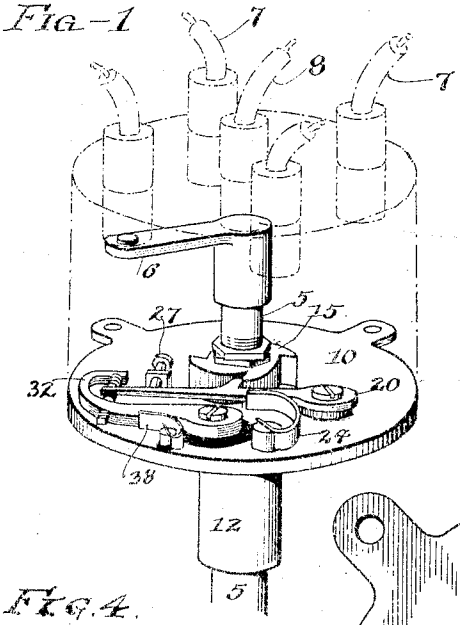
W. D. APPEL.

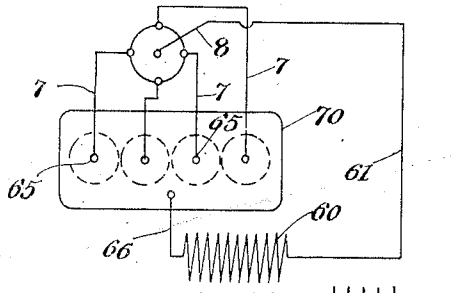
CIRCUIT MAKE AND BREAK DEVICE.

APPLICATION FILED FEB. 11, 1916.

1,255,846. Patented Feb. 12, 1918.

FIG-1





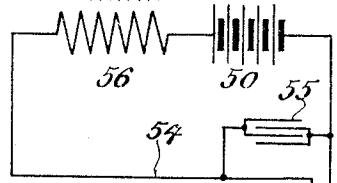
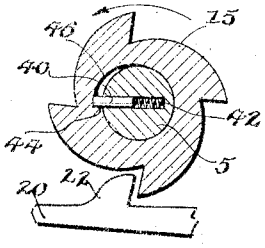


FIG. 4.



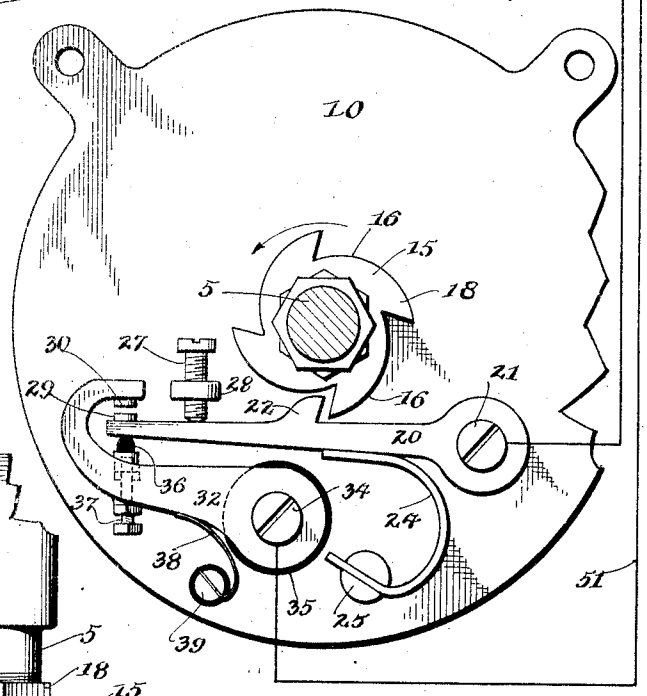


FIG-2.

