J. H. LEHMAN.

ELECTRIC CURRENT MAKING, BREAKING, AND REVERSING DEVICE.

APPLICATION FILED OCT. 30, 1917.

1,415,369.

Patented May 9, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

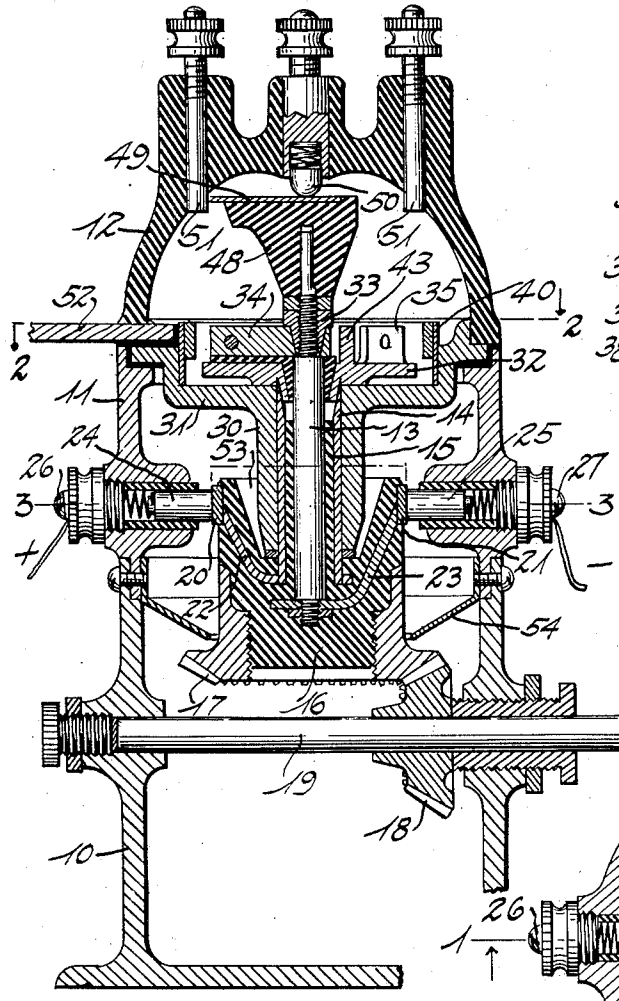


Fig. 2.

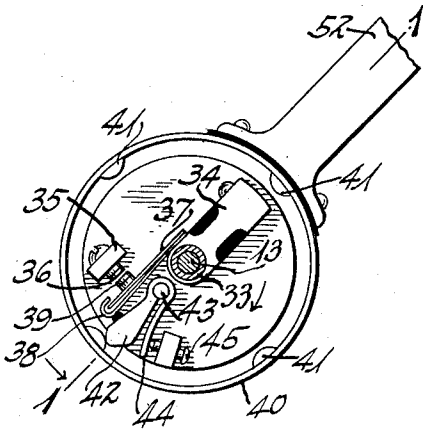
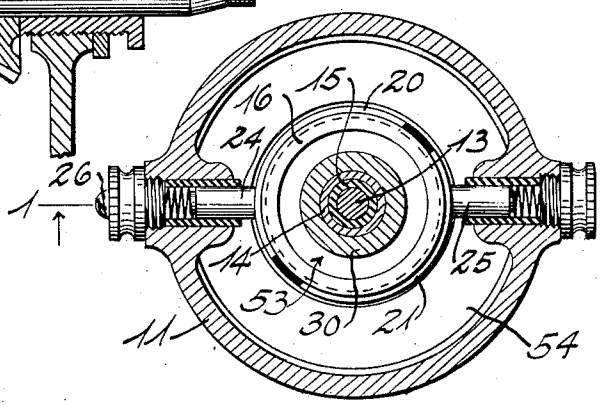


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

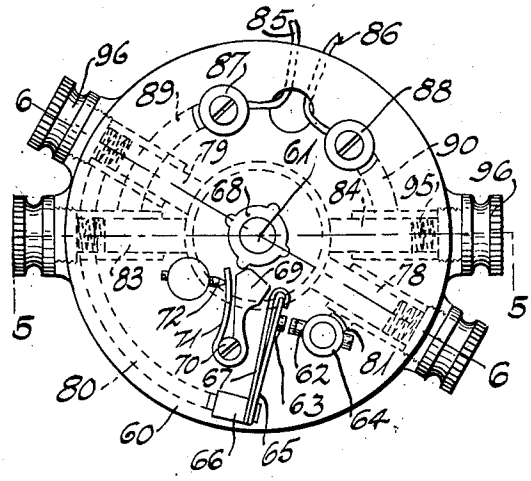


Fig. 6.

