No. 796,755. PATENTED AUG. 8, 1905.

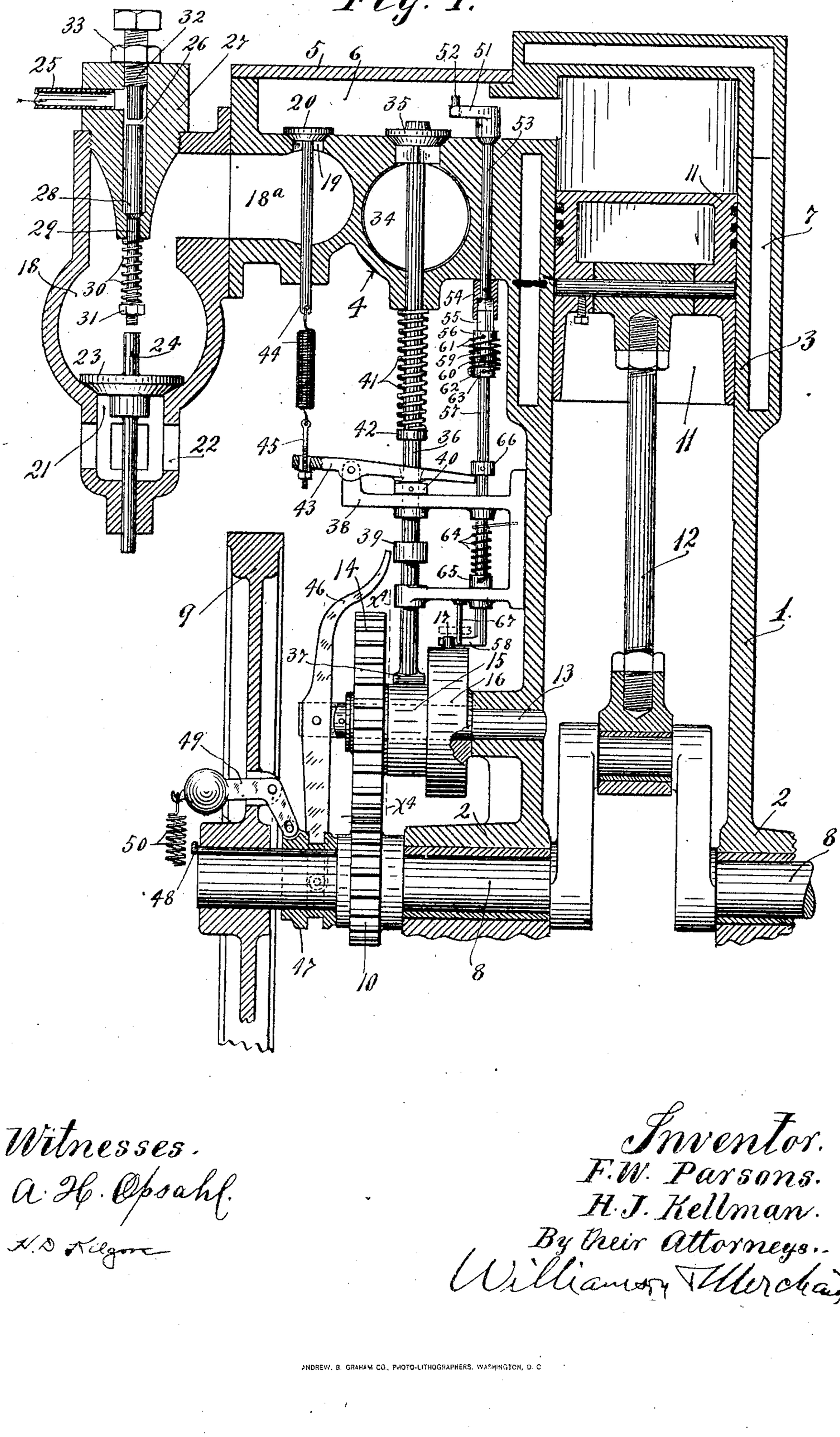
F. W. PARSONS & H. J. KELLMAN.

SPEED REGULATOR FOR EXPLOSIVE ENGINES.

