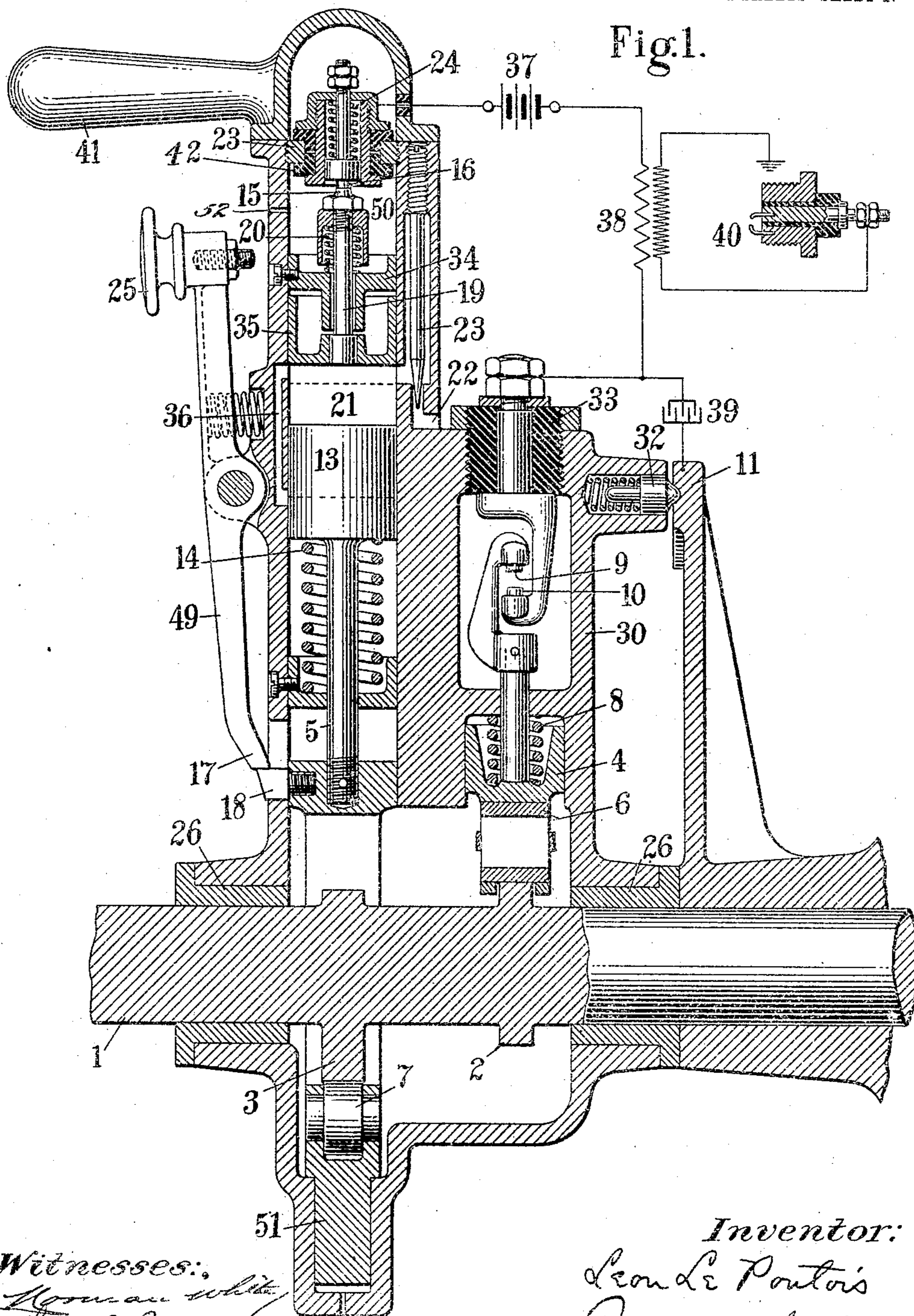


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 APPLICATION FILED AUG. 2, 1907.

904,625.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 1.



