C. F. KETTERING.

IGNITION APPARATUS FOR EXPLOSION MOTORS.

APPLICATION FILED SEPT. 15, 1909.

1,037,491. **Patented Sept. 3, 1912.**

Fig. 1.

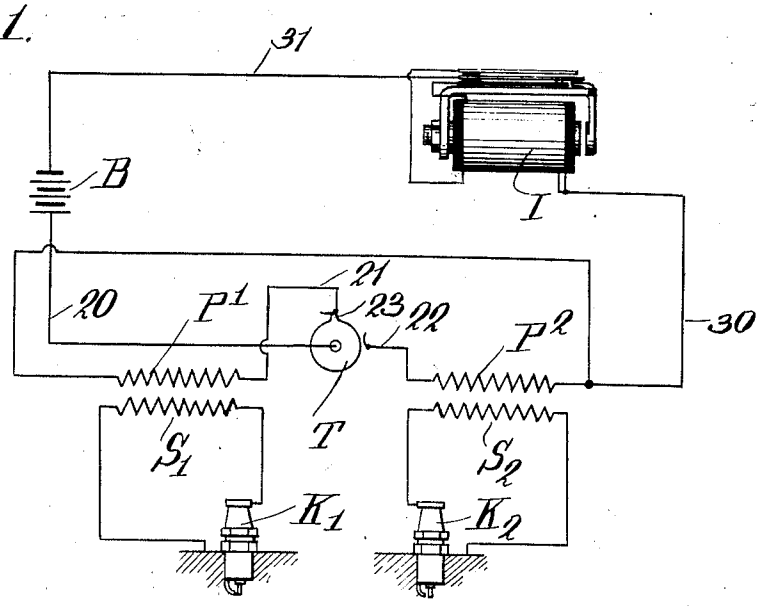
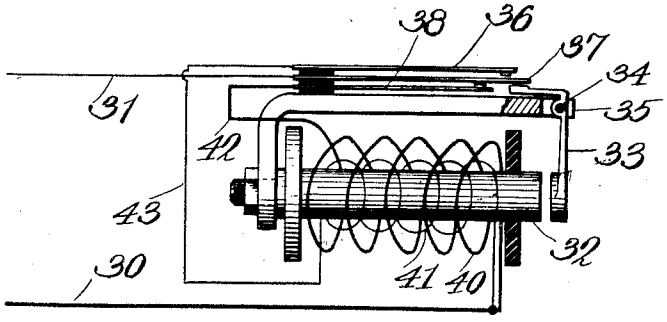


Fig. 2.



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IGNITION APPARATUS FOR EXPLOSION-MOTORS.

1,037,491. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed September 15, 1909. Serial No. 517,788.

To all whom it may concern:

Be it known that I, CHARLES F. KETTERING, a citizen of the United States, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Ignition Apparatus for Explosion-Motors, of which the following is a full, clear, and exact description.

This invention relates to improvements in ignition devices for gas engines or other forms of explosion motor, and has among its objects to provide a form of current interrupter for producing a single spark for each contact of the timer or distributer.

In the particular form of embodiment of the improvement for accomplishing this object, the interrupter magnet is provided with two coils or windings, one of high resistance and the other of low resistance. When a current is sent through the primary of an induction coil, the current also flows through the low resistance winding of the interrupter and causes the armature of the latter to be operated to break the current through said low resistance winding, and thereby produce the necessary spark. And this operation of the armature is utilized to establish a flow of current through the high resistance winding of the interrupter concomitantly with the breaking of the current through the low resistance winding. The high resistance coil then serves to hold the armature in such position until the timer or main engine controlled contact-maker has moved to break the current at that point. The parts of the interrupter then return to normal position ready for the next operation. It will thus be seen that in the succession of operations due to the timer, a single spark is produced each time the primary circuit is made and broken by the timer.

With the above mentioned objects in view, the invention consists in the novel combinations of parts, a preferred form of embodiment of which is shown in the accompanying drawings forming part of this specification.

In said drawings, Figure 1 is a diagrammatic view of the electrical connections; and Fig. 2 is a detailed view of the interrupter with its electrical connections.

It will be understood that the parts shown are represented largely diagrammatically for the sake of clearness in the description, and that in actual use they would be suitably inclosed in casings and mounted and insulated in convenient and customary ways.

A battery B or other source of electric energy is utilized, and is connected by wire 20 with the timer T. This timer is arranged to distribute the current to the circuit formed by wire 21, or to that of wire 22, of the respective primary coils P^1, and P^2, the projection 23 on the timer serving to make the successive contacts as the timer revolves in the well-known manner. The primary P^1 forms part of one induction coil, having the secondary S^1 connected with the spark plug K^1. Similarly the other induction coil has a secondary S^2 for its primary P^2, the former being connected with the other spark plug K^2. This system is for convenience described for a two cylinder engine, but it will be readily apparent that it is applicable to an engine having any number of cylinders, one, two or more, the timer being correspondingly arranged as is well-known in the art.