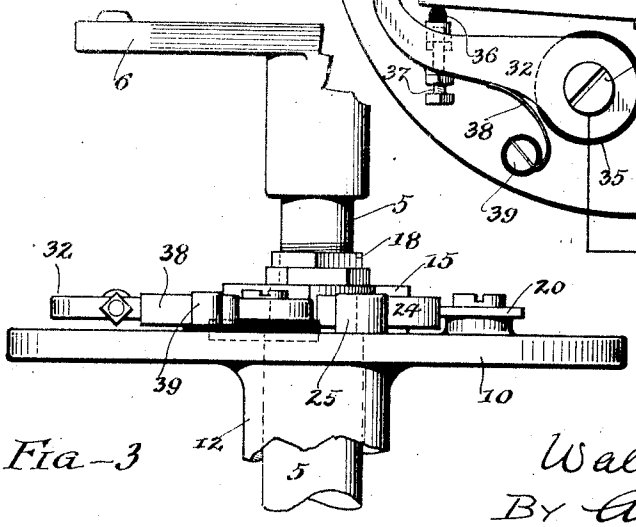


FIG-3

INVENTOR

Walter D. Appel,

BY Albert H. Baker,

ATTY

UNITED STATES PATENT OFFICE.

WALTER D. APPEL, OF CLEVELAND HEIGHTS VILLAGE, OHIO, ASSIGNOR TO ARTHUR A. KENT, OF ROSEMONT, PENNSYLVANIA.

CIRCUIT-MAKE-AND-BREAK DEVICE.

1,255,846. Specification of Letters Patent. Patented Feb. 12, 1918.

Application filed February 11, 1916. Serial No. 77,737.

To all whom it may concern:

Be is known that I. WALTER D. APPEL, a citizen of the United States, residing at Cleveland Heights Village, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Circuit-Make-and-Break Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide a simple and effective make-and-break device adapted to be used in connection with the electric ignition circuits of internal combustion engines. My device is adapted to momentarily close the circuit and immediately open it, and this operation may be repeated in rapid succession in coöperation with the usual distributers employed with engines having a plurality of cylinders.

More specific objects are to so arrange my make-and-break device that the contacts closing the circuit are normally apart and are always instantly separated after each contact, regardless of the position of the actuating parts, whereby the circuit cannot be left closed and thus waste the battery. Another object is to so construct the device that it may be very uniform and positive in operation throughout a very wide range of speeds, and will not lag at high speed. Still another object is the provision of means for preventing injury to the device consequent upon the reverse movement of the actuating means, such for example, as may occur from back firing of the engine. Features of my invention are, that it is durable, may be cheaply manufactured and readily applied to existing engines of various types.

My invention is hereinafter more fully described in connection with the accompanying drawings, and the essential characteristics are set forth in the claims.

Figure 1 is a perspective view of my device, showing the same associated with distributer mechanism which is indicated in dot and dash lines; Fig. 2 is a sectional plan of the parts shown in Fig. 1 below the distributer with an accompanying wiring diagram illustrating circuits which my make-and-break device controls; Fig. 3 is a side elevation of the same; and Fig. 4 is a sectional detail showing the means for preventing injury to the device, due to back firing of the engine.

My device is conveniently associated with the mechanism for actuating the distributer directing current to the cylinders. In the particular embodiment shown, 5 indicates a vertical shaft carrying a laterally extending contact arm 6 adapted to coöperate with contacts at the ends of the wires 7, leading to respective cylinders. The wire 8 is shown as a common return, leading current to the contact arm 6. Beneath the distributer is shown a disk-like plate 10, through which the shaft 5 rotatably extends, and which is shown as having a downwardly extending boss 12, which may form a suitable bearing for the shaft 5. Above the disk 10 is mounted a cam disk 15 having a plurality of ratchet-shaped teeth, separated by outwardly extending cam surfaces 16. This disk is rotatable with the shaft 5 and is held in position by any suitable means, as for example, lock nuts 18. This disk is adapted to be driven in the direction of the arrow in Fig. 2, and preferably has the same number of actuating teeth as there are points in the distributer or spark plugs in the motor.

In the same plane with the disk 15 and extending past one side thereof, is a contact lever arm 20, suitably pivoted at 21 to a boss rising from the plate 10. This arm is provided with a laterally projecting lug 22, adapted to coöperate with the cam disk 15 whereby the rotation of this disk may press the lug and lever away from the same until the high portion of each cam is reached, whereupon the lever is returned toward the disk by a leaf-spring member 24, shown as having one end rigidly carried in an upward projection 25 mounted on the plate 10 and having its free end bearing against the lever 20. An adjustable stop is provided to limit the return movement of the lever. This stop is shown as comprising a screw 27, extending through a lug 28, ris-

ing from the plate 10. At the free end of the lever 20 is carried a suitable contact point 29 adapted to coöperate with a contact point 30 carried on an inwardly curved arm of a coöperating lever 32.

