No. 649,644. Patented May 15, 1900.

A. E. NORRIS.

CONTROLLER MECHANISM.

(Application filed Sept. 16, 1899.)

(No Model.)

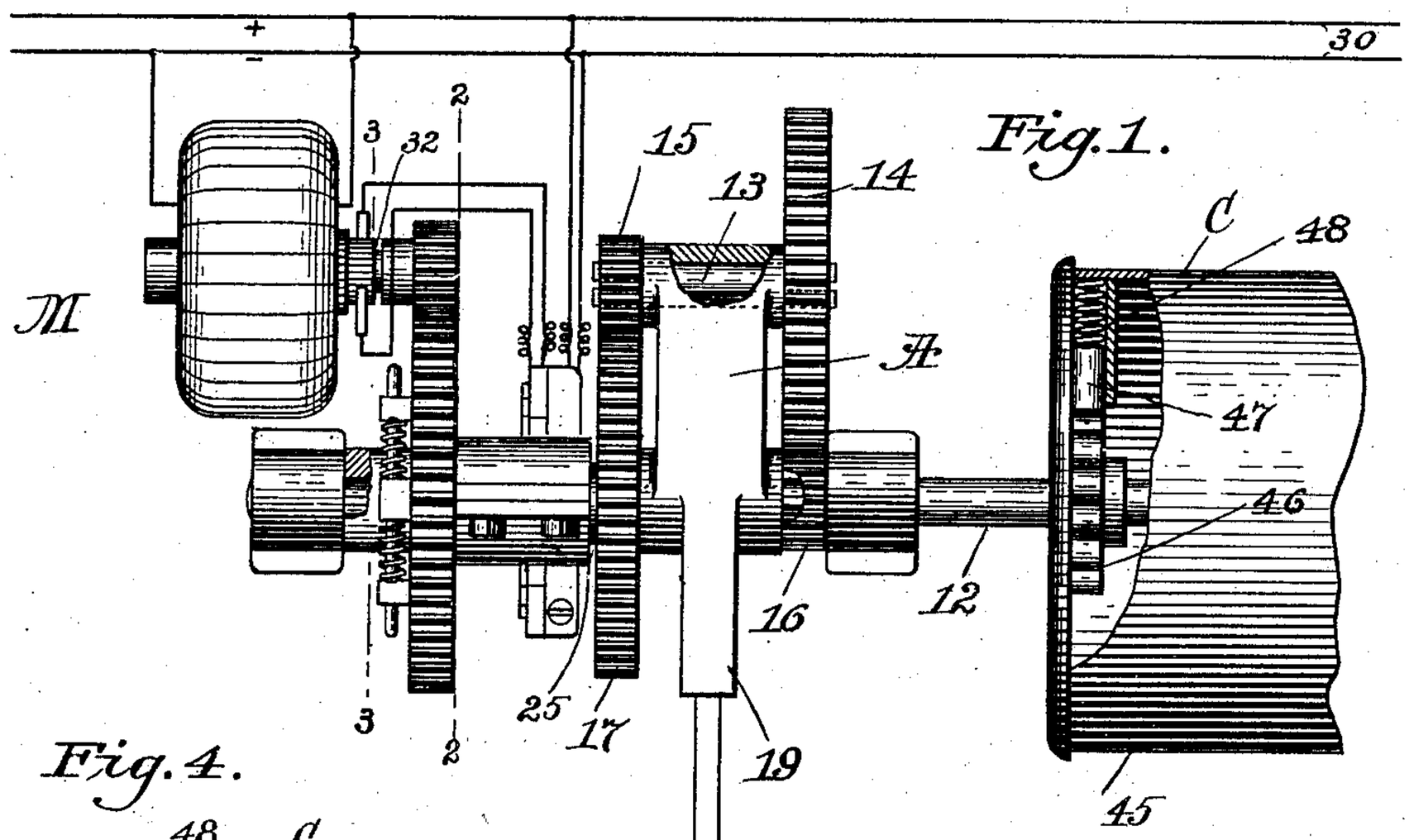


Fig. 1.