APPLICATION FILED JUNE 27, 1903.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

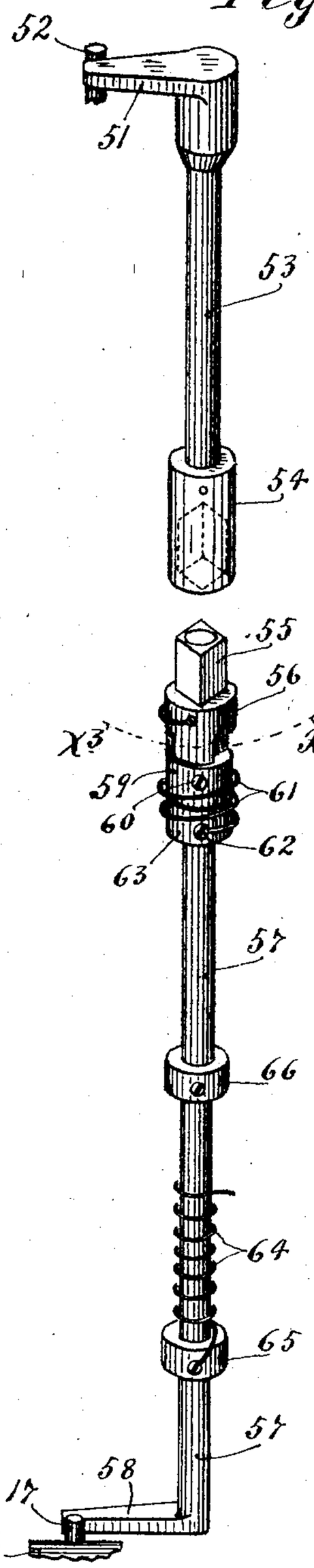


Fig. 4.

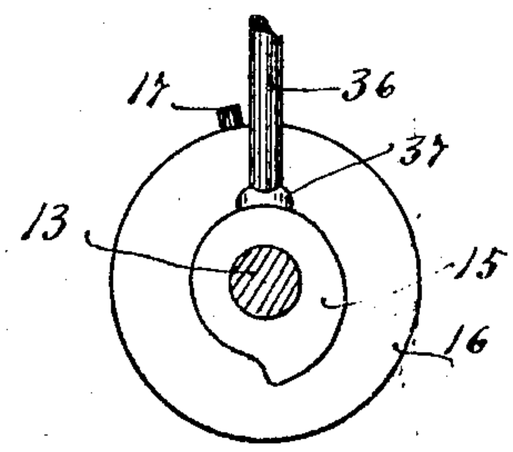
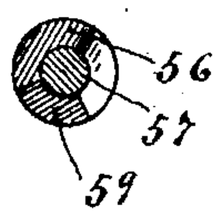


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERICK W. PARSONS AND HAROLD J. KELLMAN, OF LITCHFIELD, MINNESOTA.

SPEED-REGULATOR FOR EXPLOSIVE-ENGINES.

No. 796,755. Specification of Letters Patent. Patented Aug. 8, 1905.

Application filed June 27, 1903. Serial No. 163,289.

To all whom it may concern:

Be it known that we, FREDERICK W. PARSONS and HAROLD J. KELLMAN, citizens of the United States, residing at Litchfield, in the county of Meeker and State of Minnesota, have invented certain new and useful Improvements in Speed-Regulators for Explosive-Engines; and we 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.

Our invention relates to explosive-engines, and has for its object to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claim.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Figure 1 is a view in vertical section taken centrally through an explosive-engine involving our invention, parts of the said engine being broken away and some parts being shown in full. Fig. 2 is a perspective view showing in detail the sectional trip-rod for operating the movable member of the igniter-electrodes. Fig. 3 is a transverse section on the line x^3 x^3 of Fig. 2, and Fig. 4 is a section on line x^4 x^4 of Fig. 1.

The numeral 1 indicates the upright body-casting of the engine, which, as shown, is formed integrally with crank-shaft bearings 2 and the cylinder 3. The cylinder 3, as shown, is formed integral with the lateral extension 4, which extension is recessed at its upper portion, and, together with a removable plate 5, affords an explosion-chamber 6, which opens at one end into the upper end of the cylinder. The cylinder, as is usual, has a water-jacketing chamber 7.

The numeral 8 indicates the crank-shaft of the engine, which, as shown, carries the fly-wheel 9 and a spur-pinion 10. The numeral 11 indicates the piston, which works in the cylinder 3 and is connected to the crank of the shaft 8 by a pitman 12. A bearing-stud 13 is suitably secured to and projects outward from the body-casting 1 parallel with the crank-shaft 8, and on this stud is loosely journaled a spur-gear 14, a cam 15, and a disk 16, which parts 14, 15, and 16 are connected for common rotation. The gear 14 meshes with the pinion 10, and since this engine is of the four-cycle type it bears the relation thereto of one to two, so that the said gear will receive a complete rotation under each two rotations of the crank-shaft. The disk 16 carries a trip pin or projection 17, which, as will presently appear, acts upon the trip-rod of the movable member of the igniter-electrodes.

