No. 735,863. PATENTED AUG. 11, 1903.

O. C. DURYEA & M. C. WHITE.

CONTROLLING MEANS FOR ENGINES.

APPLICATION FILED MAR. 27, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

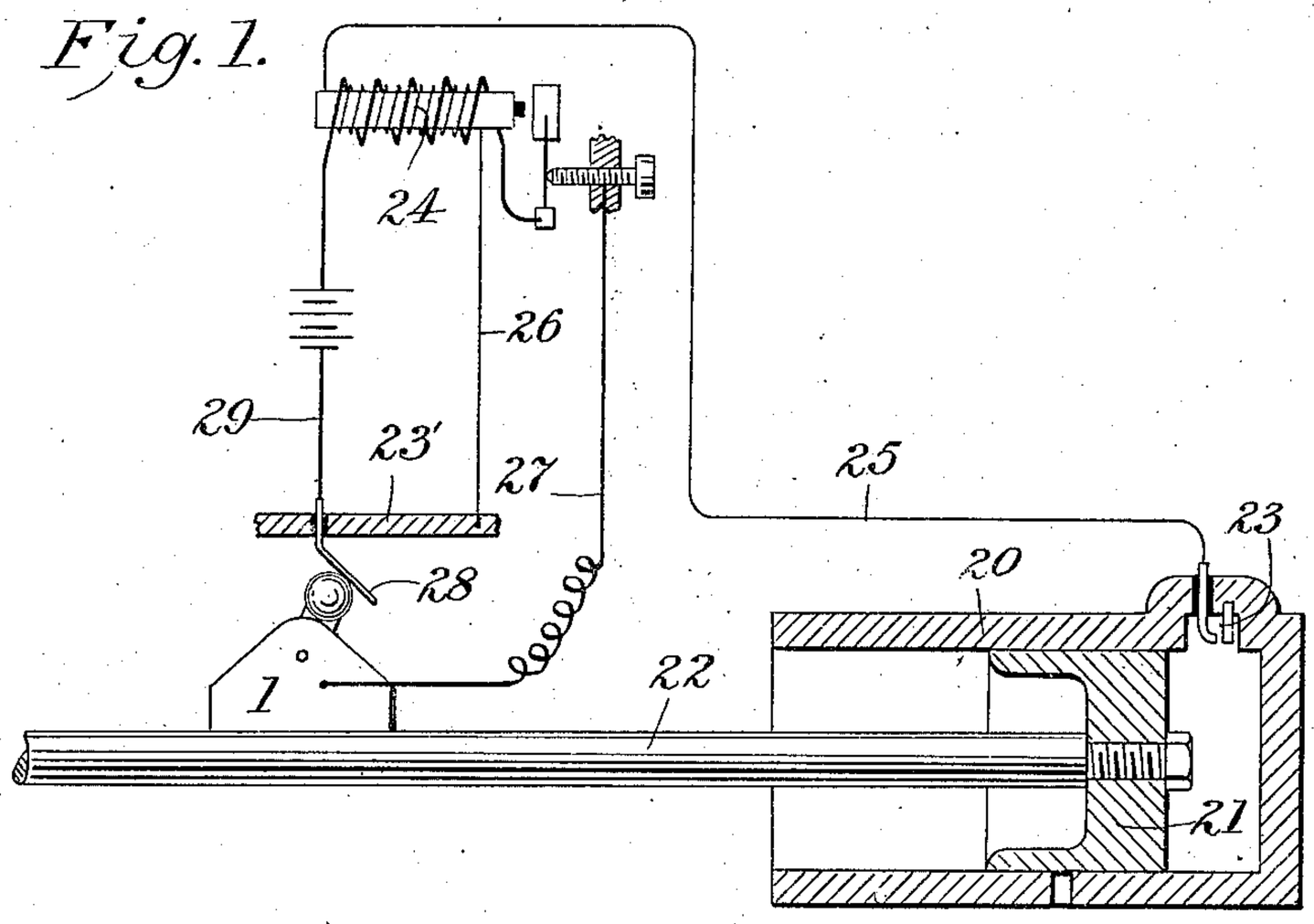


Fig. V.