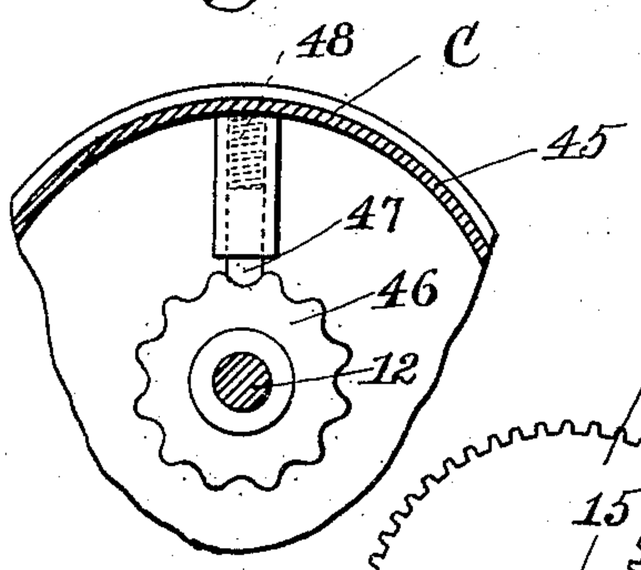


Fig. 4.

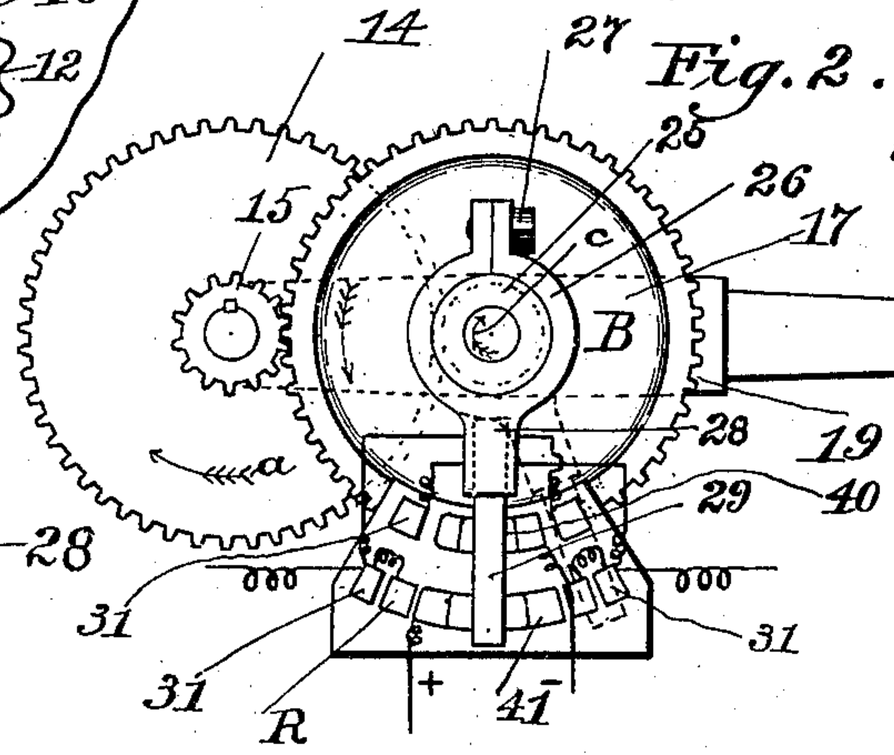
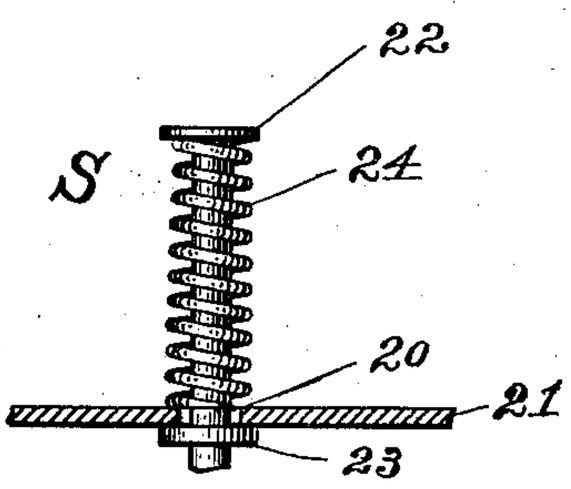


