A. A. KENT.

ELECTRIC CONTACT DEVICE.

APPLICATION FILED DEC. 7, 1908.

1,099,093.

Patented June 2, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

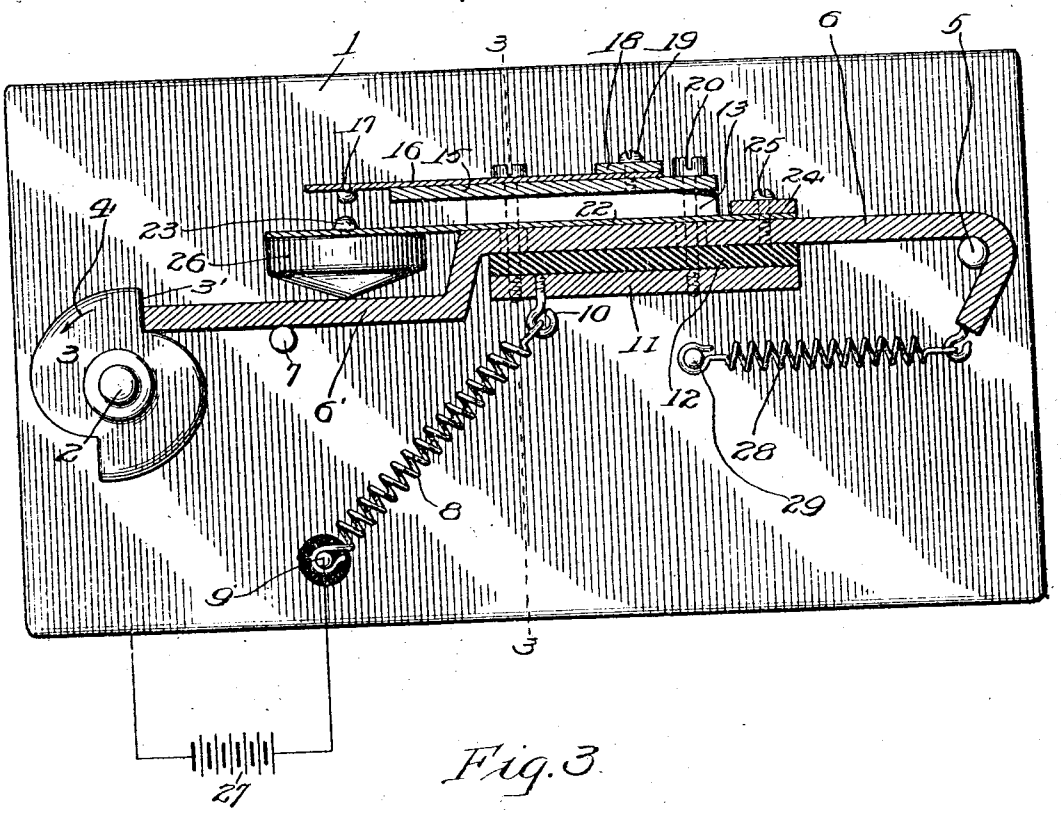
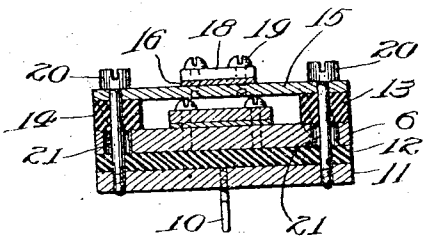


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 2.

