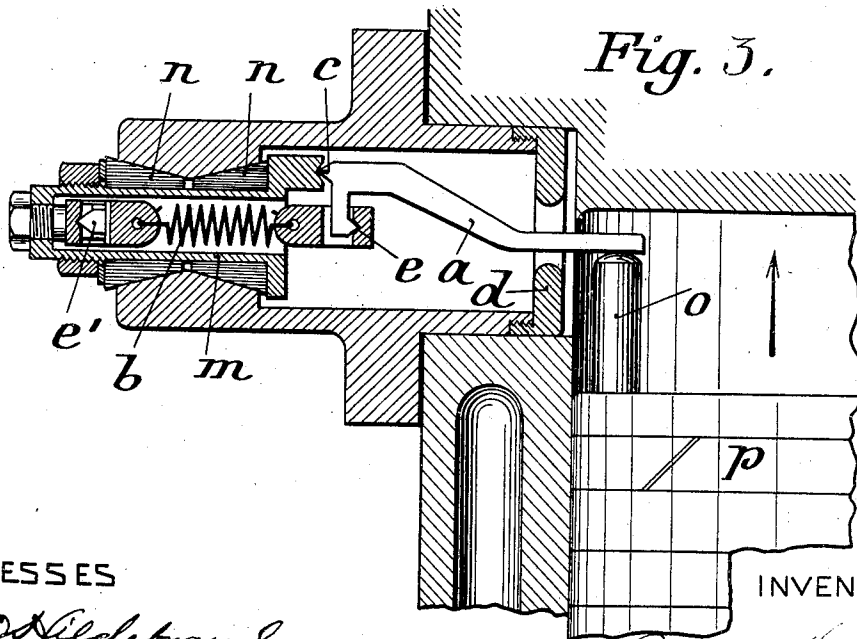
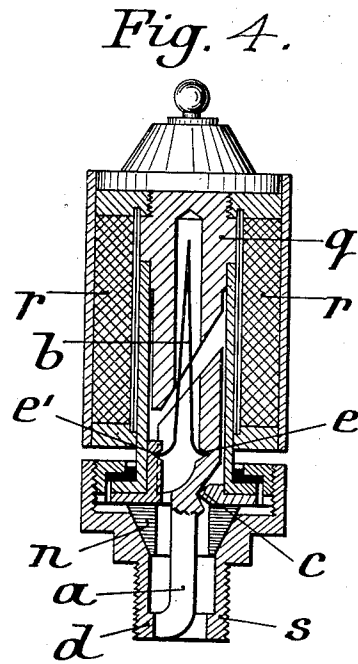
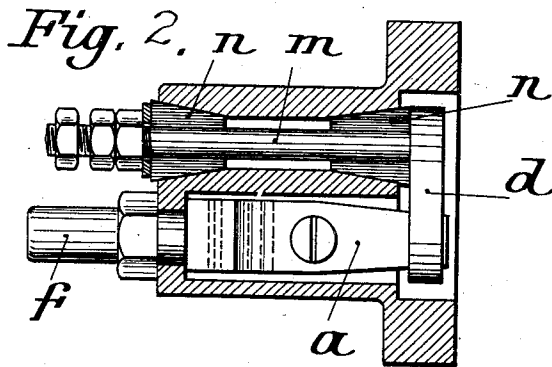
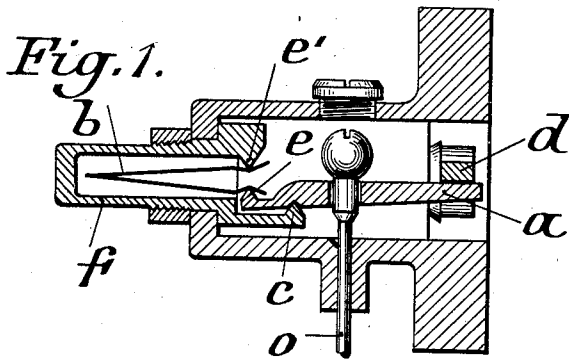


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ELECTRICAL INTERRUPTER FOR EXPLOSIVE ENGINES.  
APPLICATION FILED DEC. 18, 1905.