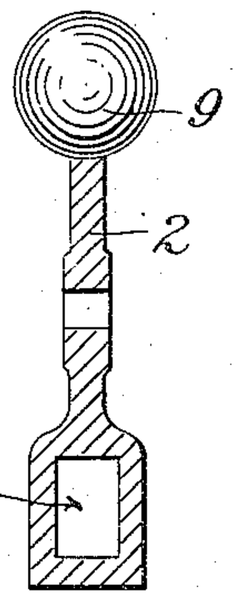


Fig. II.

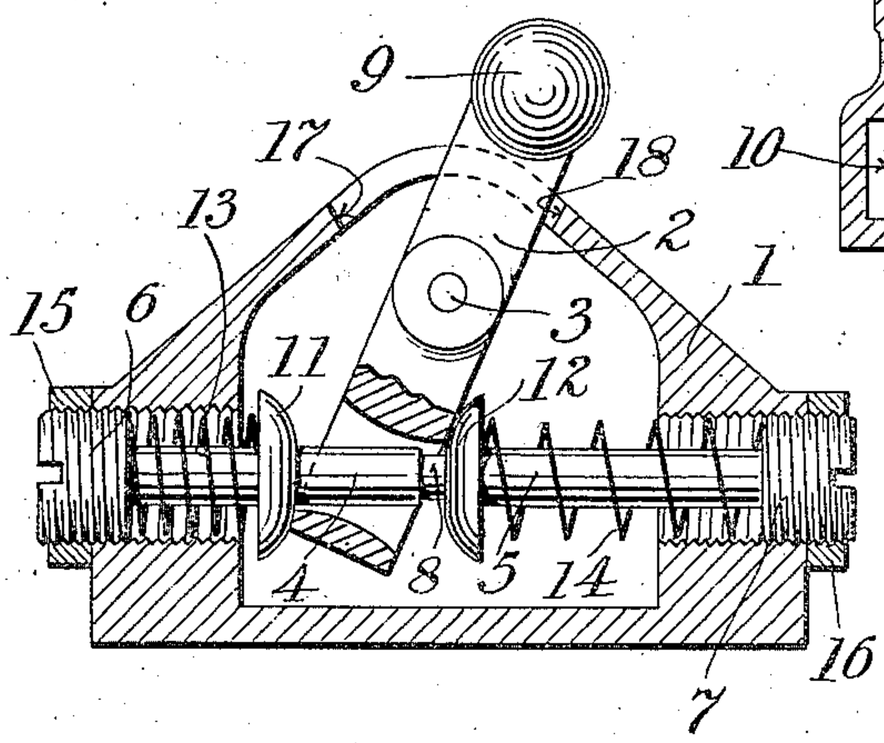
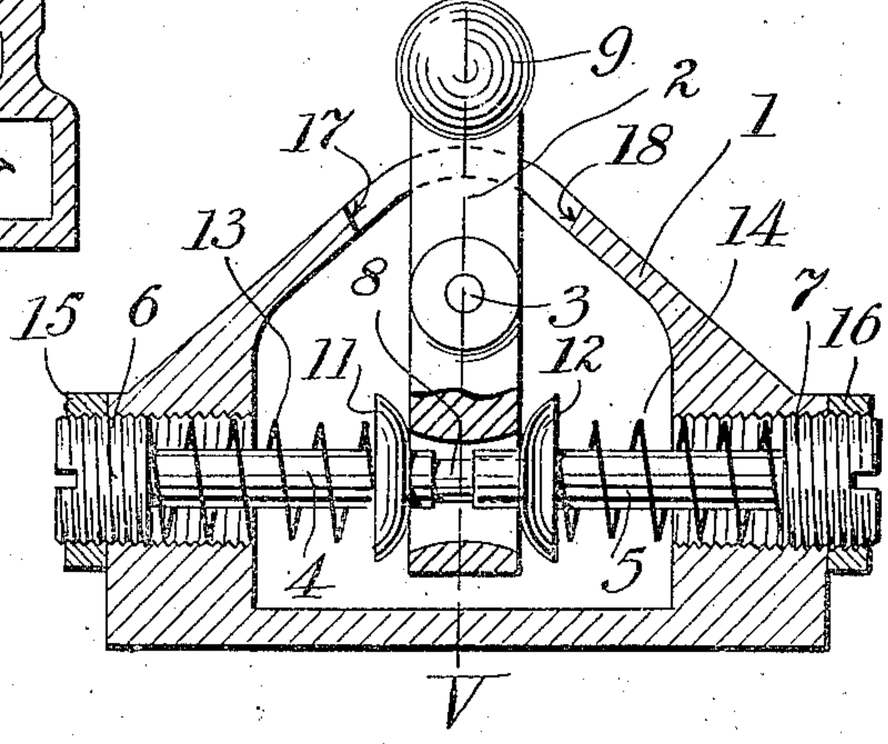


Fig. III.



