June 17, 1924. 1,497,827

A. J. ACKER

ELECTRIC CONTROLLER

Filed April 2, 1920 3 Sheets-Sheet 1

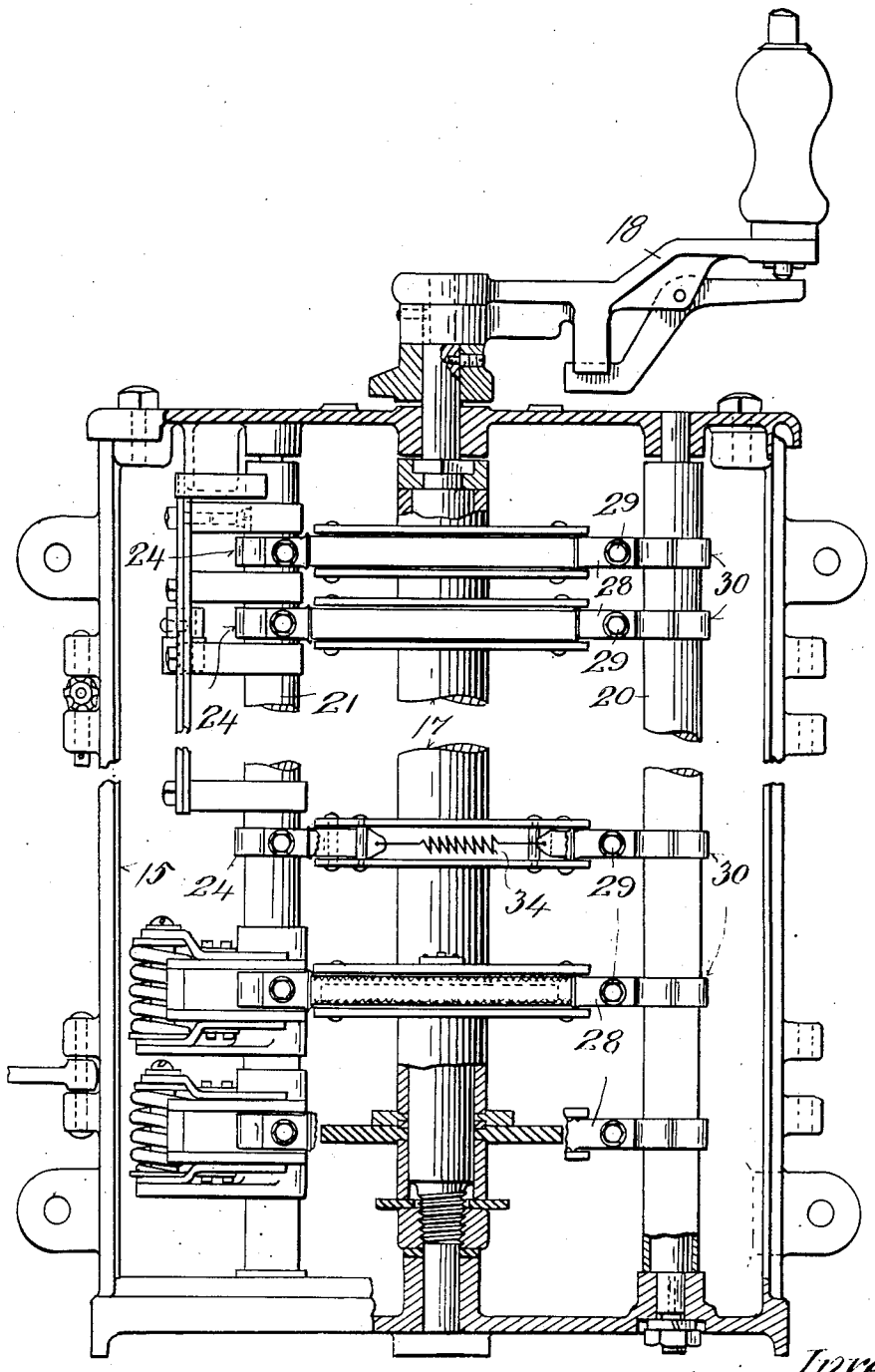


Fig. 1.

