J. E. SEELEY.

CIRCUIT INTERRUPTER FOR ELECTRIC SPARKING DEVICES.

APPLICATION FILED JULY 8, 1909.

961,902. **Patented June 21, 1910.**

Fig. 1.

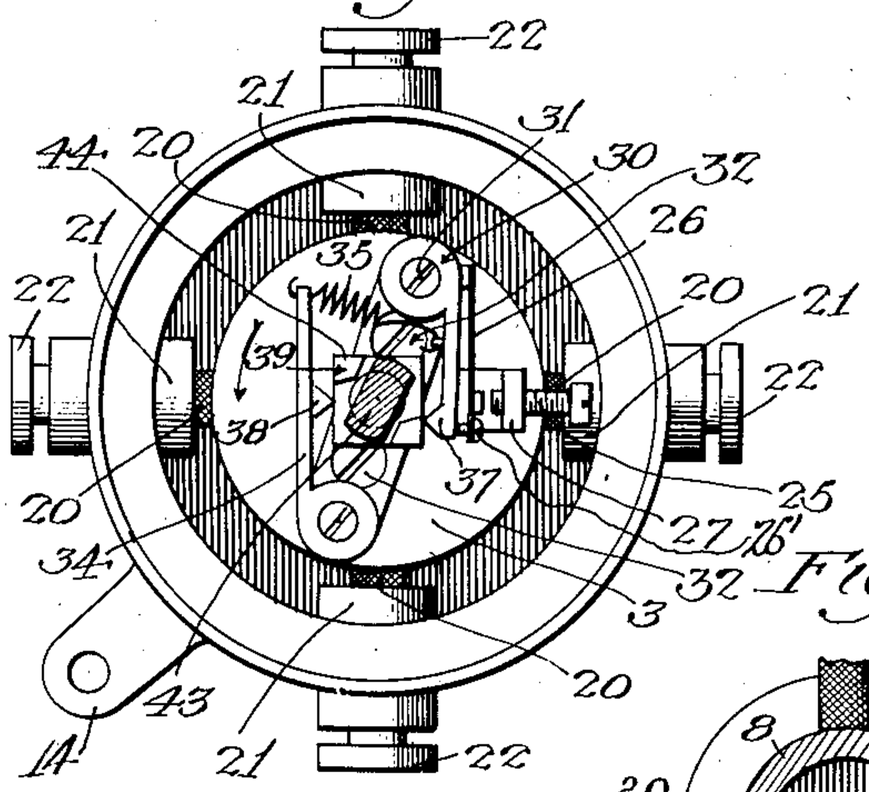
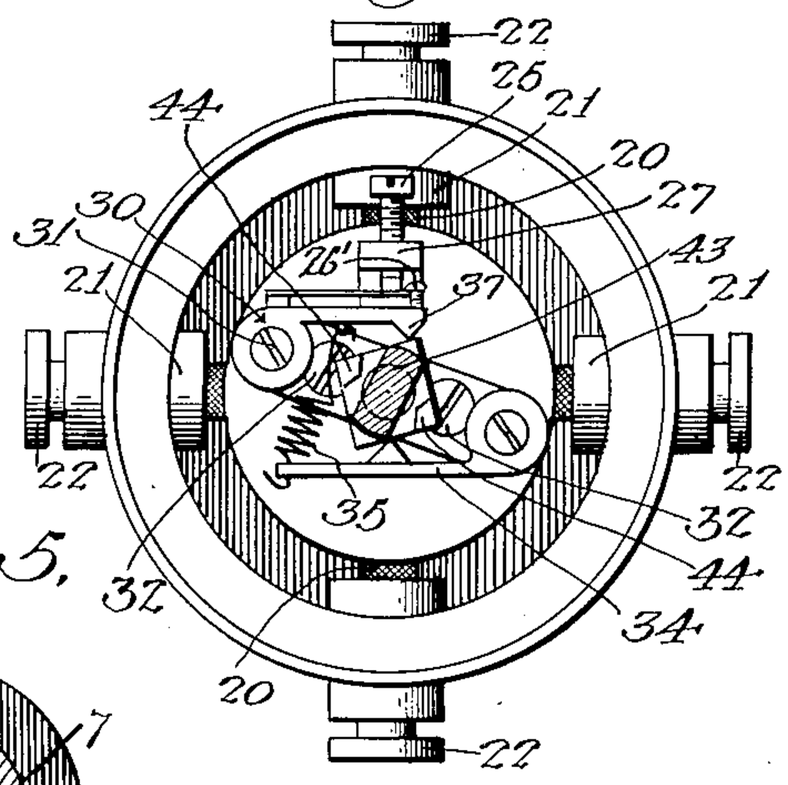


Fig. 5.



