J. A. WILLIAMS.

CIRCUIT BREAKER FOR IGNITION SYSTEMS.

APPLICATION FILED FEB. 19, 1916.

1,231,681.

Patented July 3, 1917.

Fig. 1.

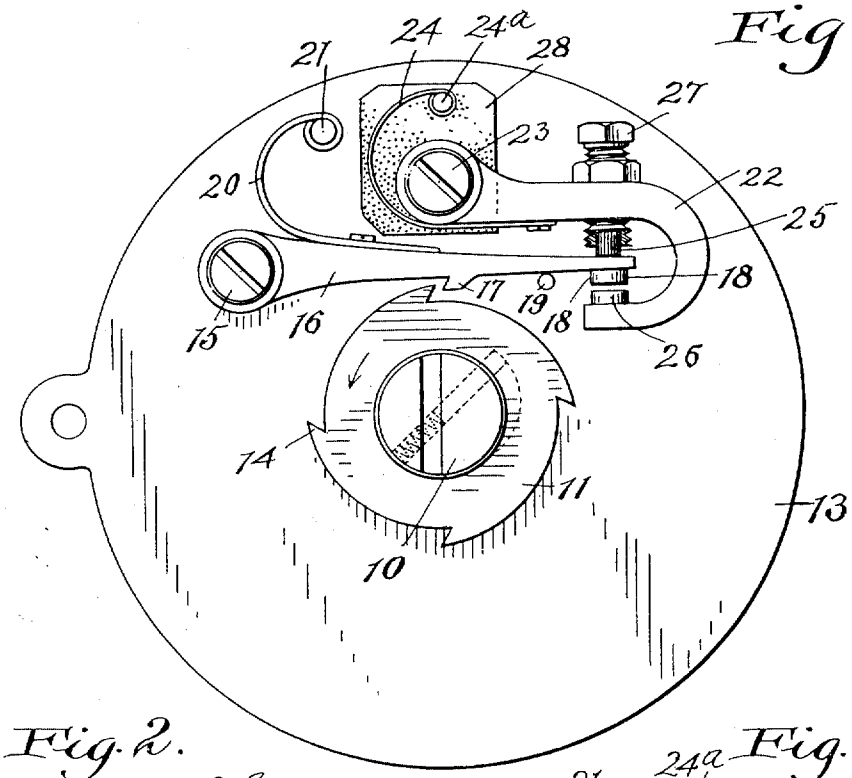


Fig. 2.

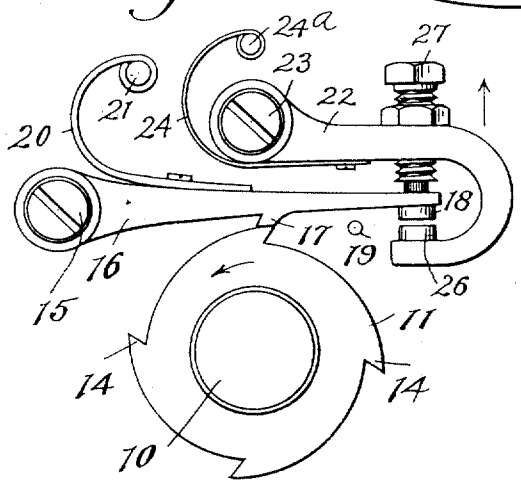
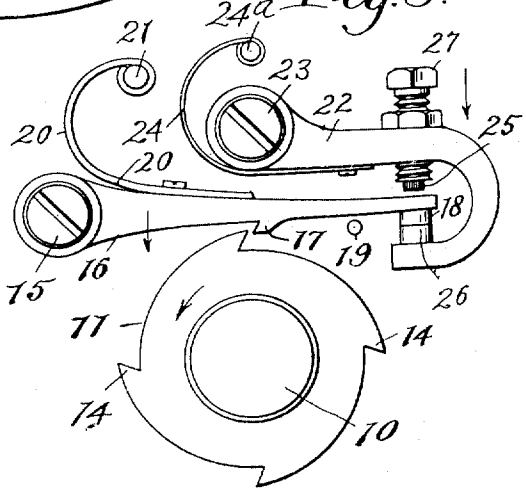


Fig. 3.



Inventor

Joseph A. Williams

by Thurston & Kwis

Attys

UNITED STATES PATENT OFFICE.