To the outer end of the cylinder extension 4 is rigidly secured the shell or case of a commingling-chamber 18, the interior of which chamber communicates with a cavity 18^a in the said extension 4. The said cavity 18^a in turn communicates with an explosion-chamber 6 through an admission-port 19, that is normally closed by a so-called "gas-admission" valve 20, the stem of which works downward through the lower portion of the said extension 4. In the lower portion of the commingling-chamber 18 is an air-admission port 21, which communicates with the atmosphere through a perforated depending cup-like section 22 of the said chamber 18. The air-admission port 21 is normally closed by a gravity-held air-admission valve 23, the stem of which works downward through the depending hub portion of the section 22. The valve 23 is provided with upwardly-projecting trip-finger 24 for a purpose which will presently appear.

The oil is delivered through a supply-pipe 25, which opens into the axial vertically-disposed passage 26 of the plug 27, which, as shown, is screwed into the upper portion of the chamber-shell 18 and depends within the same. The lower portion of the passage 26 is contracted to afford a valve-seat, the opening through which is normally closed by a plunger-valve 28, the stem 29 of which works downward through the lower end of the plug 27 and terminates in position to be struck by the trip-finger 24 of the valve 23 when the said valve 23 is raised. A coiled spring 30 on the stem 29 is compressed between the lower end of the plug 27 and the nut 31 on the stem 29 and assists gravity to normally hold the valve 28 in a closed position. A stop-screw 32, which works through the upper end of the plug 27 and, as shown, is provided with a lock-nut 33 for holding it where set, limits the upward opening movement of the oil-supply valve 28.

In the cylinder extension 4 is a large exhaust-port 34, which communicates with the

explosion-chamber 6 through a passage which is normally closed by an exhaust-valve 35, the stem 36 of which works downward through said extension 4 and is provided at its lower end with the bearing-foot 37, which is subject to the cam 15, heretofore noted. As shown, the lower portion of said stem 36 also works through suitable bearings in the prongs of the bracket 38, which is rigidly secured to the body-casting 1. On the stem 36, between the prongs of the bracket 38, is a collar 39, and on said stem, just above the upper prong of said bracket, is a similar collar 40. A coiled spring 41 on the stem 36 is compressed between the extension 4 and the collar 42 on the said stem and assists gravity to normally hold the exhaust-valve 35 in a closed position.

A lever 43, pivoted to the upper arm of the bracket 38, is connected at its outer end to the depending stem of the valve 20 by means of a spring 44. By the nutted adjusting-screw 45 the tension of the spring 44 may, as is obvious, be varied. The inwardly-projecting arm of the lever 43 rests upon and is adapted to be raised by the collar 40 on the valve-stem 36. A so-called "detaining-arm" 46 is pivoted at its intermediate portion to the projecting end of the bearing-stud 13, and at its lower end is subject to a grooved shipper-collar 47, which is free to slide on and is held to rotate with the engine crank-shaft 8 by means of a key 48. The fly-wheel 9 carries a weighted governor-lever 49, which is pivoted thereto and to the sliding collar 47. Either one or two of these governor-levers 49 may be provided. When two of the said levers are provided, their free ends are connected by a coiled spring 50; but when only one is employed the said spring is anchored at one end to the fly-wheel. The upper end of the detaining-arm 46 is so formed or bent that when the exhaust-valve is closed and the engine is at rest or running at a speed which is not above a predetermined limit it stands just out of the path of movement of the valve-stem collar 39 and projects above the lower edge thereof, as shown in Fig. 1.

The numerals 51 and 52 indicate, respectively, the movable and fixed members of the igniter-electrodes, which parts are of course located in the explosion-chamber of the engine. The electric circuit and battery or other means for producing the spark are not shown; but it will of course be understood that they may be of the standard or any other suitable construction. The movable electrode 51 is secured to the inner upper end of a stem 53, which is mounted to oscillate in a vertical seat formed in the cylinder extension 4 inward of the exhaust-port 34. At its lower end the stem 53 is provided with a socket 54, which fits the angular upper end 55 of the clutch-hub 56, which clutch-hub is loose on the upper end of an oscillating rod 57, suitably journaled in the prongs of the bracket 38. At its extreme lower end said rod 57 is provided with a laterally-projecting arm 58, which is subject to the trip-pin 17, which, as already noted, is carried by the disk 16. The loose half-clutch 56 engages with a half-clutch 59, which is secured to the rod 57, as shown, by a set-screw 60. The engaging lugs of the half-clutches 56 and 59 are so disposed and so extended that the said two half-clutches are capable of about one-third complete rotation with respect to each other. A coiled spring 61 is attached at one end to the half-clutch 56, and at its other end it is attached, as shown, by a set-screw 62 to a collar 63 in the rod 57, which collar is adjustably secured to said rod by the said set-screw 62. The spring 61 tends to rotate the collar 63, rod 57, and half-clutch 59 toward the right, and the half-clutch 56, stem 53, and electrode 51 toward the left. Another and stronger coiled spring 64 is attached at one end to the bracket 38 and at its other end to a collar 65 on the rod 57 just above the lower prong of the bracket 38. This collar 65 limits the downward movement of the rod 57. The extreme inner end of the combined tension and tripping lever 43 engages under a collar 66 on the rod 57 for a purpose which will appear in the description of the operation. The spring 64 tends to rotate the shaft 57 toward the right with respect to Figs. 1 and 2. A stop-pin 67 depends from the bracket 38 for engagement back of the arm 58 to limit the return movement of the rod 57 under the action of the spring 64.