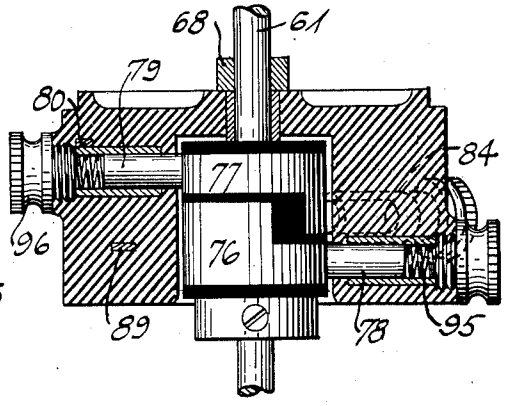


Fig. 5.

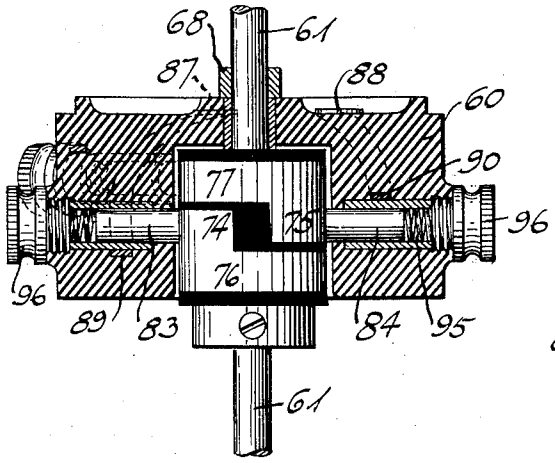
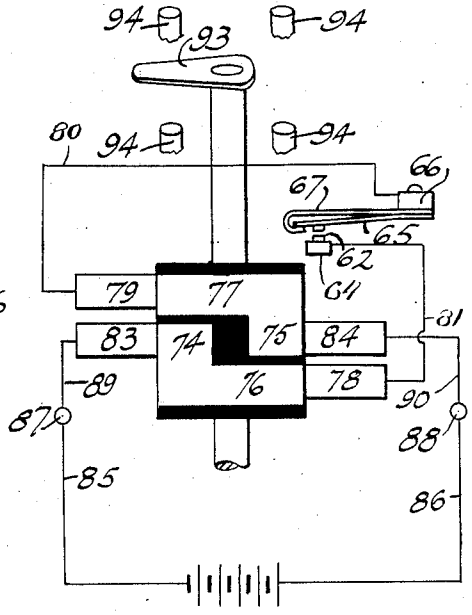


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH H. LEHMAN, OF HASBROUCK HEIGHTS, NEW JERSEY.

ELECTRIC-CURRENT MAKING, BREAKING, AND REVERSING DEVICE.

1,415,369. Specification of Letters Patent. Patented May 9, 1922.

Application filed October 30, 1917. Serial No. 199,242.

To all whom it may concern:

Be it known that I, JOSEPH H. LEHMAN, a citizen of the United States, and resident of Hasbrouck Heights, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Electric-Current Making, Breaking, and Reversing Devices, of which the following is a specification.

In my prior Patent No. 1,251,249 issued December 25, 1917, I have pointed out the desirability of automatically reversing the direction of flow of the current across the gap of a make-and-break device at intervals bearing a definite relationship to the frequency of operation of the make-and-break so that the sum total of the times during which the spark passes in one direction exactly equals the sum total of the times during which it passes in the opposite direction. In said application, I have disclosed in detail one mechanism for accomplishing this result in a combined timer and distributor for the ignition system of internal combustion engines, and have broadly claimed a circuit including a pair of relatively movable contacts and a rotatable shaft having means for making and breaking the circuit at said contacts a predetermined number of times during each rotation of the shaft and also having means operating to reverse the connections between the contacts and the poles of the source of current a predetermined number of times during each rotation of the shaft.

My present invention involves another embodiment of that invention and has for its primary object to simplify and improve the construction and reduce the cost of manufacture of the current reversing mechanism, the timer and other parts of the construction.