931,065.

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2 SHEETS—SHEET 1.



WITNESSES

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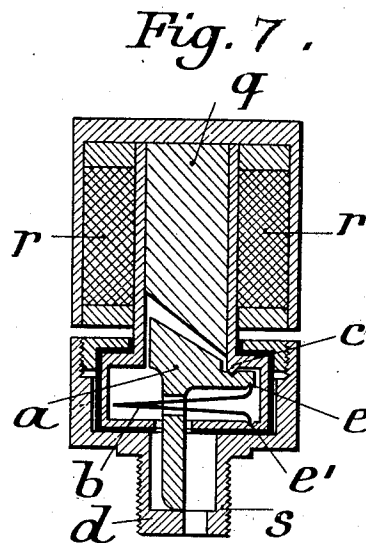
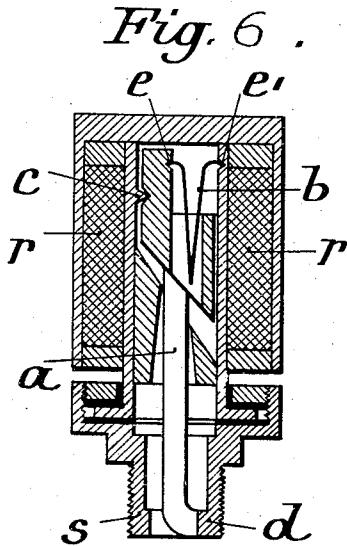
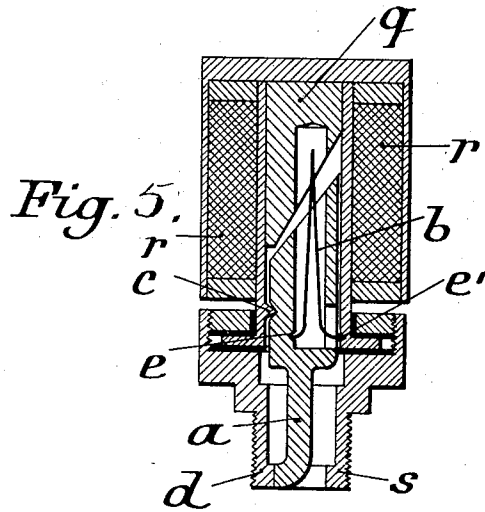
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2 SHEETS—SHEET 2



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# UNITED STATES PATENT OFFICE.

GOTTLOB HONOLD, OF STUTTGART, GERMANY.

## ELECTRICAL INTERRUPTER FOR EXPLOSIVE-ENGINES.

No. 931,065.

Specification of Letters Patent.

Patented Aug. 17, 1909.

Application filed December 18, 1905. Serial No. 292,340.

*To all whom it may concern:*

Be it known that I, GOTTLOB HONOLD, engineer, a subject of the German Emperor, residing at 11 Hoppenlaustrasse, Stuttgart, Germany, have invented certain new and useful Improvements in Electrical Interrupters for Explosion-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in make and break ignition devices for explosive engines. Such an ignition device, as is well known, comprises a movable member which serves as or operates the movable electrode, acting in conjunction with a fixed electrode to produce a spark for igniting the explosive gases, the movable and fixed electrodes forming part of an igniting circuit. As this spark must be produced within the body of the gases to be ignited, it results that at the time of explosion the movable electrode and its connected parts are exposed to the products of combustion and hence receive a deposit of carbon from such products of combustion. When the movable electrode is mounted to oscillate, the bearing upon which it is fulcrumed also receives such a deposit of carbon and consequently after a short operation becomes so clogged with carbon as to require a considerable increase in the amount of power necessary to operate it. If the movable electrode is operated mechanically from the moving parts of the engine, this increase in power necessary for the operation of the movable electrode is a pure waste of energy. Where an electromagnetic means for operating the movable electrode is employed, not only is this increase in power a waste of energy but it leads to the necessity for a corresponding increase in electric current for operating the electromagnetic operating means, thus necessitating a larger generating apparatus, and a larger electromagnet than otherwise would be required. As a result of these disadvantages and the uncertainties of action due to this carbonizing of the bearings, electromagnetic spark plugs, prior to my invention, have been unsatisfactory in practical use.

