A. A. KENT.

ELECTRIC DEVICE.

APPLICATION FILED JUNE 12, 1908.

1,082,810.

Patented Dec. 30, 1913

3 SHEETS—SHEET 1.

Fig. 1.

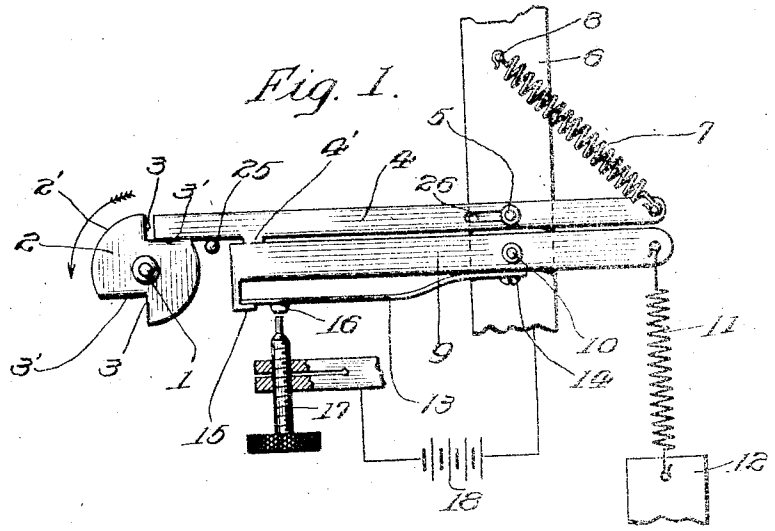
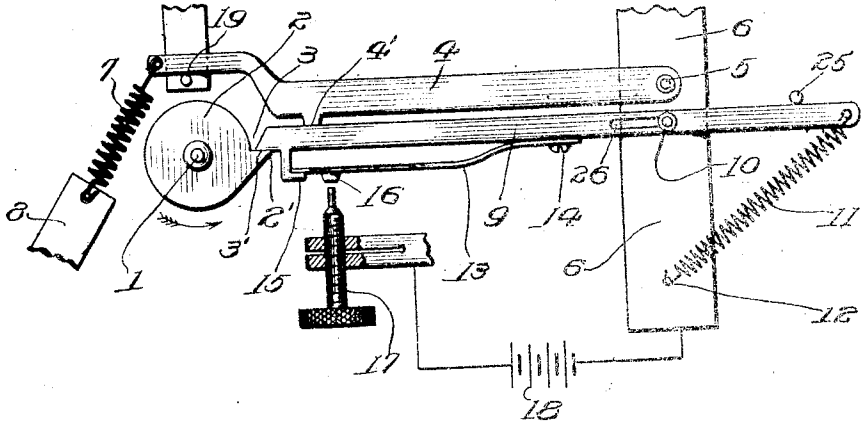