In one of the constructions shown in my prior application above referred to there are employed approximately semi-circular plates and brushes engaging therewith, the brushes and plates being relatively rotatable whereby, during each complete rotation, the brushes engage with the plates in succession. In my present construction, I utilize this same idea but secure a very decided improvement by rotating the plates instead of the brushes.

As an important feature of my present invention, I connect the poles of the source of current to brushes bearing directly upon the rotatable part of the construction and this rotatable part operates not only to make and break the circuit a plurality of times during each rotation, but also operates to reverse the connections between said brushes and the make-and-break contacts a plurality of times during each rotation.

As a further important feature, I mount the make-and-break contacts directly on the rotatable member so that they are carried by the latter and provide normally stationary means for effecting their relative movement and producing the desired make-and-break operation the desired number of times during the rotation.

By having these make-and-break contacts and also the curved collector plates of the polarity reverser carried by this rotatable member, only a single pair of stationary brushes and a single pair of plates are required and each plate is permanently and rigidly connected to the corresponding contact of the make-and-break device. Thus, the polarity of the contacts of the make-and-break device is automatically reversed as the curved collector plates pass the brushes.

A further important feature of my invention resides in the means employed whereby the timing of the make-and-break may be advanced or retarded at will without necessitating the bodily movement of any parts to which wire terminals are secured. In the ordinary timer, it is necessary to rotate the entire casing, or at least the part thereof to which the wires leading to the spark plugs are connected, each time the spark is advanced or retarded. Such movement often results in the loosening of such connections.

By means of my invention, I am able to retard or advance the spark at will by the bodily movement of a simple part having no terminals or other connections secured thereto or carried thereby.

Further important features, objects and advantages will be pointed out hereinafter in connection with a detailed description of certain embodiments of my invention.

In the accompanying drawings, to which reference is to be had,

Figure 1 is a central longitudinal section through a device constructed in accordance with my invention, certain of the parts of the timer portion being omitted, said section being taken in part on the line 1—1 of Fig-

ure 2 and in part on the line 1—1 of Figure 3;

Figure 2 is a top plan view of the timer portion, the casing of the device being removed and the parts viewed substantially in the direction of the arrow on the line 2—2 of Figure 1;

Figure 3 is a transverse section on the line 3—3 of Figure 1;

Figure 4 is a top plan view of another embodiment of certain features of my invention;

Figures 5 and 6 are central longitudinal sections on the lines 5—5 and 6—6, respectively, of Figure 4; and

Figure 7 is a wiring diagram of the system shown in Figures 4, 5 and 6.

In the specific construction illustrated in Figures 1, 2 and 3, I employ a main casing which may be made up of two superposed annular sections 10 and 11 and a cap or top wall 12, all of which may be rigidly, although detachably, connected. One of the sections, for instance the base section 10, may be constructed for rigid mounting upon any suitable support. Within the casing and preferably coaxial therewith, there is mounted a rotatable member so constructed and designed that during its rotation it makes and breaks a primary current, reverses the polarity of the contacts of the make-and-break device and distributes a secondary current to a plurality of conductors which may lead to separate spark plugs if the device be used as a part of the ignition system of a multiple cylinder internal combustion engine.

This rotatable member includes a central shaft 13 and a sleeve 14 rigid therewith and encircling the same, but spaced and insulated therefrom in any suitable manner, as for instance by an intermediate sleeve 15 of insulating material. The shaft 13 and the sleeve 14 serve as conductors to the separate contacts of the timer, as will be described more in detail hereinafter. At the lower end of the shaft there is provided a head 16 which is illustrated as being of insulation material and having the lower ends of the shaft and sleeve embedded therein. The head is provided with any suitable means for rotating it, such means being illustrated as a bevel gear 17 meshing with a pinion 18 on a transversely extending shaft 19 journaled in the opposite walls of the base section 10 of the casing. The pinion and gear may be in the ratio of two-to-one so that the shaft 19 may be geared to and driven directly by the counter shaft of the engine.

The head 16 above the gear 17 carries two curved collector ring sections or plates 20 and 21 each substantially semi-circular but with their adjacent ends spaced apart and insulated from each other. One of these curved plates is connected by a wire or any other suitable form of conductor 22 to the lower end of the sleeve 14, while the other is connected by a wire or other conductor 23 to the lower end of the shaft 13. The wall of the casing section 11 carries two brushes 24 and 25 which bear against these plates and are themselves connected to the positive and negative poles of the source of current. The particular character of the brushes is relatively unimportant as any construction common in the art may be employed for effecting the electrical connections between the plate sections 20 and 21 and the poles of the source of current during the rotation of the rotatable member of the device. Any brush commonly employed in commutators of small electric motors is suitable for use. I have shown cylindrical brushes 24 and 25 mounted to slide radially in tubes of insulation material and pressed inwardly by coil springs. The wires may be secured to terminals 26 and 27 and the terminals electrically connected to the brushes in any suitable manner.

