No. 669,233. Patented Mar. 5, 1901.

W. F. DAVIS.

ELECTRIC IGNITER FOR EXPLOSIVE ENGINES.

(Application filed Jan. 2, 1900.)

(No Model.) 2 Sheets—Sheet 1.

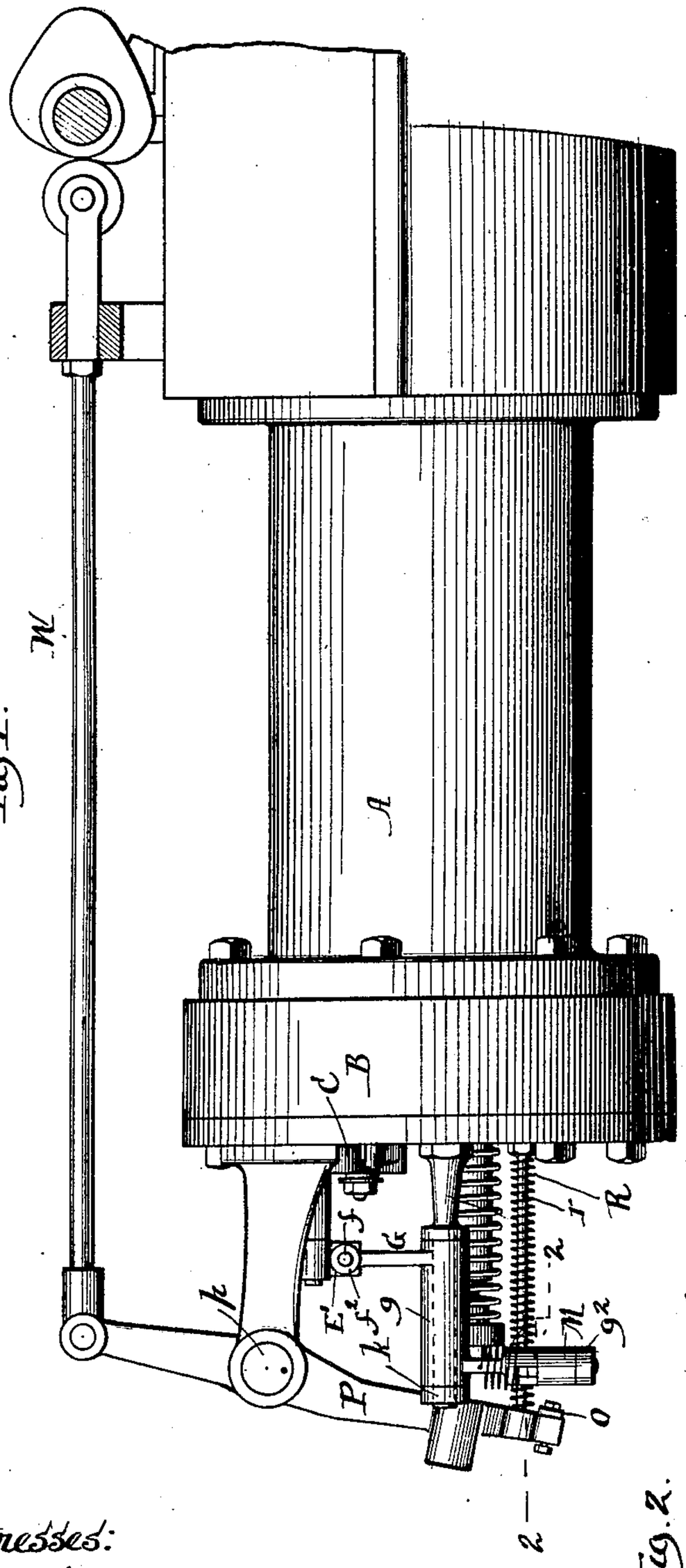

Fig. 1.

