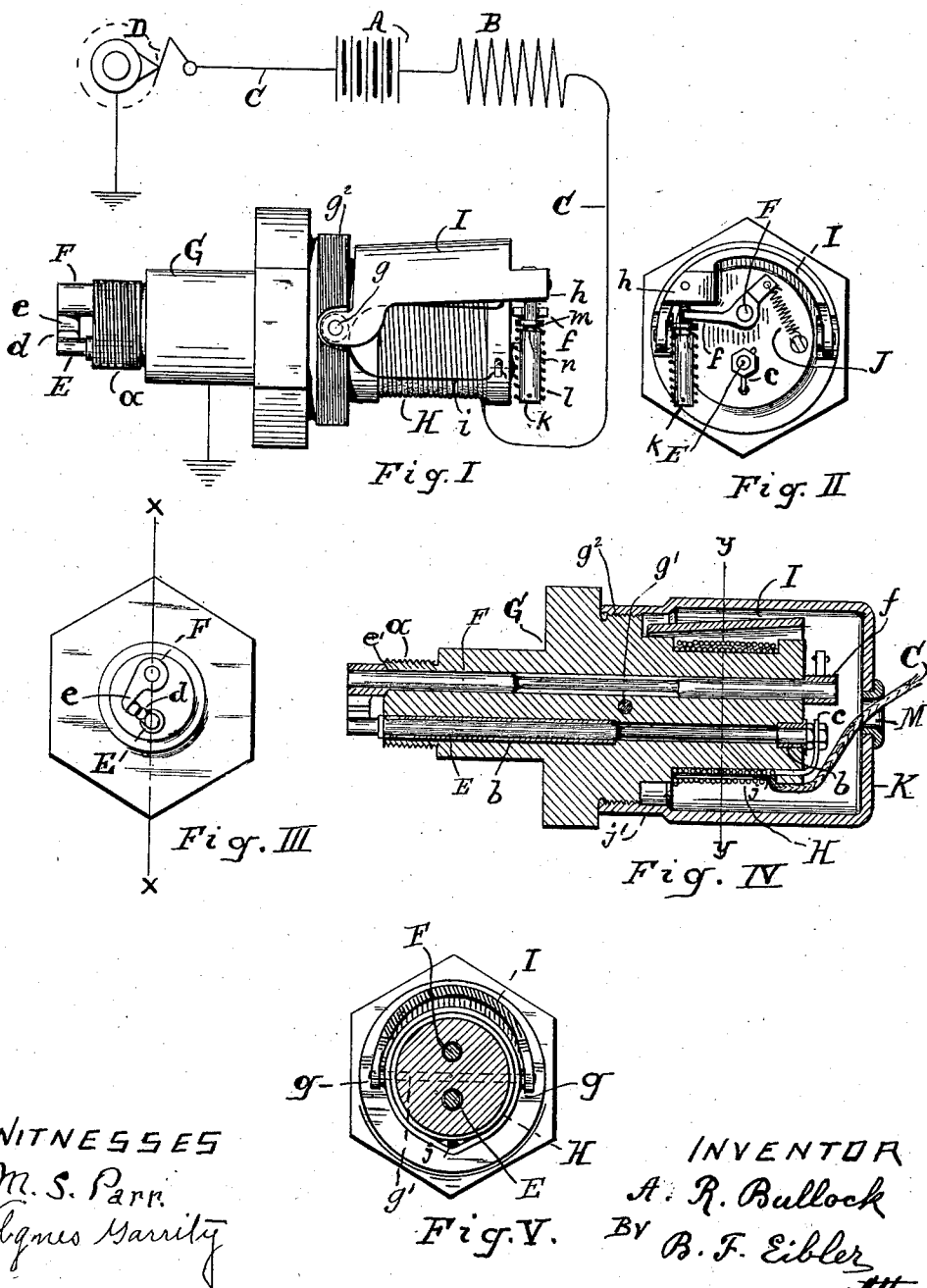


A. R. BULLOCK.
ELECTRICAL IGNITING DEVICE FOR EXPLOSIVE ENGINES.
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1,065,862.

Patented June 24, 1913.



WITNESSES
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UNITED STATES PATENT OFFICE.

ARTHUR R. BULLOCK, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE IGNITER APPLIANCE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ELECTRICAL IGNITING DEVICE FOR EXPLOSIVE-ENGINES.

1,065,862.

Specification of Letters Patent.

Patented June 24, 1913.

Application filed January 25, 1904. Serial No. 190,525.

To all whom it may concern:

Be it known that I, ARTHUR ROBERT BULLOCK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Electrical Igniting Devices for Explosive-Engines.