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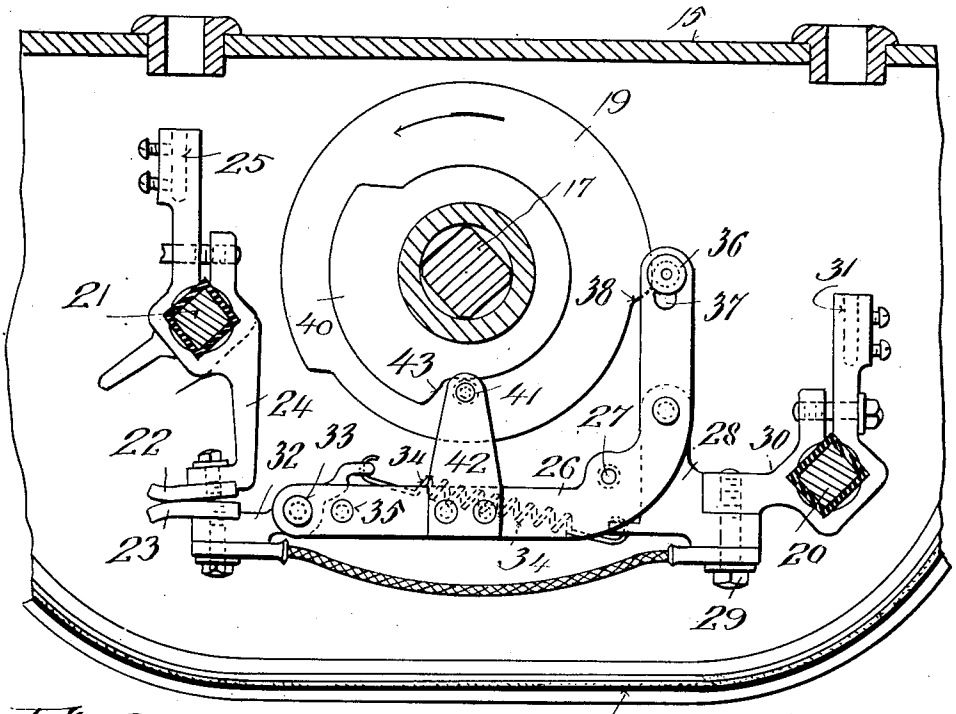


Fig. 2.

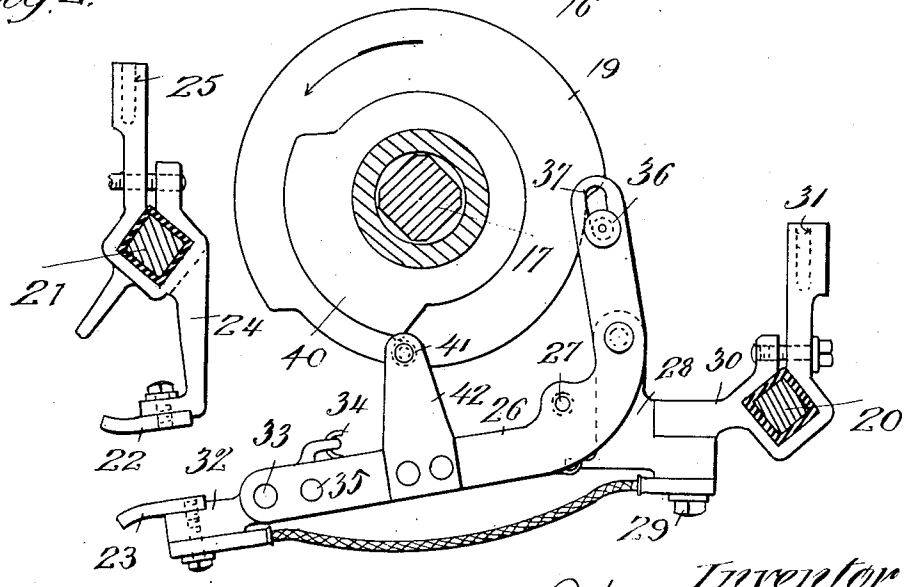


Fig. 3.

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3 Sheets-Sheet 3

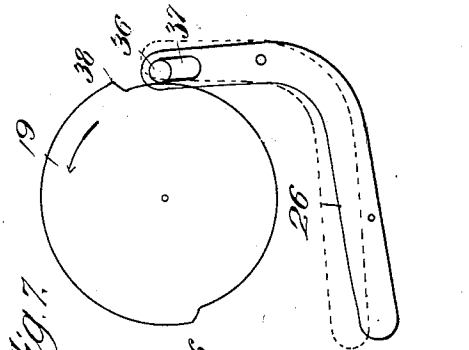


Fig. 7.