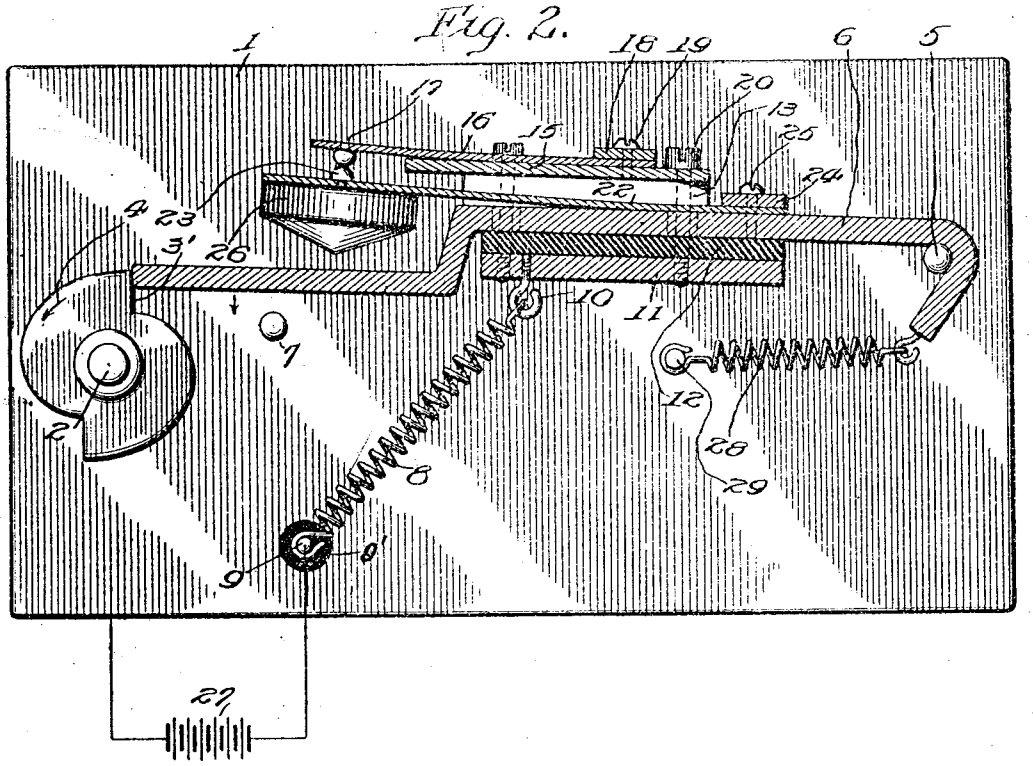
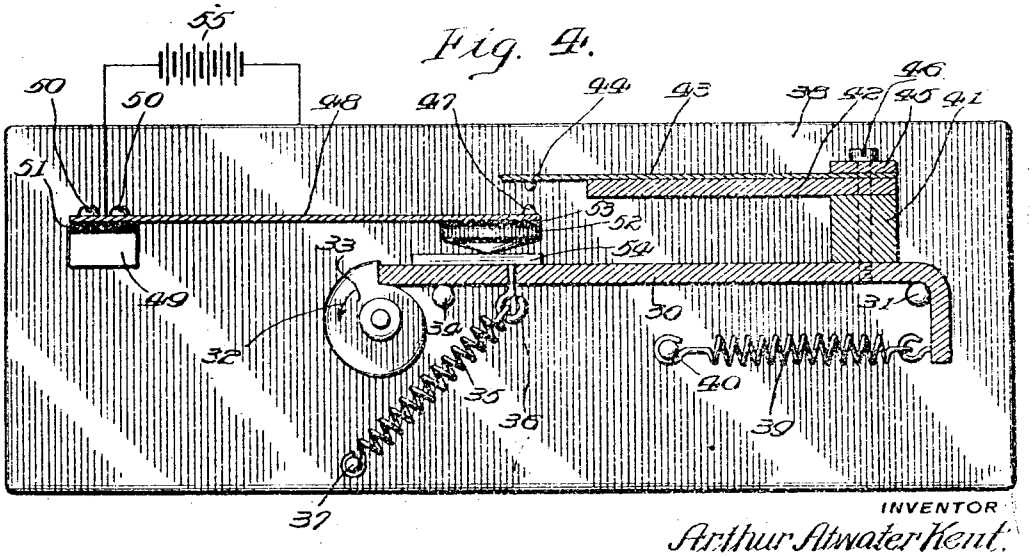


Fig. 4.



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ELECTRIC CONTACT DEVICE.

1,099,093. Specification of Letters Patent. Patented June 2, 1914.

Application filed December 7, 1908. Serial No. 466,233.

To all whom it may concern:

Be it known that I, ARTHUR ATWATER KENT, a citizen of the United States, and resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Electric Contact Devices, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to electric contact devices and especially to that kind of devices in which the circuit is closed and then broken by mechanical means, the same being particularly adapted for use in opening and closing the sparking circuit of internal combustion engines, but my invention is not to be construed as being limited to such uses inasmuch as it may be used wherever it is desirable to mechanically make and break a circuit.

One object of my invention is to provide a device in which both of the contact points are positively moved in one direction, but with the points out of contact with each other, and are then suddenly moved in a different or reverse direction and returned to their original position, and my invention contemplates the closing and breaking of the circuit during the second or reverse movement of said contact points.