The primaries P^1 and P^2 are connected to the common return wire 30 which includes the interrupter I; the path for the current after passing through the interrupter, being to the battery by the wire 31, thus completing the circuit.

The purpose of the interrupter I is to break or produce in the primary current either through the primary coil P^1 or primary coil P^2, according to the position of the timer T, such an abrupt change as will produce a secondary spark, and this break or change in the primary current occurs only once for each contact of the timer so as thereby to produce the single spark in the secondary, as above referred to.

Referring particularly to the construction of the timer for producing this effect, the parts are shown in detail in Fig. 2. The interrupter has a soft iron core 32 which when energized attracts the bell crank armature 33. This armature is pivoted at 34 to an iron framework 35 which is bent downward at its other end and connected to the core 32 so as to form a closed magnetic circuit.

Mounted above the frame or arm 35 are three contact strips 36, 37 and 38, provided with suitable contact points for making

contact between the strips. These contact strips are suitably insulated from each other and from the arm 35.

The wire 30 is connected to both the low-resistance coil or winding 40 and with the high resistance winding 41 surrounding the core 32. The low resistance wire 40 is connected by the wire 42 to the under-contact strip 38. The high resistance 41 is connected by the wire 43 to the upper contact strip 36. The middle contact strip 37 is connected to the above mentioned wire 31, which goes back to the battery.

The middle strip 37 projects outward over the horizontal arm of the bell crank armature 33, in such manner that when the armature is rocked on its pivot by the attraction of the core 32, the horizontal arm is lifted, thereby striking the contact strip 37 and causing it to make contact with the upper strip 36 and at the same time breaking the contact with the lower strip 38.

In the normal position of the parts, as shown in Fig. 2, the lower two strips, 37 and 38, make contact with each other, while the contact between strip 36 and strip 37 is broken. It results from this construction that when the timer T has revolved so as to make contact through one or the other of the wires 21 and 22 (and thus through one or the other of the primaries of the induction coils), the battery current flows through the wire 30, through the low resistance coil 40 to the under-strip 38, thence to the middle strip 37 and wire 31, back to the battery. The core 32 is then energized and attracts the armature 33 whereupon the horizontal arm of the armature is lifted and acts upon the middle strip 37 to break the contact with strip 36 and thus break the current through the low resistance coil 40.

The making of the contact between the strips 37 and 36 results in a flow of current through the high resistance coil 41, the current flowing through wire 30, coil 41, wire 43, strips 36 and 37, and wire 31 back to the battery. The high resistance coil then acts as an auxiliary to hold the armature attracted to the core until the main circuit is broken at the timer. This auxiliary circuit is of such high resistance as to permit the flow of a negligible amount of current.

While the form shown and described herein is one which is well suited for accomplishing the purposes of the invention, it is to be understood that other forms of devices may be used without departing from the spirit of the invention and all coming within the scope of the claims which follow.

What is claimed is:

1. A spark controlling apparatus for explosion engines comprising in combination, a source of current, an induction coil and spark device, a circuit-breaker in circuit with the primary of the induction coil, an auxiliary high resistance energizing circuit for said circuit-breaker, and means operated by the initial movement of said circuit breaker for controlling said auxiliary energizing circuit, as set forth.

2. A spark controlling apparatus for explosion engines comprising in combination, a source of current, an induction coil for the spark plug of the engine, an interruption magnet, two windings of different resistance thereon and forming separate paths in the circuit for the primary of the induction coil, and an armature having connections to close one of said paths on breaking the other, as set forth.

3. A spark controlling apparatus for explosion engines comprising in combination a source of current, an induction coil for the spark plug of the engine, an interruption magnet in a low resistance circuit forming part of the circuit of the primary of the induction coil, an auxiliary high resistance winding on said magnet, and an armature having connections to complete the circuit of said auxiliary winding when attracted by the magnet to break the low resistance circuit, as set forth.

4. In a spark controlling apparatus for explosion engines, a circuit breaker comprising a magnet; a low resistance winding and an auxiliary high resistance winding thereon; contact strips connected to said low and said high resistance windings respectively; an intermediate contact strip located between said former mentioned contact strips and connected with the main circuit; and an armature operated by said magnet and having connections operating upon said intermediate contact strip to retract the same from the contact strip of the low resistance winding and thereupon carry said intermediate strip into contact with the strip of the high resistance winding.

5. In an ignition system comprising a source of current, an induction coil and a spark device; the combination with a plurality of circuits of different resistance; of an electrically actuated means operable by the current passing through one of said circuits to break said circuit and establish the other of said circuits.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

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Witnesses:

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