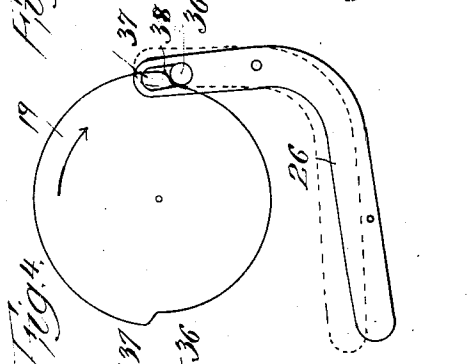


Fig. 4.

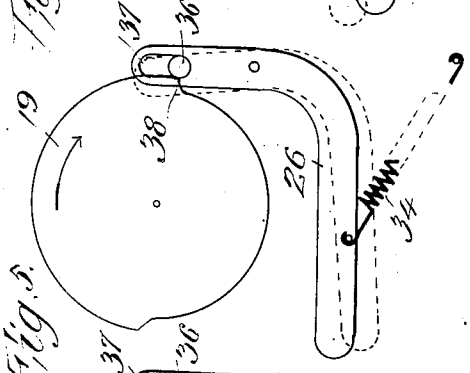


Fig. 5.

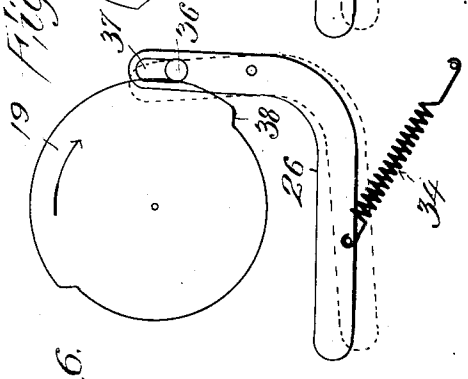


Fig. 6.

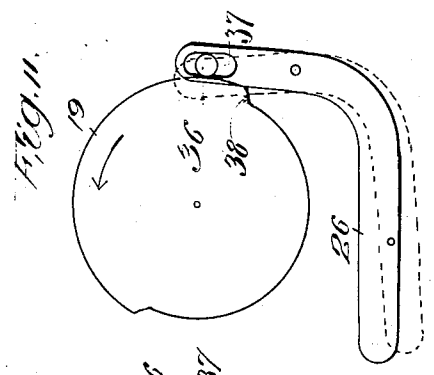


Fig. 11.

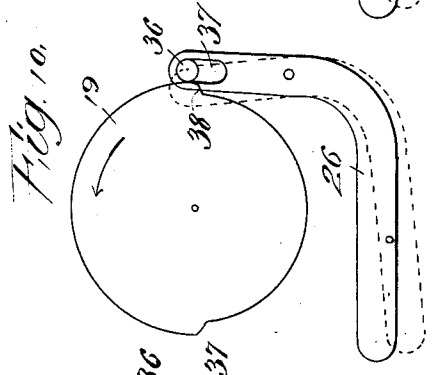


Fig. 10.

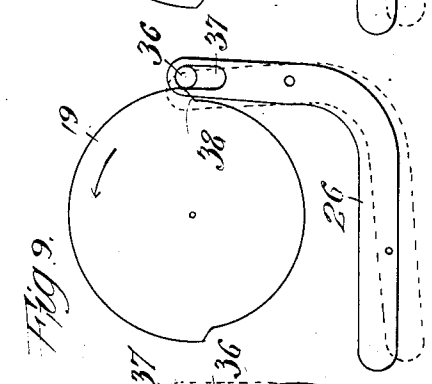


Fig. 9.

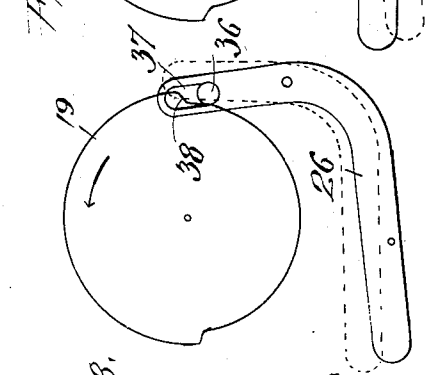


Fig. 8.

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UNITED STATES PATENT OFFICE.

ALBERT J. ACKER, OF MUSKEGON, MICHIGAN, ASSIGNOR TO MANNING, MAXWELL & MOORE, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

ELECTRIC CONTROLLER.

Application filed April 2, 1920. Serial No. 370,705.

To all whom it may concern:

Be it known that I, ALBERT J. ACKER, a citizen of the United States, residing at Muskegon, in the county of Muskegon, State of Michigan, have made a certain new and useful Invention in Electric Controllers, of which the following is a specification.