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

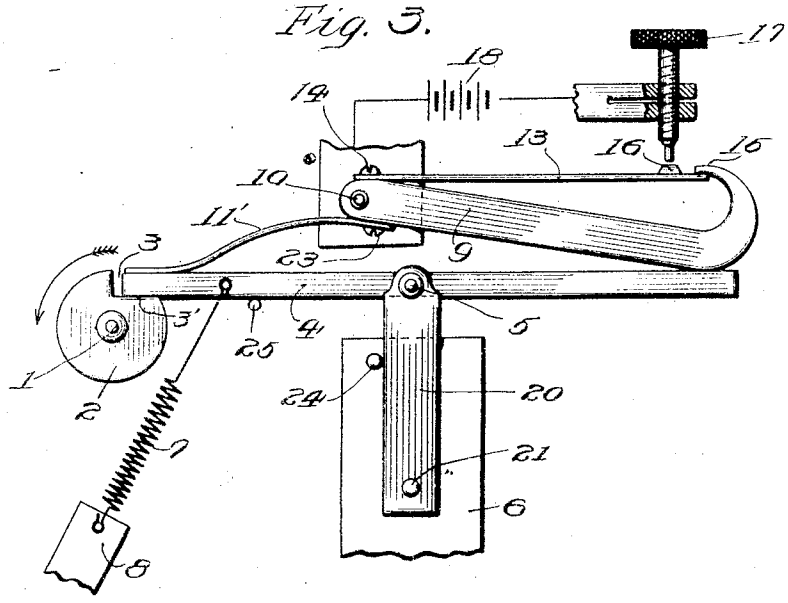
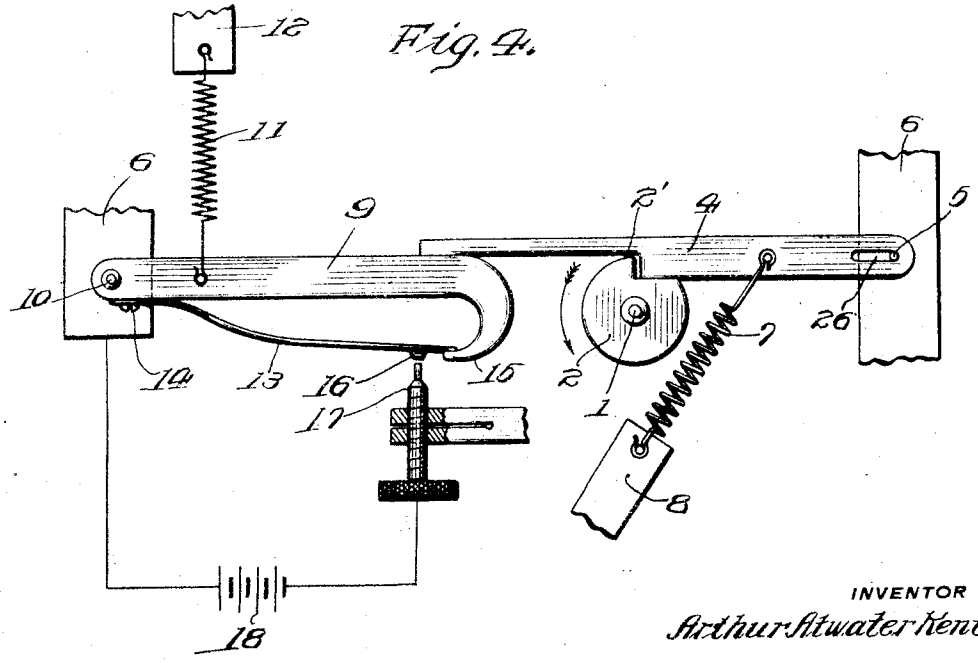


Fig. 4.



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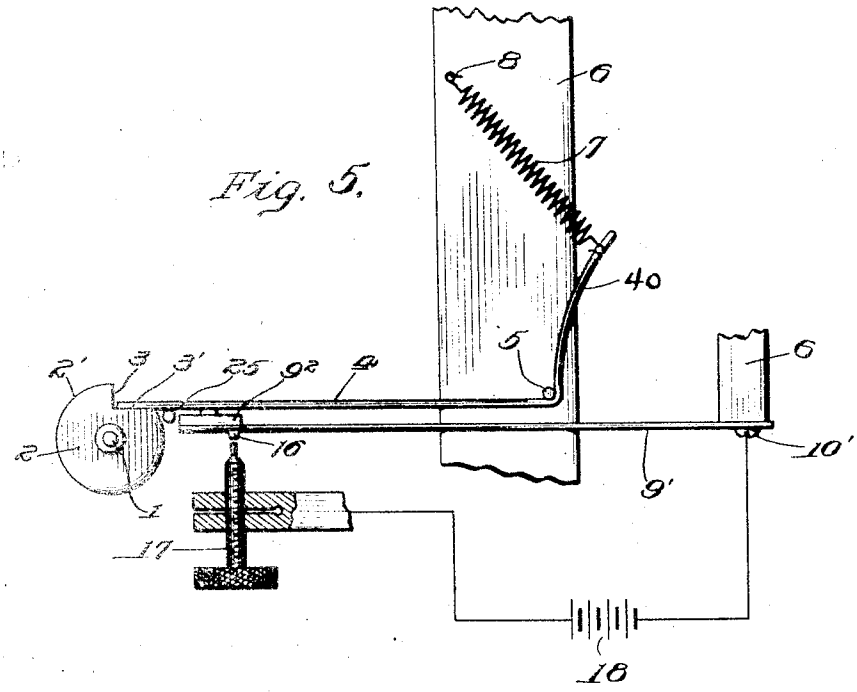
3 SHEETS—SHEET 3.

