No. 887,737. PATENTED MAY 12, 1908.

S. D. FIELD.

MAGNETIC BLOW-OUT FOR MAKE AND BREAK DEVICES.

APPLICATION FILED DEC. 12, 1907.

Fig. 2.

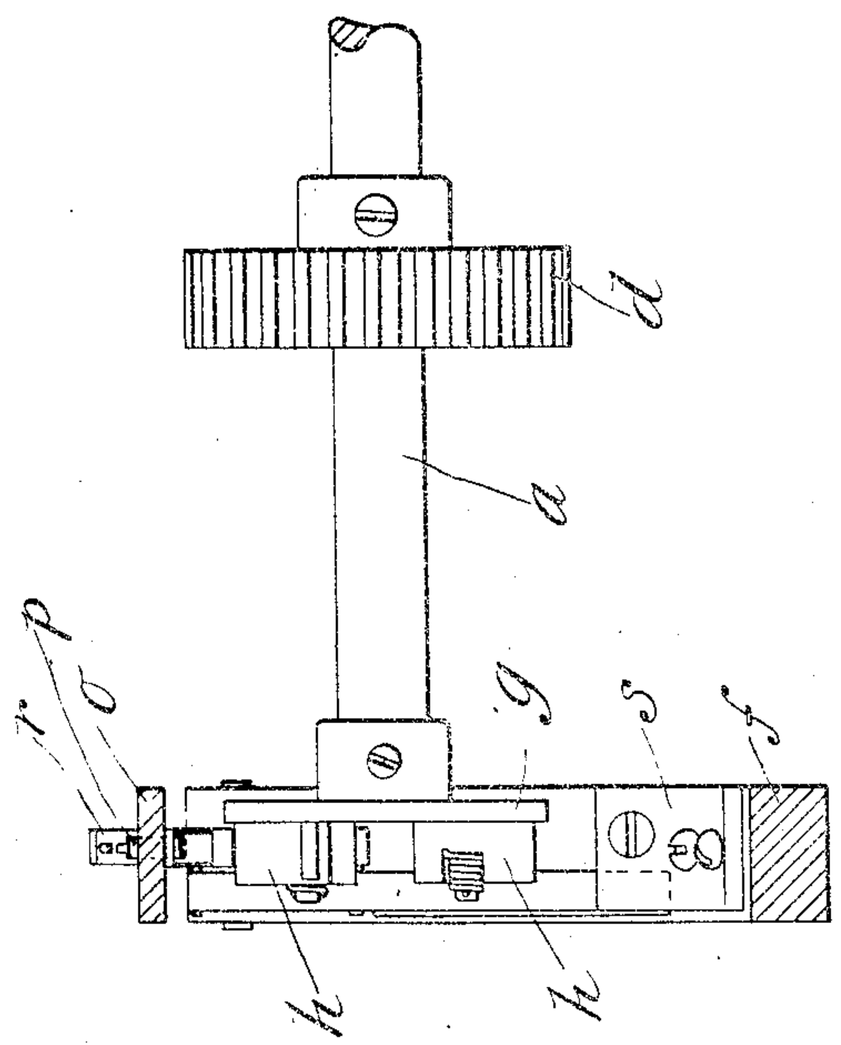
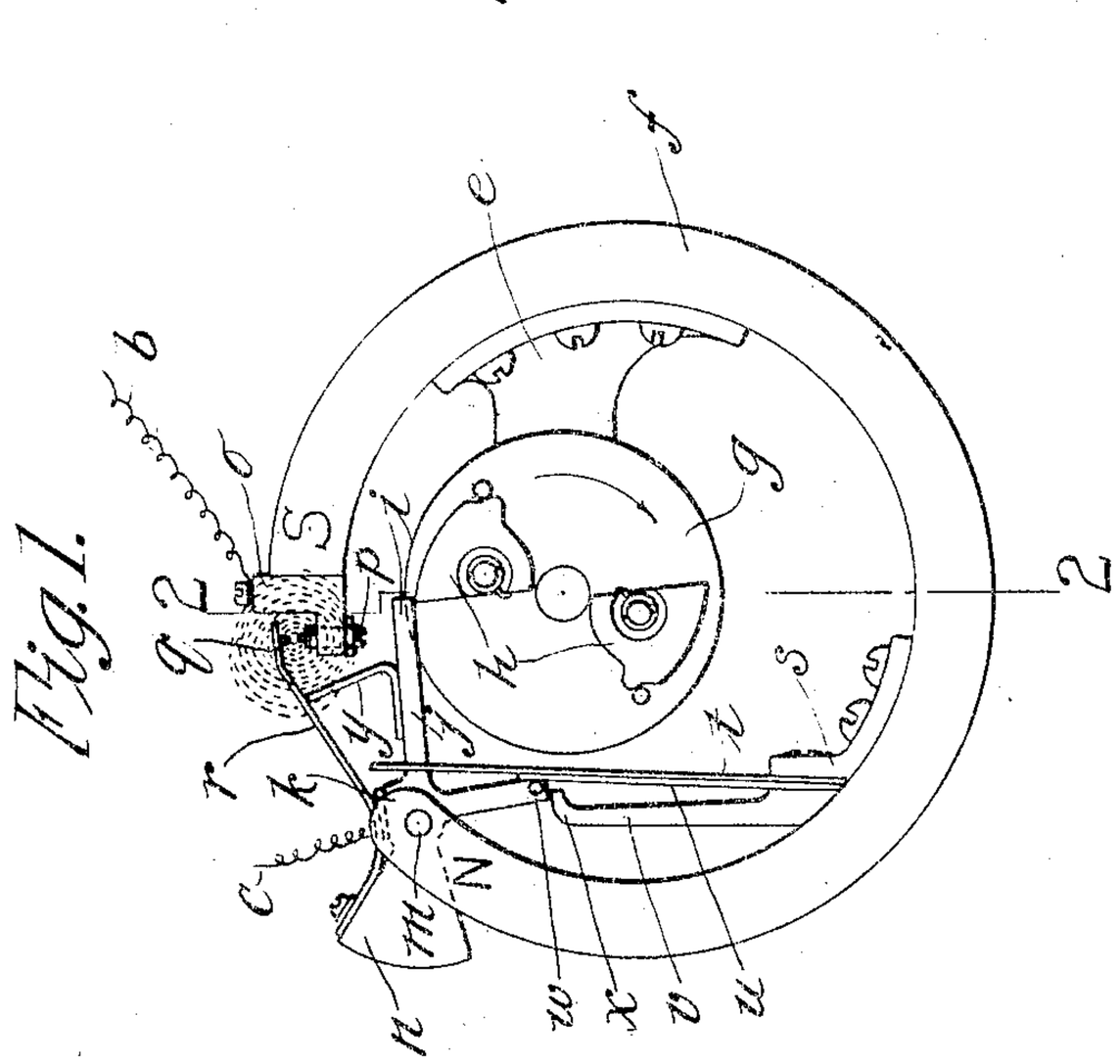