A further object of my invention is to provide one of the contact points, or the support upon which one of said contact points is mounted, with means to move that contact point into engagement with the other movable contact point for a definite predetermined length of time and then to suddenly separate said points, the speed at which the circuit is closed and broken again, and consequently the time or duration of the closure of the circuit, being uniform irrespective of the speed at which the mechanism on which said device is mounted and by which it is operated, is moving.

A further object of my invention is to make the effective weight of one of the contact points greater than that of the other, so that the closure of the circuit is controlled or governed by the lag or the retarding of the movement of the weighted contact point, at the beginning of its movement in a changed or different direction, due to the inertia of said contact point.

A further object of my invention is to mount both contact points upon a single structure, so that they may be removed together to repair, adjust or replace any of the parts thereof without disturbing the other parts of the contact mechanism.

A further object of my invention is to use a constant, unvarying force, such as the momentum or inertia of the moving parts, or of one of the contact carrying or supporting members, as the force to control the closure of the circuit and the subsequent breaking of the same, and to make the operation of said parts, and consequently the time and character of the closure of the circuit, constant and uniform.

A further object of my invention is to make the movable parts of my contact device light, simple and compact so that they will be capable of quick, certain and positive movement.

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

In the drawings, forming a part of the specification in which the same part is designated by the same reference character throughout the several views, and in which my invention is shown on a greatly enlarged scale; Figure 1 is a longitudinal, sectional view of one form of my improved contact device; Fig. 2 is a similar view of the same device showing the position which the contact points assume during the different or changed or reverse movement; Fig. 3 is a transverse sectional view of the lifter and parts mounted thereon the section being taken on the line 3—3 of Fig. 1; and Fig. 4 is a modified form of contact device embodying my invention.

Rotatably mounted in a plate or standard 1 and connected with and rotated from any suitable source of motion, as for example the drive shaft of an internal combustion engine, is a shaft 2, upon which is mounted a cam 3, normally driven in the direction of the arrow 4. Also mounted upon the base or standard 1 is a suitable pivot pin or support 5 about which as a center the lifter 6 is adapted to be oscillated by the cam 4, which is in engagement with the opposite end 6' of said lifter 6. Said lifter 6 is also supported near its outer or free end upon a pin 7 or any other suitable support.

The pivoted end of the lifter 6 is preferably bent to partially inclose or surround the pivot pin 5 to prevent any movement of the

lifter 6 longitudinally in a direction toward the cam 3. The lifter 6 is preferably held down upon and against the pivot pin 5 and the support 7 by a spring 8, one end of which is connected to a stud or pin 9 on the support or plate 1, and the other end of which is attached to any suitable fastening device, as to an eye 10 attached to a plate 11, supported on said lifter 6 but insulated therefrom by a sheet of insulating material 12. Upon the opposite side of the lifter 6, and longitudinally of each side thereof, are arranged suitable insulating plates 13 and 14, above which, and resting upon the same, is a plate 15. This plate 15 is adapted to carry the resilient arm or support 16 for the contact point 17. This resilient arm or support 16 may be secured to the plate 15 in any suitable manner, but I prefer to clamp the end of said arm 16 to said plate 15 by screws 19 passing through a clamping plate 18, and thence through the resilient arm 16 into the plate 15. The plate 11, the insulating plate 12, the upper insulating plates 13 and 14 and the upper plate 15 are firmly secured to the lifter 6 by screws 20, passing through the same as plainly shown in Fig. 3, but said screws 20 should not contact with the lifter 6, and for that purpose I have provided the lifter 6 with enlarged holes 21 through which said screws 20 pass. Upon the top of the lifter 6 I mount the resilient arm or support 22, for the contact point 23, and I similarly clamp one end of said arm 22 to the lifter 6 by means of the clamping plate 24, and the screws 25 passing through said clamping plate 24, and said resilient arm 22 and into the lifter 6. From this construction it will be seen that the resilient arms 16 and 22 normally lie for substantially their whole length upon the plates 15 and the lifter 6 respectively, and consequently they are prevented from freely vibrating in any manner other than that required by the operation of my device, as will be explained below.

I prefer to make the inertia of the free end of the support 22 for the contact point 23 considerably greater than that of the other contact point 17, and for this purpose adjacent the contact point 23, I provide the free end of the arm 22 with a weight 26, which normally rests upon the offset outer end portion 6′ of the lifter 6.