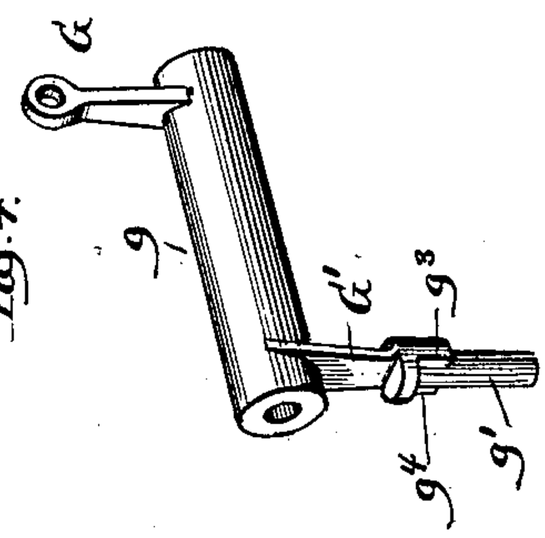

Fig. 4.

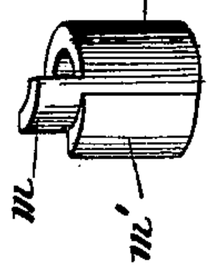

Fig. 5.

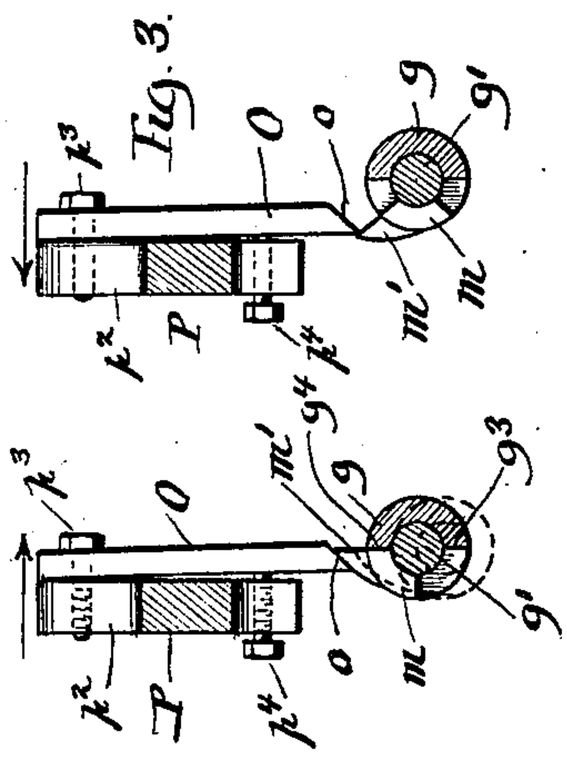

Fig. 3.

Fig. 2.

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Fig. 7.