Fig. 1.



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MAGNETIC BLOW-OUT FOR MAKE-AND-BREAK DEVICES.

No. 887,737. Specification of Letters Patent. Patented May 12, 1908.

Application filed December 12, 1907. Serial No. 406,147.

To all whom it may concern:

Be it known that I, STEPHEN DUDLEY FIELD, a citizen of the United States of America, residing at Stockbridge, in the county of Berkshire and State of Massachusetts, have invented new and useful Improvements in Magnetic Blow-Outs for Make-and-Break Devices, of which the following is a specification.

This invention relates to improvements in electrical make and break contact devices, the object of the invention being to provide means for instantaneously extinguishing the spark that occurs at the make and break contact points when the primary circuit of an induction coil is broken.

The invention set forth in this application is an improvement on the invention shown and described in my application for Letters Patent of the United States for improvement in "Rebounding ignition and spacer device for explosive engines" filed November 20, 1907 under Serial No. 402,988. In the operation of an ordinary induction coil in which a vibrator is employed, the core of the same is so arranged with relation to the vibrator (which affects the making and breaking of the primary circuit) that the lines of force from the core will assist the condenser in quickly extinguishing the spark at the contact points at the instant of the breaking of the primary circuit, it being well known that the strength of the induced current in the secondary winding is greater in proportion to the abruptness of the extinguishment of the arc at the make and break contact points of the primary. If the arc is permitted to be drawn out or lengthened before it is broken, that is to gradually die out, little, if any, inductive effect would be produced in the secondary winding of the coil, and consequently there would not be produced a sufficiently large spark at the spark plug to ignite the vaporous charge in the cylinder of the engine.

In my prior application above referred to, the make and break device being located at a distance from the induction coil, I have found it necessary to provide some means to instantaneously and thoroughly extinguish the spark when the primary circuit is broken at the contact points; and in order to accomplish this result satisfactorily, I envelop the contact points in a strong magnetic field, this field being produced, preferably, by means of a permanent magnet with the north and south poles located between the two poles of the magnet, and consequently when a break occurs in the primary circuit at the contact points, the spark, instead of being drawn out or gradually reduced, is instantaneously and thoroughly extinguished by means of the magnetic field, assisted, of course, by the usual condenser which is connected across the contact terminals in the usual manner.

In the drawings forming a part of this application,—Figure 1 is a side elevation of my improvement showing the location of the make and break device and the spark gap, and the north and south poles of a permanent magnet of the horseshoe type, and Fig. 2 is a sectional view on the line 2—2, Fig. 1.