My invention relates to improvements in electrical igniters for explosive engines, more particularly to the kind of electrical igniters wherein two contact members normally touching each other are separated by means of a blow struck upon one of the contact members by a movable armature; and the object of this present application is to perfect the construction and arrangement of the moving parts in such devices, so as to render them absolutely reliable and durable. I attain this object in a device as illustrated in the accompanying drawings in which—

Figure I represents a side view of this device, the electrical circuit and parts of an engine being diagrammatically shown. Fig. II is an outer end view of said device. Fig. III is an inner end view of same. Fig. IV represents a central sectional view of same on line *x x*, see Fig. III. Fig. V is a transverse sectional view on line *y y* see Fig. IV.

Like letters of reference denote like parts in the drawing and specification.

Referring to Fig. I, *a* represents a source of electrical supply. *B* represents a self-induction or so called spark coil. *C* indicates a part of the circuit. *D* represents a suitable auxiliary circuit closer which is operated from a moving part of the engine. *E* is an insulated stationary electrode, and *F* is a movable grounded electrode, it being presupposed that the circuit from said auxiliary closer to the movable electrode is grounded or completed through the frame of such engines, and *G* is a plug which is intended and adapted to be mounted and extend through a wall of the engine and into the combustion chamber thereof. The part *a* of the plug is screw threaded as a means for thus securing the plug upon the engine. *H* is a winding of wire which surrounds the plug and lies between two shoulders formed upon the plug. This construction forms in effect an electromagnet.

The electrode *E* is insulated as at *b b*. One terminal of said electrode is connected with the winding as at *c* and the other terminal carries a contact point as at *d*.

Each terminal of the movable electrode is provided with an arm. The arm *e* thereof makes contact with the point *d* above mentioned, while the arm *f* is arranged in operative relation with the armature *I* presently described. The arm *e* in conjunction with the stem part of this electrode forms a conical shoulder as at *e'* which fits into the conical recess of the bore of the plug and thereby forms a gas tight bearing for said movable electrode within said plug, the pressure within the engine cylinder being the means of forcing the shoulder against its seat or recess.

The armature *I* is formed as a curved shield and extends part way around the plug or pole *G*. It is hinged to said plug as at *g g* which hinged portions are countersunk in the plug so as to permit the ready placing or removal of the inclosing cover, and the projection *h* thereof is arranged within reach of the arm *f* above mentioned. As shown, the outer end of the armature is held distant from the plug by the action of a spring *i*, which in this instance is *U* shaped, one end thereof resting upon the plug and the other thrusting in under the armature as seen in Fig. I. The rod *g'* extends transversely through the plug as seen in Figs. IV and V and its terminals serve as pivots for the hinge parts *g g* of the armature.

The casing *K* as shown in Fig. IV serves in the nature of a protector of the parts inclosed thereby; it has a screw threaded connection with the plug as at *g²* and in extending over the part *g²* it retains the rod *g'* in proper position for the hinges, without requiring any extra means to obtain such result. In the end wall of the casing there is a bushing *M'*, consisting of insulating material; said bushing supports guides and protects the circuit wire in its passage through the casing onto the winding. As a further safe guard against breaking of the wire *C* a suitable connector (which may be a portion of the wire *C*) is interposed between the outer and inner coil as at *j* see Figs. IV and V; the actual connection of wire and coil being at *j'*. If desired, the connector may be in the form of a metallic piece or strip. This connector extends substantially parallel with the axis of the magnet, the outer layer of the wire winding being tightly wrapped around the outer side of the connector and thereby retaining it

in place, said outer layer practically binding the connector in its position when strain is placed on the terminal leading without the casing.

5 In Figs. I and II there is shown a member *h* depending from part *h* of the armature; said member is shouldered as at *n* and carries the spring *l* and washer *m*. The shoulder *n* limits the movement of armature
10 I, the spring *l* acts as a cushion and eliminates lost motion, while the washer merely serves as an intermediate bearing for said arm and said spring to retain these parts in proper working condition. The spring *J*
15 assures the closing of the electrodes *d* and *e* within the combustion chamber, and in a measure said spring coöperates with spring *l* upon member *h*. Jars to which such devices are exposed are thereby received under
20 the cushioning action of two springs and rendered non-injurious to the operation and durability of the device. In falling or being attracted onto its poles the armature attains momentum and strikes the arm *f*
25 with a blow (like a hammer) in consequence whereof the electrodes are parted under or with accelerated motive force and the result is an electrical discharge of high calorific efficiency.