JOSEPH A. WILLIAMS, OF CLEVELAND, OHIO, ASSIGNOR TO THE K-W IGNITION COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

CIRCUIT-BREAKER FOR IGNITION SYSTEMS.

1,231,681. Specification of Letters Patent. Patented July 3, 1917.

Application filed February 19, 1916. Serial No. 79,259.

To all whom it may concern:

Be it known that I, JOSEPH A. WILLIAMS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Circuit-Breakers for Ignition Systems, of which the following is a full, clear, and exact description.

This invention relates to circuit breakers or timers for ignition systems adapted to be employed in connection with internal combustion engines, and has for its chief object to provide a circuit breaker which is adapted particularly for use with so-called battery ignition systems wherein a battery is used alone or in conjunction with a generator for supplying igniting current.

More specifically considered, the invention aims to provide a circuit breaker wherein the contacts by which the primary circuit is made and broken will be in contact substantially the same period of time for all speeds of operation. A still further object is to provide a circuit breaker construction such that the contacts cannot be left in engagement when the engine comes to rest.

The invention may be briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheet of drawings, Figure 1 is a face view of the main parts of the circuit breaker embodying my invention with the contacts separated and the circuit open; Fig. 2 is a similar view of the cam and the contact members with the contacts still separated and about to engage to close the circuit; and Fig. 3 is a similar view with the contacts in engagement.

In the accompanying sheet of drawings 10 represents the operating shaft which drives a cam 11 which is in the form here shown and is designed for a four-cylinder engine. This shaft may be journaled on a suitable plate 13 which supports the contacts and the springs and levers employed in conjunction therewith. The distributer shaft may be coupled to the end of shaft 10, in which event the circuit breaker and distributer,—the latter not being shown,—may be combined into one unit. In that case the plate 13 will constitute a part of the casing or may be inclosed in the casing independently thereof. It will be observed that the cam 11 is provided with perpheral cam portions 14 similar to ratchet teeth, the ends of which may be, and preferably are, undercut, as shown. It will be observed also that from the base of one tooth to the point of the adjacent tooth the surface or periphery of the member 11 extends with a spiral or cam taper, forming four distinct cams or cam portions. Of course, the number of such cam portions will depend on the number of cylinders of the engine with which the device is used.

Pivoted to the plate 13 by means of a screw or equivalent pivoting device 15 is a contact lever 16 provided with a lug 17 which is adapted to be engaged by the teeth or cam projections at the periphery of the cam 11. This lever carries at its free end a contact or contact point 18 and is normally pressed toward or against a suitable stop pin or lug 19 by means of a relatively stiff spring 20, here shown as a leaf spring, one end of which is attached to the lever 16 and the other of which is attached to a pin 21 on the plate 13. Coöperating with this lever is a second lever 22 which is pivoted on a screw 23 and is likewise urged or pressed downwardly or in the same direction that the lever 16 is pressed, by a spring 24 which is relatively weak, that is to say, is weaker than the spring 20. This lever 22 is provided with a U-shaped bend forming two substantially parallel portions, the upper portion being provided with an insulated abutment 25 and the lower portion with the second circuit breaker contact 26. Between the abutment and contact 26 is located the free end of the lever 16, the contact 18 carried thereby being directly opposite and in position to engage the contact 26. The abutment 25 is preferably adjustable and in this case is mounted in an adjustable screw 27 carried by the lever 22. By means of this adjustable screw the distance between the abutment and contact 26 can be adjusted at will.

It will be understood that the two contacts 18 and 26 are in the primary circuit of the ignition system, and hence that the two levers 16 and 22 will be suitably insulated from each other, the electrical connections being made at any suitable point with the two levers. Preferably, lever 22 is pivotally supported on a small block 28 of

insulating material, which in turn is secured to the plate 13. Electrical connection may be made with the pin 24ª to which the end of spring 24 is attached, whereas lever 16 need not be insulated from plate 13 but is preferably grounded on the plate 13 and the electrical path or circuit completed in that manner through the grounded side of the primary circuit.

