W. S. HENRY.

CIRCUIT CONTROLLER.

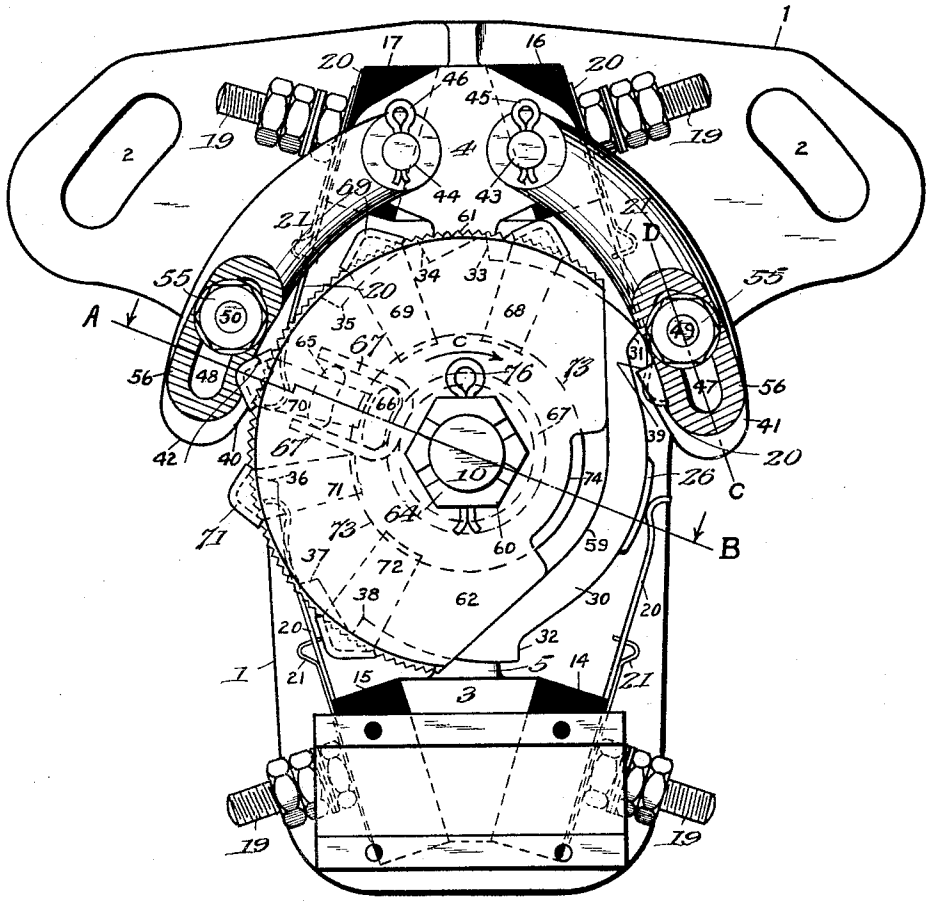
APPLICATION FILED JAN. 18, 1913.

1,224,542.

Patented May 1, 1917.

3 SHEETS—SHEET 1.

FIG. 1.



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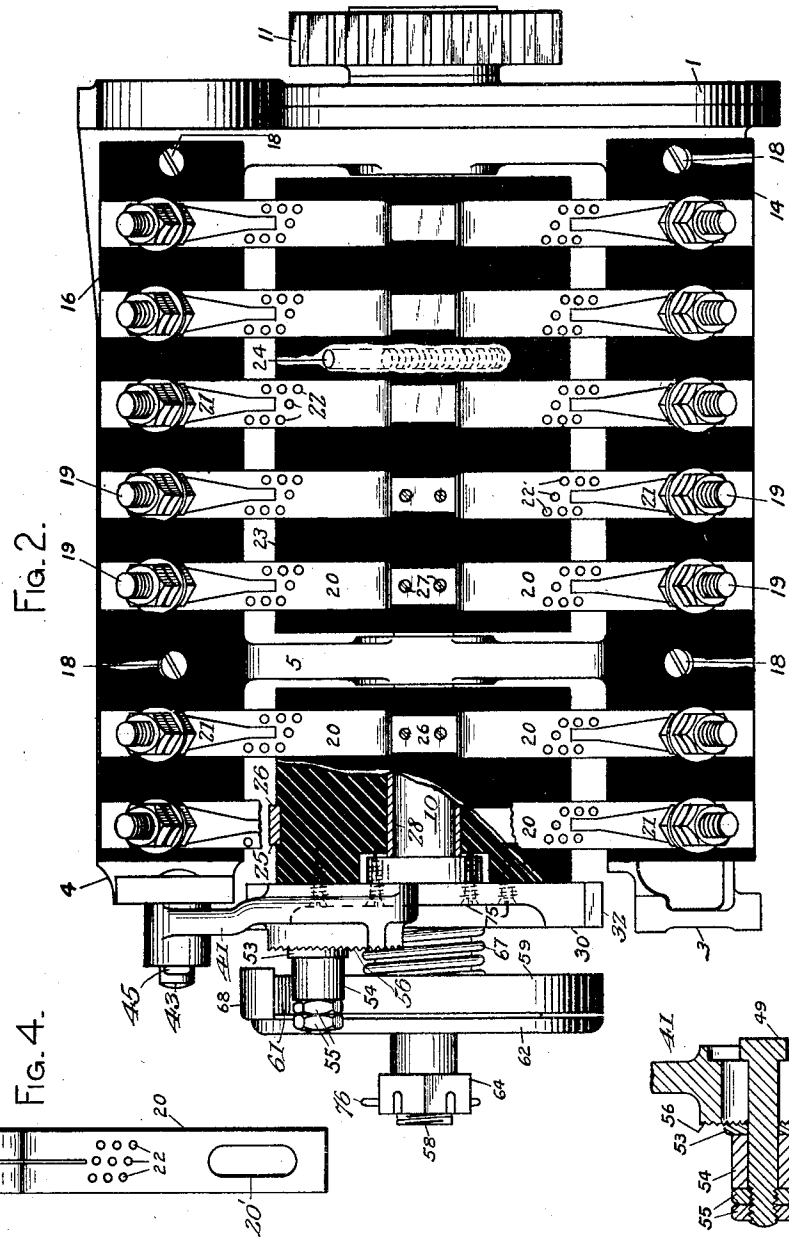