This invention relates to electric controllers and particularly to controllers of the drum type.

The object of the invention is to provide a drum type of controller which is simple in construction, economical to manufacture and efficient in use.

A further object is to provide a drum type of electric controller wherein the contacts are removed from the controller or drum shaft and are operated and controlled by cams on said shaft.

A further object is to provide novel means which are simple and efficient for securing a quick opening of the contacts.

A further object is to provide means to positively separate the contacts in case for any cause the quick opening operation should fail.

A further object is to provide a controller structure in which the contacts and their associated parts may be quickly, easily and readily removed and replaced individually without disturbing or disarranging the other parts of the controller or dismembering the same.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

In the accompanying drawings:—

Fig. 1 is a view in front elevation, parts broken off, and parts in vertical section, of a drum controller embodying the principles of my invention, the door of the enclosing casing being removed.

Fig. 2 is a transverse horizontal section through the same showing a pair of contacts and the operating and controlling devices therefor, embodying the principles of my invention, the contacts being shown in closed position.

Fig. 3 is a view similar to Fig. 2 showing the contacts in open position.

Figs. 4, 5, 6, 7, 8, 9, 10 and 11, are diagrammatic views illustrating the action of the contact operating devices.

The same same part is designated by the same reference numeral wherever it occurs throughout the several views.

In the drum type of controller ordinarily encountered in common use, contact strips are mounted upon the exterior surface of the drum and contact fingers are positioned to cooperate with said strips when the drum is axially rotated, to effect the desired circuit control. The arcs or sparking which customarily occur in controllers of this type when the contacts are separated cause injury to the drum and associated parts. Moreover, where the contact strips are carried upon the surface of the drum a large heavy and frequently bulky structure is necessitated, and when a contact strip becomes injured or is burned and requires repair or replacement the entire controller structure must be taken apart or dismembered in order to effect such repair or replacement of an individual contact strip. Again, where the controller drum is rotatively operated to effect circuit changes, the contact fingers simply slide off the contact strips on the drum and there is a failure to secure a quick snapping-open action of the contacts with the result that the arcing or sparking action becomes prolonged, thereby increasing the danger of injury due to such arcing or sparking. When arcing or sparking occurs, and frequently without sparking or arcing, the contacting surfaces of the contacts become heated and often fused together, thereby resisting the separation thereof with the result that there is failure to accomplish their separation. This is particularly true in the case of spring retracted contact fingers in the so-called quick-acting contacts, and especially is this true where the contacts are removed from the controller drum and are operated or controlled by the rotative movements of the drum.

It is among the special objects and purposes of my present invention to provide a controller of the general drum type wherein the above noted and other objections are avoided, and in carrying out my invention I propose to employ separable pairs of contacts for controlling the circuits in the usual manner, but I mount the members of each

pair of contacts independently of the drum or the drum shaft, and instead of employing a drum on the shaft I mount cams on said shaft through which the desired contact operation and control is effected. I also propose to so mount the members of each pair of contacts that any individual contact may be demounted, removed or replaced without disturbing the other parts of the controller. I also propose to employ means for securing a quick opening action or separation of the members of the pairs of contacts when circuit between them is to be opened. I also propose to employ means to positively open or separate the contacts in case, for any reason, the quick acting opening means shall fail in their duty. I have found in the practical use and test of structures embodying my invention, that the advantages above pointed out are secured in a most effective and satisfactory manner.

Referring to the drawings, reference numeral 15 is a casing, which encloses the various parts of the controller, and which may be of any suitable or convenient arrangement, and, if desired, may be provided with a door 16. Suitably mounted in the casing is the controller shaft 17, which, if desired, may be equipped with the usual handle or operating lever arm 18, by which said shaft is rotatably actuated. Mounted upon to rotate with the shaft 17 are a series of cam disks 19, corresponding in number to the pairs of contacts to be operated. Also mounted in the casing, and preferably at opposite sides of the shaft 17 are the posts 20, 21. Upon these posts are respectively mounted the supports which carry the members of cooperating pairs of contacts. In the form shown one member 22 of each pair of contacts is held stationary while the other member 23 is movable towards and from the stationary member. Each stationary member 22 is mounted upon a carrier 24 which is detachably clamped upon but insulated from post 21. Each carrier 24 is formed with means to receive a circuit terminal, as indicated at 25. In this manner any one of the contact members 22 may be detached, removed or replaced without dismembering the controller or disturbing any other part. The other contact member 23 of each part is mounted upon a bell crank lever 26, which is pivotally mounted as at 27, upon a supporting block 28, which is detachably mounted, as by means of a bolt 29, upon a carriage 30, which is detachably clamped to but insulated from the post 20, and which is also constructed to receive a circuit terminal, as indicated at 31. By simply removing the bolt 29, the block 28 and lever 26, with the contact member 23 may be quickly, readily and easily detached, removed, or replaced without disturbing any other part.