Witnesses:

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J. Townsend.

Inventors:

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by Townsend Bros

Their attys.

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CONTROLLING MEANS FOR ENGINES.

APPLICATION FILED MAR. 27, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

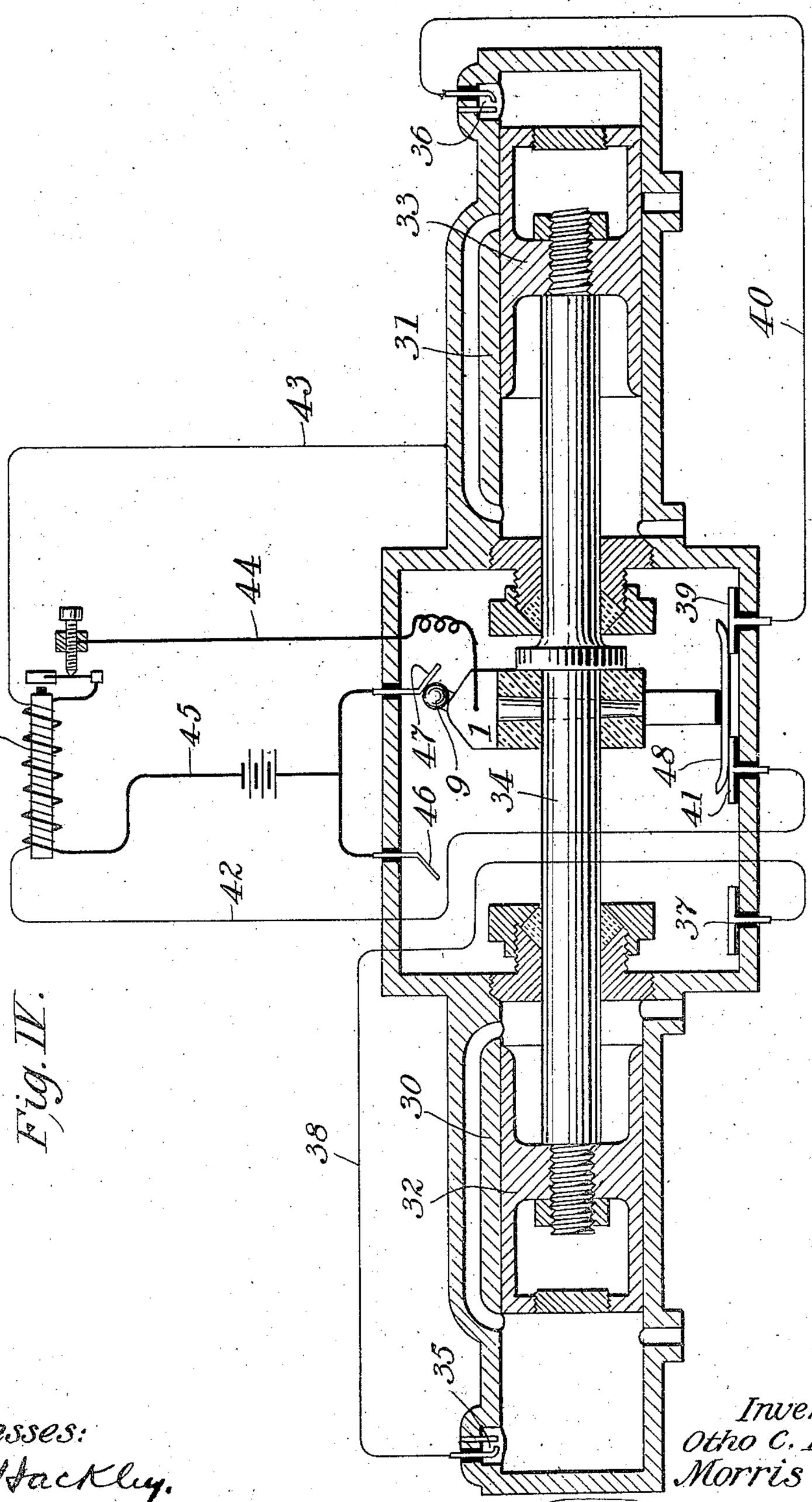

Fig. IV.