FIG. 2.

FIG. 4.

FIG. 5.

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3 SHEETS—SHEET 3.

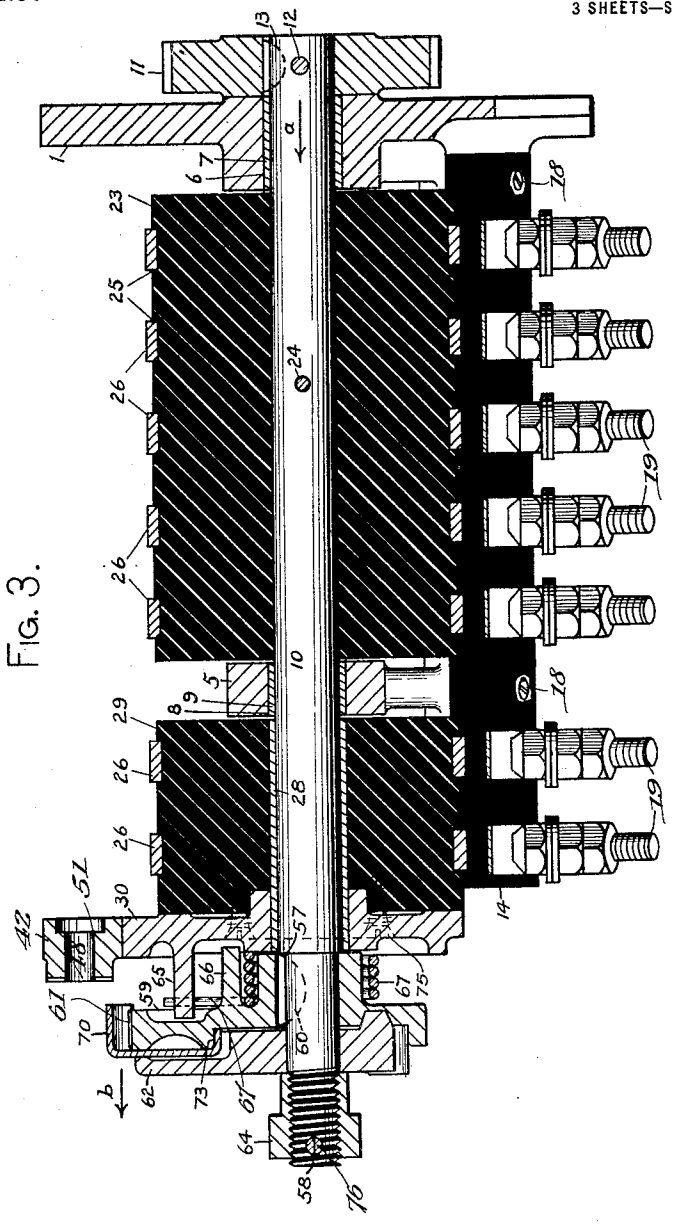


FIG. 3.

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UNITED STATES PATENT OFFICE.

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CIRCUIT-CONTROLLER.

1,224,542. Specification of Letters Patent. Patented May 1, 1917.

