

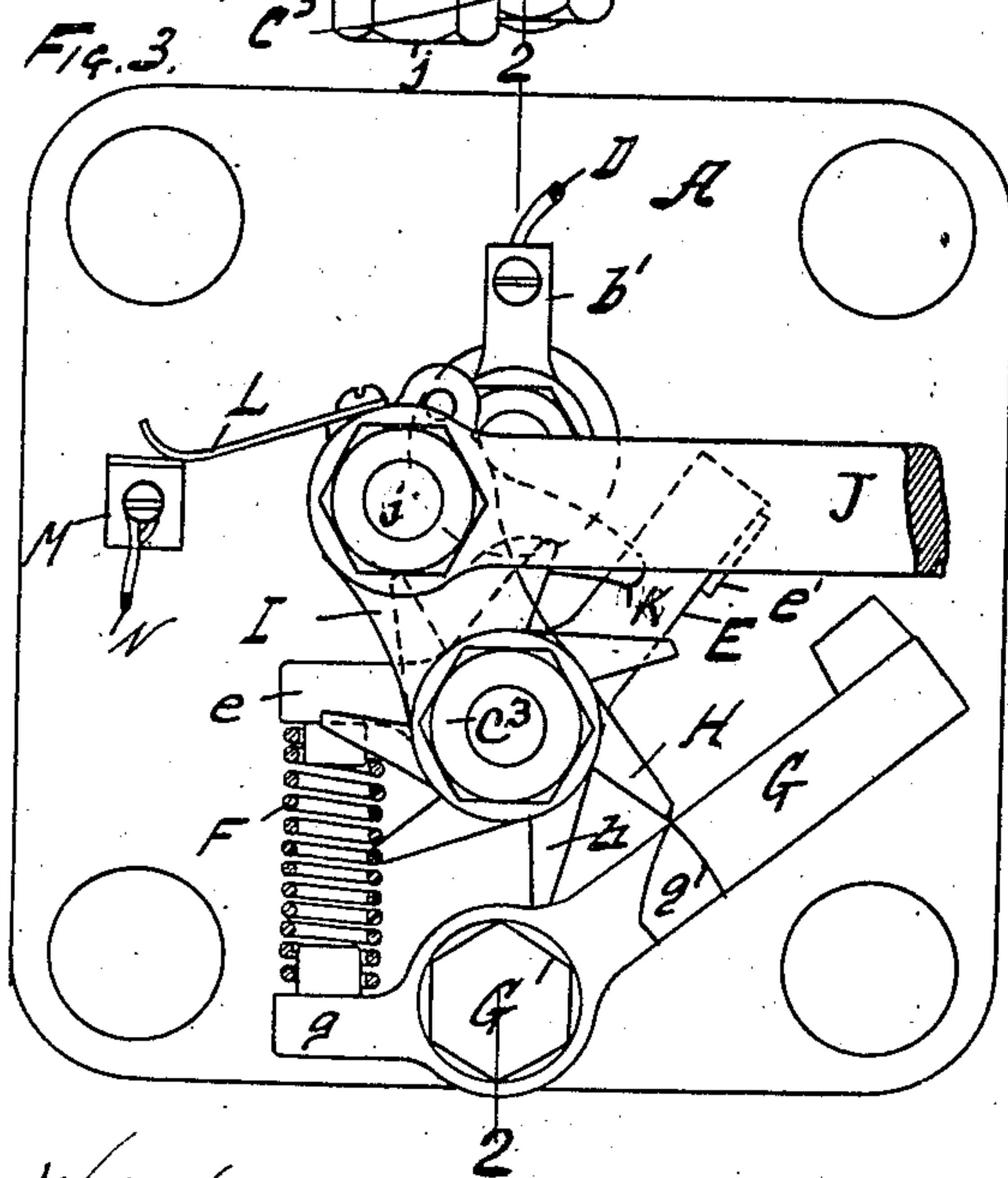