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No. 735,863. Patented August 11, 1903.

UNITED STATES PATENT OFFICE.

OTHO C. DURYEA AND MORRIS C. WHITE, OF LOS ANGELES, CALIFORNIA, ASSIGNORS TO NATIONAL FREE PISTON ENGINE COMPANY, (LIMITED,) OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

CONTROLLING MEANS FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 735,863, dated August 11, 1903.

Application filed March 27, 1902. Serial No. 100,303. (No model.)

To all whom it may concern:

Be it known that we, OTHO C. DURYEA and MORRIS C. WHITE, residing in the city and county of Los Angeles and State of California, have invented certain new and useful Improvements in Controlling Means for Engines, of which the following is a specification.

Our invention relates particularly to means for controlling an electric circuit in an engine, which circuit may operate sparking devices to explode a gas which furnishes the power, or it may operate valves for the passage of air, gas, steam, and other agents which may be used to furnish power in the engine. In this embodiment we have shown and described our device as controlling an electric circuit and sparking mechanism of an explosive-engine; but it should be understood that we do not limit ourselves to this specific application of the device, as it may be equally effective and valuable when applied to and coöperating with other mechanisms, as described.

Our invention is particularly applicable to engines having a stroke of varying length—such, for instance, as a self-contained power-drill, which is shown and described in an application of ours executed March 21, 1902. By employing our device other forms of engines or drills may be modified to have a variable stroke.

An object is to produce a simple device which is self-contained and very effective in operation.

Referring to the drawings, Figure I shows our device as applied to an explosive-engine having a variable stroke. Fig. II is a vertical sectional view of our device, showing the parts in one position. Fig. III is a similar view showing the parts in another position. Fig. IV is a view showing the device as applied to a two-cylinder engine having a varying stroke. Fig. V is a detail in section, taken on the line V V, Fig. III.

1 is a standard.

2 is an inertia-piece, in this embodiment a bar pivoted to the standard by a pin 3.

4 and 5 are oppositely-arranged rods having enlarged screw-threaded heads 6 and 7, which take into threaded portions of the standard 1. One of the rods 4 may have a contracted end, as at 8, which may fit into a tubular end of the rod 5. One end of the inertia piece may carry a weight 9. The other end may be enlarged and provided with a slot for the rods 4 and 5.

11 and 12 are suitable washers, which are carried by the rods 4 and 5 and which may lie against the bar 2.

13 and 14 are suitable springs, one of which lies between the head 6 and washer 11, the other lying between the head 7 and washer 12.

15 and 16 are the lock-nuts.

17 and 18 are shoulders formed on the standard 1.

20 is a cylinder of an explosive-engine.

21 is a piston having a piston-rod 22 connected thereto.

23 is a sparking plug in the cylinder 20.

The standard 1 may be suitably mounted on the piston-rod 22.

23′ is a portion of the frame of the engine.

24 is an induction-coil, the secondary being connected to the sparking plug 23 by wire 25 and grounded to the frame by wire 26. The primary of induction-coil is connected to the standard 1 by wire 27, the other pole of the primary being connected to a flexible contact-blade 28 by wire 29. When the piston-rod 22 is reciprocated, the standard 1 is likewise moved, and when the weight 9 is brought into contact with the blade 28 the circuit is completed, which energizes the induction-coil and causes a spark through the plug 23. The weight 9 may be brought into contact with the blade 28 by the shoulder 17 bearing against the bar 2 and moving the weight into contact, or should the piston-rod commence its return stroke before thus moving the weight into contact the inertia of the weight will cause it to swing, like an inverted pendulum, into contact with the blade 28.

Fig. IV shows the manner of applying our device to a two-cylinder engine, in which 30 and 31 are cylinders containing, respectively, pistons 32 and 33, which are connected by a piston-rod 34. 35 and 36 are sparking plugs arranged in cylinders 30 and 31. The spark-