As shown in Figure 3, the plate 20 is in engagement with the brush 24 and the plate 21 is in engagement with the brush 25. This connects the sleeve 14 with the positive terminal 26 and the shaft 13 with the negative terminal 27. As the device rotates, the plate 20 will leave the brush 24 and come in contact with the brush 25 and at the same time the contact plate 21 will leave the brush 25 and come in engagement with the brush 24. The space between the adjacent ends of the two contact plates is greater than the width of the brush, so that there will be no short circuiting as the brush passes from one plate to the other. This will connect the sleeve to the negative pole and the shaft to the positive pole. In the construction illustrated, the polarity of the shaft and the sleeve will be reversed twice during each complete rotation. It will of course be evident that the annular series of plates, which is illustrated as including only two and resulting in two reversals of polarity for each revolution, might be replaced by a larger number. For instance, there might be six plate sections each covering somewhat less than one-sixth of the periphery of the head and the series connected up electrically in two sets, one set being formed of each alternate plate and the other set being formed of the remaining plates and one set being connected to the sleeve and the other to the shaft. Such an arrangement might be somewhat similar to the inner row of plates shown in Figure 17 of my patent above referred to.

For supporting the rotatable member, there is provided a depending sleeve 30 within which the sleeve 14 may rotate and be supported. The bearing sleeve may be supported in any suitable manner. As illustrated it is made integral with a transverse

partition or wall 31 supported by but insulated from the casing section 11. This partition has an upstanding peripheral wall or flange defining a compartment or chamber above it and beneath the cap or top wall 12, and within which is mounted my improved interrupter or make-and-break mechanism. Above the latter in the cap or cover is the distributor section of the device.

The relatively movable contacts of the make-and-break device are carried by a head 32 rigidly secured to the shaft 13 and sleeve 14 but insulated from the former. The sleeve is shown as being reamed out or conical at its upper end and the head 32 is shown as having a depending flange which may be wedged down into this conical socket by the tightening of a nut 33. The passage through the head is larger than the sleeve so as to receive an insulation collar to prevent the head from short-circuiting the current from the shaft to the sleeve.

Supported on the head and insulated therefrom is a bracket 34 which may be held rigid with the shaft by means of the nut 33 which also constitutes the electrical connection between the two parts. Thus the bracket 34 is electrically connected to one pole of the battery and the head 32 to the other. The head has an upwardly extending lug 35 carrying an adjustable contact member 36 while the bracket 34 carries a pair of spring arms 37 and 38, the former of which has a contact member 39 and the latter of which has a hooked end. The spring arms and the lug 35 are so positioned in respect to each other that the contacts 36 and 39 of the make-and-break device are normally spaced a slight distance apart as shown in Figure 2.

Encircling the head and spaced therefrom is a collar or annular band 40 having a series of knobs or projections 41 extending inwardly to a slight distance and in the path of the outer end of a member 42 mounted on a pivot 43. As the rotatable member rotates in the direction indicated by the arrow in Figure 2, all of the parts illustrated in said figure are rotated bodily about the shaft as an axis with the exception of the band or collar 40 and its projections 41.

It will, of course, be evident that the particular shape of the projections 41, as illustrated, is not essential as the relative width of the projections in respect to the width of the spaces between adjacent projections may be varied at will to vary the relative times of opened circuit and closed circuit conditions.

Merely to avoid confusion in the drawing, I have omitted from Figure 1 the pivoted hammer or impact member 42 which is mounted to swing on the stud 43. The member 42 is so constructed that as its outer end comes in engagement with one of the projections 41, the member may swing back against the resistance of a spring 44 until the free end slips past the projection and then the force of the spring will cause it to rebound against the spring 38 and carry the springs 37 and 38 and the contact 39 over to such an extent that the contacts 36 and 39 engage. The contacts are immediately separated thereafter, thereby breaking the circuit for the purpose and in a manner well understood by those skilled in the art. The force of the blow of the comparatively heavy pivoted member 42 may be varied by adjusting screw 45 which engages with the spring 44. The spring 44 is shown as being integral with the impact or hammer member 42. The hammer member may be provided with an insulation face so as to prevent short-circuiting when it comes in contact with the spring 38.