Fig. 2.



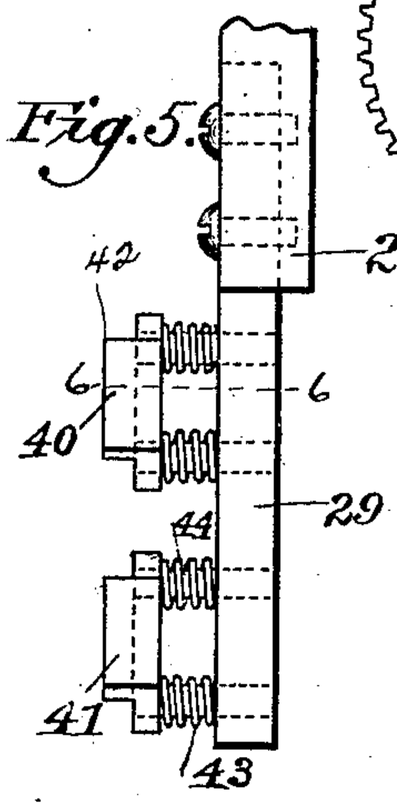


Fig. 5.

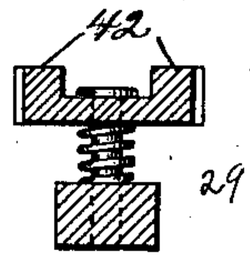


Fig. 6.

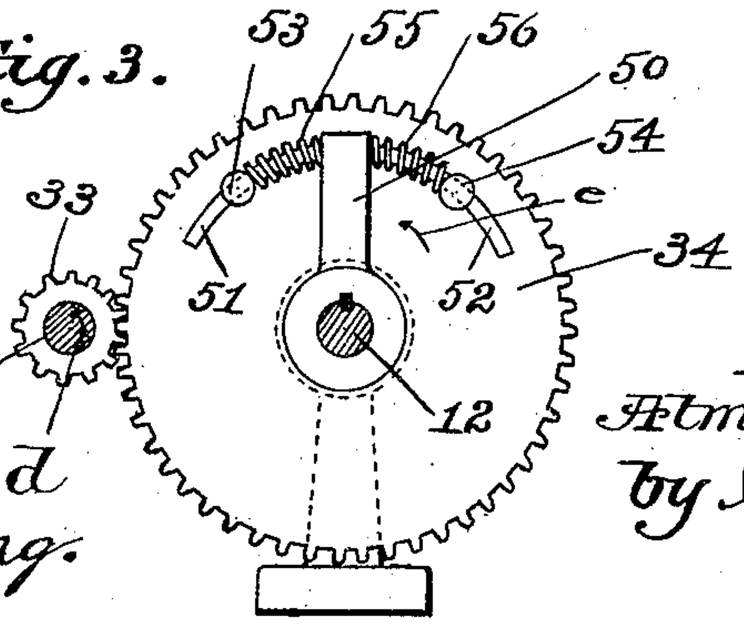


Fig. 3.

Witnesses:
Frank L. Hattis
Walter C. J. King.

Inventor.
Elmore E. Norris
by Crosby Gregory.
Atty's.

UNITED STATES PATENT OFFICE.

ALMON E. NORRIS, OF CAMBRIDGE, MASSACHUSETTS.