It is the purpose of my invention to overcome these disadvantages. I have found that if the bearing of the movable electrode or its operating mechanism be formed as a

knife-edge fulcrum, then the knife-edge not only has a very limited amount of friction, as is the case with all knife-edge bearings, but also it will keep itself clean in use, this being due probably to the fact that the knife-edge can cut the film of carbon loose as rapidly as the same is formed, so that the deposits of carbon are not given time to build up to an extent sufficient to interfere with the operation of the apparatus. Furthermore, this knife-edge bearing may serve as the contact point or device through which the electric current is led to the movable electrode, and thereby, owing to the ability of this bearing to keep itself clean, a good electrical contact is maintained.

My invention comprises an ignition device in which the movable electrode is operated by a rocking lever hinged to the stationary parts by a knife-edge bearing.

The invention also comprises certain modifications of the apparatus used for interrupting the sparking current more particularly set forth in the following specification and claims and illustrated in the annexed drawings.

Figures 1, 2 and 3 are longitudinal sections showing various constructions of interruptors adapted to produce a spark in the interior of the explosion chamber by mechanical means and Figs. 4, 5, 6 and 7 show modifications of the same in which the necessary separation of the electrodes is effected by means of an electro-magnet.

Figs. 1 and 2 show forms of my invention by which the arrangement is made capable of drawing a spark or arc within the cylinder or the explosion chamber of the cylinder of an explosion engine. The body of the apparatus carrying the movable electrode is designated by the reference letter *f*. It is made in the shape of a casing adapted to be tightly bolted to the wall of the cylinder its interior being in free communication with the interior of the cylinder. The stationary electrode *d* is carried by a bolt *m* fixed by means of conical plugs *n* made of insulating material in the casing *f*. The lever *a* which forms the movable electrode is provided with a groove coöperating with a fixed knife edge *c* on which the lever is free to be rocked. A spring *b* engages with a knife edge *e* provided on the inner arm of the lever *a* and a fixed knife edge *e'* on the casing thus tending to keep the outer arm of the lever in contact with the stationary elec-

trode *d*. A rod *o* passes through one wall of the casing and engages with the outer arm of the lever. The rod is supposed to be in connection with the main driving shaft of the engine by means of suitable mechanism not shown and to be so controlled that it is lowered at such times when the production of a spark at *d* is desired. By lowering the rod *o* the outer arm of the lever *a* is rocked downward and the current passing through the electrodes *d* is therefore broken.

In the modification shown in Fig. 3 the V-shaped flat spring is replaced by a coiled spring and the bolt *m* by a sleeve *m* insulated by conical plugs *n* and carrying the groove *c* and the knife edge *e'* of which the former serves as a fulcrum to the lever *a* and the latter forms the support for the head at the inner fixed end of the spring *b*. Both ends of the spring are provided with slotted heads having grooves to fit over and engage knife edge bearings and the groove at the outer end of the spring engages with a knife edge *e* on the inner arm of the lever *a*. The outer arm of the lever forms the movable electrode and is governed by a pin *o* fixed on the piston *p*. Thus when the piston reaches the end of its upper stroke, the pin *o* strikes the outer arm of lever *a* and by raising it breaks the current flowing through the point of contact *d* and thus produces the desired spark.

Figs. 4, 5, 6, and 7 show a further modification in which instead of being mechanically actuated the lever *a* is actuated by an electromagnet. The casing which incloses the apparatus is provided at one end with a threaded stud *s* by means of which it can be screwed into the wall of the cylinder. The casing itself is integral with or forms a part of the iron core *q* of an electromagnet which can be excited by means of the winding *r*, one end of which is connected to the ignition circuit, not shown, and the other end of which is grounded on the casing or body of the device in the usual way. The core is hollow and contains the V-shaped spring *b* one end of which engages a stationary groove *e'* and the other end of which engages a groove *e* on the inner arm of the lever *a*. The lever has a second groove which engages the stationary knife edge *c*, whereby the current may pass from the winding *r* through the knife-edge *c* to the lever *a*, whose lower end forms the movable electrode of the device. Thus the spring tends to hold the lever in its normal position and its outer arm in contact with the stationary electrode *d*. The inner arm of the lever serves as an armature for the electromagnet and when a current is sent through the winding of the latter therefore, the inner arm of the lever *a* is attracted and consequently the lever rocked so as to interrupt the current at *d* and thereby produce a spark.