The details of the distributor section of the device illustrated constitute no portion of my present invention and may be varied at will. I have illustrated the cap as made of insulation material and have shown the upper end of the shaft 13 provided with an insulation head 48. This head has a distributing member 49 permanently in engagement with a central current delivering terminal 50 and has its outer end movable into engagement with or into operative position in respect to a series of terminals 51. Thus, as the shaft rotates the secondary current is delivered to the several spark plugs in succession, it being understood that each spark plug is connected to a separate terminal 51.

For advancing or retarding the time of the make-and-break mechanism, it is merely necessary to oscillate the band or collar 40 about the axis of the shaft as a center. This is very easily accomplished as the band may be seated in a cylindrical socket in the upper face of the partition 31 and may be provided with a handle 52 extending out through a slot in the wall of the device. The handle is shown as insulated from the collar. The handle might be directly connected to the collar 40 and the latter might be insulated from the part 31 in which it oscillates, by an insulation lining in the socket receiving said collar or on the periphery of the collar.

By swinging the handle in one direction or the other, the time at which the impact member 42 comes into engagement with a projection, and is thereafter released to effect the relative movement of the make-and-break contacts 36 and 39, may be advanced or retarded. This movement of the handle 52, the collar 40, and the projections 41, does not involve any movement of any part in the electrical circuit. Thus no wires, terminals, or other parts, can be worked loose

by the frequent retarding or advancing of the spark, as often occurs in the common forms of timers.

In Figure 2, I have shown the device provided with four projections 41 which will result in four make-and-break operations during each complete rotation of the shaft. It is of course evident that this number may be increased or decreased at will, dependent upon the number of cylinders of the engine or the gear ratio of the timer to the engine.

It is important that the make-and-break device be so positioned in respect to the gaps between the ends of the plates 20 and 21 that the brushes 24 and 25 will never pass from one plate to the other while the circuit is closed at the contacts 36 and 27, and that the relative movement of said contacts to effect the make-and-break operation will never take place while the brushes 24 and 25 are on the gaps between the plates.

As important structural features of the form illustrated, the head 16 is provided with a centrally disposed socket 53 in its upper face and into which the bearing sleeve 30 extends. This not only permits of a long bearing sleeve and the firm supporting of the rotatable members, but permits the head 16 to be of the desired length to space the contact plates from the gear 17 without unduly lengthening the casing. It also leaves an annular chamber within which oil may be placed and which will serve as a reservoir for the lubrication of the bearing, the oil being free to rise between the bearing sleeve 30 and the exterior of the rotating sleeve 14. By filling the chamber 53 with oil, it will not be necessary to provide additional lubrication except at very long and infrequent intervals.

The gear 17 is shown with its toothed bearing part of materially larger diameter than the body of the head 16. This is of advantage in connection with an annular baffle 54 carried by the wall of the casing and inclined downwardly and inwardly toward the periphery of the head above the gear. Thus, any oil thrown from the gears or from the bearing of the shaft 19 will strike the underside of the baffle and drain downwardly and back to the gears. The baffle also prevents any oil from being thrown or otherwise forced up to the contact plates 20 and 21 and the brushes 24 and 25. Furthermore, any oil which might overflow or be spilled from the chamber 53 will be directed by the baffle 54 to the working face of the gear 17.

Various changes may be made in the details of construction of the form above described without departing from the spirit of my invention. The parts may be rearranged without affecting their mechanical or electrical operation or relationship.

The specific means for operating the make-and-break device, particularly so far as it involves the rebounding oscillatory member 42 for giving an increased length of contact for increased speed of rotation, is not claimed herein but is covered by my Patent 1,311,902 issued August 5th, 1919.