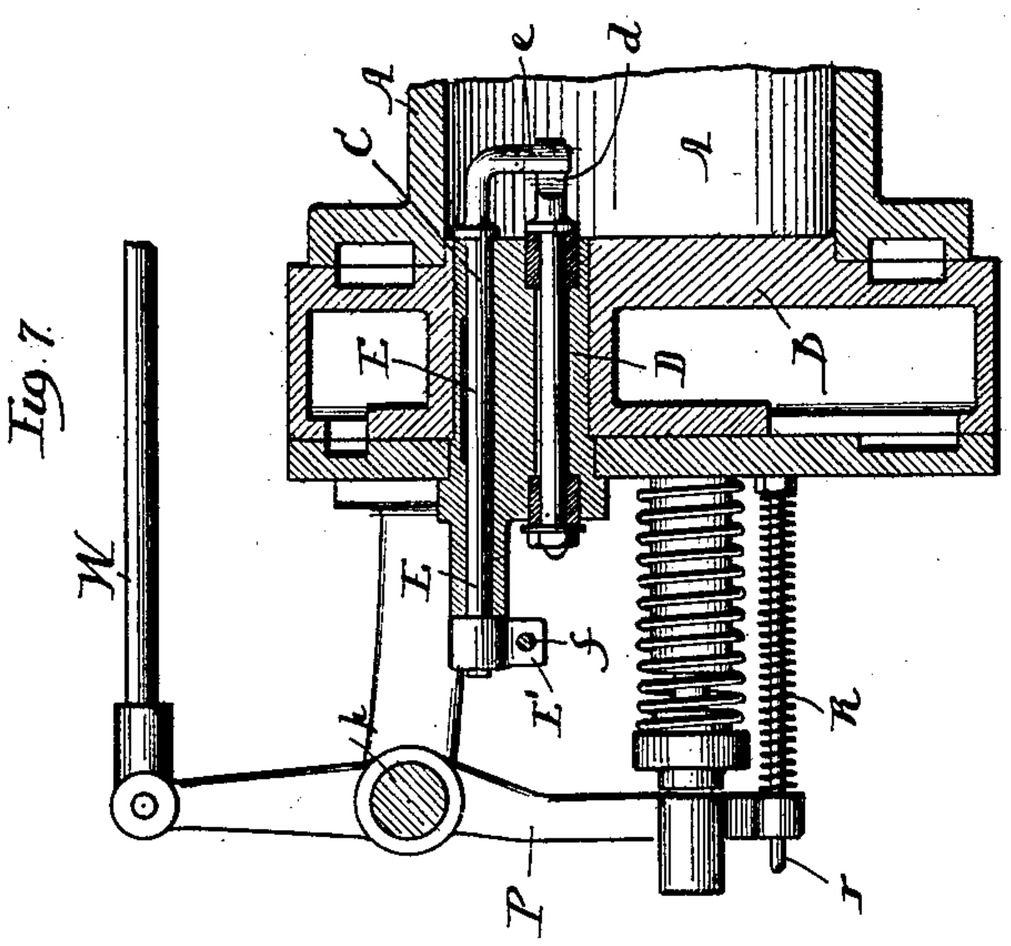


Fig. 9.

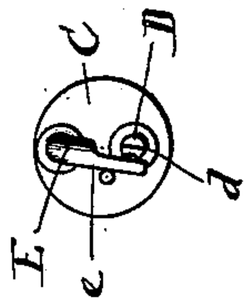


Fig. 6.

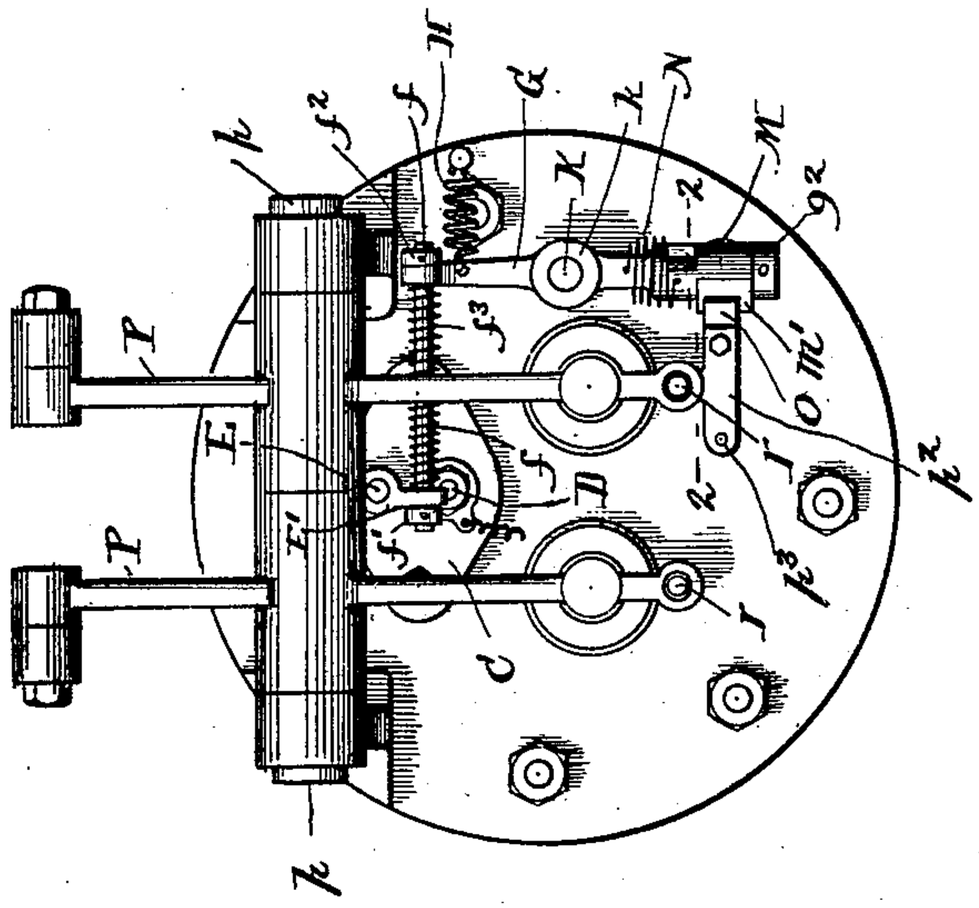
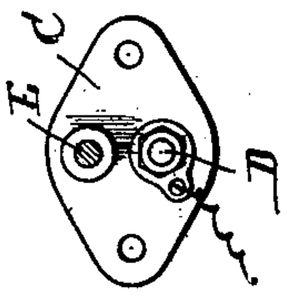