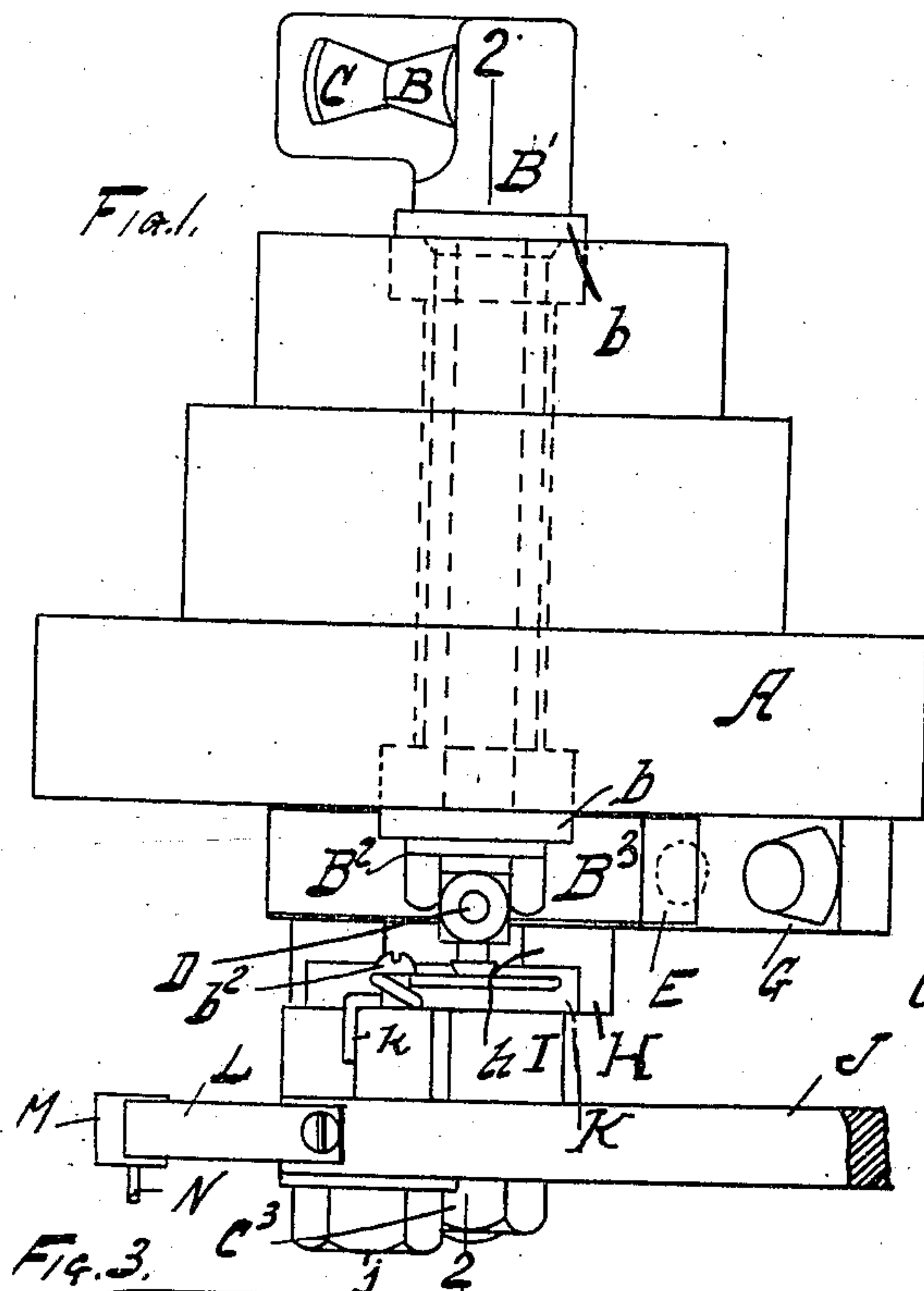
No. 837,708.