CONTROLLER MECHANISM.

SPECIFICATION forming part of Letters Patent No. 649,644, dated May 15, 1900.

Application filed September 16, 1899. Serial No. 730,681. (No model.)

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, of Cambridge, Massachusetts, have invented an Improvement in Controller Mechanism, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to controller mechanism, and it includes certain fundamental features to be set forth in the accompanying claims, and one advantageous adaptation of which will be hereinafter set forth.

In the drawings, Figure 1 is a plan view of a controller apparatus constructed in accordance with my invention in a simple embodiment thereof and showing one of its uses. Fig. 2 is a sectional left-hand side elevation, the section being taken in the line 2 2, Fig. 1. Fig. 3 is a similar view, the section being taken on the line 3 3, Fig. 1, but certain of the parts to the right being omitted. Fig. 4 is a sectional elevation of a means for effecting the step-by-step movements of the controller-shaft. Fig. 5 is a rear elevation of a part of a controller device; and Fig. 6 is a sectional plan view, the section being taken in the line 6 6, Fig. 5.

The controller mechanism constituting the subject-matter of this application and shown in a simple and convenient embodiment thereof can be employed for different purposes. It is illustrated and will hereinafter be described as a means for first rotating a shaft in one direction and then oppositely rotating the same or for moving the shaft partially in either direction without making a complete turn. The shaft represented is that of an electric controller, and it is adapted when turned in one direction through suitable mechanism to effect the supply of an electric current to a motor (not shown) and when reversely operated to shut off said current, whereby the motor can be intermittingly stopped and started. In the present case the apparatus involves a controller device, a shifter, and means between the shifter and controller device organized and adapted to move the controller device in one direction and away from its normal or neutral position when the shifter is moved in one direction and to move said controller device in the opposite direction from said normal or neutral position on the return movement of the shifter, and the means will be of such a character that the controller device can be returned to its primary or neutral position without affecting the action of the shifter.

The parts comprising the combination just set forth may be of any suitable construction capable of securing the peculiar function set forth, and the shifter can be actuated either by hand or foot, or, if necessary, automatically.

In Fig. 1 I have shown an end of an electric controller, the same being denoted by C and being electrically connected with a suitable generator and motor. (Not shown.) The shaft of said controller is designated by 12 and is extended longitudinally beyond the same for some distance, and in conjunction therewith controller mechanism is illustrated and also a small or auxiliary motor, the construction being such that said small motor can be stopped or started by mechanism deriving its motion from the shaft 12 and thrown into action by a shifter, which in the present case is operated by foot. The shaft 12 is shown as loosely supporting the carrier A, generally consisting of a casting and having a hub or bearing at its outer end adapted to receive the short shaft 13, to one end of which the gear 14 is secured, the pinion 15 being secured to the opposite end of said short shaft. The gear 14 meshes with the pinion 16, keyed or otherwise fixed to the shaft 12, while the pinion 15 meshes with the gear 17, loose upon the shaft, the mechanism described constituting a convenient train of power-transferring elements for governing the action of the controller device.

The apparatus illustrated involves a controller and a shifter, and one of these parts is connected to one member of the controller mechanism, while the other part is connected to another member of the controller mechanism. In the form illustrated the shifter is shown as connected with the carrier A, while the controller is represented as connected with the final power-driving element 17 of the series of power-transmitting members, previously described. The shifter is denoted by S, and it is represented consisting of a substantially-vertical bar 18, pivoted at its

