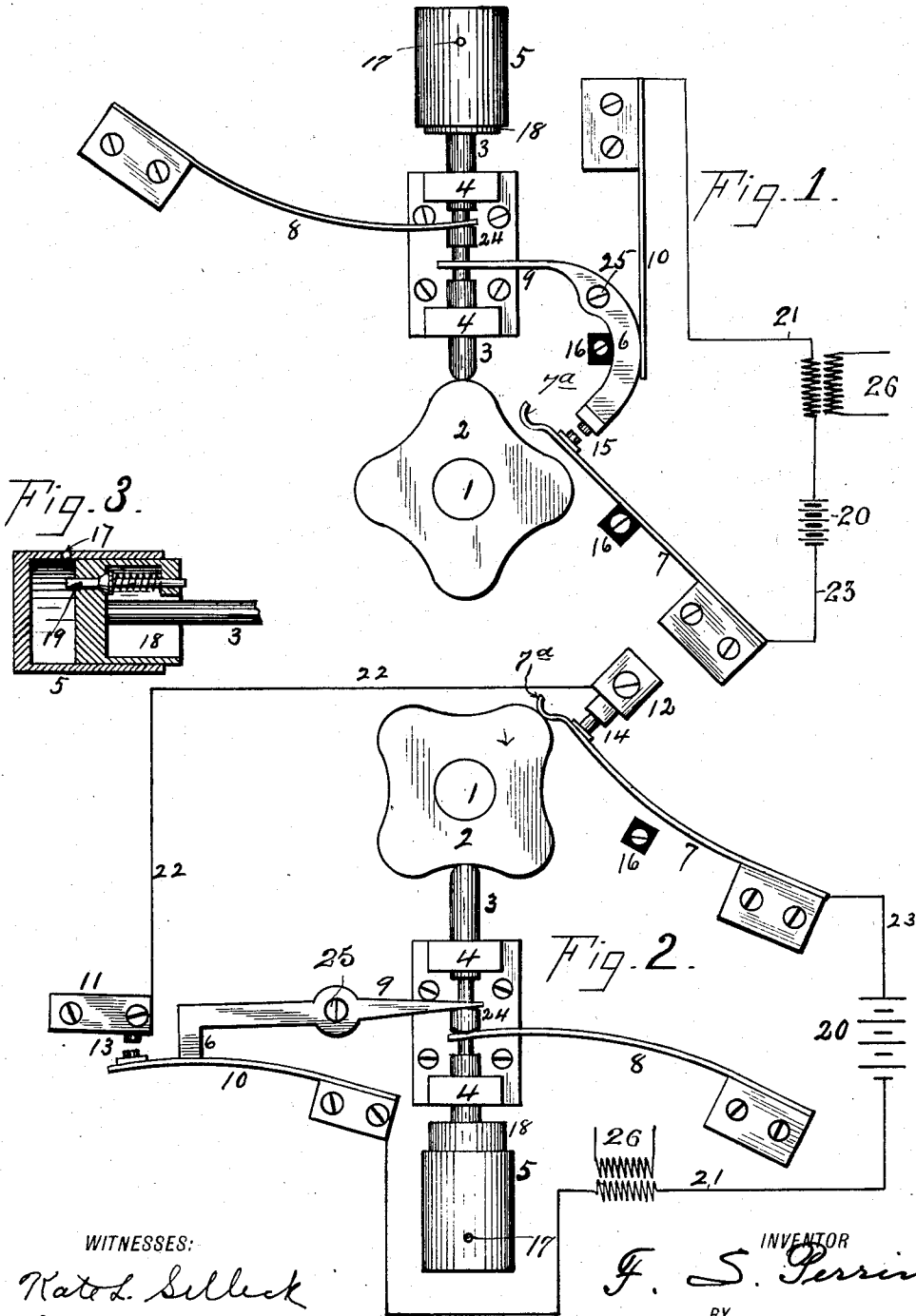


F. S. PERRIN.  
ELECTRIC CIRCUIT BREAKING DEVICE.  
APPLICATION FILED APR. 18, 1916.

1,213,799.

Patented Jan. 23, 1917.



WITNESSES:

Kate L. Sillick  
Fanny S. Perrin

INVENTOR

F. S. Perrin

BY

D. F. Brown  
ATTORNEY

# UNITED STATES PATENT OFFICE.

FREDERIC S. PERRIN, OF BROOKLYN, NEW YORK, ASSIGNOR TO SPLITDORF ELECTRICAL CO., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## ELECTRIC-CIRCUIT-BREAKING DEVICE.