In the operation of this device, as the cam 11 is rotated in the direction indicated by the arrow, each individual cam or spiral portion of the rotating cam 11 elevates the lever 16, and by reason of the fact that the end of the lever engages the abutment 25 it moves upwardly also the lever 22, thus compressing or putting more tension in both springs 20 and 24. As soon, however, as the tooth or point of the spiral cam projection passes the lug 17 the lever 16 is immediately moved downwardly under the influence of the relatively stiff spring 20 and nearly, but not quite at the same time, lever 22 is moved downwardly under the influence of the relatively weak spring 24. Due, however, to the fact that the springs are of unequal strength, and due also to the fact that the lever 22 has a greater mass and hence inertia, the lever 22 is more sluggish so to speak, or moves considerably less rapidly than the lever 16, with the result that the contact 18 overtakes the contact 26 engaging the same or making contact which completes or closes the primary circuit. The position of the parts when this takes place is shown in Fig. 3. The contacts remain in engagement for a predetermined interval or until the lever 16 engages the stop 19, whereupon the movement of the lever 16 is arrested but the lever 22 continues to move downwardly until the abutment 25 engages the lever 16 thus breaking the circuit or separating the contacts 18 and 26. The position of the parts when this takes place is shown in Fig. 1.

This cycle of operations is repeated with each individual cam or cam-shaped portion on the periphery of the rotating cam member 11, both elements 16 and 22 being moved upwardly with the contacts separated until the point of the cam passes the lug 17, whereupon both levers are moved in the reverse direction but the lever 16 moving more rapidly than the lever 22 with the result that the contacts remain in engagement for a predetermined interval of time and are then separated. This action is not affected by the speed of operation, but the length of time or period that the contacts are in engagement remains the same for all speeds. This is a feature of great importance in so-called battery ignition systems where the voltage of the primary source of current is not affected by the speed of operation.

It will be observed, furthermore, that the engine cannot stop leaving the contacts in engagement, for as long as the lug 17 is in engagement with the cam or any part of the cam member 11, the contacts are separated, and are not engaged until the point of each individual cam passes the lug 17, whereupon the contacts are in engagement only for a brief predetermined interval and are then separated when the lever 16 engages the stop 19. This feature is also of considerable importance in battery ignition systems, for the reason that it avoids the liability of the primary circuit remaining closed when the engine is at rest and thus eliminates danger of the battery discharging through a closed primary circuit.

The cam 11 may be driven from the shaft 10 through a so-called ratchet clutch which is indicated in Fig. 1, so that in the event that the engine crank shaft is rotated in the reverse direction the cam 11 will not be rotated and no injury can be caused by the engagement of the sharp or abrupt points of the cam with the lug 17.

It will be understood that when the contacts of the circuit breaker are in engagement a circuit is completed through the battery (or generator, as the case may be) and primary of a suitable induction coil, the secondary of which will be connected to the movable member of a distributer, and that when the contacts are separated the primary circuit is interrupted with the result that current is induced in the secondary circuit in the usual and well known manner.

Having thus described my invention, what I claim is:—

1. In a circuit breaker, a cam, a pair of contact members arranged to be moved by the cam in one direction, one of said contact members having a limited range of movement relative to the other and the latter having two opposite abutments to limit said relative movement, said member having the limited range of relative movement acting more quickly than the other member when said members are released by the cam, whereby the circuit will be closed momentarily by one contact member overtaking the other.

2. In a circuit breaker, a cam, a pair of contact members arranged to be moved by the cam in one direction, one of said contact members having a limited range of movement relative to the other and the latter having two opposite abutments to limit said relative movement, and means whereby the member having the limited range of relative movement acts more quickly than the other member when said members are released by the cam, whereby the circuit will be closed momentarily by one contact member overtaking the other.

3. In a circuit breaker, a cam, a pair of contacting members which are simultaneously moved by the cam in one direction with the circuit open, one of said contacting

members being directly engaged by the cam during said simultaneous movement, said member moving more quickly than the other member when released by the cam, and said other member having two opposing abutments between which said first member may move relative to the second to a limited extent whereby when the cam releases said contact members the more quickly moving member overtakes the other member and temporarily closes the circuit.

4. In a circuit breaker, a cam, a pair of contacting members which are simultaneously moved by the cam in one direction with the circuit open, one of said contacting members being directly engaged by the cam during said simultaneous movement, said member moving more quickly than the other member when released by the cam, and said other member having two opposing abutments between which said first member may move relative to the second to a limited extent whereby when the cam releases said contact members the more quickly moving member overtakes the other member and temporarily closes the circuit, and means for causing the opening of the circuit after the closure thereof.

In testimony whereof, I hereunto affix my signature in the presence of a witness.

JOSEPH A. WILLIAMS.

Witness:
E. B. GILCHRIST.

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