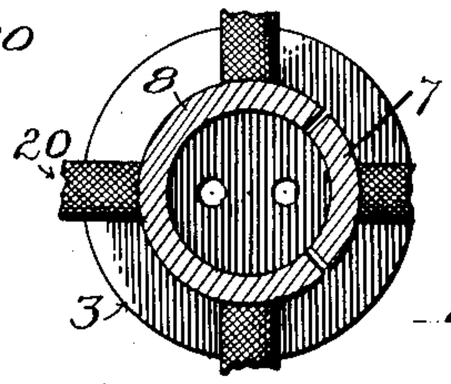


Fig. 2.

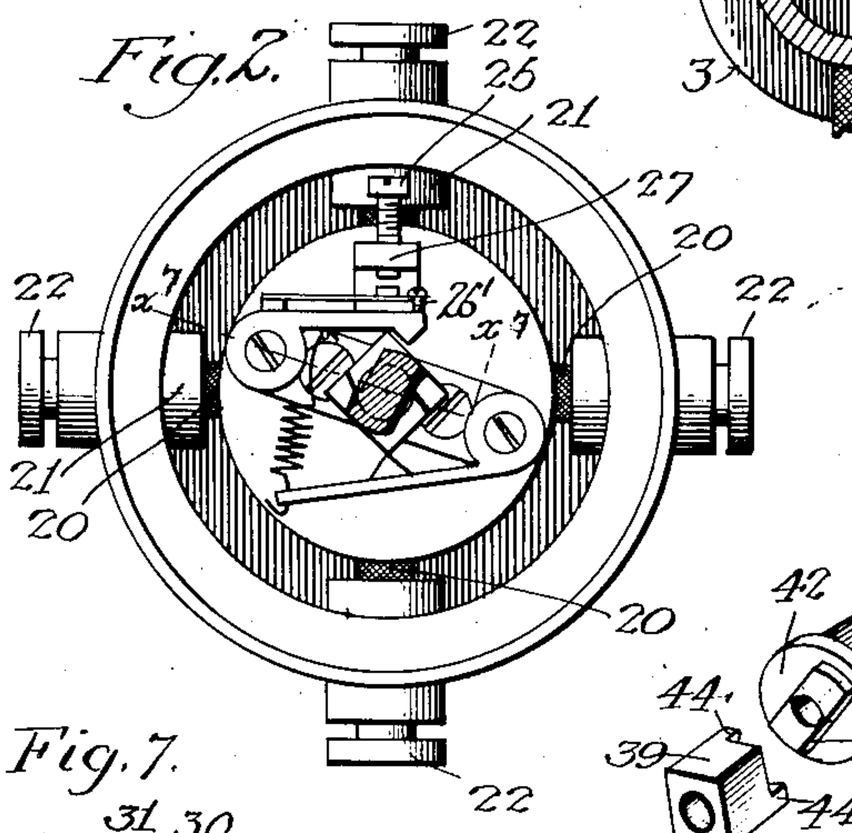


Fig. 4.