lower end to the longitudinal projection 19, extending forward from and constituting a part of the carrier A. The shifter S passes through the guide-opening 20 in the floor 21. The upper end of the bar 18 is provided with a treadle 22 and is equipped between the floor 21 and its pivot to the part 19 with a stop-collar 23, adapted to engage the under side of the floor 21 when it reaches its initial position. (Shown in Fig. 2.) The bar 18 is depressed to swing the controller in one direction, as will hereinafter appear, and is returned to its initial position preferably by the action of a spring which was placed under compression upon the downward movement of the bar. The spring shown for returning the shifter to its initial position is denoted by 24, it being of the "coiled" type and surrounding the upper end of the same and bearing against the shoulder or treadle 22 and also against the floor 21. The gear 17 is shown carrying the controller device, and the latter is denoted in a general way by B. Said gear is provided with a lateral hub 25, extending to the left therefrom. (See Fig. 1.) A split collar is shown at 26, and it is clamped to the hub 25 by means of screws, as 27, and is provided with the downward projection 28, recessed upon its inner face to receive the arm 29 of electro non-conducting material, said arm being provided with circuit-closers operable in conjunction with a rheostat to supply to or shut off the current from the small or auxiliary motor, which is employed to run the controller-shaft 12 in opposite directions alternately to stop and start the main motor (not shown) electrically connected with the controller C.

While the controller device B is shown as a means for throwing a motor of suitable kind into and out of action, it is obvious, of course, that said controller device could be employed to equal advantage for many different purposes.

In Fig. 2 the shifter S is shown as occupying its elevated or initial position. When it is pressed downward to the proper extent, the projection 19 will be correspondingly moved, while that part of the carrier A which sustains the shaft 13 will be elevated. This operation will be one that ordinarily will be performed with rapidity, and during the same the pinion 16 serves, in effect, as a resistance device, it being fixed to the shaft 12 and being so will cause the gear 14 to rotate in the direction of the arrow *a*. The pinion 15 being correspondingly rotated and being in mesh with the gear 17 will cause the latter to travel in the direction of the arrow *d* in Fig. 2, so that the controller B can be swung from its full-line position to that illustrated by dotted lines. It will be assumed that during this motion the necessary current to drive an electric motor will have been supplied thereto. The wiring and the small motor are of such kinds that when the latter is started by the depression of the shifter S it will serve to rotate the shaft 12 in the direction of the arrow *c* in Fig. 2, thereby correspondingly moving the pinion 16, which is keyed to said shaft. As the pinion 16 is in mesh with the gear 14, the latter will be oppositely rotated and in a direction reverse to the arrow *a* to thereby rotate the shaft 13 and pinion 15, and consequently effect the rotation of the large gear 17 in a direction opposite to the arrow *b*, and the ratios of these gears are such that the controller B will be returned to its initial position upon the corresponding action of the controller-shaft 12, and this function can be obtained, notwithstanding the fact that the carrier A, and consequently the shifter S, is still shifted, for these last two mentioned parts are, in effect, independent of the controller-shaft, it being remembered that the carrier is loose upon the controller-shaft—that is, the shifter S can be held down by the foot while the controller device is being returned to its initial position.

When the controller device B is operated from its full to its dotted line position, previously described, it serves to secure the supply of a current to the small motor, so that said motor can operate the main controller-shaft 12 in one direction or forwardly for supplying the current to the main motor, (not shown,) and when said controller device is shifted from said full-line position to a position exactly opposite to that represented said shaft 12 will be reversely operated or returned to its initial position, so that the current can be cut off from the main motor, and it will be understood that said controller device can be returned to its initial position even while the shifter S is down. Let it be assumed that said shifter has been depressed and that the current has been supplied to the motor which operates the shaft 12 and that said shaft has been returned, and, further, that it has served through the intermediate gearing to return the controller B to its primary position. It will be understood that after this operation the main motor is running, although the current from the small motor has been shut off, as the controller B will occupy its ineffective or neutral position. Should it be desired to stop the large motor, the spring-actuated shifter will be released and the relaxing-spring 24 will serve to elevate the same, so that that part of the carrier A which supports the shaft will be lowered, and whereby the controller B will be moved in a direction exactly opposite that hereinbefore set forth or until a current is supplied to the small or auxiliary motor sufficient to operate the same. When the current is thus furnished, said shaft will be turned in the direction opposite to that of the arrow *c*, so that the controller device can be returned to its primary position.