Fig. 5.



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ELECTRIC DEVICE.

1,082,810. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed June 12, 1908. Serial No. 438,089.

To all whom it may concern:

Be it known that I, ARTHUR ATWATER KENT, a citizen of the United States, and a resident of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Electric Devices, of which the following is a full, clear, and exact disclosure.

My invention relates to electric contact devices and especially to that class of devices in which it is desired to obtain a positive, certain closing and rapid break of an electric circuit; such, for example, as those contact devices used to produce a spark for internal combustion engines; but my invention is not limited to such specific use, inasmuch as it is applicable for many purposes.

One object of my invention is to provide a device of the kind above indicated, in which the circuit closing member or element is separate from its actuating member, so that the said parts may be removed or replaced without disturbing the adjustment of the other parts of the device.

A further object of my invention is to provide a device in which a constant force, such as a spring, may be used to give the circuit closing member its initial motion, and to throw the circuit closing member by momentum into operative engagement with a contact point to close the circuit, the said circuit closing member holding the circuit closed long enough to insure a flow of the current instantaneously and positively breaking the circuit to cause the spark.

A further object of my invention is to provide a device in which the circuit cannot be held closed indefinitely to run down the battery or waste the current; that is to say, the machine cannot be stopped in such a position as to leave the contacts in engagement.

A further object of my invention is to provide a mechanism in which the time during which the circuit closing elements operate is constant, although the speed of the driving mechanism may vary, to produce a circuit closer which may be operated from a moving or driven part of any suitable mechanism with which the said device is used.

Further objects of my invention will appear in the specification and claims below.

In the drawings forming a part of this specification and in which the same reference character is used throughout the various views to designate the same part, Figure 1 indicates diagrammatically one form or embodiment of my invention; Figs. 2 to 5 are similar views of different modified forms of my device.

Referring particularly to Fig. 1, 1 indicates a shaft which is adapted to be driven by any suitable means. It may be the shaft of an internal combustion engine or a shaft coupled to and driven by an internal combustion engine, or of any other machine with which it may be desirable to use a contact device. Upon the shaft is mounted a cam 2 having one or more interruptions or depressions 3 in the surface thereof. 4 indicates an actuating element or member which in the drawing is shown in the form of a lever pivoted at the point 5 on a suitable support 6. One end of the said actuating member or element is adapted to contact and follow the surface of the cam 2, the said element being normally pressed in the direction of the said cam 2 by means of a spring 7 attached at one end to said element 4 and at the other end to a suitable pin 8 mounted on the structure 6. The actuating member 4 is slotted as at 26, the pivot pin 5 passing through said slot, and the spring 7 is preferably so arranged that it holds the said member in the position shown in said figure, with the pin 5 at one end of the slot and the outer end of said member yieldingly pressed against the cam 2. The stop pin 25 is also arranged under the member 4 so that the said member 4 is prevented from further movement in a forward direction even when forced to the right and off the stop surface 3^1 of said cam as will be explained below.