Application filed January 18, 1913. Serial No. 742,800.

To all whom it may concern:

Be it known that I, WILLIAM S. HENRY, a citizen of the United States, and a resident of the city of Rochester, in the county of Monroe and State of New York, have invented a new and useful Circuit-Controller, of which the following is a specification.

This invention relates to a circuit controller.

The object of this invention is to provide a circuit controller, which will be rugged in construction, adapted for a very wide range of application, that will act both as a drag and as a snap circuit controller, and will be easily and readily adjustable so that the circuits controlled thereby may be completed or opened accurately at a precise point in the movement of the circuit controller.

Other objects and advantages will appear as the description of the invention progresses, and the novel features of the invention will be particularly pointed out in the appended claims.

In describing the invention in detail, reference is had to the accompanying drawings, wherein I have illustrated a preferred physical embodiment of my invention, and wherein like characters of reference designate corresponding parts throughout the several views, and in which—

Figure 1 is an end elevational view of my improved circuit controller; Fig. 2 is a side elevational view of my improved circuit controller; Fig. 3 is a cross sectional view on the line A—B of Fig. 1, looking in the direction of the arrows; Fig. 4 is a detail view of a contact finger; Fig. 5 is a cross sectional view on the line C—D of Fig. 1.

Referring to the figures, 1 designates a frame upon which are mounted the movable and stationary parts for opening and completing electric circuits. This frame 1 has slots 2, by means of which, by the aid of bolts or other convenient means, it may be attached to any suitable support. The frame 1 has the projections 3 and 4 which may be attached to the frame 1 in any approved manner as by casting integrally therewith as shown in Fig. 2. The projections 3 and 4 are joined together at some distance from the frame 1 by the cross piece 5, which serves not only to make the construction more rigid, but also serves as a journal as will be later described. The frame 1 has a hole 6 formed therethrough, in which is placed an anti-friction bushing 7, best shown in Fig. 3, and through the cross piece 5 a similar hole 8 is formed, in which an anti-friction bushing 9 is placed. A shaft 10 is journaled in the bearings formed by the anti-friction bushings 7 and 9 and has on its right hand end, as shown in Figs. 2 and 3, the toothed segment 11 firmly attached thereto, in any approved manner, as by means of the pin 12 and the key 13. The toothed segment 11, when the shaft 10 is in position, bears against the face of the frame 1, best shown in Fig. 3, so as to prevent a longitudinal movement of the shaft 10 in the direction of the arrow *a* in Fig. 3, thus acting not only as a means for turning the shaft but as a means for keeping the shaft in proper position.

Blocks of insulating material 14, 15, 16 and 17 are attached to the projections 3 and 4, best shown in Fig. 1 by means of screws 18, best shown in Fig. 2. These blocks of insulating material bear binding posts 19 firmly attached thereto and the binding posts are connected to and support individual contact fingers 20, which have longitudinal slots 20^1 through which the posts pass. The contact fingers 20 rest in recesses in the blocks 14, 15, 16 and 17 best shown by Fig. 1, so that they may not have any movement about the binding post 19 as a pivot, although they are adjustable longitudinally and are held in adjusted position by means of the bent metallic member 21, which has a hole through one end which fits tightly over the bolt of the binding post 19, and has the other end turned at a right angle, best shown in Fig. 1, which is placed in the proper one of finger holes 22 so that the fingers 20 will have their ends the desired distance from the binding posts 19.

Upon the shaft 10, between the cross piece 5 and the frame 1, is placed a drum of insulating material 23, which is keyed to the shaft 10, by means of the screw 24, well shown in both Figs. 2 and 3, so that it must turn therewith. This drum, 23, has grooves cut in its periphery suited to receive non-corrosive metallic strips 26, of any desired length, which, by means of the screws 27, may be attached at any desired point of the grooves.

In order to control any circuit by means of the "drag" circuit controlling part of my circuit controller which has just been described, it is necessary merely to cut any

conductor of the circuit carrying current and attach one end of the conductor to an upper post 19 and the other end to an opposed lower binding post 19. If with all of the parts in the illustrated position, it is desired to have the circuit completed through the circuit controller, a strip 26 would be placed in one of the grooves 25, so that both an upper and a lower finger 20 will bear upon it. If it is desired to have the circuit opened immediately upon a slight movement of the member 11, then the strip 26 would be of such a length that it would quickly move from under either one of the fingers 20. If it is desired to have the circuit remain closed during a considerable movement of the member 11, then the strip 26 would be lengthened accordingly, or if it is desired to break the circuit upon a slight movement of member 11 and then close the circuit again, after some certain movement of member 11, it would merely be necessary to apply another strip 26 in the same drum groove 25, so that it would connect an upper finger 20 and a lower finger 20 at the proper moment.