1,213,799.

Specification of Letters Patent.

Patented Jan. 23, 1917.

Application filed April 18, 1916. Serial No. 91,861.

*To all whom it may concern:*

Be it known that I, FREDERIC S. PERRIN, a citizen of the United States, and resident of New York city, borough of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric - Circuit - Breaking Devices, of which the following is a specification.

My invention relates to improvements in electric circuit breaking devices, whereby the circuit may be broken automatically.

An object of my invention is to provide simple and efficient mechanically operating means to cause automatic breaking of the circuit when it happens to be closed for a longer time than necessary for the purpose intended, whereby to stop the useless consumption of the electric current.

A further object of my invention is to provide mechanically operating means to break the circuit when the devices are not operating, which means are controlled by a movable member and are adapted to permit closing of said circuit when said member operates, which member is also adapted to control said circuit for makes and breaks therein as required for the use of the circuit, whereby, when said member ceases to operate, said circuit will be automatically broken in any position of said member.

My invention is applicable for use in ignition systems of internal combustion engines using primary or storage batteries to prevent waste of such batteries when the engine is at rest.

In the present state of the art, many internal combustion engines are equipped with a timer and distributor to time the break of the primary electric circuit for the production of a secondary current of high tension for distribution to the cylinders. Such timer and distributor is operated by, and synchronized with, the engine, in a manner to distribute the high tension current to the different cylinders at the proper time during rotation of the engine shaft, but it may often happen that, when such engine stops operating, the primary circuit of the ignition system may be closed and then the primary electric current will continue to flow and be uselessly consumed, in case the circuit controlling switch may have been left closed by the operator. By utilization of my improvements in such an ignition system,

the primary electric circuit will be automatically broken when the engine stops operating, regardless of the position of its shaft or shafts, and irrespective of whether the controlling switch has been left closed or not by the operator. My improvements are so organized that as soon as the engine is again started my improved devices will be operated to permit proper operation of making and breaking the circuit as required for its intended operation.

While I have above referred to my improvements as adapted for use in ignition systems of internal combustion engines having primary and secondary circuits, it will be understood that my improvements may be utilized in any other circuits utilizing electric batteries, such as in ignition systems commonly known as "make-and-break" systems, as distinguished from "jump-spark" systems, wherein the discharge of the current in the primary or battery circuit is utilized upon a break in the circuit.

My invention comprises novel details of improvement and combinations of parts that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1 is a view illustrating my improvements as adapted for use with a single make-and-break contact in the circuit; Fig. 2 is a similar view illustrating my improvements as adapted for use with a plurality of make-and-break contacts in the circuit, and Fig. 3 is a sectional detail view hereinafter referred to.

Similar numerals of reference indicate corresponding parts in the several views.

The numeral 1 indicates a shaft that is adapted to be operated in any suitable manner, and may be a part of any machine to which my improvements may be applied, such as an internal combustion engine. At 2 is a member adapted to be rotated by shaft 1, to which shaft said member may be suitably secured. Member 2 may be in the form of a cam, which in the accompanying drawing is indicated as having four high points and four low points. At 6 is a movable element, such as an arm or lever shown pivotally supported at 25 and normally pressed by a spring 10 tending to close a circuit. In Fig. 1 the members of contact 15 are respectively carried by arm 6 and by a breaker