When the levers 26 are rocked, their contact members 23, are closed upon or separated from their cooperating contact members 22. It sometimes occurs that the contacting surfaces of the contacts 22, 23, become more or less fused together by the arcing which occurs between them when separated, and such fusing tends to cause the contacts to stick together. In order to minimize this trouble I prefer to so mount one or both of the members of pairs of contacts 22, 23, as to permit a rolling action of the one upon the other when they are brought together into contacting relation. To accomplish this result the contact members 22, 23, are slightly curved in opposite directions in the direction of their length, and instead of mounting the contacts directly and rigidly upon their supports, one of them, as 23, is mounted upon a rock member 32, which is pivotally mounted, as at 33, upon the lever 26. A spring 34, is connected at one end to the rock member 32, and at the other end to the block 28 upon which the lever 26 is pivoted. The tension of this spring is exerted upon the rock member 32 to hold the same against a stop 35, upon lever 26, but permit the rock member 32 to turn upon its pivoted axis when the contacts 23, 22, are brought together, thereby securing a rolling contact of the surfaces of the contacts, keeping such surfaces bright and clean and tending to reduce and minimize the effects of fusing, burning or blistering of such surfaces.

The springs 34, normally exert their tension upon the levers 26, tending to rock said levers in a direction to separate the contacts 23, 22. It is desirable that the contacts be separated with a quick snap in order to reduce the arcing which occurs when circuits are opened. I will now describe means embodying my invention for accomplishing this result. One arm of each bell crank lever 26, is arranged, as above described, to support its contact member 23. The other arm of said lever is acted upon by a cam disk 19 on the controller shaft 17. Instead of the end of the lever 26 being directly engaged by the cam disk, said lever end is provided with a roller 36 which takes the working contact of the cam disk. This roller is mounted in an elongated slot 37, in the end of the lever so as to have a range of play relative to and in the direction of the length of the lever depending upon the length of said slot. The action of this arrangement is illustrated diagrammatically in Figs. 4 to 11, inclusive. Thus in Fig. 4, the controller shaft and cam disk 19 are being turned in a direction to complete circuit between the contacts 22, 23, and the roller 36 is just ready to ride up the cam surface of disk 19. It will be observed that the roller 36 has shifted to one extreme limit of its movement relative to lever 26, permitted by the slot 37.

This position of the roller is maintained throughout the "on" movement of the cam disk and controller shaft as indicated by the arrows in Figs. 5 and 6. Now when the cam disk and controller shaft are turned toward "off" position, the roller 36 first begins to move along slot 37 toward the other limit of its relative travel permitted by said slot, as indicated in Fig. 11, and attains such limit before the cam shoulder of disk 19 is reached, as indicated in Fig. 10. This position of the roller continues until the cam shoulder is reached, as indicated in Fig. 9. Up to this point no separation of the contacts 22, 23, has taken place, but spring 34 is under tension ready to rock the lever 26, and separate the contacts the instant the roller passes the cam shoulder 38. Because of this tension, when the roller passes the edge of the shoulder 38, see Fig. 9, it snaps or jumps along the slot 37, see Fig. 8, to the other limit of slot 37, thereby enabling the spring to separate the contacts 22, 23, with a quick snap action. After the contacts have snapped open the continued "off" movement of the cam disk and controller shaft will cause the roller to again shift to the other limit of slot 37, as indicated in Fig. 7, which position it will maintain until the next "on" movement of the controller shaft when the above cycle of operation will be repeated.

By this arrangement a quick opening of the contacts with a snap is secured, thereby decreasing the effects of arcing.