M represents a shunt-wound motor having constantly-excited fields, it being electrically connected with the main 30 and also with the resistance device R, and the latter in return being connected with said main in

some well-known manner. The resistance apparatus includes a series of contacts electrically connected, respectively, with the motor M and the main 30, and the motor and wiring are of such a character that when the controller device B is swung to the right the armature-shaft 32 will be rotated in the direction of the arrow *d*, Fig. 3, thereby correspondingly moving the gear 33, secured to said shaft, and hence oppositely rotating the gear 34, keyed to the shaft 12, by reason of which the said shaft 12 can serve to return the controller B from its right-hand shifted and dotted-line position to its initial position, and when the shifter S is elevated by the action of the spring the opposite action will take place.

From the preceding description it will be understood that the shaft 12 is operated in one direction to effect the supply of a current to a main electric motor (not shown) and is reversely operated to shut off such current from said motor and that the successive actions of said shaft are obtained by the intermittent operation of the small motor M, controlled by the mechanism previously set forth.

The electric non-conducting piece 29 of the controller device B is equipped with circuit-closers, as 40 and 41, of substantially-duplicate construction and each consisting of a plate or shoe having feet or projections, as 42, adapted to successively engage the superposed sets of contacts 31 upon the resistance or rheostat R. The circuit-controllers or shoes for the two sets of contacts are held against the same by means of springs, which are designated by 43 and encircle the pins 44, secured to the part 29, one above the other and passing through openings in the respective shoes or plates 40. The pins 44 are headed, as shown in Fig. 5, to hold the said shoes or plates 40 in place. As the part 29 is moved back and forth the lower shoe 41 coöperates with the lower series of contacts 31, while the upper shoe or circuit-controller 40 coöperates with the second series of contacts 31, whereby the current can be properly governed to secure the successive and alternate rotation of the armature-shaft of the motor M.

In operating the controller-shaft 12 of the main motor it is desirable that the same be turned both forward and backward with an intermittent and quick movement, so that the circuit-controller can be jumped from contact to contact to prevent arcing. The controller-shaft 12 is given a step-by-step movement, and as a means for insuring this operation it is provided at a point near one end of the controller-casing 45 with a star-wheel 46, with which the spring-actuated dog or detent 47, inclosed by the said casing 45, coöperates, the spring which maintains the dog in working position being denoted by 48. The shaft 12 is shown provided at the extreme left-hand end thereof with the arm 50, keyed thereto and adapted to be operated from the motor M through the agency of oppositely-disposed segmental projections 51 and 52, extending through transverse openings in the studs 53 and 54, respectively, upon the outer face of the gear 34, which will be remembered is carried by the shaft 12 and is operated by the motor M. The said projections are encircled by the coiled springs 55 and 56, the inner ends of which abut against the arm 50, while the outer ends abut against the studs 53 and 54. It is desirable that the arm 56 should be shifted step by step and very quickly, as previously stated. Let it be assumed that the gear 34 is moving in the direction of the arrow *e* in Fig. 3. In this case the spring 56 will be compressed, but the arm 50 will not be at once actuated. When, however, the said spring is compressed nearly to its full extent, it will shift the arm 50 with a quick and sudden motion and will cause the dog or detent 47 to quickly pass out of a space between two adjacent teeth upon the star-wheel 46, so that the star-wheel can be turned a distance corresponding to one tooth of said wheel, and such motion will be continued step by step while the shaft 12 is turning, being assured by the yielding connection set forth. On the return movement the opposite action will take place, the spring 55 being compressed.

This invention is not limited to the employment of any of the mechanism previously set forth, for different kinds of devices may be employed for securing the peculiar function incident to the invention.