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM F. DAVIS, OF MILWAUKEE, WISCONSIN.

ELECTRIC IGNITER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 669,233, dated March 5, 1901.

Application filed January 2, 1900. Serial No. 101. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. DAVIS, a resident of the city and county of Milwaukee, State of Wisconsin, have invented certain new and useful Improvements in Electric Igniters for Explosive-Engines, of which the following is a full, clear, and exact description.

This invention has for its object to provide improved igniter mechanism whereby the charges of an explosive-engine may be ignited; and the invention consists in the features of improvement hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the claims at the end of this specification.

Figure 1 is a view in side elevation showing the cylinder and certain other parts of an explosive-engine having my invention applied thereto. Fig. 2 is an enlarged view in horizontal section on line 2 2 of Figs. 1 and 6. Fig. 3 is a view similar to Fig. 2, but showing the parts in different position. Fig. 4 is a detail perspective view of the rocker-sleeve and its arms. Fig. 5 is a detail perspective view of the trip-sleeve carried by one of the rocker-arms. Fig. 6 is an end view of the cylinder with the apparatus thereon. Fig. 7 is a view in vertical longitudinal section through the cylinder-head and through the casing of the igniter, parts being shown in elevation. Fig. 8 is a detail outer end view of the igniter-casing. Fig. 9 is a detail inner end view of the igniter-casing.

The cylinder A and the cylinder-head B may be of any approved construction. The cylinder-head B is provided with a suitable opening adapted to receive the igniter-casing C, whereby are carried a fixed electrode D and a movable electrode E. The fixed electrode D is shown as insulated from the casing C and is held in place by a nut that engages its outer threaded end, the inner end of the electrode being provided with a suitable shoulder or other convenient means for retaining it against displacement. The movable electrode E is provided at its inner end with an angular extension or terminal *e*, adapted to engage with the terminal *d* of the fixed electrode D. The outer end of the electrode D is connected with one branch of an electric circuit, the other branch of this circuit being suitably joined to the cylinder-head or other part of the engine, or, if preferred, directly to the end of the movable electrode E. The outer end of the movable electrode E has fixed thereto a shifting-arm E′, through which passes one end of a rod *f*, the opposite end of this rod passing through an opening in the upper end of a rock-arm G. The ends of the rod *f* are provided with the collars f' and f^2, fixed thereto and bearing, respectively, against the arm E′ and the rocker G. Between the arm E′ and the rocker G is interposed a spring f^3, this spring being preferably coiled about the rod *f* and having its ends bearing against the arm E′ and rocker-arm G. To the rock-arm G is connected one end of a spring H, the opposite end of which is attached to the cylinder-head or some other fixed point. The spring H serves to withdraw the rock-arm G to normal position (seen in Fig. 6) after said arm has been moved toward the arm E′. The purpose of the spring f^3 is to insure the firm contact of the electrode-terminals *d* and *e*.