PATENTED DEC. 4, 1906.

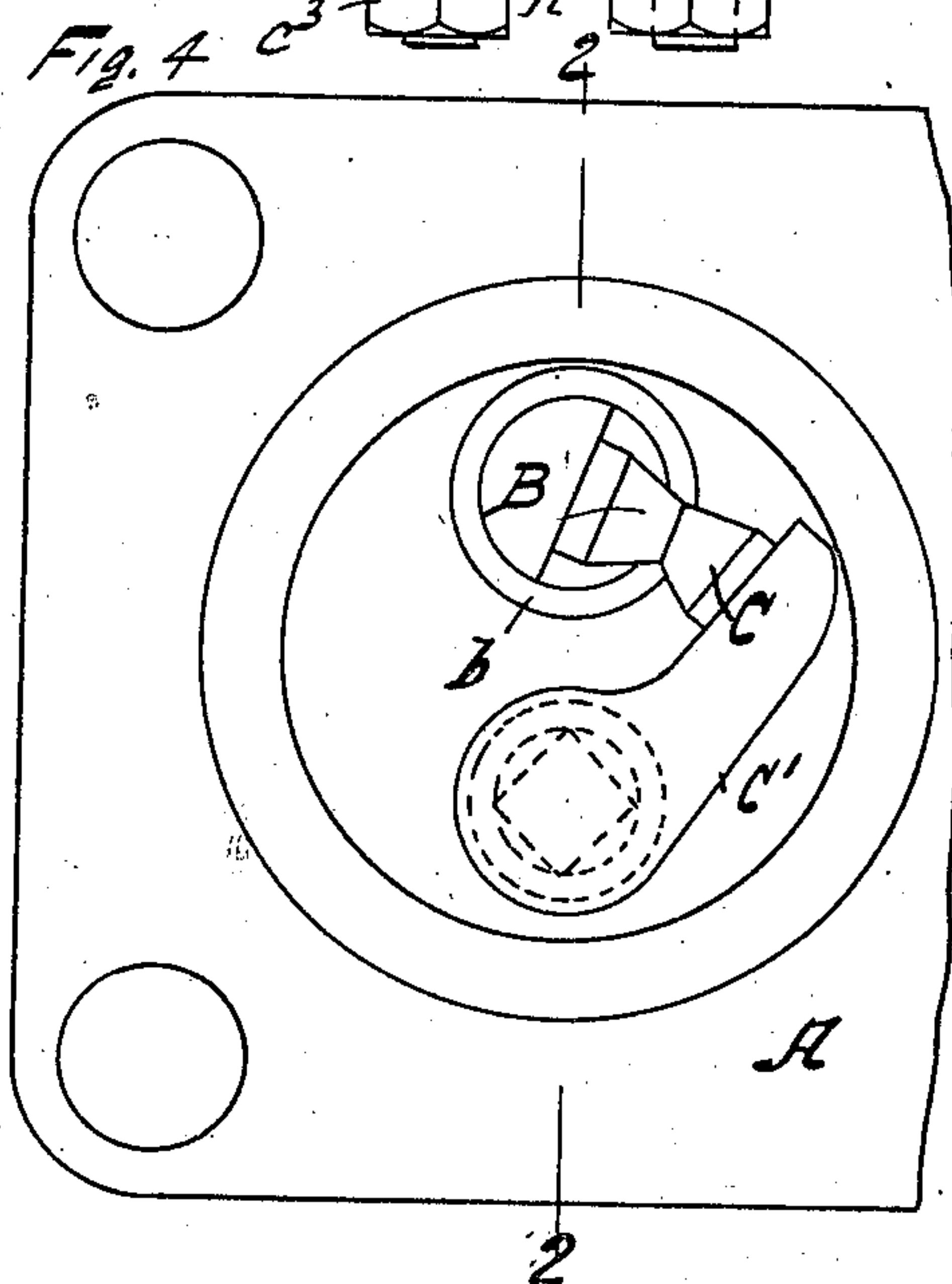