From the above it will be seen that the arm 22 and the weight 26 mounted thereon form a member or support, having a considerable mass or weight, upon which the contact point 23 is mounted or carried.

It will also be apparent from the above description that the resilient arm 16, and the contact point 17 carried thereby, are insulated from the lifter 6, but by reason of the metallic engagement of the arm 16, plate 15, screws 20, and lower plate 11, the said contact point 17 is electrically connected with the lower plate 11 and also with the spring 8.

The stud or pin 9 is electrically insulated from the base plate 1 by an insulating block 9′. I have indicated diagrammatically a battery 27, one pole of which is grounded to the machine by being connected with the base 1 and consequently with the contact point 23, and the other pole of which is connected to the stud or pin 9 and hence through the spring 8, eye 10, and screws 20 with the contact point 17.

The operation of my device is as follows: Motion being communicated to the shaft 2 to rotate the cam 3 in the direction of the arrow 4, the outer or free end of the lifter 6 is first carried upwardly and away from the pin or support 7, the whole structure turning about the pivot pin 5 as an axis. This movement of the lifter 6 also carries with it the contact points 17 and 23, the same being rigidly carried by reason of the engagement of the resilient arms 16 and 22 with the plate 15 and the lifter 6 respectively, and the contact points 17 and 23, during this part of their movement, are thus normally held out of engagement with each other. As the cam 3 rotates further the free end of the lifter 6 drops downwardly as the cut away portion of the cam comes or travels under it. The lifter is then free to be acted upon by the spring 8, and is quickly snapped back against the pin or support 7. It will be observed from this movement that the time of the return of the free end of the lifter, after its release from the high point on the cam and up to its return to the pin or support 7, must be constant or invariable, the movement being effected by the constant force, the tension of the spring 8, absolutely independently of the speed of the shaft 2.

In Fig. 2 I have shown my device in the position which it assumes immediately after its release from the high point on the cam during its downward movement under the influence of the spring 8. This downward movement of the lifter 6 being very rapid, and the resilient contact carrying arm 16 being very light, the contact point 17 follows very rapidly the downward movement of the lifter 6. With the weighted contact point 23, however, there is a lag or retardation at the beginning of the downward movement of the said contact point 23, that is to say, on account of the inertia of the weighted contact point 23, that contact point does not at first move downwardly so rapidly as the contact point 17. The resilient arm or support 22 for the contact point 23 allows this lag or retardation of the movement of the contact point 23 and consequently during the first part of the downward movement the two contact points 17 and 23 are for a moment brought into engagement, in which en-

gagement they remain until the contact point 23 has acquired the same speed as the contact point 17. At this point, however, the resiliency of the arm 22 comes into effect and accelerates the downward movement of the contact point 23, thus suddenly effecting a breaking of the circuit by the movement of the contact points out of engagement with each other. It may here also be noticed that the weight of the contact point 23 may, momentarily, lift the resilient arm 16 away from the plate 15 and thus produce a slight dwell in the engagement of the contact points and consequently a slightly prolonged engagement of the contact points and a correspondingly prolonged closure of the circuit. This is shown plainly in Fig. 2, wherein the resilient arm 16 is slightly forced away from its supporting plate 15. When the said arm 16 is so forced away from its supporting plate 15, the tension of the resilient arm 16 acts against, and supplementary to the tension of, the spring arm 22 and produces a more rapid movement of the arm 22 and the parts carried thereby than would result if the arm 16 were not resilient. The effect of this is that when under the combined tension of the arms 16 and 22, the contact point 23 is about to move out of engagement with the contact point 17, the end of the arm 22 is moving quite rapidly, and the contact points 17 and 23 are separated or moved out of operative engagement with each other very quickly and sharply. Thus a very rapid breaking of the circuit is effected.

I have shown the spring 8 as attached to the lifter 6 through the eye 10 and plate 11 in such a manner as to tend to draw the lifter 6 longitudinally in the direction of the cam 3 so as to hold the lifter 6 firmly against the pivot pin 5 while at the same time the said spring also exerts tension to draw the free end of the lifter 6 down against its supporting pin 7 at the instant it is released from the high point on the cam 3. If desirable, however, I may provide an auxiliary spring 28 having one end attached to the lifter 6 and its other end secured to a pin 29 carried by the base or support 1.