As shown, the rock-arm G extends from one end of a hub or sleeve *g*, that is pivotally mounted upon a stud or bracket K, projecting from the end of the cylinder-head, the sleeve *g* being held in place upon the stud K by a suitable nut or collar *k*. From the hub or sleeve *g* also extends an arm G′, that serves to carry a trip-sleeve or pivot-block M. This trip-sleeve M seats over the rounded portion g' of the arm G′ and is held thereon in manner free to turn by a suitable collar g^2. The trip-sleeve M is provided with an arm or extension *m*, that projects between the shoulders or offsets g^3 and g^4 of the arm G′, these shoulders or offsets serving to limit the turning movement of the sleeve M. The sleeve M has connected thereto one end of a coil-spring N, (see Fig. 1,) that encircles the arm G′, the opposite end of the coil-spring N being attached to the arm G′. This spring N serves to hold the trip-sleeve M normally in the position seen in Fig. 2—that is to say, with the arm *m* of the sleeve in bearing against the shoulder or offsets g^4 of the arm G′. The sleeve M is furnished with a cam-shaped offset face or extension m', extending lengthwise thereof and adapted to be engaged by a trip-arm *o*, that is carried at the lower end of one of the valve-levers P, that is pivoted upon a shaft *p*, extending across the front of the cylinder-head.

The means for sustaining the valve-levers P forms no part of the present invention, and therefore need not be more particularly described. Each of the valve-levers is shown with an opening in its lower end, through which passes a rod r, that is encircled by a coil-spring R, the springs R serving to force the valve-levers normally outward. The lower end of the valve-lever P nearest the rocking sleeve g is provided with a lateral extension p^2, to which the trip-arm O is connected by the screws p^3 and p^4. By reference to Fig. 2 of the drawings it will be seen that by means of the screws p^4, that pass through a threaded opening in the arm p^2 of the lever P, the adjacent end of the trip-arm O can be adjusted, the purpose of this adjustment being to enable the exact time of ignition to be varied as may be required. In order to more readily permit the adjustment to be effected, the hole in the trip-arm O through which the screw p^3 passes will be formed somewhat larger than the screw, so that a slight turning of the arm about the screw is permitted. The end of the trip-arm O is beveled, as at o, to engage the inclined surface of the offset face or extension m' of the pivoted sleeve M, and this extension m' has a square edge, so that as soon as the trip-arm O passes off the inclined face of the extension it will abruptly release the sleeve M, so as to permit the instantaneous separation of the electrodes, as will presently more fully appear.

From the foregoing description the operation of the parts will be seen to be as follows: When the valve-lever P is operated—as, for example, by the valve-rod W—in manner well understood in the art, the lower end of the lever P being rocked toward the cylinder-head will about the end of its movement cause the trip-arm O to strike the inclined extension m' of the pivoted sleeve M. As the trip-arm O continues to move in the direction of the arrow, Fig. 2, it will force the sleeve or block M away from the outer end of the trip-arm O, thereby causing the rock-arms G and G' to turn about their pivot-points. As the rock-arm G is thus shifted it will compress the spring f^3 against the arm E' of the movable electrode E, and will thus force the terminal e of such electrode into firm bearing with the terminal d of the fixed electrode. As soon, however, as the trip-arm O passes from engagement with the extension m' of the sleeve M the spring H will draw back the rocking arm G and parts connected therewith to the normal position, (seen in Fig. 6,) and this backward movement of the rocking arm will cause the rod f to abruptly rock the movable electrode E, so as to produce a quick separation of its terminal e from the terminal d of the fixed electrode. This quick separation of the terminals will insure the electric spark necessary to explode the charge of vapor that has been admitted to the engine. By reference to Fig. 6 it will be seen that as the rock-arm G moves toward the shifting-arm E of the movable electrode the rod f will pass freely through either the upper end of the rock-arm G or through the shifting-arm E', since the connecting-rod does not serve to bring the terminals e and d together by a compression of the spring f^3. On the reverse movement of the rock-arm G, however, it will be seen that the connecting-rod f comes into play and serves to quickly and positively effect the separation of the electrode-terminals. On the return movement of the rod-lever P—that is to say, when the lower end of such lever is moving in the direction of the arrow, Fig. 3—the outer end of the trip-arm O will contact with the square face of the extension m' of the sleeve M', thereby turning the sleeve against the force of the spring N until the arm O clears the extension m', when the spring N restores such sleeve to the normal position. (Seen in Fig. 2 of the drawings.)