Figs. 5, 6, and 7 show some further modifications of the same arrangement in which the different knife-edges and the spring are differently disposed. The action of all these modifications however is the same and will be understood from the drawings without further description.

By reason of my construction, the electrodes will be kept in operative condition at all times. Ordinarily, the bearings of the igniter are quickly covered with a film of carbon precipitated by the burning gases in the explosion chamber to which they were exposed and the high temperature vaporizes any lubricant which may be applied so as to render it ineffective. By employing a knife-edge bearing, I overcome the necessity for using lubricants and also prevent the accumulation of the carbon deposit because the knife edge cuts away the deposit as fast as it is formed so that there is always a clean smooth bearing for the knife edge or fulcrum.

Having now particularly described and ascertained the nature of my said invention I declare that what I claim is:

1. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever the fulcrum of which is formed by a knife edge working in a groove, means for holding one arm of said lever in contact with the said electrode, and other means for rocking said lever out of contact.
2. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever the fulcrum of which is formed by a knife edge working in a groove, a spring holding one arm of said lever in contact with said electrode, the ends of said spring engaging said lever and the frame of the apparatus by means of knife edges working in grooves, and means for rocking said lever so as to break the contact.
3. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever the fulcrum of which is formed by a knife edge working in a groove, a V-shaped spring engaging a stationary groove on the frame of the apparatus and another groove in the said lever, and means for rocking said lever so as to bring its arm out of contact with the said electrode.
4. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever having for its fulcrum a knife edge working in a corresponding groove, means for normally holding one arm of said lever in contact with

said electrode, and an electromagnet adapted to act upon one arm of said lever.

5. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever having for its fulcrum a knife edge working in a corresponding groove, a spring the ends of which engage one arm of said lever and a stationary part by means of knife edges working in grooves, and an electromagnet adapted to rock said lever out of contact with the said electrode.

6. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever having for its fulcrum a knife edge working in a groove said lever being held in contact with said electrode by a spring, the ends of which engage the lever and a stationary part by means of knife edges working in corresponding grooves, one arm of said lever forming the armature of an electromagnet.

7. In an igniter arranged to be inserted within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever having for its fulcrum a knife edge working in a corresponding groove, one arm of said lever being normally held in contact with said electrode by a spring, the ends of which engage the lever and a stationary part by means of knife edges working in grooves, the other arm of said lever forming the armature of an electromagnet.

8. In an igniter arranged to be inserted

within the explosion chamber of an internal combustion engine, the combination, with a stationary electrode, of a lever having for its fulcrum a knife edge working in a corresponding groove, one arm of said lever being held in contact with said electrode by means of a spring, the ends of which engage a stationary part and the lever by means of knife edges working in grooves, the other arm of said lever forming the armature of an electromagnet, said electromagnet being formed as a casing inclosing the apparatus, and means for fastening said casing in the wall of the cylinder of the engine.

9. In an igniter for internal combustion engines, the combination with a pair of electrodes arranged to be inserted within the path of the combustible gases, one of said electrodes having a knife edge fulcrum, of a bearing for said knife edge fulcrum, said knife edge fulcrum and its bearing being arranged in the path of the explosive gases, and means for making and breaking contact of said electrodes.

10. In an igniter for internal combustion engines, the combination, with a stationary electrode, of a movable electrode device having a knife-edge fulcrum forming part of the ignition circuit.

In testimony whereof I affix my signature to this specification, in the presence of two witnesses.

GOTTLOB HONOLD.

Witnesses:

FRIEDRICH HIMMEL,  
ERNST ENTENMANN.