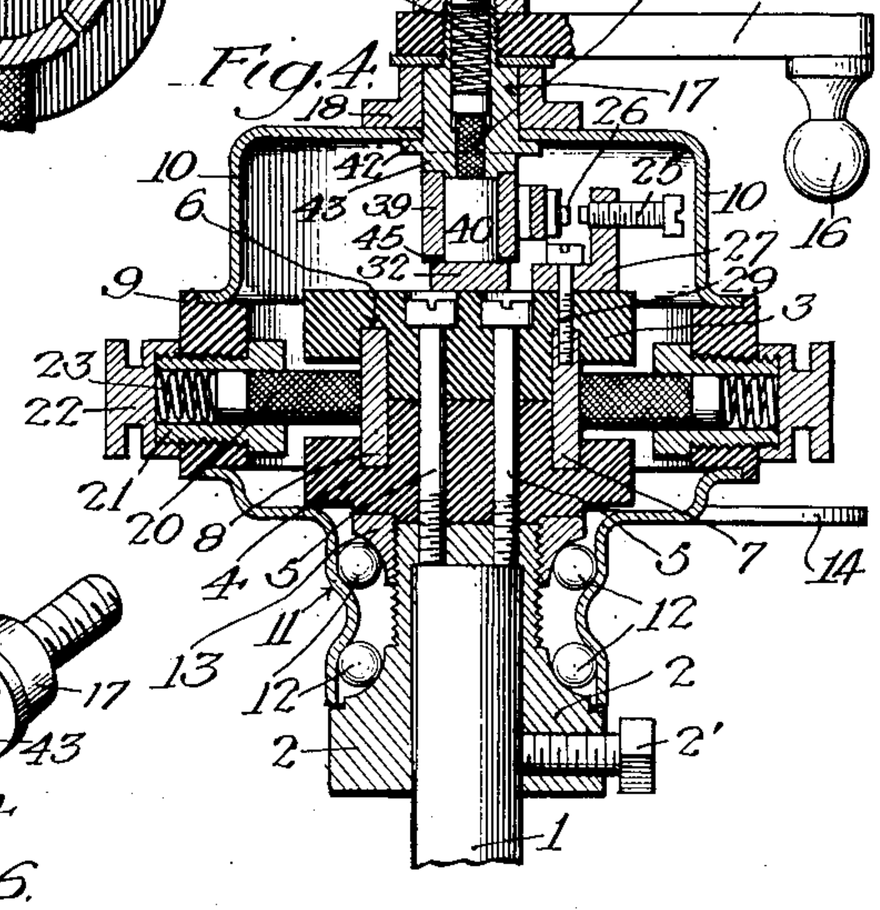


Fig. 7.

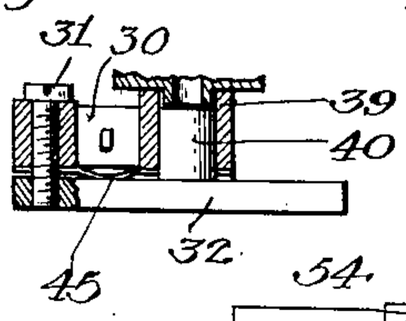
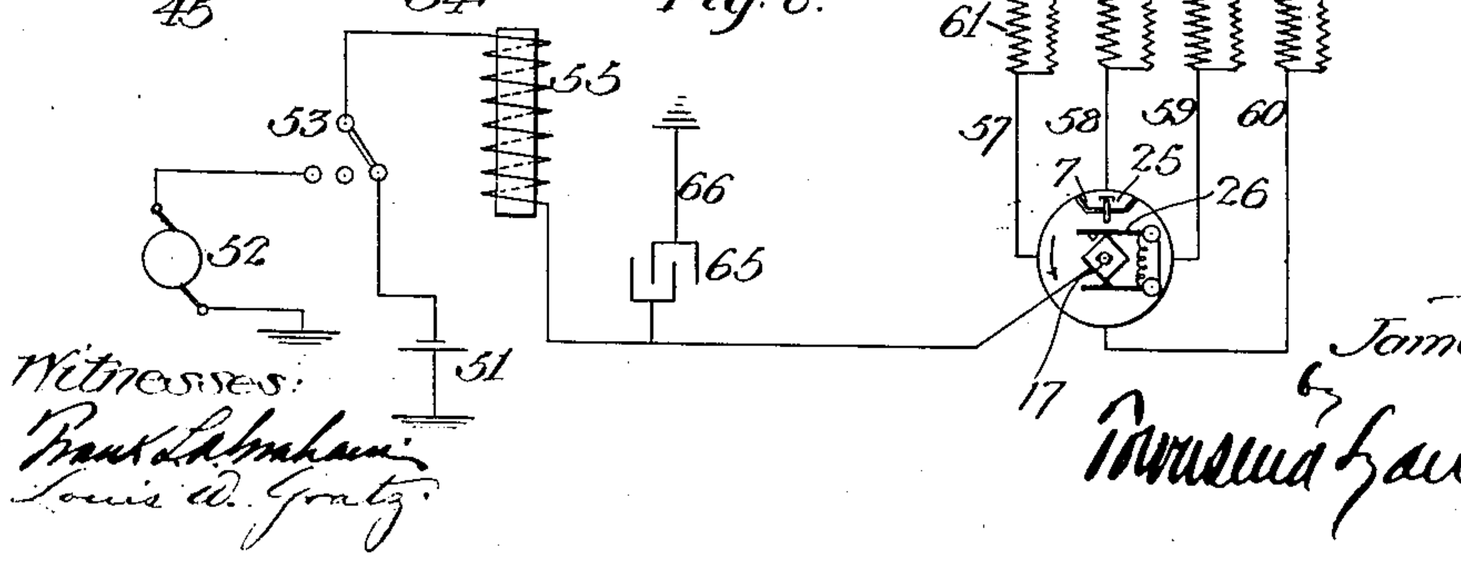


Fig. 6.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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CIRCUIT-INTERRUPTER FOR ELECTRIC SPARKING DEVICES.