Another embodiment of certain features of the invention hereinbefore described and particularly so far as it involves the polarity reversing features, is shown in Figures 4 to 7 inclusive. In this construction there is a normally stationary body portion 60 preferably of insulating material and through which extends a rotatable member including a shaft 61. Mounted upon the upper end of this body portion is the make-and-break device which is illustrated as including make-and-break contacts 62 and 63, one of which is carried by a stud 64 and the other of which is carried by a leaf spring 65. This leaf spring is mounted on a lug or stud 66 which also carries a leaf spring 67 provided with a hooked end engaging the end of the leaf spring 65. The shaft 61 has a cam member 68 rigid therewith and provided with a plurality of spaced projections for engaging a pivoted rebound or hammer member 69. The latter is mounted on a pivot 70 and has a spring 71 integral therewith and engaging with an adjustable stop 72. As the cam member 68 rotates clockwise, it swings the member 69 toward the left from the position shown in Figure 4 and against the action of the springs 71. As the cam projection slips past the end, the member rebounds to strike the leaf spring 67 and permits the contacts to come together. The force with which it strikes the leaf spring 67 is dependent upon the force with which it was moved against the action of the spring 71 and this in turn is controlled by the speed of rotation of the cam member. The farther the member 69 rebounds after the compression of the spring 71, the farther the member 67 will be carried toward the right from the position shown and the longer will be the time before it returns to the position shown, thereby separating the contacts. Thus, the greater the speed of rotation of the shaft the longer will be the interval between the making and breaking of the circuit and the greater will be the current flow. This constitutes an important improvement but it is not specifically claimed herein as it is also a part of the subject matter of my Patent 1,311,902, granted August 5, 1919 on a co-pending application.

For delivering current to the contacts 62 and 63 and reversing the polarity of the latter a predetermined number of times during each rotation of the shaft, I have illustrated a form of polarity reversing device in which the shaft is provided with two curved collector ring sections or plates 74 and 75, corresponding to the curved collector

plates 20 and 21 of the forms shown in Figures 1 and 3. One of these is permanently connected to one contact of the make-and-break device and the other is permanently connected to the other contact of said device. As a means for establishing such permanent connections, the semi-cylindrical plate 74 is shown connected to or integral with an annular plate or collector ring 76 and the semi-cylindrical plate 75 is shown as connected to, or integral with the second annular plate or collector ring 77. A pair of brushes 78 and 79 are carried by the body and are in permanent engagement with the said collector rings. The brushes are shown as being on opposite sides of the shaft in the same diametrical plane, but this is not important. The brush 79 is connected by a conductor 80 with the stud 66 which carries the leaf spring 65 so that this brush is permanently connected to the contact 63 of the make-and-break device and the other brush 78 is connected by a conductor 81 to the stud 64 carrying the contact 62 so that said brush is permanently electrically connected to the contact 62. Thus, the contacts 62 and 63 will always be of the same polarity as the collector rings 76 and 77.

For delivering current to the collector rings and reversing the polarity, there are provided two brushes 83 and 84 corresponding to the brushes 24 and 25 of the form shown in Figure 1. These brushes are diametrically opposite in the same transverse plane as shown in Figure 5 so that one engages with the contact plate 74 and the other with the contact plate 75 and each brush contacts first with one plate and then with the other during the rotation of the rotatable member. These brushes are connected to the terminals of the source of electrical energy in any suitable manner.

I have shown the wires 85 and 86 which lead from the positive and negative poles of the battery, generator or other source of electrical supply, secured to the terminals 87 and 88. The terminal 87 is connected to the casing of the brush 83 by a conductor 89 while the other terminal 88 is connected to the casing of the brush 84 by a conductor 90. Thus, the brushes 83 and 84 are always of the same polarity but the polarity of the brushes 78 and 79 is reversed twice during each rotation of the rotatable member. It will of course be evident that the number of reversals will be increased by increasing the number of curved collector plates or faces 74 and 75. It is only important that the plates which are in engagement with the brushes 83 and 84 at any one instant be connected to opposite rings 76 and 77. It is also important that the space between adjacent contact faces 74 and 75 be of greater width than the width of a brush so as to avoid short circuiting and that the spaces between said faces be so oriented in respect to the cam faces on the member 68 of the timer, that the reversing of polarity will always take place while the current is broken at the contacts 62 and 63. This will avoid the possibility of any arcing as the brushes 73 and 74 come in contact with or are separated from the rotatable collector ring sections or faces. It will be noted that the collector rings 76 and 77, the brushes 78 and 79 and the conductors 80 and 81, correspond in function to the permanent electrical connections shown in Figure 1 as comprising the conductors 22 and 23 and the shaft and sleeve 13 and 14.

It will of course be understood that the distributor may be employed in connection with the form shown in Figures 4, 5 and 6. Such distributor has not been illustrated as the details thereof may follow those of other devices now in use.