In the case of some one or more or all of the contacts it is desirable to positively prevent accidental untimely closing, and also to positively and certainly open the contacts through failure of the spring, for any cause, to effect their opening, or in case the contacts should stick together and thereby fail to open. To accomplish this result I employ in connection with the contacts which are to be locked against accidental closing or which are to be positively opened, an auxiliary cam disk 40, which is mounted on the controller shaft 17, to rotate therewith, and which auxiliary cam disk cooperates with a stud 41, carried in an arm 42, mounted on lever 26. With this arrangement it will be seen that when the controller shaft is rotated to "on" position, the stud 41 rides down the shoulder 43 of the auxiliary cam disk 40, as the roller 36 rides up the shoulder 38 of the cam disk 19, see Fig. 2. When, however, the controller shaft is rotated to "off" position, as soon as the roller 36 snaps off or jumps away from the shoulder 38, the stud 41 will engage and ride up the shoulder 43 of cam disk 40, thereby causing a positive separation of the contacts should the spring 34, fail for any reason to effect such separation, and said contacts are locked open during the continued rotation of the controller shaft towards "off" position and hence during the time when it is desired to avoid accidental closing of the contacts.

Many variations and changes in the details might readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described.

But having now set forth the objects and nature of my invention, and a construction embodying the principles thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent is:—

1. An electric controller comprising in combination a stationary contact, a rocker arm, means constantly urging said rocker arm open; means for positively moving said rocker arm to close said contacts and to open the same, said means being adapted normally to cause said contacts to snap open in advance of the operation of the mechanism for positively opening the same.

2. An electric controller comprising in combination a plurality of stationary contacts and a plurality of movable contacts, a spring normally operative to separate said contacts, means for positively closing said contacts, said last mentioned means being adapted to release the movable contact to permit said spring to snap the said contacts apart, as soon as said means causes such movement to start.

3. In an electric controller comprising in combination a drum shield and a pair of posts, contacts upon one of said posts, a rocking lever pivotally mounted on the other of said posts, a cam upon said drum shield adapted to engage said rocker lever, and means for operating said rocking lever in the other direction, said connection between said cam and said rocking lever being such as to cause said cam to operate said lever at a different point in its circumference when moving in one direction than when moving in the other direction.

4. In an electric controller comprising in combination a rocker arm pivotally mounted to a support, a rocking member pivotally connected to said rocker arm and carrying a contact, a second contact member, a spring mounted to said rocking member and said support, and adapted to rock said rocker arm to separate said contacts and to rock said rocking member in a direction to close said contacts and a stop to limit the effect of said spring on said rocking member when said contacts are separated.

5. In an electric controller of the drum type, a controller shaft and means for rotatively actuating the same, in combination with a post arranged adjacent to the controller shaft but independent of it, a support mounted on said post, a lever pivotally

mounted on said support, a contact member carried by said lever, a cooperating contact member, a cam on said controller shaft to rock said lever to close said contact members upon each other, means effective when said cam releases said lever to snap said contact members apart, and auxiliary means to positively separate said contact members, said auxiliary means serving to lock said contact members in their open or separated relation.

6. In an electric controller, contact members, means to positively close said contact members upon each other, means to snap said contact members apart when released by said closing means, auxiliary devices to positively separate said contact members, said auxiliary devices operating to lock said contact members apart until acted upon by said closing means.

7. In an electric controller, a controller shaft, a pair of contact members, a pivoted lever carrying one of said contact members, a cam on said shaft to rock said lever to close the contact members upon each other, a spring connected to said lever and operating to snap the same to open position when released by said cam, and an auxiliary cam on said shaft operating to positively force said lever to open position when released by said closing cam.

8. In an electric controller including a stationary and a relatively movable contact, and in combination with tension means normally operating to separate said contacts and a cam to retain said contacts closed upon each other, of means effective when said cam releases its retaining relation to aid said contacts in snapping apart, said means including a member movably mounted with relation to the movable contact and with which said cam engages.

9. In an electric controller including separable contacts, the combination with a lever carrying one of said contacts, said lever having an elongated slot, a tension means normally operating to rock said lever to separate said contacts, a member loosely mounted for movement in said elongated slot, a cam engaging said loosely mounted member, and means to actuate said cam.

10. In an electric controller including separable contacts, the combination with a pivotally mounted lever carrying one of said contacts, said lever having an elongated slot, a spring connected to said lever and normally exerting its tension thereon to separate said contacts, a roller loosenly mounted for movement along said elongated slot, a cam cooperating with said roller, and means for actuating said cam.

11. In an electric controller including separable contacts, the combination with a pivotally mounted bell crank lever carrying one of said contacts at one end thereof, the other end of said lever having an elongated slot, a retracting spring connected to said lever, a roller loosely mounted for movement along said slot, a cam cooperating with said roller, and means for actuating said cam.

In testimony whereof I have hereunto set my hand on this 18 day of March A. D., 1920.

ALBERT J. ACKER.