9 indicates a movable circuit closing member or element which is pivoted at 10 to the rigid portion of the machine or apparatus. The movable circuit closing element is shown as a lever, one end of which is normally pressed against or held in operative engagement with the actuating element 4 by a spring 11. The said member is shown as resting against a lug 4^1 on the actuating member 4. The spring 11, exerting a less tension than the spring 7, is attached to said circuit closing element 9 and to the rigid portion of the mechanism as at 12.

The circuit closing element or member is provided with a spring or resilient portion 13 secured to said circuit closing element 9

at one end, as by a screw 14, with the free end of said spring tending to move in a direction away from said circuit closing element but restrained from said movement by a lug 15 attached to or integral with the said circuit closing element, and engaging the outer or free end of said spring 13. Said spring therefore is under tension and presses normally against the said lug 15. The said spring is provided with a platinum contact point 16 adapted to coöperate with a stationary contact point or screw 17 supported by the rigid portion of the device. A battery 18 or other source of electrical energy is shown with its terminals electrically connected with the circuit closing members.

The operation of my device is as follows: Motion being communicated to the shaft when the cam is rotated in the direction of the arrow and the end of the actuating element, then in engagement with said cam, is lifted from the stop surface 3^1 of the depression 3 until it rides upon the outer surface 2^1 of said cam, the same being moved against the tension of the spring 7. The circuit closing element 9 moves upward with the actuating element 4 under the influence of the spring 11, which holds the elements 4 and 9 pressed together or in operative engagement during such movement. When the cam 2 is rotated sufficiently to bring the notch or depression 3 under the free end of the actuating element 4 the said element is rapidly impelled downward until it strikes the stop surface 3^1 of the notch 3, this being effected by the action of the spring 7. This movement of the actuating element 4 carries with it the circuit closing element 9 because the tension of the spring 11 tending to turn the element 9 on its pivot is less than that of the spring 7 tending to turn the element 4. When the actuating element strikes the surface 3^1 its downward motion is suddenly arrested but the circuit closing element 9 continues to move on by its momentum until the contact point 16 engages the stationary contact point 17. The action of the spring 11 will immediately separate the contact points and the parts will resume the position shown in Fig. 1.

In connection with the operation above described it is to be noted that the spring 13 is under tension at all times and consequently when the element 9 is being thrown downward by inertia, the moment the contact points 16 and 17 engage the spring 13 will be forced off the lug or lip 15 and when so forced off said lug 15, the tension of the spring 13 will coöperate with and assist the spring 11 in rapidly separating the contact points. Moreover, since the spring 13 normally presses against the lug or lips 15 it cannot vibrate independently to the circuit closing element 9 or move relatively thereto except as it is pushed or forced off the lip 15 by the engagement of the contact points 16 and 17. Moreover, the breaking of the circuit between the contact points 15 and 16 is instantaneous since the moment the spring 13 reëngages the lip or lug 15 there is no pressure whatever between the contact points 16 and 17 and the contact point 16 is positively carried away from the contact point 17 by the circuit closing member. If, however, the cam 2 is revolved in the reverse direction to that indicated by the arrow, the actuating member 4 will be pushed or slid to the right against the tension of the inclined spring 7 such movement being permitted by the slot 26, and no vibratory movement, but merely a reciprocating movement will be imparted to the member 4, as the notch 3 moves into and out of register with the end of the said member 4. This movement will not cause any movement of the circuit closing member 9 and the circuit will remain broken.

In the modification shown in Fig. 2, the parts are slightly differently arranged but their operation is substantially the same with that previously described. In the said modification the cam 2 engages the circuit closing member 9 and lifts both the actuating element 4 and the circuit closing element 9 together. When the elevated portion 2^1 passes the end of the lever 9 the stiff spring 7 forces both elements downward and when the actuating element 4 engages the stop 19 the circuit closing element continues to move under the influence of inertia closing the contact points 16 and 17. The spring 11 returns the circuit closing element to the position shown in Fig. 2 and breaks the circuit.