arm or spring 7, said arm and spring being normally held against insulating stops 16 with the circuit normally broken. A conductor 23 connects breaker arm or spring 7 with one terminal of a battery 20 and from the other terminal of said battery conductor 21 leads to spring 10. Any suitable translating devices indicated at 26, such as an induction coil or transformer, may be included in the circuit of the battery. The member 2 is adapted, when rotated, to close and open the circuit at 15 by operating breaker arm or spring 7, the bent end portion 7<sup>a</sup> of which spring is adapted to be engaged by the high portions of member 2. When arm 6 is held against a stop 16 the circuit may be made and broken at contact 15 by the rotation of member 2, and my improvements are designed to retain the circuit broken when member 2 is not rotating, regardless of the position of such member with respect to spring 7. Arm 6 is adapted to be operated by a rod 3 shown guided in bearings 4 and provided with a shoulder 24 adapted to engage the end portion 9 of said arm, in case a low portion of member 2 comes to rest opposite said rod for the purpose of separating the members of contact 15 (by moving arm 6 on its pivot) that member 2 cannot cause closing of the circuit at 15 in case a high part of member 2 comes to rest in engagement with spring 7. Rod 3 is adapted to be moved outwardly by member 2 and my improvements comprise means to temporarily retard the return stroke of rod 3 while member 2 is rotating and to permit the sudden return of said rod toward member 2 in case the latter stops with a low part thereof opposite said rod, whereupon arm 6 will be quickly operated to break or retain broken the circuit at 15. Rod 3 is shown connected with a piston 18 slidable in a cylinder 5, (Fig. 3) said parts acting in the nature of a dash pot. A valve 19, preferably normally spring pressed to its seat, and shown carried by piston 18, is adapted to relieve compression in cylinder 5, when the piston is moved inwardly therein. At 17 the cylinder 5 is shown provided with an inlet opening located in such relation to the movement of piston 18 within said cylinder as to be covered or closed by said piston when the latter is in certain positions within cylinder 5, and to be opened or uncovered by said piston when the latter is in certain other positions within said cylinder to relieve the partial vacuum therein. A spring 8 coacts with rod 3, being shown bearing against a shoulder thereon, the tendency of said spring being to normally press rod 3 toward member 2 and to cause piston 18 to be moved outwardly within cylinder 5 to uncover inlet 17. The relation of member 2 to piston 18 is such that when rod 3 enters a low part of said member piston 18 will move

outwardly sufficiently to uncover inlet 17, and when a high part of member 2 presses said rod 3 outwardly the piston 18 will be moved within cylinder 5 to close inlet 17, and air in the inner portion of the cylinder will then escape through valve 19, whereby when piston 17 tends to move outwardly a partial vacuum will be produced within the cylinder tending to retard the outward movement of piston 18 and rod 3. The parts 3, 5, 18 and 8 thus constitute a controller for a contact of the circuit for breaking the latter.

The operation of the parts so far set forth may be described as follows: If member 2 comes to rest with a high part thereof against rod 3, the latter and piston 18 will be held in outward position with respect to cylinder 5, and at such time the circuit will be broken at contact 15, since member 2 will not then press breaker arm or spring 7 to close the circuit, and element 6 will be against a stop 16. If, however, member 2 should come to rest with a high part in engagement with spring 7, said spring would thereby be moved to cause closing of contact at 15, but spring 8 then would have moved rod 3 toward the low part of member 2, whereby shoulder 24 would be caused to engage the end portion 9 of element or arm 6, and thereby tilt said arm to carry its contact member away from the contact member of spring 7 so that the circuit would remain broken at contact 15. During rotation of member 2 its high parts will engage rod 3 successively, thereby tending to cause said rod to move outwardly, and the counteracting effect of spring 8 upon said rod is retarded or resisted by reason of the partial vacuum maintained in cylinder 5 with respect to piston 18, since at such time said piston will keep inlet 17 closed, and the movement of the high parts of member 2 in engagement with rod 3 will be sufficiently rapid to prevent piston 18 from moving far enough to uncover inlet 17, and thereby shoulder 24 will be maintained out of coaction with arm 6 and the latter will remain held against the adjacent stop 16, so that circuit can be made and broken at 15 during rotation of member 2. As soon as member 2 comes to rest with a low part thereof opposite rod 3, then spring 8 will gradually move piston 18 toward member 2, overcoming the partial vacuum within the cylinder, until said piston opens inlet 17, whereupon the partial vacuum will be broken and spring 8 will cause rod 3 to move suddenly or quickly and its shoulder 24 will engage the portion 9 of arm 6 to quickly break the circuit at 15 by rocking arm 6 against spring 10.

While in Fig. 1 I have illustrated a single make-and-break contact 15 in the circuit adapted to be operated by member 2, I have illustrated in Fig. 2 a substantially