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

1. In an apparatus of the class specified a movably-mounted member, a motor for operating said movably-mounted member, controlling means governed by the movably-mounted member for controlling the motor, and a shifter movable in one direction to effect the operation of said controlling means and the latter being operable by the movably-mounted member to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means.

2. In an apparatus of the class specified a movably-mounted member, a motor for operating said movably-mounted member, controlling means governed by the movably-mounted member for controlling the motor, and a spring-actuated shifter movable in one direction to effect the operation of said controlling means and the latter being operable by the movably-mounted member to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means.

3. In an apparatus of the class specified, a shaft, an electric motor for operating said shaft, controlling means for said electric motor governed by the shaft, and a shifter movable in one direction for effecting the opera-

tion of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means.

4. In an apparatus of the class specified, a shaft provided with a toothed wheel, a spring-actuated detent coöperative with said wheel, a motor for operating said shaft, controlling means governed by the shaft for controlling the motor, and a shifter movable in one direction and effecting the operation of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means.

5. In an apparatus of the class specified, a shaft, a motor-controlling means governed by the shaft for controlling the motor, a shifter movable in one direction and effecting the operation of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means and connection between the motor and the shaft, including a yielding operating device.

6. In an apparatus of the class specified, a shaft, a motor for operating said shaft, controlling means governed by the shaft for controlling the motor, including an arm movable in opposite direction from a neutral or ineffective position and a shifter movable in one direction for effecting the operation of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means.

7. In an apparatus of the class specified, a shaft, an electric motor for operating said shaft, controlling means governed by the shaft for controlling the motor, an arm provided with an electrical non-conducting portion equipped with contact-shoes and also including a shifter movable in one direction for effecting the operation of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means and a resistance device electrically connected with the motor and provided with sets of contact-pieces adapted to be engaged by said shoes.

8. In an apparatus of the class specified, a shaft, a motor, controlling means governed by the shaft for controlling the motor, a shifter movable in one direction and effecting the operation of said controlling means and the latter being operable by the shaft to return the same to its initial position and the shifter being mounted to be held in its shifted position during the return of the controlling means, two members, one of which is fixed on said shaft and the other of which is loose thereon, one of said members having a spring-actuator adapted to engage the other and means for effecting a step-by-step movement of the shaft.

9. In an apparatus of the class specified, a shaft, a carrier, a series of power-transmitting elements supported by said shaft and the carrier and those that are on the shaft being respectively loose and fixed, and a controller device and a shifter device one connected to the carrier and the other operable with one of said power-transmitting elements.

10. In an apparatus of the class specified, a shaft, a carrier loose on said shaft, a series of power-transmitting elements supported by said shaft and the carrier, and those that are on the shaft being respectively loose and fixed, and a controller device and a shifter device one connected to the carrier and the other operative with one of said power-transmitting elements.

11. In an apparatus of the class specified, a shaft, a carrier, a series of power-transmitting elements supported by said shaft and the carrier, and those that are on the shaft being respectively loose and fixed, a controller device and a shifter device, one connected to the carrier and the other operable with one of said power-transmitting elements, and a driving-motor for said shaft governed by said controller device.

12. In an apparatus of the class specified, a shaft, a carrier, a series of power-transmitting elements supported by said shaft and the carrier, and those that are on the shaft being respectively loose and fixed, a motor for driving said shaft, and means operative with one of said power-transmitting elements for controlling the motor.

13. In an apparatus of the class specified, a shaft, a carrier, a series of power-transmitting elements supported by said shaft and the carrier, and those that are on the shaft being respectively loose and fixed, an electric motor, a resistance device electrically connected with the motor, and a movable switch-arm for the resistance device controlled by one of the power-transmitting elements.

14. In an apparatus of the class specified, a motor for operating said shaft, controlling means governed by the shaft for controlling the motor, and a shifter movable in one direction to effect the operation of said controlling means, and the latter being operable by the shaft to return the same to its initial position, and the shifter being mounted to be held in its shifted position during the return of the controlling means, and said shifter serving upon its return movement to repeat the action of said controlling means.