By reference to Fig. 3, it will be noticed that the strips 26 are considerably thicker than the slots 25 are deep, therefore, when an upper and a lower finger 20 bear upon a strip 26, they will be raised safely above the surface of the insulating drum 23, so that there will be no tendency for current to flow from an upper finger 20 to a lower finger 20 over the drum surface and which if permitted may carbonize it and perhaps form a path of low resistance which might complete a circuit from an upper finger 20 to a lower finger 20 at a time when both fingers were not bearing upon a strip 26.

Beyond the frame piece 5, the shaft 10 has a metallic sleeve 28 placed about it, so that if the sleeve is held from movement, the shaft 10 can rotate freely therein. The sleeve 28 has forced upon it a latch plate 30 to which is attached with screws 75 an insulating drum 29 similar to the insulating drum 23, and capable of bearing strips 26 in the same manner as drum 23 does. The latch plate 30 does not form a complete circle as best shown by Fig. 1, and has two peripheral shoulders 31 and 32 for a purpose to be later described. The latch plate 30 may also have other shoulders formed in its periphery at any suitable or desired points as illustrated by those shown in Fig. 1 at 33, 34, 35, 36, 37 and 38.

Certain of the above named latch plate shoulders may be engaged by the shoulders 39 and 40, of the latches 41 and 42, which are respectively pivoted upon pin 43, 44, carried by the frame part 4, and the latches are held in place by cotter pins 45, 46. The latches respectively have slots 47, 48, through which are respectively passed the bolts 49, 50, having heads fitting rabbeted shoulders 51, formed by lateral enlargements of the latch slots 47, 48, whereby turning of the bolts is prevented and as will be understood by inspection of Fig. 5, of the drawings. The bolts each carry a facially serrated washer 53, a spacing sleeve 54, and a nut 55, and by tightening the nuts the serrations on the washers 53, may be forced into the serrations 56, of the latches 41, 42, thereby preventing movement of the bolts and sleeves longitudinally of the latches. Unscrewing the nuts 55, allows the serrations of washers 53, to be disengaged from the latch serrations 56 to permit adjustment of the bolts 49, 50, to any desired positions within the limits of the slots for holding their sleeves 54 in proper relation to trip cams hereinafter described.

Shaft 10 has a shoulder formed on it at the point 57 by reason of the end 58 of reduced diameter. The reduced end 58 bears a trip plate 59, which fits snugly upon and is keyed to the reduced shaft end 58 by means of the key 60, and bears against the shoulder 57 so that it does not tend to bind the insulating drum 29 and the latch plate 30 between it and the frame piece 5. The trip plate 59 does not form a complete circle and its outer periphery is formed into a series of serrations 61, best shown in Fig. 1. Outside of the trip plate 59 is situated a clamping plate 62, which fits the reduced portion 58 of the shaft 10, but is not keyed thereto and may revolve freely thereabout, except when fastened by the castle nut 64 which is threaded upon the reduced end portion 58 of the shaft 10 and is locked thereon by a cotter pin 76.

The latch plate 30 bears a projection 65 and the trip plate 59 bears a projection 66, well shown in Figs. 1 and 3. Coiled about the hub of the trip plate 59 is a spring 67, the two ends of which are extended tangentially and about parallel so as to bear one on each side of the projections 65 and 66, best shown in Fig. 1.

Between plate 62 and trip plate 59 are placed trip cams, five of which are shown in the particular structure used to illustrate the invention and are numbered 68, 69, 70, 71 and 72. These trip cams have both their inner and outer ends bent at right angles. The inner end bears against a shoulder 73 of the trip plate 59 and the edges of the laterally arched or angular outer end rest within the serrations 61 of the trip plate 59, so that when the castle nut 64 is tightened upon the reduced end 58 of the shaft 10 the trip cams are held firmly in adjusted position. If it is desired to change the adjustment of the trip cams, it is necessary merely to unloosen the castle nut 64, and rotate the plate 62 about the axis of the shaft 10, so that the cut-away portion 74 comes opposite the trip

cam that it is desired to move, under which condition the trip cam may be moved bodily in the direction of the arrow *b*, Fig. 3, until the edges of its outer end disengage the serrations 61 of the trip plate, after which it may be moved opposite to the desired position and then forced into contact with the serrations 61 by moving it in a direction opposite to the direction of the arrow *b* of Fig. 3. The serrations 61 should be of such a size that the most accurate adjustment needed may be obtained.