Referring to these drawings in detail, *a* designates the ordinary cam-shaft or some equivalent moving part of an internal combustion engine, that is employed to operate the make and break mechanism and which opens and closes the circuit in the primary windings of an induction coil. These terminals are indicated by the wires *b* and *c*.

d designates a gear mounted on the cam or other shaft *a* which is arranged to mesh with the main shaft of the internal combustion engine.

e designates a bracket that is secured to the permanent magnet *f*, which bracket supports the face-plate *g* on which are mounted the cam devices *h*. The magnet *f* employed is of the horseshoe type. These cam devices are arranged so as to strike the end *i* of the arm *j* of the contact lever during their rotary movements.

k designates as a whole the balance contact lever which is pivotally mounted on one pole of the permanent magnet *f* at the point *m*. The balanced or weighted portion of this lever is indicated at *n*. Secured to the other pole of the permanent magnet *f* is a pole piece *o* of soft iron and on which is secured one of the contact points of the make and break device that is designated by the letter *p*. The other contact point is designated by the letter *q* and is carried on the end of a leaf spring *r*. *s* designates a bracket that is also secured to the permanent magnet *f* for rigidly securing one end of the leaf springs *t* and *u* and also the arm *v* which is used to place the springs normally in a state of stress. The position of the parts, as

shown in Fig. 1, is at the moment of separation of the contact points *p* and *q*, and the pin *w* pressing the springs away from the curved end *x* of the arm *v*, the free end of the spring *t* being also at this instant away from the pin *y*.

The above described parts and their function and operation have already been fully described and set forth in my copending application, and further reference to them seems unnecessary in this application.

By locating the balance contact lever *k* on one pole of the permanent magnet *f* and the contact point *p* on the other pole by means of the soft iron pole-piece *o*, and in the plane of the permanent magnet, the make and break mechanism will therefore operate in the field or air-gap of the permanent magnet and be completely enveloped by the lines of force, which at this point are very dense.

When a break occurs in the primary circuit at the contact points *p* and *q* the spark that follows such break will be instantaneously extinguished or blown out by reason of the lines of force in this field or air-gap, as well known, resulting in the sudden demagnetization of the core of the induction coil, whereby the induced or spark current is correspondingly strong, by reason of the greater inductive effect produced therein.

The ordinary spark-coil, as employed for internal combustion engines, is provided with a condenser to assist in demagnetizing the core of the coil at the instant of breaking of the contact points in the primary circuits; but if this spark is not instantly extinguished, the induction in the secondary winding will be very much less; therefore, in order to bring about the same result when the make and break devices are located at a distance from the induction coil, that is out of the range of the field of the core, I employ the permanent magnet *f* to effect the same results, that is to blow out or instantaneously extinguish the spark when a break occurs in the primary circuit of the coil.

It should be stated that the balance lever *k* and the arm *j* are composed of magnetic material, preferably soft iron or mild steel so that the lines of force will be very much confined or concentrated between the north and south poles of the magnet, and in the region of the contact points *p* and *q* of the make and break device.

What I claim is:—

1. In combination, a contact lever, a magnet having its poles oppositely disposed, a cooperating contact element mounted on the magnet, means for operating said lever, the lever and its coöperating contact element being located within the magnetic influence of the magnet poles, whereby when the contacts are separated an arc will be extinguished as described.

2. As an improvement in means for extinguishing the electric arc at the make and break contacts of an ignition system, in combination, a permanent magnet, the contacts being arranged in the air gap of the magnet, one of said contacts comprising a contact arm and forming a portion of the magnetic circuit, means for operating one of the contacts, whereby when the contacts are separated an electric arc between said contacts may be prevented.

3. In combination, a permanent magnet, the poles of which are arranged in opposition to each other, a make and break device arranged within the air gap of the magnet, said make and break device forming a portion of the magnetic circuit.

4. In combination, a magnet, the poles of which are arranged in a juxtaposed position, a make and break mechanism located within the magnetic influence of the poles, as described, and forming a portion of the magnetic circuit of the magnet.

5. In combination, a magnet, a contact element mounted thereon, a movable member for engaging the contact element and providing a path for the magnetic flux, whereby any arc formed between the contact and movable element may be extinguished.

6. In combination, make and break devices, a permanent magnet for producing a permanent magnetic flux for enveloping said devices, one of the members of said devices constituting a portion of the magnetic circuit, whereby the reluctance of the circuit is decreased, and whereby when a break occurs at the make and break devices the formation of an arc is prevented.

7. In combination, a permanent magnet, the poles of which are arranged in opposition to each other, a make and break element pivotally supported in proximity to one pole of the magnet and having its free or contact end arranged in proximity to the other pole of the magnet, whereby said element constitutes a portion of the magnetic circuit, and whereby the reluctance of the circuit is decreased, as described.

8. In a magnetic blow-out for ignition systems, in combination, a make and break device, means for enveloping said device with a permanent magnetic field of force, said device constituting a part of the magnetic circuit.

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