As previously described the reverse motion of the cam 2 will similarly cause a reciprocatory movement of the circuit closing member 9, but the spring 11 will hold the said member 9 against the member 4 and the circuit will not be closed.

In the modification shown in Fig. 3 the actuating element or member 4 is shown as being pivoted at 5 upon a lever 20, which in turn is pivoted as at 21 on the rigid portion 6 of the device and the circuit closing element or member 9 is normally pressed and held in engagement with the actuating element or member 4 by means of a leaf spring 11^1, one end of which is secured to the circuit closing element by a screw 23 and the other end of which normally presses against the actuating element 4. In this modification provision is also made for the reversal of the cam without closing the circuit. The spring 7 in addition to holding the actuating member 4 normally pressed against the cam also draws the said member 4, and with it the pivoted lever 20 upon which it is supported, against the stop 24. When, however, the cam is revolved in the

direction opposite to that indicated by the arrow in Fig. 3 the member 4 will be forced to the right of Fig. 3 and against the action of the spring and the lever 20 will be turned to the right on its pivot 21. The end of the actuating member 4 which engages with the cam is prevented, however, from moving downward any farther by the stop pin 25. In this modification when the cam 2 is driven in the reverse direction the lever 20 will be oscillated about the point or pivot 21 and the actuating member will merely reciprocate without effecting a closure of the circuit.

In the modification shown in Fig. 4 a similar provision is made for the reciprocation of the actuating element or member 4 without operating the circuit closing element when the cam 2 is driven in the reverse direction to that at which it normally operates. In this modification the actuating member 4 is provided with a slot 26 within which is the pin 5 forming the pivot of said actuating member. The spring 7 normally holds said actuating member in the position indicated in the said figure at one end of its path and when the shaft is rotating in the direction shown by the arrow the operation of the device is the same as that which has been previously described, the actuating member 4 turning about the pin 5 as a pivot. When, however, the shaft is revolved in the opposite direction the actuating element will be forced to the right of the position shown in Fig. 4 until the elevated portion 2^1 of the cam passes the shoulder of the said member and will remain there until the notch 3 again is opposite the said member when it will return to the position shown in Fig. 4 under the influence of spring 7. In other words, the actuating element will be longitudinally reciprocated when the cam 2 is driven in the reverse direction and without effecting any operation whatever of the circuit closing element 9.

Fig. 5 indicates a simplified form of construction. In this modification the actuating element 4 is provided with an upturned end 40 forming an angle within which the member is pressed against the pivot pin 5 by the spring 7. As before the tension of the spring 7 also holds the free end of said member pressed against the cam 2.

The circuit closing member 9^1 consists of a spring arm, rigidly secured to the structure or frame 6 by a screw or other fastening means 10^1. The tension of the spring arm or member 9^1 is such as to hold it normally pressed against the actuating member 4. Both members are constructed so that they have little weight in order that an instantaneous movement of the same may be effected when the cam 2 has rotated to bring the notch 3 under the free end of the actuating member or element 4 and the spring 7 is allowed to force the said member against the stop 3^1. When the cam is rotated in the reverse direction the member 4 merely reciprocates longitudinally on the pivot 5 and stop pin 25 as guides, being forced in one direction by said cam and in the opposite direction by said spring 7. A small weight 9^2 on the free end of the circuit closing element 9^1 may be employed to impart sufficient weight to cause it to be thrown under momentum against the contact 17; the point 16 should be located adjacent the inner end of the said weight so as to allow the weight to tend to turn about the contact 17 when it strikes the same and the spring arm 9^1 to yield thereby preventing a heavy blow to be struck upon the contact points and excessive wear is prevented.