From the description of the detailed construction it may be readily seen that latch plate 30, and insulating drum 29, can only be moved by reason of force exerted upon projection 65, by the ends of spring 67. If shaft 10 be turned by segment gear 11, in direction of arrows *c*, in Fig. 1, the shoulder 31, of latch plate 30, will first be moved to the shoulder 39, on the latch 41, and further movement of shaft 10, will merely cause the ends of spring 67, to be separated by pressure of the trip plate projection 66, on one end of the spring and without moving latch plate 30 and drum 29. If shaft 10, be turned clockwise so far that trip cam 68, engages spacer 54, on bolt 49, the shoulder 39, of latch 41, will be disengaged from the latch plate shoulder 31, and then the tension of spring 67, acting by its other end on the latch plate projection 65, will force latch plate 30, and insulating drum 29, clockwise around shaft 10, until projections 65, 66, again come into line one with the other. Further clockwise rotation of shaft 10, by segment 11, will cause latch plate shoulder 33, to engage latch shoulder 39, and then no further clockwise movement of drum 29, by the spring will take place until trip cam 69, engages spacer sleeve 54 on bolt 49, and disengages latch 41, from latch plate shoulder 33.

The drum 29 with its associated contact strips 26, and contact fingers 20, constitute the "snap" circuit governing device of applicant's circuit controller. When one desires to either open or complete a circuit in which a current of high potential flows, it is necessary to make the change quickly or with a "snap." Applicant's device provides a means for closing or opening a circuit carrying a current of comparatively high potential, for by means just described, the contact strips 26 may be made to "snap" into contact with an upper and lower contact finger 20 or to "snap" out of contact with an upper and lower contact finger 20. By positioning the contact strips 26 upon the periphery of the insulating drum 29, the circuits which are controlled may be opened or closed at any desired point in the movement of the shaft 10.

As applicant's construction embodies two latches 41 and 42, acting on opposite peripheral parts of the latch plate, it is not necessary to have the same range of rotary movement of the shaft 10, cause a closing or opening of a circuit when the shaft turns counter-clockwise as when the shaft turns clockwise. For instance, if when the shaft is turned clockwise in direction of the arrow *c* a circuit is closed and kept closed from the initial movement of shaft 10 until it has moved 45° and is then snapped open, and another circuit is snapped closed at the same time that the first mentioned circuit is snapped open, and the second circuit then remains closed during a further 45° clockwise movement of the shaft and is then snapped open, one may by a suitable arrangement of trip cams, which will coact with spacer sleeve 54 upon bolt 50 which is attached to latch 42, on a reverse or counter-clockwise movement of shaft 10, by the segment 11, cause the second above mentioned circuit to remain open during the first 45° counter-clockwise movement of the shaft 10 and then cause it to be "snap" made and by a further backward rotation of 45° cause the first above mentioned circuit to be "snap" closed. If it is not desired, however, to have the range of reverse movement of the drum exactly the same as the extent of its forward movement, then by using the proper number of trip cams and suitably positioning the same upon the trip plate 59, when the shaft 10 is rotated backwardly, the drum 29 may be caused to make three or four snap movements or perhaps only one, covering the complete 90° movement of the shaft. The action of the snap drum 29 can be further modified by modifying the position of the shoulders 32, 36, 37 and 38, some one of which passes shoulder 40 of latch 42, after the shaft 10 has been moved a certain amount in the direction of the arrow *c*, and engages with shoulder 40 upon the return movement.

The construction of applicant's device being symmetrical at opposite halves, it is possible to obtain exactly the same circuit controlling effect whether the turning of shaft 10 is in the direction of arrow *c*, or the reverse.

The coaction of the fast and loose drums 23, 29, in opening or closing a series of electric circuits, is at times important, as for instance in operating railway semaphore signals assuming three different positions and for which purpose this invention was more especially designed, such use of the invention being shown and described in U. S. Patent No. 1,150,005, granted August 10th, 1915, to Winthrop K. Howe, for a signal. It may be generally stated that the loose spring-actuated drum 29, is used to avoid destructive sparking by quickly opening or closing higher voltage circuits with a

"snap," and the fast drum 23, is used for "drag" opening or closing lower voltage circuits wherein such sparking usually does not occur. By this simple invention it is possible to "snap" close or open higher voltage circuits by the loose contact carrying part simultaneously with or before or after "drag" opening or closing of lower voltage circuits by the relatively fixed contact carrying part. It is obvious that the invention may be used in other situations or under other conditions for controlling a system of electric circuits operating other devices or apparatus. Any suitable support for the fast and loose drums 23, 29, other than the preferred shaft 10, serving as a prime mover may be employed provided the two drums may turn, relatively to each other and to the coacting contacts in manner substantially as hereinabove described and therefore the term "shaft" used in the appended claims is to be construed as including any suitable support for the coacting fast and loose contact carrying drums; and the term "drum" is to be construed as including a contact carrying part of any form adapted to perform the hereinabove named functions.