961,902. Specification of Letters Patent. Patented June 21, 1910.

Application filed July 8, 1909. Serial No. 506,623.

To all whom it may concern:

Be it known that I, JAMES E. SEELEY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Circuit-Interrupter for Electric Sparking Devices, of which the following is a specification.

This invention relates to electric igniting devices for internal combustion engines wherein ignition is effected by a spark produced by a circuit periodically interrupted by a mechanical circuit breaker operated by the engine.

The main object of the present invention is to provide for approximate uniformity in the duration of contact at different speeds.

A distinctive feature of the present invention is that the circuit closing members are mounted to rotate and the operating cam means is mounted in stationary position, thereby obtaining certain advantages in the practical operation.

Referring to the drawings illustrating a preferred embodiment of the invention: Figure 1 is a front elevation of the circuit interrupting device, with the power removed, and part of the limiting device being in section. Figs. 2 and 3 are similar views to Fig. 1, showing successive stages in the operation of the device. Fig. 4 is an axial section of the device. Fig. 5 is a transverse section through the distributer. Fig. 6 is a perspective showing the interlocking means for limiting the angular movement of the circuit controlling device. Fig. 7 is a fragmentary section on line x^7—x^7 in Fig. 2. Fig. 8 is a diagram of the circuit connections.

1 designates an operating shaft or arbor which may be, for example, the valve operating shaft of an internal combustion engine. A collar 2 is mounted by set screw 2′ on said shaft so as to turn therewith, and a distributer member, preferably comprising two disks 3, 4, of insulating material, and contact segments carried thereby, is attached to said collar 2 by screws 5, so as to rotate with the shaft 1. The insulating means 3, 4 are formed with an annular groove 6 to receive and hold metallic segments 7, 8 of the distributer, segment 7 occupying a portion of the periphery corresponding to the period for distribution to a single cylinder of a multi-cylinder engine, for example; with a four-cylinder engine, the segment 7 will extend approximately one-quarter of the circumference.

A case, consisting of an insulating ring 9, a cap member 10 and a tubular supporting member 11 connected to said ring, is supported on the shaft 1 as by means of balls 12 engaging with annular faces formed on the tubular member 11, on the collar 2 and on screw collar 13, so as to permit rotation of the shaft 1 independently of the said casing, said casing being held in definite angular position by an arm 14, fastened to a part of the engine, and advancing means is provided consisting of an arm 15 having a projection 16 for connection with the usual controlling rod and mechanically connected to a bolt 17 rotatable axially on the aforesaid casing, said bolt being journaled centrally in a central member 18 on the cap 10 of said casing and held by a nut 17′ at the outer end of the bolt. The parts 15 being all in rigid relation, it follows that the angular position of the bolt and the members carried thereby is determined by the position of the controlling means 15. The insulating ring 9 of the casing carries a plurality of contact devices, one for each cylinder, each contact device comprising a carbon or other brush 20 sliding in a tubular guide 21, which screws within the insulating ring 9 and is closed at the outer end by a screw cap 22, a spring 23 being interposed between the outer end of the brush and the said cap and pressing the brush against the segments 7, 8.

The circuit interrupting means comprises a contact 25 electrically connected to the segment 7 aforesaid and contact 26 mounted on the rotative member 3 in such manner as to rotate therewith, but to be movable toward and from the contact 25. Contact 25 may consist of a set screw working in a metal support 27 fastened to the insulating member 3 and having a connection through a screw 29 with the segment 7. Contact 26 may consist of a spring having a contact at its outer end and secured at its other end to an arm or member 30 pivoted at 31 on a cross arm 32 fastened to the rotative insulating member 3. At the other end of said cross arm 32 is pivoted an arm 34 connected by a spring 35 to the arm 26 to tend to draw said

