auto-transformer windings and a running position in which the motor is connected directly to the mains, and means for returning the controller to "off" position if it is released while in starting position.

12. A controller for induction motors, comprising a rotatatable drum having separate "off", starting and running positions, connections whereby the controller when in starting position connects the motor to the mains through auto-transformer windings and when in running position connects the motor directly to the mains and disconnects the auto-transformer windings, means for preventing backward movement of the controller save from starting position, and means tending to move the controller backward when it is in starting position.

13. A starting controller for electric motors, comprising a switch, an operating shaft, gearing between the operating shaft and switch, and means to automatically return the switch to its off position if it is left at any point between off and running positions.

14. A starting controller for electric motors, comprising a drum, an operating shaft, means to drive the drum from the operating shaft, and means acting upon the operating shaft tending to turn it in a backward direction during predetermined angles of its movement.

15. In a controller, a rotatable drum, an operating shaft therefor, a notch-plate mounted upon the shaft, a spring plunger co-acting with the notch-plate to locate it

and to lock it against backward movement in certain positions and to assist a backward movement in certain other positions.

16. A controller for electric motors comprising an oil immersed drum, a spring, means to store energy in the spring during a movement of the drum to a predetermined operative position tending to return the drum to "off" position, and means whereby a further movement of the drum brings it out of the influence of said spring.

17. A manually operated controller comprising fixed and movable members, and means independent of the current whereby said controller will return to "off" position if released in a starting position but if released in a running position will remain there without the use of any holding means.

18. A controller for electric motors comprising fixed and movable members, the latter having a starting position between "off" and running position and being biased toward "off" position when the controller is in starting position but unbiased when the controller is in running position.

19. A manually operated controller comprising fixed and movable members, said movable member being so arranged that if released in a starting position it will return to "off" position but if released in a running position will stand there without the use of any retaining means.

20. A potential starter for induction motors comprising fixed and movable members, said movable member having "off", running and intermediate positions, and mechanism whereby the contact arm can not be left in an intermediate position.

21. A potential starter for induction motors comprising auto-transformer windings, means for connecting the motor to be controlled to the line directly or through the auto-transformer windings, and means whereby the controller can not be left in a position in which the motor is connected to the line through the auto-transformer windings.

In testimony whereof I affix my signature, in the presence of two witnesses.

HERBERT W. CHENEY.

Witnesses:
GEO. B. SCHLEY,
FRED. J. KINSEY.