When for any reason the cam is revolved in the reverse direction, it is desirable to have the lifter moved out of the way of the cam 3 without closing the circuit through the contact points 17 and 23. The structure above described is fully capable of such movement because when the flat face 3′ of the cam presses against the end of the lifter 6, the whole structure, that is to say, the lifter 6 and the parts carried thereby, will be forced longitudinally to the right of the position shown in Fig. 1, the said lifter and the parts carried thereby sliding on the pivot pin 5 and the support 7, and when the flat face 3′ of the cam has been moved below the end 6′ of the lifter 6, the whole structure will be quickly drawn back to the position shown in Fig. 1 under the influence of the tension of the spring 8, and if the spring 28 is used, such movement will be assisted by said spring 28. From this it will be apparent that when the cam 3 is rotated in the direction of the arrow 4 the lifter and the parts carried thereby will be oscillated about the pivot 5, but when the cam is driven in the reverse direction the lifter and the parts carried thereby will reciprocate longitudinally on the pins 5 and 7.

In the modification shown in Fig. 4 the same results are attained but the structure is slightly different. In this form the lifter 30 is mounted to oscillate upon the pin 31 when the cam 32 is rotated in the direction of the arrow 33, the said lifter 30 also resting upon the pin 34, down upon which it is held by the spiral spring 35, having one end attached to a hook 36 carried by the lifter 30 and its other end fastened to a pin 37 carried by the base 38. In this case also an auxiliary spring 39 may be employed, said spring having one end attached to the lifter 30 and the other to a pin 40 carried by the base 38. Upon the lifter 30 I mount a suitable block or support 41 carrying a plate 42 against which the resilient arm 43 of the contact point 44 is adapted to be held and pressed by a clamping plate 45, the said plate 45, arm 43, plate 42, and block 41 being rigidly secured to the lifter 30 by suitable screws 46. In this case the other contact point 47 is carried by a resilient arm 48, rigidly secured at one end to a block 49 by screws 50, a sheet or plate of insulation 51 being interposed between the end of said arm 48 and said block 49. The outer end of said resilient arm 48 is provided with a weight 52 rigidly secured to the free end of said arm in any suitable manner, but insulated therefrom by a plate of insulation 53. The tension of said arm 48 is so arranged as to make the weight carried by the free end of said arm normally press firmly against the plate 54, rigidly secured to the lifter 30 immediately beneath said weight. The battery 55 is shown as having one pole grounded to the machine by being connected with the plate 38 and the other pole connected to said resilient arm 48.

When the cam 32 is rotated in the direction of the arrow 33, both contact points are moved upwardly but out of contact with each other, but when the free end of the lifter 30 drops from the highest point of the cam 32 down against its seat or stop pin 34, the weighted contact point 47 will lag, that is to say, it will not start on its downward movement so quickly as the lighter contact point 44, and a closure on the breaking of the circuit will be effected in the same manner as that described in connection with the form of my device illustrated in Figs. 1, 2

and 3. In this modified form a reversal of the movement of the cam will oscillate the lifter 30 and the parts carried thereby on the supporting pins 31 and 34, but without bringing the contact points into engagement with each other.

While I have described two structures in which my invention is embodied, I do not wish to be construed as being limited to the exact forms above shown and described, inasmuch as my invention is capable of being embodied in many forms.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States:—

1. In a contact device, a pair of contact points, means to increase the inertia of one of said points over the other, and a yielding support for that point having the greater inertia, a support for the other of said contact points, and means to oscillate said supports whereby that contact point having the greater inertia lags and brings the points into operative engagement with each other.

2. In a contact device, a pair of contact points, means to increase the inertia of one of said points over the other, a yielding support for that contact point having the greater inertia, a support for the other of said contact points, and means to oscillate said supports substantially simultaneously whereby said point having the greater inertia lags and comes into operative engagement with the other of said contact points during their oscillation in one direction.

3. In a contact device, a pair of contact points, means for moving the same in substantially one direction separated from each other, means to reverse the direction of the movement of said points, and means to retard the reverse movement of one of said points to bring said contact points into operative engagement with each other to close the circuit.

4. In a contact device, a contact point, a support therefor, means to oscillate said support, a second contact point, and means to hold said points out of operative engagement with each other during their movement in one direction and operated by the inertia of said second point to bring said points into operative engagement with each other during their movement in the opposite direction.

5. In a contact device, a pair of contact points, means for simultaneously moving said points in one direction out of operative engagement with each other, means to change the direction of the movements of said points and means to cause one of said points to respond to said means for changing the direction of said points less rapidly than the other to bring said points into operative engagement with each other.