arms 34, 26 inwardly. The arms 30, 34 are provided with inwardly extending projections 37, 38, preferably having inclined faces, said projections resting on the opposite peripheral faces of a rectangular block 39 constituting a cam-member rotatably mounted on a stud 40 projecting centrally from the cross arm 32. Bolt 17 is provided at its inner end with a head 42 formed with a cross bar 43 and the rectangular block 39 is provided with two longitudinally projecting pins 44 extending on opposite sides of the cross bar so as to limit the rotative movement of the said block relatively to the bolt or member 17. A metal spring 45 (see Fig. 7) is provided between block 39 and cross bar 32 and below pivoted arm 30, the object of this spring being to bond the connections so as to prevent sparking at the sliding contacts. Contact spring 26 may have an adjusting screw 26′. Connection from bolt 17 to members 40, 30, 32, 26 is by a brush 46 bearing on stud 40 and seated in an axial bore in bolt 17, said brush being pressed forward by a spring 47 whose pressure is adjusted by a screw plug 48.

The circuit connections are shown in Fig. 8, said figure illustrating the application of the invention in connection with a system in which both battery and magneto supply are used. 51 designates the battery, 52 the magneto, and 53 a switch for putting either of these sources of electricity in connection with a circuit 54 including a self-induction coil 55, said circuit being connected to the movable contact 26, for example, by connection of said circuit to bolt 17, said bolt being in metallic contact or connection with the parts 39, 32 and 30. The other contact 25 is connected as stated to the metallic segment 7 and the four brushes or contacts 20 bearing on the distributer ring and on said segment are connected respectively to four wires 57, 58, 59 and 60 leading respectively to the primaries of four transformers 61, the other ends of said primaries being grounded at 62 and the secondaries of said transformers being connected at one end to the primaries thereof and at the other end to spark plugs indicated at 63 in the respective engine cylinders 64. A condenser 65 is connected in a circuit 66 leading from wire 54 to ground.

The operation is as follows:—In the rotation of the shaft 1 the member 3, 4, is carried therewith, causing the distributer segment 7 to successively come into contact with the brushes 20, and at the same time causing rotative movement of the cross arm 32, and parts carried thereby. In such rotative movement the projections 37, 38, on the arms 30, 34 slide over the faces of the rectangular block 39. In position shown in Fig. 1, the said block is in a condition of minimum extension, so that the arms 30, 34 are drawn to position nearest the axis of the device, the contact means 26 being separated from the contact 25. In the rotation of the members 1, 32, 30, 34, the block 39 is dragged around by friction, and when it reaches the position shown in Fig. 2 the pins or projections 44 come into contact with the cross bar 43 on the fixed stop member or head 42, thereby arresting the rotary movement of the rectangular block 39. In the further rotation of the arm 32, the projections 37, 38 ride over the faces of the rectangular block 39, and owing to the angularity of said faces, the said projections will be expanded or moved farther from the axis of the device, the projection 37, however, at this time being disengaged from the rectangular block as shown in Fig. 2 so that the arm 30 is not affected thereby. When the block reaches the position shown in Fig. 2, the arm 34 is at maximum extension and is practically on the dead center with the point of projection 38 resting on the corner of the rectangular block, so that immediately following this position the projection passes the dead center and by its cam action on the block tends to throw the same reversely to the direction of rotation in the position shown in Fig. 3. This operation takes place by a spring or snap action independent of the speed of rotation of the driving shaft and therefore of the engine and its effect is to operate through the opposite corner of the rectangular block, projection 37 and the arm 30, to close the contact 36 for a definite period which is uniform at different rotative speeds of the engine. The cross bar 43 on the stationary member 17, serves to limit the vibratory motion of the block 39 to a certain angular range, the actual position of the range being determined by the position of the controlling means 15. The segment 7 of the distributer is of sufficient length to maintain the connection as the arm 15 is shifted to advance the spark. The point of the projection 37 on lever 30 may be flattened to prolong the period of contact to any desired extent. The circuit controlling or contact means 26 is operated wholly by the actuating means 34, the driving shaft 1 serving to accumulate energy in the spring 35 through the actuating means 38 and said energy being suddenly expended in the operation of the contact device 26 through the cam member 39. The connection of the spring 35 to the arm 30 is between the cam projection 37 and the pivot 31, whereas the connection of said spring to the actuating arm 34 is farther from the pivot of said arm than is cam projection 38, so that a quick action is produced on the contact means 26. It will be noted that as the casing holding the contact brushes is held in fixed position and is not shifted by the operation of the spark advancing means, and the leading means are therefore not subject to breakage by bending.

What I claim is:

1. A circuit controlling device comprising an operating shaft, movable contact means mounted to rotate with said shaft, a movable actuating member mounted to rotate with said shaft, a member mounted to rotate through a limited angle and having cam faces engaging with the contact means and with the said actuating means to store energy in the actuating means during a portion of the rotation of said shaft and to utilize said energy in the operation of the contact means.