30 The auxiliary circuit closer *D* is preferably connected with a rotative part of the engine in such manner that the circuit will be closed at the moment when the charge in the cylinder should be exploded. Upon the
35 closing of the circuit maker or closer *D*, the current passes from the cell *A* through the coil *B* and conductor *C*. The conductor *C* forms an electrical contact with one end of the coil *H*. The other end of the wire forming
40 said coil is in electrical communication with the plug *G*. This allows the current flowing through the conductor *C* to first enter the coil *H* and pass from thence to the electrode *E*, contact point *d*, short arm *e*,
45 and rotatable electrode *F*. Since the electrode *F* is not insulated from the plug, the current will pass to the plug *G* and through the engine to the ground. When the circuit is closed, the winding *H* establishes a mag-
50 netic field in the plug *G* whereupon the armature is attracted and the part *h* thereof strikes the arm *f* which rotates the electrode *F* causing a parting of the contact points whereupon a spark is produced between the
55 parts *d* and *e* of the electrodes *E* and *F*. This spark is increased in intensity due to the presence of the sparking coil *B* in the circuit. The moment however the points are parted the circuit is again broken, the field
60 established by the winding *H* becomes demagnetized, releasing in turn the armature and following this the spring *J* retracts the arm *f*, which allows the points *d* and *e* to make contact, ready for effecting another
65 spark as quickly as the armature is attracted.

It will be noticed that there is clearance established between the contact face *h* of the armature and the free end of arm *f* such a condition is of vital importance in order to assure satisfactory results as to sparking. 70

What I claim and desire to secure by Letters Patent is:

1. An igniter plug for explosive engines with fixed and movable electrodes, a winding and a pivoted armature, the said electrodes being arranged approximately at right angles to the pivots of said armature and the movable electrode carrying an arm which is arranged within contact reach of said armature the latter having a depending member adapted to control the movement of said armature in the manner and for the purpose as set forth. 75 80

2. In an igniter plug for explosive engines the combination with the movable electrode and a hinged armature of a depending member arranged in front of said armature for the purpose of controlling the movement of said electrode in the manner as set forth. 85 90

3. An igniter plug for explosive engines having a stationary and a movable electrode, a winding on said plug forming with a portion of said plug an electro-magnet, an armature upon said plug, and a connector forming the terminal of said winding, said connector extending in a direction substantially axial of the coils of said winding and interposed between adjacent layers thereof. 95 100

4. In an igniter plug the combination with an electro-magnet an armature and a pivotal support therefor of a casing surrounding the said parts of said plug and serving as means to retain said support securely in position. 105

5. In a sparking igniter, the combination of a plug having a portion provided with a coil of wire forming an electro-magnet, and a curved armature mounted upon said plug and conforming in contour to the said coil of wire and adapted to be drawn toward said coil. 110

6. In a sparking igniter, the combination of a plug having a portion provided with a coil of wire, and a curved armature pivotally mounted upon said plug and partly encircling said wire coil. 115

7. In a sparking igniter, the combination of a plug, a movable electrode, an arm carried by said electrode, a winding upon the plug, an armature partly encircling said winding, there being an arm upon the armature adapted to deliver a blow to the arm carried by the movable electrode when the winding is energized, means for returning the armature to its initial position, and means for returning the arm carried by the movable electrode to its initial position when the winding is deenergized. 120 125 130

8. In a sparking igniter, the combination of a plug and an electro-magnet, an armature pivoted adjacent the electro-magnet, a fixed electrode, and a movable rod carrying a second electrode normally contacting the fixed electrode, said electrodes being carried by the plug, the armature being adapted to move when the electro-magnet is energized to impart a blow to the movable rod to break the contact with the fixed electrode, and means for cushioning the blow of the armature.

9. In a sparking igniter, the combination of a plug, an electro-magnet, an armature pivoted adjacent the electro-magnet, a fixed electrode carried by the plug, and a movable rod mounted in the plug carrying a second electrode normally contacting the fixed electrode, the said armature being adapted to move when the electro-magnet is energized to impart a blow to the movable rod to break the contact with the fixed electrode, and a resilient member in the path of the

armature with which the armature engages, whereby the blow thereof is cushioned. 25

10. In a sparking igniter, the combination of a plug, an electro-magnet, an armature pivoted adjacent the electro-magnet, a fixed electrode carried by the plug, and a movable rod mounted in the plug carrying a second electrode normally contacting the fixed electrode, the said armature being adapted to move when the electro-magnet is energized to impart a blow to the movable rod to break the contact with the fixed electrode, and a resiliently supported plunger in the path of the member with which the said armature engages, whereby the blow is cushioned. 30 35

In witness whereof, I have hereunto set my hand in the presence of two witnesses. 40

ARTHUR R. BULLOCK.

Witnesses:

BERNH. F. EIBLER,
HORACE G. SIETZ.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."