ing plug 35 is connected to a contact-block 37 by a wire 38, while sparking plug 36 is connected with a contact-block 39 by a wire 40. The secondary of the induction-coil is connected to a contact-block 41 by a wire 42, while wire 43 from secondary of an induction-coil 24 is grounded on the frame. Wire 44 connects the primary of induction-coil 24 with the standard 1, while a wire 45 from the primary of induction-coil 24 is branched and connects with flexible contact-blades 46 and 47, mounted in the frame. 48 is a contact-blade carried by the piston-rod 34. When the piston-rod and attached parts are in the position shown in Fig. IV, the contact-blade 48 forms a connection between contact-blocks 41 and 39, thus completing the secondary circuit, and the weight 9 is in contact with blade 47, thus completing the primary circuit. The induction-coil being thus energized, a spark is caused at sparking plug 36, which explodes the gas in cylinder 31 and drives the piston 33 and attached parts to the left, thus breaking the contact between weight 9 and blade 47 and breaking the contact between blade 48 and contact 39. When the parts have moved to the left sufficiently, the weight 9 is thrown into contact with blade 46 either by its inertia or by means of the shoulder 18 pressing against bar 2, as before explained, and the primary circuit is completed. At the same time the blade 48 has been moved into contact with contact-block 37 and contact-block 41, thereby completing the secondary circuit, energizing the induction-coil 34, and causing a spark at sparking plug 35, which explodes the gas in cylinder 30 and drives the piston 32 and attached parts to the right and breaking contact between weight 9 and blade 46 and also connection between block 37 and block 41. The action of the weight 9 is to be thrown into contact alternately with blades 46 and 47 at the end of each stroke either by inertia or through the medium of either of the shoulders 17 and 18. The bar 2 is allowed a sufficient degree of swing, so as to reach the contact-blade at the shortest length of stroke which occurs in an engine having a variable stroke. The springs 13 and 14 serve to return the weight to normal position after contacting with a blade. When running at a high speed, the bar 2 may not stand vertically, as shown in Fig. V, but the springs operate to counterbalance the weight 9 and steady it from erratic movement. The tension of the springs may be regulated by the screws 5 and 6, the ends of the rods 4 and 5 telescoping to allow of this adjustment.

While we have shown the device as applied to a horizontal engine, it will operate equally well when applied to a vertical engine by properly adjusting the tension of the springs 13 and 14.

It is obvious that many changes may be made in the particular construction herein shown and described without departing from the spirit of the invention.

What we claim is—

1. A plurality of cylinders, a piston in each cylinder, a rod connecting said pistons, sparking mechanism having sparking terminals in each cylinder, an electric circuit for controlling said sparking mechanism, an inertia-piece carried by said rod and forming a movable terminal, a stationary contact electrically connected to one pair of sparking terminals, another stationary contact electrically connected to the other sparking terminals, each contact being at opposite limits of the path of movement of said inertia-piece.

2. A plurality of cylinders, a piston in each cylinder, a rod connecting said pistons, sparking mechanism having sparking terminals in each cylinder, an electric circuit for controlling said sparking mechanism, an inertia-piece carried by said rod and forming a movable terminal, a stationary flexible contact electrically connected to one pair of sparking terminals, another stationary flexible contact electrically connected to the other sparking terminals, each contact being at opposite limits of the path of movement of said inertia-piece.

3. A plurality of cylinders, a piston in each cylinder, a rod connecting said pistons, sparking mechanism having sparking terminals in each cylinder, an electric circuit for controlling said sparking mechanism, an inertia-piece carried by said rod and forming a movable terminal, a stationary contact electrically connected to one pair of sparking terminals, another stationary contact electrically connected to the other sparking terminals, each contact being at opposite limits of the path of movement of said inertia-piece; and adjustable means for regulating the inertial movement of said inertia-piece.

4. A cylinder, a piston therein, a sparking mechanism in said cylinder, an inertia-piece external of the cylinder and mounted on means reciprocated by the piston, an electric circuit for controlling said sparking mechanism; a contact-blade in said circuit and the path of the inertial movement of said inertia-piece.

5. A cylinder, a piston therein, a sparking mechanism in said cylinder, an electric circuit for controlling said sparking mechanism, said circuit being normally open, a circuit-closer comprising an inertia-piece flexibly mounted on means supported and carried by said piston, said inertia-piece being external of the cylinder and movable into contact with said circuit to close the same.

6. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism in said cylinder, an electric circuit for controlling said sparking mechanism, said circuit being normally open, a circuit-closer comprising an inertia-piece flexibly mounted

on said piston-rod, said inertia-piece being movable into contact with said circuit to close the same in movable contact with said circuit.

7. A cylinder, a piston therein, a sparking mechanism in said cylinder, an electric circuit for controlling said sparking mechanism, said circuit being normally open, a circuit-closer comprising an inertia-piece external of said cylinder and flexibly mounted on means supported and carried by said piston, a flexible contact-blade in said circuit and in the path of movement of said inertia-piece.