similar circuit and circuit controlling devices, except that such circuit is provided with a plurality of make-and-break contacts controlled by member 2. In said Fig. 2 one member of contact 14 is shown carried by spring 7 that is adapted to rest against a stop 16 when the circuit is broken, the other member of said contact being carried by support 12, from which conductor 22 leads to a support 11 of a member of contact 13, the other member of which contact is connected with a movable element, such as spring 10, to which conductor 21 leads from battery 20, conductor 23 leading from said battery to spring 7 substantially as illustrated in Fig. 1. Member 2, by engaging spring 7, is adapted to make and break the circuit at contact 14. Movable element or arm 6 is shown adapted to operate spring 10 for the purpose of making and breaking the circuit at contact 13, a member of said contact being shown carried by spring 10 instead of by element or arm 6 as in Fig. 1. The rod 3 having shoulder 24 to coact with portion 9 of arm 6, the piston 18 and cylinder 5 are substantially the same as described with relation to Fig. 1, spring 8 tending to move rod 3 toward member 2 as before explained. When member 2 starts to rotate, a high part of said member will push rod 3, thereby moving the piston into cylinder 5 to cause closing of inlet 17, and thereupon shoulder 24 will relieve arm 6 and spring 10 will tilt said arm and cause closing of the circuit at 13, and the circuit will remain closed thereat so long as member 2 rotates, because the high parts of member 2 will tend to keep rod 3 and piston 18 pushed outwardly and the partial vacuum in cylinder 5 will tend to retard the reverse movement of said rod and piston to prevent arm 6 from causing spring 10 to break circuit at 13. During such rotation of member 2 circuit will be made and broken by the operation of spring 7 by said member. If member 2 comes to rest with a high part engaging spring 7 to cause closing of the circuit at 14, then a low part of the cam will be opposed to rod 3 and piston 18, and said rod will be moved toward member 2 in manner before described, whereupon shoulder 24 will cause tilting of arm 6 and breaking of circuit at 13. Should, however, member 2 come to rest with a high part against rod 3, so that arm 6 will be tilted to cause the circuit to be closed at 13, then a low part of member 2 will oppose part 7<sup>a</sup> of spring 7 and the latter will break the circuit at 14, and spring 7 will rest against the adjacent stop 16.

From the foregoing it will be apparent that my improvements provide mechanically operated means for causing the circuit to be broken and to remain broken so long as member 2 is not rotating irrespective of any position in which said member comes to rest,

since in no position of said member when at rest can the circuit be closed thereby, either because arm 6 will have been removed by the action of piston 18 to break the circuit or the circuit will be broken by spring 7 causing its contact members to separate.

The arrangement is such that the small amount of reciprocation to which piston 18 may be subjected during the rotation of member 2, because of its high portions rapidly striking rod 3, does not allow a sufficient movement of said rod to cause shoulder 24 to touch portion 9 of arm 6, to cause a break in the circuit at the contact controlled by said arm, and such action of piston 18 will continue so long as member 2 revolves, and when said member ceases to rotate the aforesaid movements of piston 18 will cease and rod 3 will be moved by spring 8 and encounter member 2, and if rod 3 then encounters a low part of the cam the circuit will be broken by the movement of arm 6, and if rod 3 then encounters a high part of the cam the circuit will be broken through the action of spring 7, and if the member 2 stops at an intermediate position the circuit will be broken by one or the other means.

My improvements may be used in any circuit wherein a rotative member is utilized to make and break the circuit with assurance that when such member ceases rotating said circuit will be broken to prevent the waste of current through the circuit, and such circuit will remain broken until such member is again put into rotation, and so on.

Since it often happens that an operator forgets to open a circuit at a controlling switch, and thereby a waste of current and running down of batteries is occasioned, my improvements will be found of advantage in that even though such switch be left closed the circuit nevertheless will be automatically broken when the machine, to which member 2 is connected or by which it is operated, ceases to operate. As before noted, my improvements should be useful in the ignition systems of internal combustion engines, wherein a rotative member or cam, such as 2, is utilized to make and break a circuit applied with current from a battery, so that if the engine should stop in such position that the circuit ordinarily would be closed if the controlling switch were left closed, the battery circuit nevertheless will be automatically broken, either by the action of piston 18 causing arm 6 to be moved to break the circuit, or the circuit being broken by spring 17 remaining in its normal open position, or nearly so. It will be obvious that my improvements operate mechanically for causing the circuit to be broken when member 2 is idle, as distinguished from electrically or thermally operated devices for such purpose.

While I have illustrated and described

simple and efficient means for carrying out the purposes of my invention, it will be understood that my invention is not limited to the details of construction and arrangements of parts set forth, as the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having now described my invention what I claim is:—

1. The combination of an electric circuit having a pair of coöperative contacts, with a movable member adapted to make and break said circuit, and means controlled by said member to positively break said circuit at said contacts in any position of rest of said member.

2. The combination of an electric circuit having a pair of coöperative contacts, a movable element carrying one of said contacts, a movable member coöperating with said movable element to make and break said circuit at said contacts, and means adapted to be actuated by said member to control one of said contact members to cause it to break the circuit when said movable member is at rest in certain positions.