2. A circuit controlling device comprising an operating shaft, a movable contact means mounted to rotate therewith, a movable actuating means mounted to rotate with said shaft, a member mounted to oscillate through a limited angle and having cam portions engaging with the actuating means and with the contact means, and a spring connected to the actuating means, whereby energy is stored in said spring by the action of the said cam portions on said actuating means, and subsequently the energy of the spring operates the said cam portions through the actuating means to cause the operation of the contact means.

3. A circuit controlling device comprising an operating shaft, and an actuating means movably mounted on said shaft to rotate therewith, a stationary member, and a cam member mounted to have a limited oscillatory movement relatively to the stationary member and having portions engaging the actuating means to operate the actuating means by the movement of the actuating means over the cam member during a part of the rotation of the shaft, and to be reversely operated by the actuating means during another part of such rotation, and contact means engaging said cam member to be operated thereby in such reverse motion.

4. In a circuit controller, an operating shaft, contact means and actuating means therefor, both mounted to rotate with the shaft, and provided with spring means, a stationary member and a cam means mounted to have a limited angular motion with respect to the stationary member, and adapted to engage the actuating means, against the action of its spring means, and to be reversely operated by said spring means, through said actuating means, to operate the contact means.

5. A circuit controller comprising an operating shaft, a distributer member mounted on said shaft to rotate therewith, and provided with a contact segment, a contact means mounted movably on the said shaft to rotate therewith and connected to said segment, fixed distributer contacts mounted to engage said segment, a stationary member, and means for operating said contact means by the rotation thereof relatively to said stationary member.

6. A circuit controller comprising an operating shaft, a distributer member mounted on said shaft to rotate therewith, and provided with a contact segment, a contact means mounted movably on the said shaft to rotate therewith and connected to said segment, fixed distributer contacts mounted to engage said segment, a stationary member, and means for operating said contact means by the rotation thereof relatively to said stationary member, said stationary member being angularly shiftable to vary the time of operation.

7. A circuit controlling device comprising an operating shaft, and an actuating means movably mounted on said shaft to rotate therewith, a stationary member, and a cam member mounted to have a limited oscillatory movement relatively to the stationary member and having portions engaging the actuating means to operate the actuating means by the movement of the actuating means over the cam member during a part of the rotation of the shaft, and to be reversely operated by the actuating means during another part of such rotation, and contact means engaging said cam member to be operated thereby in such reverse motion, said stationary member being angularly shiftable to vary the time of operation.

8. In a circuit controller, an operating shaft, contact means and actuating means therefor, both mounted to rotate with the shaft, and provided with spring means, a stationary member and a cam means mounted to have a limited angular motion with respect to the stationary member, and adapted to engage with the actuating means, against the action of its spring means, and to be reversely operated by said spring means, through said actuating means, to operate the contact means, said stationary member being angularly shiftable to vary the time of operation.

9. A circuit controller comprising a rotary operating shaft, a casing having a bearing for said shaft whereby the shaft is adapted to rotate within the casing, means connected to the casing to maintain a definite angular position thereof, a distributer member mounted within the casing to rotate with the shaft and provided with a contact segment, a plurality of distributer contacts carried by the casing, contact means mounted to rotate with the shaft and comprising two contact members relatively movable to open and close the circuit, one of said contact members being connected to the aforesaid segment, a cam member coöperating with the said movable contact member and mounted to oscillate through a limited angle, means carried by the casing for limiting the movement of said cam member, an actuating

member mounted to rotate with the rotary shaft, and having a portion engaging said cam member, and a spring for said actuating member to resist the operation of the actuating member by the cam member and to subsequently effect the operation of the actuating member to cause operation of the movable contact member.

10. A circuit controller comprising a rotary operating shaft, a casing having a bearing for said shaft whereby the shaft is adapted to rotate within the casing, means connected to the casing to maintain a definite angular position thereof, a distributer member mounted within the casing to rotate with the shaft and provided with a contact segment, a plurality of distributer contacts carried by the casing, contact means mounted to rotate with the shaft and comprising two contact members relatively movable to open and close the circuit, one of said contact members being connected to the aforesaid segment, and a cam member coöperating with the said movable contact member.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 17th day of June 1909.

JAMES E. SEELEY.

In presence of—
ARTHUR P. KNIGHT,
P. H. SHELTON.