Operation: When the engine is running at a speed which is not in excess of the maximum speed under which the governor is set to permit the same to run, the action will be substantially as follows: The electrodes of the igniter will of course be first brought together and thereafter separated to produce the spark, while the crank-shaft of the engine and the piston are approximately at the extreme of their compression-strokes. The spring 61 permits the lower section of the igniter-actuating shaft made up of the sections 53 and 57 to move slightly after the electrodes are brought together. When the arm 58 of the shaft 57 is released from the trip-pin 17 of the disk 16 the spring 64 will rapidly throw the shaft-section 67 back to its normal position, under which movement the half-clutches 56 and 59 are again brought together, so that the electrode 51 is moved out of engagement with the electrode 52 with a sudden impulse, such as is required to produce a good spark. Under the working stroke of the piston the valves 20 and 35 are of course pressed tightly closed. Under the exhaust-stroke of the piston the cam 15, acting on the head 37 of the valve-stem 36, positively forces the exhaust-valve 35 into an open position, and this upward movement of the said valve-stem causes the collar 40 to force upward the inner end of the tension-lever 43. This movement of said le-

ver 43 accomplishes two things, to wit: It increases the tension of the spring 44, thereby more tightly holding closed the gas-admission valve 20 under the exhaust-stroke, and it raises the shaft section or lug 57, so that its arm 58 will not be struck by the tripping-pin 17, as indicated by dotted lines in Fig. 1. This upward movement of the shaft-section 57 causes the shank 55 to telescope within the socket 54. Such movement of the said shaft-section at the time just noted is not in itself important, but is important when the engine is to be thrown temporarily out of action or caused to run under momentum by the action of the governor. When the engine acquires a speed sufficient to throw the governor-arms 49 outward and the sliding collar 47 toward the hub of the fly-wheel, the free upper end of the detaining-arm 46 will be thrown inward, so that under the first upward movement of the exhaust-valve it will be engaged under the collar 39 of the valve-stem 36 and will thereby be caused to hold the exhaust-valve open until the speed of the engine has been again decreased below the maximum speed at which it is set to run. It will now be noted that when the exhaust-valve is thus held in an open position by the detaining-arms 46 the tension-lever 43 will be raised, as before stated, and temporarily hold the gas-admission valve 20 closed under increased tension and by raising the shaft-section 57 will throw the igniter out of action while the engine is running under momentum. This latter feature of course saves both the batteries and the electrodes. Under the suction or charging stroke of the engine both the air-admission valve 23 and the gas-admission valve 20 will be opened by suction. Under the upward movement of the valve 23 its tripping finger or projection 24 strikes the depending end of the valve-stem 29 and forces upward into an open position the oil-admission valve 28, and thus admits oil into the commingling-chamber. The upward movement of the said valve 28 is intercepted by the stop-screw 32, and by adjusting the said screw the amount of oil which will be admitted may be varied at will. The air and the spray of oil admitted when the valves 23 and 28 are open are of course commingled within the commingling-chamber 18, and the gas formed thereby is of course drawn from the commingling-chamber into the explosion-chamber when the valve 20 is open. The action of the engine is thought to be made clear from the foregoing description.

It will of course be understood that the engine described is capable of modification within the scope of the invention herein set forth and claimed.

Having thus described our invention, we claim as new and desire to secure by Letters Patent of the United States—

In an explosive-engine, the combination with a cam and an igniter-trip, of an exhaust-valve 35, having a depending stem 36, terminating in a foot 37, subject to said cam, a coiled spring acting on said stem 36 to close said exhaust-valve, said stem having collars 39 and 40, the admission-valve 20, having the depending stem with attached spring 44, the lever 43 pivoted at its intermediate portion and subject to the collar 40 on said stem 36, a coupling adjustably connecting said spring 44 to one end of said lever 43, a governor-controlled retaining-arm coöperating with the collar 39 of said stem 36 to hold said exhaust-valve open and said admission-valve closed, under increased tension, under excessive speeds of the engine, and an electric igniter, the movable electrode of which is provided with an axially-movable section, subject to said lever 43 and movable thereby into an inoperative position when said exhaust-valve is open, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

FRED. W. PARSONS.
HAROLD J. KELLMAN.

Witnesses:
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HAGMAR NELSEN.