While I have described what I regard as the preferred embodiment of my invention, I do not wish the invention to be restricted to the precise details of construction above described, since these may obviously be varied by the skilled mechanic.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric igniter for explosive-engines the combination of two electrodes, one of which is movable and provided at its outer end with a shifting arm or extension, of a rock-arm, a connecting-rod interposed between said arms, said rod loosely connected to said shifting-arm but provided with a projection for engaging the same, a spring also interposed between said arms and bearing against each of them and means for vibrating said rock-arm.

2. In an electric igniter for explosive-engines the combination with two electrodes, one of which is movable and provided at its outer end with a shifting-arm, of a rock-arm, a rod loosely connected to and provided with projections for engaging each of said arms, a spring interposed between said arms and means for vibrating said rock-arm.

3. In an electric igniter for explosive-engines, the combination with suitable fixed and movable electrodes, the movable electrode being provided with a shifting-arm at its outer end, of means for operating said movable electrode, comprising a rock-arm G and means for vibrating said rock-arm, a spring H for restoring said rock-arm G to normal position, a connecting-rod f provided with stops or collars f' and f^2 for engaging said shifting-arm E' and said rock-arm G, and a spring f^3 upon said rod f, and bearing against said arms E' and G.

4. In an electric igniter for explosive-engines, the combination of two electrodes, one of which is movable, of mechanism for operating said movable electrode comprising a rock-arm, connections between said rock-arm and said movable electrode, a sleeve or block

having an extension pivoted to said rock-arm, a movable trip-arm for engaging said extension and a spring for holding said sleeve or block in normal position.

5. In an electric igniter for explosive-engines, the combination with a fixed electrode and with a movable electrode having a shifting-arm at its outer end, of mechanism for operating the movable electrode comprising a rock-arm, a connecting-rod and spring interposed between said rock-arm and the shifting-arm of the movable electrode, a second rock-arm connected with the hub or sleeve of the first-mentioned rock-arm, a pivoted sleeve having an inclined extension carried by said second rock-arm, a movable trip-arm for engaging the extension of said pivoted sleeve or block and a spring for holding said pivoted sleeve in normal position.

6. In an electric igniter for explosive-engines, the combination with a fixed electrode and with a movable electrode having a shifting-arm at its outer end, of mechanism for operating the movable electrode, comprising a rock-arm, a rod and spring interposed between said rock-arm and said shifting-arm of the movable electrode, a second rock-arm connected with the hub or sleeve of said first-mentioned rock-arm, a pivoted sleeve or block carried by said second rock-arm and an adjustable trip-arm adapted to engage said pivoted sleeve or block.

7. In an electric igniter for explosive-engines, the combination with a fixed electrode and with a movable electrode having a shifting-arm at its outer end and mechanism for operating said movable electrode, comprising a rock-arm, a connecting-rod and spring interposed between said rock-arm and said shifting-arm of the movable electrode, a second rock-arm connected with the hub or sleeve of said first-mentioned rock-arm, a sleeve or block carried by said second rock-arm and having an inclined extension, a trip-arm adapted to engage said inclined extension and a valve-lever whereby said trip-arm is carried.

8. In an electrical igniting device for explosive-engines, the combination with two electrodes, one of which is movable, and provided at its outer end with a shifting arm or extension, of mechanism for operating said movable electrode comprising a moving part, mechanical connections between said moving part and said shifter arm or extension, a sleeve or block having an extension and pivoted to said moving part, a trip device connected to and operated by a moving part of the engine for engaging said extension and a spring for holding said sleeve or block in normal position.

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