Although I have particularly described the construction of one physical embodiment of my invention, and explained the operation and principle thereof; nevertheless, I desire to have it understood that the form selected is merely illustrative, but does not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a circuit controller, in combination: a shaft; a circuit controlling means moved with said shaft; a second circuit controlling means moved independently of said shaft; means fixed to said second means; means coacting with said last mentioned means for holding said second means against movement with said shaft in any one of a number of different positions of said second means; means controlled by said shaft for successively rendering ineffective said holding means as said shaft is turned; and resilient means tending to move said second means with said shaft.

2. In a circuit controlling device, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller capable of movement independently of said shaft; each of said circuit controllers being capable of assuming a plurality of circuit controlling positions; means for holding said second circuit controller against movement in any one of its circuit controlling positions; means for successively rendering said holding means ineffective as the shaft is turned successively to its different circuit controlling positions; and resilient means tending to move said second circuit controller with said shaft.

3. In a circuit controlling device, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller capable of movement independently of said shaft; each of said circuit controllers being capable of assuming a plurality of circuit controlling positions; a latch plate fixed to said second circuit controller having shoulders around its outer periphery; a latch adapted to engage said shoulders and hold said second circuit controller in each of its circuit controlling positions; means for successively releasing said latches as said shaft is turned; and means governed by said shaft for snapping said second circuit controller from one circuit controlling position to another such position as said shaft is turned and as said first mentioned circuit controller is advanced successively from one circuit controlling position to another such position.

4. In a circuit controller, in combination: a shaft; a contact carrying drum loosely mounted on said shaft and having a plurality of circuit controlling positions; a latch plate fixed to said drum and having shoulders around its outer periphery; a latch adapted to engage said shoulders and to hold said drum in each of its circuit controlling positions; a part adjustably secured to said latch; a trip plate moved with said shaft and including a plurality of cams adjustable thereon, said cams being arranged to successively engage said part and to disengage said latch from said latch plate and to free said contact drum as the shaft is turned; and resilient means for snapping said drum successively from one circuit controlling position to another such position when said drum is released.

5. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a shouldered latch plate movable with the drum, a latch engaging the latch plate shoulder to stop the drum, said latch having a longitudinal slot and an adjacent serrated face, a facially serrated washer, a sleeve, a fastening means passing through said washer, said sleeve and said slot to hold said washer and said sleeve at any desired adjustment on said latch, a trip cam movable by the shaft and acting on the adjusted sleeve to free the latch from the latch plate, and means turning the loose drum when the latch plate is freed.

6. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a latch plate having a plurality of shoulders and movable with the drum, a latch successively engaging the respective

latch plate shoulders to stop the drum, a plurality of spaced trip cams movable by the shaft and freeing the latch from successive shoulders of the latch plate thereby permitting successive limited movements of the drum in the same direction, and means turning the drum when the latch plate is freed.

7. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a latch plate having a plurality of shoulders and movable with the drum, a latch successively engaging the respective latch plate shoulders to stop the drum, a plurality of spaced trip cams movable by the shaft and freeing the latch from successive shoulders of the latch plate thereby permitting successive limited movements of the drum in the same direction, a longitudinally adjustable part on the latch acted upon by the trip cams to free the latch from the successive latch plate shoulders, and means turning the drum when the latch plate is freed.

8. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a shouldered latch plate movable with the drum, a latch engaging the latch plate shoulder to stop the drum, a trip plate movable by the shaft and having a shoulder inside of its periphery, an adjustable trip cam having inner and outer parts respectively overlying the trip plate shoulder and periphery and adapted to trip the latch from the latch plate, means fastening the adjusted trip cam to the trip plate, and means turning the drum when the latch plate is freed.

9. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a shouldered latch plate movable with the drum, a latch engaging the latch plate shoulder to stop the drum, a trip plate movable by the shaft and having a shoulder inside of its periphery, an adjustable trip cam having inner and outer parts respectively overlying the trip plate shoulder and periphery and adapted to trip the latch from the latch plate, means fastening the adjusted trip cam to the trip plate and comprising a clamp plate having a recessed peripheral portion which when moved opposite the applied trip cam permits its lateral detachment and readjustment to another position on the trip plate, and means turning the drum when the latch plate is freed.

10. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a shouldered latch plate movable with the drum, a latch engaging the latch plate shoulder to stop the drum, a trip plate movable by the shaft and having a serrated periphery and an inner shoulder, an adjustable trip cam having two parts respectively engaging the serrated periphery and the inner shoulder of the trip plate, means fastening the adjusted trip cam to the trip plate, and means turning the drum when the latch plate is freed.

11. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a latch plate having a plurality of shoulders and movable with the drum, a latch successively engaging the respective latch plate shoulders to stop the drum, a trip plate movable by the shaft and having a shoulder inside of its periphery, a plurality of relatively adjustable trip cams each having parts respectively engaging the periphery and the shoulder of the trip plate and adapted to trip the latch from a latch plate shoulder, means fastening the adjusted trip cams to the trip plate, and means turning the drum when the latch plate is freed.

12. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a latch plate having a plurality of shoulders and movable with the drum, a latch successively engaging the respective latch plate shoulders to stop the drum, a trip plate movable by the shaft and having a shoulder inside of its periphery, a plurality of relatively adjustable trip cams each having parts respectively engaging the periphery and the shoulder of the trip plate and adapted to trip the latch from a latch plate shoulder, means fastening the adjusted trip cams to the trip plate and comprising a clamp plate having a recessed peripheral portion which when moved opposite any applied trip cam permits its lateral detachment and readjustment to another position on the trip plate, and means turning the drum when the latch plate is freed.

13. A circuit controller comprising a shaft, a contact carrying drum loose thereon, conductive fingers adapted to co-act with the drum contacts, a latch plate having a plurality of shoulders and movable with the drum, a latch successively engaging the latch plate shoulders to stop the drum, a trip plate movable by the shaft and having a serrated periphery and an inner shoulder, a plurality of relatively adjustable trip cams each having parts respectively engaging the serrated periphery and the shoulder of the trip plate and adapted to trip the latch from a latch plate shoulder, means fastening the adjusted trip cams to the trip plate, and means turning the drum when the latch plate is freed.

14. A circuit controller comprising a shaft, one contact carrying drum fixed thereto, another contact carrying drum loose

thereon, conductive fingers adapted to co-act with the contacts of each of said drums, means adapted to turn the shaft in either direction, means tending to turn the loose drum in the same direction as the shaft is turned, a latch plate having two reversely arranged shoulders and movable with the loose drum, two latches respectively engaging the respective latch plate shoulders and temporarily stopping movement of the loose drum, and two trip cams movable by the shaft and respectively adapted to trip the respective latches from the respective latch plate shoulders and permit turning of the loose drum after the fixed drum had been turned to a predetermined extent by the shaft.

15. A circuit controller comprising a shaft, one contact carrying drum fixed thereto, another contact carrying drum loose thereon, conductive fingers adapted to co-act with the contacts of each of said drums, means adapted to turn the shaft in either direction, means tending to turn the loose drum in the same direction as the shaft is turned, a latch plate having two reversely arranged series of shoulders and movable with the loose drum, two latches respectively engaging the respective series of latch plate shoulders and temporarily stopping successive movements of the loose drum, and two series of trip cams movable by the shaft and respectively adapted to trip the respective latches from the latch plate shoulders and permit successive step-by-step turning of the loose drum after the fixed drum is turned step-by-step by the shaft.

16. In a circuit controller; a shaft; means to turn the shaft; a drum formed of insulating material and fastened to the shaft so as to move in unison therewith; a metallic strip on the drum; a pair of contact fingers bearing on the drum in the path of movement of the conducting strip; means for supporting the contact fingers; another drum formed of insulating material mounted on the shaft for independent movement; a latch plate, formed with shoulders, fastened rigidly to the second mentioned drum; latches pivoted by one end having shoulders on the other end for engaging the shoulders of the latch plate; a member carried by and movable with the shaft; trip cams carried by the member; projections on the latches in the path of movement of the trip cams; a projection on the latch plate and a projection on the said member; a coiled spring about the shaft having one end bearing against the projection on the latch plate and the other end against the projection on the member for moving them into alinement when the latch plate is free from the latches and so free to move.

17. In a circuit controller; a shaft; means to turn the shaft; an insulating drum loosely mounted on the shaft; a metallic strip on the drum; a pair of contact fingers bearing on the drum in the path of movement of the metallic strip; a latch plate having shoulders attached to the drum; latches for engagement with the shoulders of the latch plate in the path of movement of the latch plate for preventing movement of the latch plate and so of the drum; means for tripping the latches and moving the latch plate, comprising a projection on the latch plate and a device attached to the shaft which device comprises a plate formed with a serrated periphery, fingers formed with sloping faces for engagement with the latches and a sharp edge for engagement in the serrations of the last mentioned plate, said last mentioned plate also formed with a central circular depression forming a shoulder, said fingers formed with a bent portion for engagement with said shoulder; and a clamping plate for holding said fingers firmly in adjusted position, said clamping plate formed with a hole therethrough whereby it may be placed on said shaft, a screw thread formed on said shaft, and a nut engaging said thread and bearing against said clamping plate, and a projection on said plate with the serrated edges; a spring coiled about said shaft having one end bearing on said projection on said latch plate and the other end on the projection on said plate formed with the serrated edges.