In all the forms above described the two elements are yieldingly pressed together and move together in one direction when actuated by the cam 2. When the notch 3 allows the spring 7 to act, both members are impelled in the opposite direction, but when the element 4 engages the surface 3^1 or the pin 25, the circuit closing element moves on under momentum away from the actuating element into engagement with a circuit closing member such as the contact point 17. When the movement of the circuit closing element is stopped by the point 17, the spring arm 13 or the spring 11 or both, (Figs. 1 to 4) or the resiliency of the arm 9^1 (Fig. 5) causes the circuit closing element to break the circuit and reëngage the actuating element 4.

From the above it will be seen that I have provided a construction in which an electric circuit may be mechanically closed and broken at a uniform rate of speed irrespective of the speed of the operating mechanism, inasmuch as the same is effected by the spring alone. The spring is placed under tension and released at the proper time by a mechanically driven member but the circuit is closed by the momentum of a spring actuated member. Moreover the construction is such that if one of the various parts becomes worn or broken it can be removed and repaired or replaced without disturbing the other parts of the device. The circuit closing element is separate and independent from the other parts of the mechanism and from the actuator, but is normally yieldingly pressed against it under tension.

While I have described several forms or embodiments of my invention I do not wish to be construed as being limited to the same, inasmuch as my invention is capable of embodiment in different forms, all of which are fully contemplated by me so long as they fall within the scope of the appended claims.

Having thus described my invention what

I desire to protect by Letters Patent of the United States is—

1. In a contact device a contact member, a movable element, a second movable element disconnected from said first element, yielding means for normally holding said elements in operative engagement and tending to move said second movable member away from said contact member, means for rapidly moving said first mentioned element in opposition to said yielding means for holding said elements in engagement, means for suddenly arresting the motion of said first mentioned element, whereby said second element is separated from its operative engagement with said first element and thrown by momentum into operative engagement with said contact member to substantially momentarily close a circuit.

2. In a contact device a contact member, a movable element, a second movable element, disconnected from said first element, yielding means for normally holding said elements, in operative engagement and tending to move said second movable element away from said contact member, means for moving said elements in a direction away from said contact member, means for rapidly moving said elements in the opposite direction, means for suddenly stopping the motion of said first element at the end of its movement in said opposite direction whereby said second element is thrown out of said engagement with said first element and into operative engagement with said contact member.

3. In a contact device a contact member, a movable element, a second movable element, means for normally holding said members in yielding engagement, means for moving said elements together in a direction away from said contact member, means for rapidly moving said elements in the opposite direction, and in opposition to said means for holding the same together, means for suddenly stopping the motion of said first element at the end of its movement in said opposite direction whereby said second element is substantially momentarily separated from said first element and thrown by momentum in operative engagement with said contact member.

4. In a contact device a contact member, a movable element, a second movable element mounted independently of said first element, means for normally holding said elements in substantially yielding engagement and tending to move said second movable element away from said contact member; means for moving said elements rapidly toward each contact member in opposition to said means for holding said elements together; means for suddenly stopping said motion of said first element whereby said second element is substantially momentarily thrown out of said engagement with said first element into operative engagement with said contact member.

5. In a contact device a contact member, a movable element, a second independent movable element, means normally acting to yieldingly press said elements toward each other and tending to move said second element in a direction away from said contact member, means for rapidly moving said elements together toward said contact member and for then suddenly stopping the motion of said first element whereby the second element is thrown out of operative engagement with said first element and into operative engagement with said contact member.

6. In a contact device a contact member, an actuating element, a circuit closing element disconnected from said first element, means for yieldingly pressing said circuit closing element toward said actuating element and away from said contact member, means for moving said elements together toward said contact member, and for then suddenly stopping the motion of said actuating element whereby said circuit closing element is thrown by momentum away from said actuating element and into operative engagement with said contact member to close an electric circuit.

7. In a contact device an electrical contact, an actuating element, a circuit closing element detached from said actuating element, but normally yieldingly pressed substantially against the same and in a direction substantially away from said electrical contact, means for moving said elements together toward said electrical contact, means for suddenly stopping said motion of said actuating element whereby said circuit closing element is substantially momentarily thrown out of operative engagement with said actuating element and into operative engagement with said contact.