8. A cylinder, a piston therein, a sparking mechanism, an electric circuit for controlling said sparking mechanism, said circuit being normally open, a circuit-closer comprising an inertia-piece, a standard connected to said piston and carrying said inertia-piece, said piston having a variable length of stroke, said inertia-piece having an inertial movement independent of said standard, a contact-blade in said circuit and in the path of the inertial movement of the inertia-piece.

9. A cylinder, a piston therein, a sparking mechanism, an electric circuit for controlling said sparking mechanism, a circuit-closer comprising an inertia-piece flexibly mounted on means supported and carried by said piston, a flexible contact-blade in said circuit and in the path of movement of said inertia-piece.

10. A cylinder, a piston therein, an explosion-chamber, a sparking mechanism therein, an electric circuit for controlling said sparking mechanism, a circuit-closer external of said explosion-chamber comprising an inertia-piece, said inertia-piece being pivotally mounted on a standard, said standard being rigidly mounted on means supported and carried by said piston, said piston having a variable stroke, and a flexible contact-blade in said circuit and in the path of the inertial movement of said inertia-piece.

11. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism, an electric circuit for controlling said sparking mechanism, a standard, an inertia-piece pivoted to said standard and forming a circuit-closer, said standard being mounted on said piston-rod, said piston operating to move said inertia-piece and cause it to contact with and close said circuit.

12. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism, an electric circuit for controlling said sparking mechanism, a standard, an inertia-piece pivotally mounted on said standard and forming a circuit-closer, spring-pressed means bearing against said pivoted weight, said standard being connected to the piston-rod, said piston operating to move said inertia-piece and cause it to contact with and close said circuit.

13. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism, an electric circuit controlling said sparking mechanism, a standard, an inertia-piece pivotally mounted on said standard and forming a circuit-closer, adjustable spring-pressed means bearing against said pivoted weight, said standard being connected to the piston-rod, said piston operating to move said inertia-piece and cause it to contact with and close said circuit.

14. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism, an electric circuit for controlling said sparking mechanism, a standard, an inertia-piece pivoted to said standard, a rod adjustably attached to the standard, a washer on said rod bearing against said bar, a spring carried by said rod and pressing against said washer, said piston operating to move said standard and weight and cause the weight to contact with said circuit.

15. A cylinder, a piston therein, a piston-rod connected thereto, electrical sparking means for controlling said piston, a standard, an inertia-piece pivoted to said standard, said standard being mounted on said piston-rod, said inertia-piece being movable into engagement with said electrical means and controlling the same.

16. A cylinder, a piston therein, a piston-rod connected thereto, electrical sparking means for controlling said piston, a standard connected to said piston-rod, an inertia-piece pivotally mounted on said standard, and spring-pressed means bearing against said inertia-piece for restoring said inertia-piece.

17. A cylinder, a piston therein, a piston-rod connected thereto, electrical sparking means for controlling said piston, a standard connected to said piston-rod, an inertia-piece pivotally mounted on said standard, and adjustable spring-pressed means bearing against said inertia-piece.

18. A cylinder, a piston therein, a piston-rod connected thereto, electrical sparking means for controlling said piston, a standard mounted on means supported and carried by said piston, an inertia-piece pivoted to said standard, a rod adjustably attached to said standard, an antifriction-washer on said rod bearing against said inertia-piece, and a spring carried by said rod and pressing against said antifriction-washer.

19. A cylinder, a piston therein, electrical sparking means for controlling said piston, a standard mounted on means supported and carried by said piston, an inertia-piece pivoted to said standard, a shoulder on said standard forming a stop for said inertia-piece, and spring-pressed means bearing against said inertia-piece.

20. A cylinder, a piston therein, a piston-rod connected thereto, a sparking mechanism in said cylinder, an electric circuit for controlling said sparking mechanism, a circuit-closer comprising an inertia-piece mounted on said piston-rod, a flexible contact-blade

lying in the path of movement of said inertia-piece, said inertia-piece being connected to and forming a movable contact in said circuit, said inertia-piece having an inertial movement into contact with said blade to close said circuit and cause said sparking mechanism to produce a spark.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 20th day of March, 1902.

OTHO C. DURYEA.
MORRIS C. WHITE.

Witnesses:
G. T. HACKLEY,
F. M. TOWNSEND.