The lever 32 is shown as pivoted at 34 to the plate 10, the pivot member extending into a suitable insulating washer 35 adapted to prevent current passing from the lever 32 to the disk 10. The lever 32 carries an abutment 36 of suitable insulating material adapted to engage the rear side of the lever 20, preferably opposite the contact, and so positioning the lever 32 with relation to the lever 20 that the contact points proper are normally separated, as shown. The lever 32 is pressed toward the lever 20 by a leaf spring 38 carried in a projection 39, mounted on the plate 10 and insulated therefrom, the spring itself being slightly above the disk, prevents current passing from the lever through the spring to the disk.

It will be noted that the lever 20 is shown as much thinner and lighter in weight than the lever 32 and the spring 24 actuating the lever 20 is materially heavier and stronger than the spring 38. Thus, when the shaft 5 is rotated, rotating the disk 15, the projection 22 rides outwardly from the shaft on the cam surfaces, compressing the spring 24, which instantly returns the lever against the stop 22 when the projection 22 rides off from the high point of the cam. When the lever 20 moves outwardly it moves the lever 32 outwardly correspondingly, through the abutment 36, and immediately upon the release of the lever 20, the spring 38 moves the lever 32 toward the position shown in Fig. 2. This movement, however, is comparatively slower than the movement of the lever 20, thus the lever 32 overtakes the lever 20, bringing the contacts 29 and 30 together for an instant until the lever 22 is stopped in its innermost position (by engaging the screw 27) whereupon the farther movement of the lever 32 immediately separates the contact points.

I have found in practice that this operation takes place almost instantaneously and while the contacts are tightly pressed together long enough to accomplish the desired result, the circuit is broken before the next successive cam engages the projection 22.

It will be seen that regardless of where on the cam surface the projection 22 may rest, that is regardless of the position the actuating parts may be in when stopped, the spring 38 will press the abutment 36 against the lever 20, separating the contact points and preventing the wasting of the battery.

The abutment 36 is preferably adjustable toward and away from the lever 32 by means of a screw 37 whereby the normal distance between the contacts and the relative time of contacting may be changed for purposes of adjustment to conditions. In order to avoid injury to the parts of my make-and-break device, resulting from a reverse movement of the shaft 5 which may frequently occur, due to a back firing of the engine, I provide a ratchet mechanism for driving the disk 15. This mechanism is shown particularly in Fig. 4. A pin 40 is mounted in the shaft 5 and is pressed radially outwardly, by a spring 42, into engagement with a shoulder 44, formed in the disk 15. Upon a reverse movement of the shaft 5, the pin is pressed inwardly by a cam surface 46, (the disk being held against rotation in the reverse direction by engagement with the projection 22) permitting a comparatively free rotation of the shaft with relation to the disk. When the shaft again resumes the forward movement, the disk is held against rotation by engagement with the projection 22 until the pin 40 again engages its coöperating shoulder, again driving the cam disk in the normal direction.

In Fig. 2 is indicated a wiring diagram illustrating a convenient manner of arranging circuits for ignition purposes in an internal combustion engine. As shown, the levers 20 and 32 with their contacts 29 and 30 are the make-and-break members in a primary circuit, comprising a battery 50, a wire 51 leading to the lever 32, the contacts and lever 20, wire 54 and a primary coil 56 connected with the battery. 55 indicates a suitable condenser arranged in the primary circuit in parallel with the battery. Current through this primary circuit, including the primary winding 56, induces a current through a secondary winding indicated at 60, connected with the distributer and cylinders of the engine in the following manner; a wire 61, leads from the coil to the common wire 8 of the distributer from which current may pass through a suitable connection, such as the arm 6 heretofore described, to any of the wires 7 leading to the usual spark plug 65, mounted in an engine indicated at 70. From the spark plugs the current may pass through the engine frame to a wire 66 leading to the other terminal of the winding 60. Thus, by synchronizing the closing of the circuit at the contacts 29 and 30 in the primary circuit with the closing of the circuit through the successive spark plugs in the secondary circuits, the desired coöperation between the usual distributer and my make-and-break device may be obtained.