8. In a contact device a movable element, an independently mounted second movable element, yielding means for normally holding said elements together, means acting in opposition to said yielding means for throwing said second element by momentum away from said first mentioned element, and a contact member against which said second movable element is thrown to close an electric circuit.

9. In a contact device an actuating element normally held against a stop, a movable circuit closing element mounted independently of said actuating element, yielding means for normally pressing said circuit closing element against said actuating element and tending to move said actuating element away from said stop, means to move said actuating element away from said stop, and means for rapidly returning said actuating element to its original posi-

tion against said stop whereby said circuit closing element is thrown by momentum out of engagement with said actuating element.

10. In a contact device a contact point, a pivoted actuating element, an independently pivoted circuit closing element, means to normally hold said circuit closing element yieldingly against said actuating element and tending to move said circuit closing element away from said contact point, a stop, yielding means to normally hold said actuating element against said stop, means to move said actuating element away from said stop, and to then release said actuating element to allow said yielding means to move said actuating element back against said stop, whereby said circuit closing element is thrown by momentum into substantially momentary engagement with said contact point.

11. In a contact device, a contact point, a rotatable cam having a portion of its surface nearer to the axis of rotation of said cam than another portion of its surface and provided with a shoulder forming a quick drop between said portions, an actuating element having one end bearing against said cam and provided with a recess one edge of which forms a shoulder, a support for said actuating element loosely mounted in said recess, yielding means for normally holding said actuating element with said shoulder against said support, a circuit closing member mounted independently of said actuating member, and yielding means to normally press said circuit closing member against said actuating member and tending to move said circuit closing member in a direction away from said contact point.

12. In a contact device a contact point, a circuit closing member having a resilient portion normally under tension, a contact point mounted on said resilient portion, an independently mounted actuating member, means for normally holding said elements in yielding engagement and tending to move said circuit closing member away from said first mentioned contact point, means for rapidly moving said elements toward each contact point and for then suddenly arresting the movement of said actuating member whereby said circuit closing member is thrown by momentum away from said actuating member and said contact point on said resilient portion of said circuit closing member is moved into engagement with said first mentioned contact point.

13. In a contact device, a contact member, a movable element, a second movable element, yielding means for normally holding said elements in operative engagement and tending to move said second movable element away from said contact member, means for moving said elements in a direction away from said contact member, means for rapidly moving said elements in the opposite direction, means for suddenly stopping the motion of said first element at the end of its movement in said opposite direction whereby said second element is momentarily thrown into operative engagement with said contact member.

14. In a contact device a stationary contact member, a movable element, a movable contact member, yielding means for normally holding said movable contact member in operative engagement with said movable element, and tending to move said movable contact member in a direction away from said stationary contact member, means to move said movable element in a direction away from said stationary contact member, said yielding means holding said movable contact member in engagement with said element during said movement, means to rapidly move said movable element and said movable contact member toward said stationary contact member, and means for suddenly stopping the motion of said movable element at the end of its movement toward said stationary contact member whereby said movable contact member is thrown into momentarily operative engagement with said stationary contact member.

15. In a contact device, a stationary contact point, a movable element, a second movable element, yielding means for holding said elements in operative engagement and tending to move said second movable element away from said stationary contact point, a rotatable cam having a portion of its surface nearer to the axis of rotation of said cam than a second portion of its surface and provided with a quick drop between said portions, yielding means for holding said first movable element against the surface of said cam and to move said first movable element rapidly toward said stationary contact point when that portion of the surface of said cam most remote from the axis of said cam moves from under said movable element to momentarily throw said second movable element into operative engagement with said stationary contact point.

In witness whereof I have hereunto set my hand this tenth day of June, A. D., 1908.

ARTHUR ATWATER KENT.

Witnesses:
G. B. Lucas,
J. B. Simpson.