15. A motor, a reciprocatory shifter, and means controlled by the shifter between the latter and the motor to alternately start and stop said motor during the advancing movement of the shifter, and to alternately start and stop said motor during the return movement of the shifter, and said shifter being arranged to be held at rest during a portion

UNITED STATES PATENT OFFICE.

ALMON E. NORRIS, OF CAMBRIDGE, MASSACHUSETTS.

CONTROLLER MECHANISM.

SPECIFICATION forming part of Letters Patent No. 649,644, dated May 15, 1900.

Application filed September 16, 1899. Serial No. 730,681. (No model.)

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, of Cambridge, Massachusetts, have invented an Improvement in Controller Mechanism, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to controller mechanism, and it includes certain fundamental features to be set forth in the accompanying claims, and one advantageous adaptation of which will be hereinafter set forth.

In the drawings, Figure 1 is a plan view of a controller apparatus constructed in accordance with my invention in a simple embodiment thereof and showing one of its uses. Fig. 2 is a sectional left-hand side elevation, the section being taken in the line 2 2, Fig. 1. Fig. 3 is a similar view, the section being taken on the line 3 3, Fig. 1, but certain of the parts to the right being omitted. Fig. 4 is a sectional elevation of a means for effecting the step-by-step movements of the controller-shaft. Fig. 5 is a rear elevation of a part of a controller device; and Fig. 6 is a sectional plan view, the section being taken in the line 6 6, Fig. 5.

The controller mechanism constituting the subject-matter of this application and shown in a simple and convenient embodiment thereof can be employed for different purposes. It is illustrated and will hereinafter be described as a means for first rotating a shaft in one direction and then oppositely rotating the same or for moving the shaft partially in either direction without making a complete turn. The shaft represented is that of an electric controller, and it is adapted when turned in one direction through suitable mechanism to effect the supply of an electric current to a motor (not shown) and when reversely operated to shut off said current, whereby the motor can be intermittingly stopped and started. In the present case the apparatus involves a controller device, a shifter, and means between the shifter and controller device organized and adapted to move the controller device in one direction and away from its normal or neutral position when the shifter is moved in one direction and to move said controller device in the opposite direction from said normal or neutral position on the return movement of the shifter, and the means will be of such a character that the controller device can be returned to its primary or neutral position without affecting the action of the shifter.

The parts comprising the combination just set forth may be of any suitable construction capable of securing the peculiar function set forth, and the shifter can be actuated either by hand or foot, or, if necessary, automatically.

In Fig. 1 I have shown an end of an electric controller, the same being denoted by C and being electrically connected with a suitable generator and motor. (Not shown.) The shaft of said controller is designated by 12 and is extended longitudinally beyond the same for some distance, and in conjunction therewith controller mechanism is illustrated and also a small or auxiliary motor, the construction being such that said small motor can be stopped or started by mechanism deriving its motion from the shaft 12 and thrown into action by a shifter, which in the present case is operated by foot. The shaft 12 is shown as loosely supporting the carrier A, generally consisting of a casting and having a hub or bearing at its outer end adapted to receive the short shaft 13, to one end of which the gear 14 is secured, the pinion 15 being secured to the opposite end of said short shaft. The gear 14 meshes with the pinion 16, keyed or otherwise fixed to the shaft 12, while the pinion 15 meshes with the gear 17, loose upon the shaft, the mechanism described constituting a convenient train of power-transferring elements for governing the action of the controller device.

The apparatus illustrated involves a controller and a shifter, and one of these parts is connected to one member of the controller mechanism, while the other part is connected to another member of the controller mechanism. In the form illustrated the shifter is shown as connected with the carrier A, while the controller is represented as connected with the final power-driving element 17 of the series of power-transmitting members, previously described. The shifter is denoted by S, and it is represented consisting of a substantially-vertical bar 18, pivoted at its