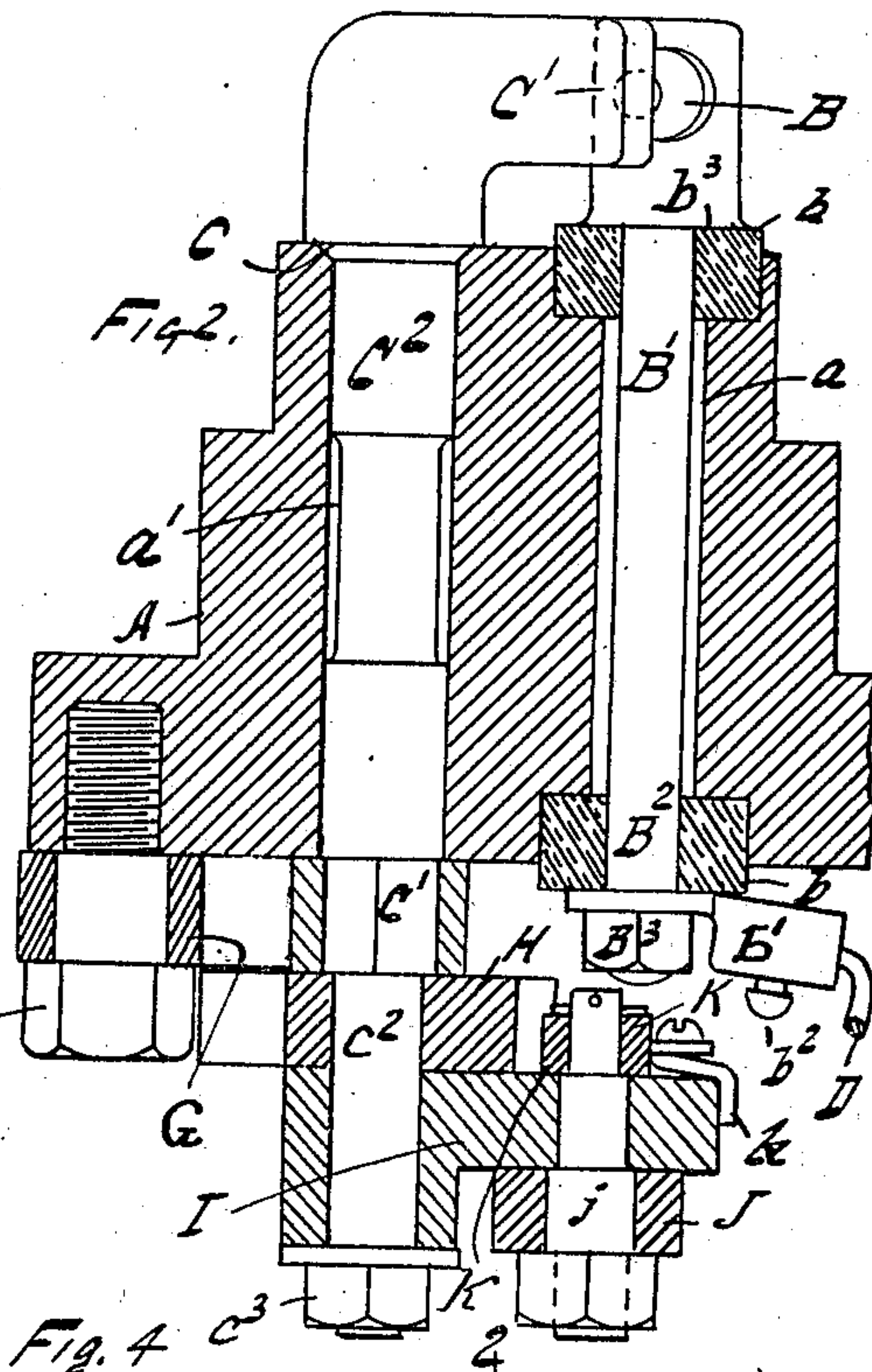
H. D. MURRAY & E. J. FITHIAN.