In Figure 7 I have shown the wiring system diagrammatically and have shown the shaft 61 as provided with a distributor brush 93 for engagement with a series of terminals 94 of parallel secondary circuits.

It will be evident that various changes may be made in the details of construction of the polarity reversing device shown on Sheet 2 of the drawing. Each of the brushes is shown in a metal sleeve to which the conductor is connected and each brush is pressed inwardly by a spring 95, the outer end of which engages a threaded plug 96. This permits the ready removal of the brushes. The wires 85 from the battery might be connected directly to the plugs at the outer ends of the brushes 83 and 84. The connections to the brushes might be reversed. As shown, the polarity of the collector rings 76 and 77 is reversed as the shaft rotates. The battery terminals might be connected to the brushes 78 and 79 so that the polarity of the collector rings would remain constant and the make-and-break device might be connected to the brushes 83 and 84 so that the polarity of said brushes and of the make-and-break device would be reversed as these brushes pass from one contact face 74 or 75 to the other.

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

1. A timer including a rotatable member, a pair of semi-cylindrical plates carried thereby and insulated from each other and arranged in succession in the same annular path, a pair of diametrically opposed, normally stationary brushes engaging with said plates in succession during the rotation of said member and adapted to be connected to the opposite poles of a source of electrical energy whereby the polarity of said plates is reversed twice during each rotation of said member, and make-and-break device,

and means for effecting a relative movement of the parts thereof to make and break a circuit a predetermined number of times during each rotation of said member.

2. A timer having a pair of relatively movable make-and-break contacts, a rotatable member, means for effecting a make-and-break action of said contacts a predetermined number of times during each complete rotation of said member, a pair of substantially semi-cylindrical plates carried by said rotatable member, separate permanent connections between the separate plates and the separate contacts of said make-and-break device, and a pair of brushes for engaging with said plates and adapted to be connected to the opposite terminals of a source of electrical energy.

3. A timer having a rotatable member, a pair of relatively movable make-and-break contacts carried thereby, means for effecting the make-and-break action of said contacts a predetermined number of times during each complete rotation of said member, a series of collector plates carried by said member and rigid in respect to each other, successive plates being insulated from each other and connected to the separate make-and-break contacts, and a pair of brushes engaging with separate plates of said series and connected to opposite poles of a source of electrical energy.

4. A combined timer and distributor including a casing, two rigidly connected sections, a plurality of terminals of parallel secondary circuits carried by one section, a pair of terminals for the opposite poles of a primary source of electrical energy carried by the other section of the casing, a partition within said casing, a rotatable member mounted in said partition and having collector faces for alternate and successive engagement with said last mentioned terminals, a distributor brush for delivering secondary current to said first mentioned terminals in succession, and a pair of relatively movable make-and-break contacts also carried by said rotatable member, connections between said contacts and said collector faces, and an annular member seated in said casing above said partition and having a plurality of projections for effecting a relative movement of said make-and-break contacts during the rotation of said rotatable member, and means for oscillating said annular member to advance or retard the time of the make-and-break action.

5. A timer having a rotatable member including a shaft, a sleeve rotatable therewith and insulated therefrom, a head rotatable with said shaft and having separate make-and-break contacts thereon, one of said contacts being connected to said shaft and the other to said sleeve, an annular series of normally stationary projections, and means carried by said head for engaging with said projections in succession to effect successive relative movements of said make-and-break contacts.

6. A timer having a rotatable member including a shaft, a sleeve rotatable therewith and insulated therefrom, a head rotatable with said shaft and having separate make-and-break contacts thereon, one of said contacts being connected to said shaft and the other to said sleeve, an annular series of normally stationary projections, means carried by said head for engaging with said projections in succession to effect successive relative movements of said make-and-break contacts, a pair of collector plates, one connected to said shaft and the other to said sleeve, and a pair of normally stationary brushes for connection to the opposite poles of a source of electrical energy and engaging with said plates separately and in succession.

7. A timer having a rotatable member including a shaft, a sleeve insulated therefrom and a pair of collector plates, one connected to said sleeve and the other connected to said shaft, a pair of brushes adapted to be connected to the opposite poles of a source of electrical energy and engaging with said plates separately and in succession during the rotation of said member, and a make-and-break device having relatively movable contacts, one connected to said shaft and the other to said sleeve.