18. In a circuit controller, a shaft, means to turn the shaft; a drum formed of insulating material and fastened to the shaft so as to move in unison therewith; a conducting strip on the drum; a pair of contact fingers bearing on the drum in the path of movement of the conducting strip; means for supporting the contact fingers; another drum formed of insulating material mounted on the shaft for independent movement; a latch plate, formed with shoulders, fastened rigidly to the second mentioned drum; latches pivoted by one end having shoulders on the other end for engaging the shoulders of the latch plate; a member carried by and movable with the shaft; trip cams carried by the member; projections on the latches in the path of movement of the trip cams; a projection on the latch plate and a projection on the said member; a coiled spring about the shaft having one end bearing against the projection on the latch plate and the other end against the projection on the member for moving them into alinement when the latch plate is free from the latches and so free to move; said another drum bearing a metallic strip; a pair of contact fingers bearing on said another drum in the path of movement of the metallic strip.

19. In a circuit controller, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller

loosely mounted on said shaft; means for holding said second circuit controller in any one of a plurality of its positions against movement with said shaft; a trip plate, fixed to said shaft, a plurality of cams each adjustably secured to said trip plate around its periphery and adapted to render said holding means successively ineffective; and means tending to turn said second circuit controller as said shaft is turned.

20. In a circuit controller, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller loosely mounted on said shaft; a latch plate fixed to said second circuit controller having spaced stops around its outer periphery; latches adapted to engage said stops successively and to successively hold said second circuit controller against movement with said shaft; a trip plate, fixed to said shaft, including trip cams spaced around the outer periphery of said trip plate and adapted to successively disengage said latches from said stops; and means controlled by said shaft tending to move said second circuit controller as said shaft is moved.

21. In a circuit controller, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller loosely mounted on said shaft; a latch plate, fixed to said second circuit controller, having a plurality of shoulders cut in its outer periphery; latches adapted to engage said shoulders for successively holding said second circuit controller against movement with said shaft; means fixed to said shaft including a plurality of other means for successively rendering said latches ineffective; and means tending to turn said second circuit controller as said shaft is turned.

22. In a circuit controller, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller loosely mounted on said shaft; a latch plate fixed to said second circuit controller having shoulders cut in its outer periphery; latches adapted to engage said shoulders for holding said second circuit controller against movement with said shaft; means fixed to said shaft for rendering said latches temporarily ineffective; and means controlled by said shaft tending to turn said second circuit controller as said shaft is turned.

23. In a circuit controller, in combination: a shaft; a circuit controller moved with said shaft; a second circuit controller loosely mounted on said shaft; means for holding said second circuit controller against movement with said shaft; means fixed to said shaft for rendering said holding means temporarily ineffective; means tending to turn said second circuit controller as said shaft is turned; and means for causing said holding means to again become effective after said loosely mounted means has turned.

24. In a circuit controller, in combination: a shaft; a circuit controlling drum loosely mounted on said shaft; means tending to turn said drum as said shaft is turned; a latch plate fixed to said drum and having shoulders around its outer periphery; a latch adapted to engage said shoulders; a trip plate fixed to said shaft and having serrations cut in its outer periphery and an annular rib on one face; a plurality of cams each having one end adapted to hook over said rib, the other end of each cam being formed with a raised central portion and two angularly extending sides adapted to fit in said serrations, said cams being adjustable around said trip plate; a clamping plate loose on said shaft and having an opening permitting each cam to be adjusted on said trip plate or removed therefrom when said clamping plate is turned so that said opening is brought opposite that cam; and means for holding said trip plate, cams and clamping plate rigidly together.

25. In a circuit controller, in combination: a shaft; a circuit controlling drum loosely mounted on said shaft; means tending to turn said drum as said shaft is turned; a latch plate fixed to said drum having shoulders around its outer periphery; a latch adapted to engage said shoulders being pivotally mounted at one end and having at its other end laterally extending bosses with a longitudinal slot therethrough, serrations in the face of one of said bosses and a longitudinally extending counterbore in the face of the other of said bosses; a shoulder on one side of said latch for engaging said shoulder in said latch plate; a washer having serrations in one face, these serrations being adapted to fit in said serrations on said boss, said washer being capable of longitudinal adjustment on said boss; a cylindrical collar; a fastening means adapted to pass through said longitudinal slot, said washer and said collar having at one end a squared portion which fits into said counterbore, said fastening means holding said washer and said collar rigidly and relatively fixed to said latch; and a trip plate, fixed to said shaft, including cams adapted to engage said collar for lifting said latch out of engagement with said latch plate.

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Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."