3. The combination of an electric circuit having a pair of coöperative contacts, with a movable element carrying one of said contacts, a movable member coöperating with said movable element to make and break said circuit at said contacts, and a controller for said element adapted to actuate the latter to break the circuit when said member is at rest in certain positions.

4. An electric circuit having two contact points, means to move one of said contact points to make and break the circuit, and means to move the other contact point to retain the circuit broken when not in use.

5. An electric circuit having two contact points, means to move one of said contact points in one direction to successively make the circuit, and means to move the other contact point in an opposite direction to break the circuit when not in use.

6. The combination of an electric circuit having a pair of coöperative contacts, a member to operate one of said contacts, a dash pot having a movable member adapted to be operated with said first named member, and means controlled by the movable member of the dash pot to permit the closing of the circuit while in one position and to cause breaking of the circuit while in another position.

7. The combination of an electric circuit and circuit breaking means therefor, with a dash pot, and means controlled by said dash pot to cause breaking of the circuit at said circuit breaking means when the circuit breaking means is idle.

8. The combination of an electric circuit and circuit breaking means therefor, with a

dash pot having a movable member, said dash pot having means to cause retardation of the movement of said member in one direction for a distance, and to permit more ready movement of said member for a further distance, and means controlled by said dash pot member to cause breaking of the circuit when the circuit breaking means is idle.

9. The combination of an electric circuit and circuit breaking means therefor, with a dash pot having a movable member, said dash pot having an inlet to be controlled by said movable member to cause retardation of the movement of said member in one direction for a distance, and to permit ready movement of said member when said member has uncovered said inlet, and means controlled by said dash pot member to cause breaking of the circuit when the circuit breaking means is idle.

10. The combination of an electric circuit and circuit breaking means therefor, with a dash pot having a movable member, a valve to permit escape of air from the dash pot cylinder when said member moves in one direction, said dash pot having an inlet to be controlled by said movable member to cause retardation of the movement of said member in one direction for a distance, and to permit ready movement of said member when said member has uncovered said inlet, and means controlled by said dash pot member to cause breaking of the circuit when the circuit breaking means is idle.

11. The combination of an electric circuit having a pair of coöperative contacts, a movable element carrying one of said contacts, a dash pot having a movable member, means to cause said member to actuate said element to break the circuit, and a movable member to make and break the circuit and coactive with the movable member of the dash pot to control said movable element.

12. The combination of an electric circuit having a pair of coöperative contacts, a movable element carrying one of said contacts, a movable member, a dash pot having a cylinder and piston, a rod connected with said piston and coactive with said movable member, a spring to move said rod in one direction, and means coactive between said rod and element for operating the latter to break the circuit when said movable member is at rest in certain positions.

13. The combination of an electric circuit having a pair of coöperative contacts, a movable element carrying one of said contacts, a movable member, a dash pot having a cylinder and piston, a rod connected with said piston and coactive with said movable member, a spring to move said rod in one direction, means coactive between said rod

and element for operating the latter to break the circuit when said member is at rest in certain positions, and means to retard the movement of said piston by said spring.

14. The combination of an electric circuit having a pair of coöperative contacts, a breaker carrying one of said contacts, a movable element carrying the other of said contacts, a rotative member to operate said breaker to make and break the circuit successively, and means controlled by said member and coactive with said element to break said circuit when said member is at rest in certain positions.

15. The combination of an electric circuit having a pair of coöperative contacts, a breaker carrying one of said contacts, a movable element carrying the other of said contacts, a rotative member to operate said breaker to make and break the circuit successively, a dash pot having a piston and a rod coactive with said member, and means to cause said rod to actuate said element to break the circuit when said member is at rest in certain positions relatively to said rod.

16. The combination of an electric circuit having a pair of coöperative contacts, a breaker carrying one of said contacts, a movable element carrying the other of said contacts, a rotative member having high and low parts, the high parts being adapted to actuate said breaker to make and break the circuit successively, a dash pot having a piston and a rod coactive with said rotative member, and means to cause said rod to actuate said element and arranged whereby when a high part of said rotative member engages said rod the contact member of said element will be in position to be engaged by the contact member of said breaker, and when said rod is in the low part of said rotative member the contact member of said element will be out of operative relation to the contact member of said breaker.

Signed at New York city, in the county of New York and State of New York, this 11th day of April, A. D. 1916.

FREDERIC S. PERRIN.

Witnesses:

T. F. BOURNE,  
MARIE F. WAINRIGHT.