8. A timer having a rotatable member including a shaft, a sleeve insulated therefrom and a pair of collector plates, one connected to said sleeve and the other connected to said shaft, a pair of brushes for connection to the opposite poles of a source of electrical energy and engaging with said plates separately and in succession during the rotation of said member, a make-and-break device having relatively movable contacts, one connected to said shaft and the other to said sleeve, said contacts being carried bodily by said member, and a normally stationary member having an annular series of projections for effecting the relative movement of said contacts during the rotation of said member.

9. A timer, including a casing, a transverse partition having a central bearing, a rotatable member mounted on said bearing and having a make-and-break device at one side of said partition, a pair of conductors extending lengthwise through said bearing, and a head at the opposite side of said partition and having separate collector plates connected to said conductors, said head having an annular lubricant carrying chamber in the upper surface thereof at the lower end of said bearing.

10. A timer having a casing, including a bearing sleeve, a rotatable member extending through said sleeve and including lon-

gitudinally extending insulated conductors, a head at the lower end of said bearing sleeve and having a recess in the upper surface thereof adapted to receive lubricant and into which the lower end of said sleeve extends, collector plates carried by said head and connected to said conductors, and a pair of normally stationary brushes for separate and successive engagement with said plates.

11. A timer having a rotatable member, a plurality of curved collector plates distributed around the periphery thereof, and a gear below said plates, a pair of normally stationary brushes engaging separately and in succession with said plates and an inwardly and downwardly inclined baffle below said brushes, the lower inner periphery of said baffle being above and smaller than the outer periphery of said gear.

12. A timer having a rotatable member including a pair of relatively movable contact members, a pair of semi-circular collector ring sections, and separate connections between each ring section and the corresponding contact member.

13. A timer including a cup shaped casing member having a depending bearing sleeve, a rotatable member journaled in said sleeve and having a pair of make-and-break contacts and a pair of collector rings, and separate connections between said rings and said contacts.

14. A timer having an insulation head, a pair of semi-cylindrical collector sections embedded in the periphery thereof, a pair of make-and-break contacts rotatable with said head, a separate connection between each contact and its corresponding section, and means for engaging with one of said contacts for effecting a movement thereof relative to the other contact during the rotation of said member.

15. A timer having a closed casing formed of a rigidly supported base section and a removable cover section normally rigid therewith, a rotatable member journaled within and supported by said casing having make and break contacts carried thereby, an annular member mounted wholly in one of said casing sections and having a series of projections for effecting relative movements of said make and break contacts during the rotation of said rotatable member, and means secured to said annular member and projecting to the exterior of said casing for oscillating said annular member in respect to both sections of the casing.

16. A timer having a closed casing formed of a stationary base section and a removable cover section, a rotatable member journaled within and supported by said casing and having make and break contacts carried thereby, an annular member mounted wholly in said base section and having a series of projections for effecting relative movements of said make and break contacts during the rotation of said rotatable member, said casing having a slot therein and said annular member having a handle projecting through said slot whereby said annular member may be oscillated in respect to both sections of said casing.

17. A timer having a rotatable member, a pair of substantially semi-circular collector ring sections carried thereby and insulated from each other, a pair of make-and-break contacts carried by said member, one electrically connected to one of said collector ring sections and the other electrically connected to the other section, means for moving one of said contacts in respect to the other during a rotation of said head, and a pair of brushes engaging with said collector ring sections, and each of a width less than the distance between adjacent ends of said collector ring sections.

18. A timer having a rotatable member including a shaft, a cup shaped casing receiving the upper portion of said member and provided with a bearing sleeve for supporting said shaft, make-and-break contacts carried by said member and a lever pivoted to said member, said casing having a plurality of projections in the path of one end of said lever for swinging said lever and moving one make-and-break contact in respect to the other a plurality of times during each complete rotation of said head.

19. A timer including a rotor having a pair of make-and-break contacts, a pair of collector ring sections insulated from each other and connected respectively to said contacts, and an operating member for one of said contacts, and a casing having a pair of brushes engaging said collector ring sections and an annular row of projections in the path of said operating member.

20. A timer including a rotatable member having a pair of make-and-break contacts, said member presenting a pair of metallic curved collector faces insulated from each other and rigid in respect to each other and separately connected to said make-and-break contacts, a casing within which said member is mounted, said casing having means for effecting a movement of one make-and-break contact in respect to the other during the rotation of said member, and also having means for conducting current to said faces during said rotation.

Signed at New York, in the county of New York, and State of New York, this 25th day of October A. D. 1917.

JOSEPH H. LEHMAN.