From the foregoing description it will be seen that by the use of the relatively light lever actuated by the heavy spring to overtake a comparatively heavy lever actuated by a light spring, thereby making a contact,

after which the light spring separates the contact, I provide for substantially instantaneous and positive operation for each actuation of the make-and-break mechanism. Thus it is immaterial whether the disk 18 is rotating rapidly or slowly as the contact is made practically instantly after the projection 22 passes off of the shoulder at the high part of the cam and the relative time of this contact with relation to the rotation of the actuating shaft and other parts is uniform.

Having thus described my invention, what I claim is:

1. In a device of the character described, the combination of a pair of contacts, a movable member carrying each of said contacts, one of said members being materially lighter than the other, a comparatively heavy yielding means acting on the light member, a comparatively light yielding means acting on the heavy member, an abutment against which the yielding means presses one of said members, an abutment between said members so arranged as to hold the contacts separated, and means for moving said members out of their normal position and permitting a sudden return, whereby the lighter member with its heavier yielding means may return more quickly than the heavier member with its lighter yielding means, thereby bringing the contacts together on the return movement.

2. The combination of a pair of movable members carrying contacts adapted to coact but normally out of contact, an operating device adapted to act on one of the members and thereby move them both while the contacts remain apart and then release said members, and springs of different power acting on the two members and causing one to overtake the other on the return movement, there being means for retarding such return movement of the overtaking member.

3. In a device of the character described, the combination of a pair of movable members having contacts normally separated but adapted to coact, an operating device adapted to move said members while maintaining their contacts separated and to release the members allowing them to return to normal position, and means for causing one of said members to overtake the other on the return movement and make a temporary contact therewith, said means including the characteristic of the overtaking member being heavier than the member overtaken and springs of different power acting thereon.

4. In a device of the character described, the combination of a pivoted lever constituting an electric terminal, means for periodically moving said lever away from normal position, a spring tending to return it to normal position, a second pivoted lever constituting another terminal and extending onto both sides of the lever first mentioned, said second lever, carrying a contact point coöperating with the lever first mentioned, a spring acting on the second lever and tending to separate its contact from the contact of the first lever, and an insulated distance member between said levers.

5. In a device of the character described, the combination of a rotary wiper cam, a pivoted lever adapted to be engaged by said cam and periodically swung away from the center of rotation, a spring pressing said lever toward the cam, a second lever having a hooked portion extending onto opposite sides of the lever first mentioned, contact points carried by the first lever and the hooked portion of the second lever, an insulated distance piece between the two levers, the second lever being heavier than the first lever.

6. In a device of the character described, the combination of a rotary wiper cam, a pivoted lever adapted to be engaged by said cam and periodically swung away from the center of rotation, a spring pressing said lever toward the cam, a second lever having a hooked portion extending onto opposite sides of the lever first mentioned, contact points carried by the first lever and the hooked portion of the second lever, an insulated distance piece between the two levers, and a spring acting on the second lever which is lighter than the spring acting on the first lever.

7. In a device of the character described, the combination of a pivoted lever carrying a contact point, a second pivoted lever extending onto opposite sides of the lever first mentioned, a coöperating contact point carried by said second lever, an adjustable insulated abutment stop carried by the second lever on the other side of the first mentioned lever from its contact point, springs acting on the two levers, and a means for periodically swinging the first lever.

8. In a device of the character described, the combination of a rotary wiper cam, a pivoted lever adapted to be engaged by the cam between its pivot and its free end, a comparatively heavy spring pressing said lever toward the cam, an adjustable abutment stop for the lever when pressed toward the cam, a second lever pivoted independently of the first lever and hooked around the end of the first lever, a comparatively light spring pressing said second lever toward the first lever, and an adjustably positioned insulated distance piece between said levers.

9. In a device of the character described, the combination of a rotary wiper cam, a pivoted lever adapted to be engaged by said cam between its pivot and free end, said

lever being comparatively light, a comparatively heavy spring pressing said lever toward the cam, a second lever which is comparatively heavy and which extends onto opposite sides of the lever first mentioned adjacent to its free end, contact points carried by the heavy lever and the lever first mentioned on the side of the first lever adjacent to the cam, an adjustable insulated distance piece carried by the heavy lever and adapted to be abutted by the first lever on its side away from the cam, and a comparatively light spring pressing said heavy lever toward the cam.

In testimony whereof, I hereunto affix my signature.

WALTER D. APPEL.