6. In a contact device, a pair of contact points, means for moving the same in one direction out of contact with each other, and means to reverse the movement of said points and means to cause one of said points to respond to said means to reverse the movement of said points less rapidly than the other to effect an engagement of said points.

7. In a contact device, a pair of contact points, means for moving the same in one direction out of engagement with each other, means to reverse the movement of said points, and means to retard the reverse movement of one of said points to cause an engagement of said points and to then separate said points.

8. In a contact device, a pair of contact points, means to simultaneously move both points in substantially one direction and out of engagement with each other, means to suddenly change the direction of movement of said points, and weighted yielding means for supporting one of said points to allow the said point to be acted upon by said reversing means less rapidly than the other point is acted upon by said reversing means.

9. In a contact device, a pair of contact points, a stiff support for one of said points, a support for the other of said points yieldable when moved in the direction of said stiff support and means to oscillate said supports in substantial unison.

10. In a contact device, a pair of contact points, yielding means for supporting said points, means to move both of said contact points simultaneously in substantially one direction and out of contact with each other, means to change the direction of the movement of said points, and means to cause one of said points to move in the changed direction more slowly than the other of said contact points to cause an engagement of said points.

11. In a contact device, a pair of contact points, one of which is heavier than the other, means to move both of said contact points simultaneously in substantially the same direction, out of engagement with each other, means to change the direction of the movement of said points, the inertia of the heavier of said points causing the same to move in the changed direction at first more slowly than the other to cause an engagement of said points, and means to separate said points.

12. In a contact device, a pair of contact points, one of said points being weighted, a yielding support for said weighted point, means to move both of said points in substantially the same direction out of engagement with each other, and means to reverse the direction of the movement of said contact points, whereby said weighted contact

point will be moved in the reversed direction at first more slowly than the other contact point.

13. In a contact device, a pair of contact points, one of said contact points being weighted, means to move both of said contact points in the same direction, and means controlled by the inertia of said weighted contact point to cause said points to momentarily engage and then separate.

14. In a contact device, a pair of contact points, one of said contact points being weighted, a resilient arm for supporting said weighted contact point, means to move both of said contact points in one direction out of engagement with each other, and means to suddenly reverse the movement of said contact points.

15. In a contact device, a pair of contact points, one of said points being weighted, means to move both of said points simultaneously in one direction out of engagement with each other, means to reverse the direction of the movement of said points, and a yielding connection between said reversing means and said weighted point.

16. In a contact device, a pair of contact points and supports therefor, means to move said supports in substantially the same direction and then to release said supports from said moving means, and a spring to return said supports to their original position, the support of one of said contact points being controlled by the inertia of the point mounted thereon to bring said points into engagement during their return movement.

17. In a contact device a lifter, a pair of contact point supports mounted on said lifter, said supports being yielding in one direction, a contact point on each of said supports, means to move said lifter relatively gradually in one direction, and means to suddenly and relatively rapidly reverse the direction of the movement of the said lifter, the mass of the contact point in advance of the other contact point during the reverse movement of the lifter being greater than that of the said other contact point whereby the inertia of the contact point of greater mass operates to bring said contact points into engagement during such reverse movement of the lifter.

18. In a contact device, a lifter, a pair of contact point supports mounted on said lifter, said supports being yieldable in the same direction, a contact point on each of said supports, means to move said lifter relatively slowly in one direction, and means to suddenly and relatively rapidly reverse the direction of the movement of said lifter, the weight of the contact point in advance of the other contact point during the reverse movement of the lifter being greater than that of said other contact point whereby the inertia of said heavier contact point causes its support to yield in the direction of the other contact point, and to effect an operative engagement of said contact points.

19. In a contact device, a contact point, means to oscillate said point, a second contact point, a connection between said second contact point and said means to vibrate said first contact point and yieldably in a direction toward said first contact point, the inertia of said second contact point being greater than that of the other contact point.

20. In a contact device, a contact point, a support therefor, means to oscillate said support, a second contact point, and means operated by the inertia of said second contact point to bring said contact points into operative engagement with each other during the movement of said first contact point in one direction of its oscillation.

In witness whereof I have hereunto set my hand this second day of December, 1908.

ARTHUR ATWATER KENT.

Witnesses:
JOHN B. RUTHERFORD,
ALSTON B. MOULTON.