IGNITING DEVICE FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAY 27, 1905.



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# UNITED STATES PATENT OFFICE.

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## IGNITING DEVICE FOR EXPLOSIVE-ENGINES.

No. 837,708.

Specification of Letters Patent.

Patented Dec. 4, 1906.

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*To all whom it may concern:*

Be it known that we, HARRY D. MURRAY and EDWIN J. FITHIAN, citizens of the United States, residing at Grove City, in the county of Mercer and State of Pennsylvania, have invented new and useful Improvements in Igniting Devices for Explosive-Engines, of which the following is a specification.

This invention relates to igniting devices for explosive-engines; and it consists in certain improvements in the construction thereof, as will be hereinafter fully described, and pointed out in the claims. The ignition is effected in this apparatus by an electric spark, and the apparatus is designed to simplify and make more efficient devices of this character.

The invention is illustrated in the accompanying drawings, as follows: Figure 1 shows a plan view of a spark-plug with mechanism in place thereon; Fig. 2, a section on the line 2 2 in Figs. 1, 3, and 4, the lever I being swung to a vertical position; Fig. 3, an end elevation of the plug with the mechanism attached; Fig. 4, an end view of the same from the interior of the plug, with attached mechanism, the point of view being from the inside end of the plug.

A marks the spark-plug. This, ordinarily, is a cylinder part and is secured in the cylinder of the explosive-engine and can be readily removed, carrying with it all the parts of the igniting device. The electrodes B and C are arranged at the inner ends of the plug. The electrode B is carried by the post B', which extends through the opening a in the plug. At each end of this opening insulating-blocks b are arranged. The washer B<sup>2</sup> is arranged at the outer end of the post B' and is secured in place thereon by a nut B<sup>3</sup>. This nut B<sup>3</sup> forces the shoulder b<sup>3</sup> against the inner block b and the washer B<sup>2</sup> against the outer block b, thus assembling these parts of the mechanism. A socket b' extends from the washer B<sup>2</sup>, into which is inserted one of the wires D. A perfect contact is secured by means of the set-screw b<sup>2</sup>.

The electrode B is stationary. The electrode C is movable and is carried by the arm C'. The arm C' is preferably an integral part of a rod C<sup>2</sup>, extending into the opening a' in the plug A. A shoulder c engages the plug at the inner end of the opening a'. Just

outside of the plug A the rod C<sup>2</sup> has a squared portion c'. An actuating-lever E is arranged on this squared portion. An arm e extends from this lever, and a spring F presses against it, tending to keep the electrode C in contact with the electrode B. The opposite end of the lever E has an anvil-surface e', which is subjected to the blow of the hammer device to move the rod C<sup>2</sup> and arm C', so as to break the contact between electrodes C and B and form spark. The hammer-lever G is pivoted on the post G', and post G' is secured to the plug A. One end g of the hammer-lever G is acted upon by the spring F, which tends to force the hammer-lever G toward the lever E. The hammer-lever G is also provided with a cam-lug g'. This cam-lug g' is in the path of the ratchet-cam H. The ratchet-cam H is rotatively mounted on the extension C<sup>2</sup> of the shaft c<sup>2</sup>. This ratchet-cam is arranged immediately outside of the lever E. Next to the ratchet-cam H a rock-lever I is mounted on the extension c<sup>2</sup>. This is secured in place by a nut c<sup>3</sup>. A reciprocating lever J, attached to some part of the engine, actuates the rock-lever I. It is pivotally connected with the rock-lever I by means of the bolt j. The ratchet-pawl K is secured to the inner end of this bolt and is forced into engagement with the ratchet-cam H by means of the spring k. The ratchet-pawl is designed to catch one of the teeth h with each reciprocation of the lever J and move it one space. The other wire for the electric circuit may be connected directly through the plug; but we prefer to break the connection except just at the time of sparking, and to accomplish this any device may be used. We have shown one way that this may be done. A spring-switch finger L is mounted on the end of the reciprocating rod J, and just prior to the end of the movement of the rod J it contacts a post M, which is insulated from the plug. The contact through the switch L M is completed just prior to the release of the hammer-lever G, so that at the moment of release there is a current passing through the electrodes C and B.

The operation of the device is as follows: In the position shown in the drawings the electrodes C and B are together. The ratchet-cam H has been moved through the action of the lever J and pawl K to nearly the ex-



treme of one of its movements, so that a tooth *h* is just about to release this cam-lug. Just as this tooth *h* passes the cam-lug *g'* the hammer-lever *G*, through the action of the spring *F*, is sprung forward, striking the lever *E* and oscillating to a slight extent the rod *C<sup>2</sup>*, and this oscillation acting through the arm *C'* breaks the contact between the electrodes *C* and *B* and forms a spark. Immediately the spark is formed the ignition takes place, and the pressure in the cylinder acting against the rod *C<sup>2</sup>* forces the shoulder *c* into contact with the plug *A* and momentarily holds the arm *C'* against a return movement. This locking action will continue until the pressure in the cylinder is reduced through the exhaust at the end of the stroke. While it remains in this position the lever *J* has moved sufficiently to open the switch *L M*, so that when the electrodes *C* and *B* return to contact through the influence of the spring *F* upon the end *e* of the lever *E* the circuit is broken through the switch *L M*. In this manner there is no waste of current.

It will be noted that in this device even though the electrodes *C* and *B* are burned off or worn off the moment of spark is practically the same, inasmuch as the hammer-lever *G* is released at exactly the same point in the travel of the lever *J*. The very slight difference in the position of the lever *E* through any corrosion or wearing off of the electrodes *C* and *B* would make so little difference in the moment of delivery of the blow by the lever *G* as to be practically imperceptible. Through this mechanism, therefore, a substantially uniform spark-moment may be obtained and maintained throughout the life of the device.

What we claim as new is—

1. In an igniting device for explosive-engines, the combination with the cylinder part; electrodes arranged within said cylinder part; means for completing an electric circuit through said electrodes; an oscillating rod extending through said part and carrying one of said electrodes; means outside of said cylinder part for oscillating said rod for breaking contact; means actuated by the pressure of exploded gases for momentarily locking said rod against a return movement; and means for breaking the circuit while said rod is momentarily locked against the return movement.

2. In an igniting device for explosive-engines, the combination with the plug *A*; the electrodes *C* and *B* arranged on the inner end of the plug; means for completing an electric circuit through said electrodes; the rod *C<sup>2</sup>* extending through the plug and having the arms *C'* thereon for carrying the contact-points *C*; the shoulder *c* on said rod engaging said plug; means for rocking the rod *C<sup>2</sup>* for breaking the contact between the electrodes *C* and *B*, said rod *C<sup>2</sup>* being free to move axi-

ally to permit the shoulder *C'* to be brought into frictional contact with the plug *A* to lock the rod against a return movement; and means for breaking the electric circuit while the rod is locked against the return movement.

3. In an igniting device for explosive-engines, the combination with the electrodes; a movable means carrying one of said electrodes; devices for delivering a hammer-blow to said means to break the contact; rotating mechanism comprising a ratchet-cam for actuating said hammer device; and means imparting movement to said rotary mechanism.

4. In an igniting device for explosive-engines, the combination with the electrodes; a movable means carrying one of said electrodes; devices for delivering a hammer-blow to said means to break the contact; a ratchet-cam; the teeth of which in their movement actuate and release the hammer devices; and a reciprocating bar and pawl therein operating upon the teeth of said ratchet for rotating the same step by step.

5. In an igniting device for explosive-engines, the combination with the electrodes; movable means carrying one of said electrodes; a lever *E* for moving said movable means; a spring *F* actuating the lever *E*; the lever *G* forming a hammer device and arranged to deliver a hammer-blow to the lever *E* to break the contact of the electrodes, said lever *G* being influenced to this movement by the spring *F*; the ratchet-cam *H* having the teeth *h* adapted to operate the lever *G*; and the reciprocating part *J* and the ratchet-pawl *k* carried with the lever *J* and acting upon the teeth of the ratchet for moving the same.

6. In an igniting device for explosive-engines, the combination with the electrodes *C* and *B*; the oscillating rod *C<sup>2</sup>* having the arm *C'* carrying the electrode *C*; the plug *A* on which said parts are mounted; the lever *E* mounted on the rod *C<sup>2</sup>*; a hammer-lever *G* pivotally mounted and arranged to deliver a hammer-blow to the lever *E* to break the contact between the electrodes *C* and *B*; the spring *F* for actuating the lever *G* and lever *E*, the lever *G* to deliver the blow and the lever *E* to return the electrodes into contact; the cam-ratchet *H* arranged to operate the lever *G* as it is rotated; and a moving part for rotating the cam-lever *H*.

7. In an igniting device for explosive-engines, the combination with the electrodes *C* and *B*; the oscillating rod *C<sup>2</sup>* having the arm *C'* carrying the electrode *C*; the plug *A* on which said parts are mounted; the lever *E* mounted on the rod *C<sup>2</sup>*; a hammer-lever *G* pivotally mounted and arranged to deliver a hammer-blow to the lever *E* to break the contact between the electrodes *C* and *B*; the spring *F* for actuating the lever *G* and lever *E*, the lever *G* to deliver the blow and the



lever E to return the electrodes into contact; the cam-ratchet H arranged to operate the lever G as it is rotated; a moving part for rotating the cam-lever H; the rod C<sup>2</sup> having a shoulder c thereon free to be forced into frictional contact with the plug by the pressure of exploded gases and to lock the parts against a return movement.

5 8. In an igniting device for explosive-engines, the combination with the electrodes; a movable means carrying one of said electrodes; spring-actuated devices for delivering a hammer-blow to one of said means to

break the contact; means controlled by the exploded gases for momentarily holding the electrodes out of contact; and means for breaking the circuit during the time that the electrodes are locked out of contact.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

HARRY D. MURRAY.  
EDWIN J. FITHIAN.

Witnesses:

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J. M. REYNOLDS.