Witnesses:  
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by

Inventor:  
*Leon Le Pontois*  
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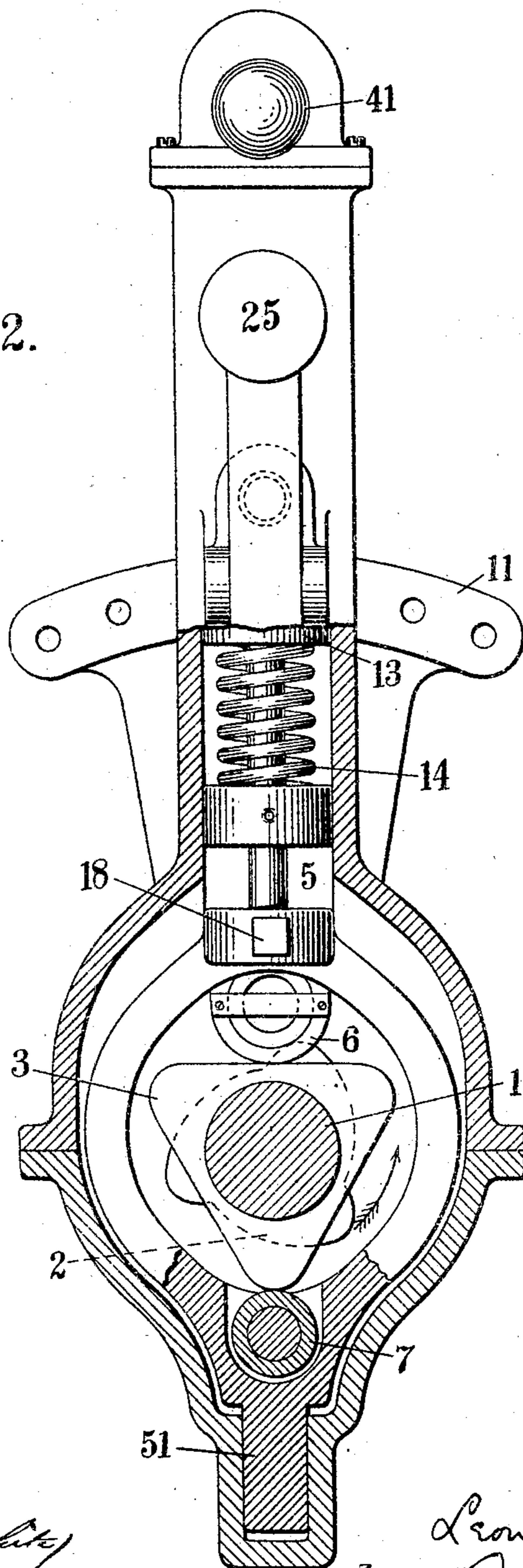
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Fig. 2.



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# UNITED STATES PATENT OFFICE.

LEON LE PONTOIS, OF NEW ROCHELLE, NEW YORK.

## DEVICE FOR REVERSING THE DIRECTION OF ROTATION OF INTERNAL-COMBUSTION ENGINES.

No. 904,625.

Specification of Letters Patent.

Patented Nov. 24, 1908.

Application filed August 2, 1907. Serial No. 386,696.

*To all whom it may concern:*

Be it known that I, LEON LE PONTOIS, a citizen of the Republic of France, residing at New Rochelle, in the county of Westchester and State of New York, have invented a new and useful Device for Reversing the Direction of Rotation of Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to means for accomplishing such reversal of direction of rotation by control of the time of ignition of the fuel gases employed in such engines, and it consists in a new device for automatic selection of the most advantageous time for such ignition and automatic establishment of ignition at such time.

The mechanism shown and described herein is a typical one which will operate automatically to effect this result.

Internal combustion engines may be constructed so as to be adapted to rotate in either direction, and in starting them it often happens that the ignition of the fuel gases is accomplished by the source of heat employed for this purpose at so early a time in the revolution of the engine that the impulse from expansion of the ignited gases is exerted too early to be effective to drive the engine forward and results in an unexpected and undesirable reversal of the direction of rotation known as "back kick". This result is due to the fact that at the time of ignition and development of the energy of the burning gases in the cylinder the crank is still so far ahead of the dead center, that the energy of inertia in the fly wheel is insufficient to carry the crank forward to the dead center and slightly past that point. As the speed of revolution of the engine decreases this result is more apt to occur by reason of the reduced energy of inertia of the fly wheel.

By my invention I make use of the "back-kick" and make this hitherto undesirable result a useful one to accomplish the reversal of the engine. This I do by making it take place when desired for this purpose.

My invention consists in devices which automatically select the proper time for the ignition which will successfully accomplish reversal when desired, and in effecting such ignition when a governing device deter-

mines that the right conditions exist. The mechanism which I show and describe for this purpose is one which will automatically determine when the conditions suitable for the reversal ignition exist and which will automatically establish such ignition when and only when such conditions are present. It consists essentially in a device which I call a spark "governor" placed in the electric circuit which furnishes the igniting spark. It will be understood that this apparatus may be used in connection with any intermittent source of heat by which ignition is accomplished and will determine when the proper conditions exist for the application of such heat and will then apply it. This specification shows it as applied to the control of a sparking circuit adapted to furnish three ignition sparks at each revolution of the engine, which would be the case if employed upon a six cylinder four cycle engine, or a three cylinder two cycle engine, if actuated from or in register with the main engine shaft.

In the drawings Figures 1 and 2 are side and end views.

Referring to the drawings: 1 is a shaft driven by the engine; 2 is a cam which operates the usual spark circuit breaker. This cam is shown by dotted lines in Fig. 2. The break is made between the contacts 9 and 10. 9 is movable and is operated by the cam 2, through its piston 4 and roller 6 bearing upon the cam. A spring 8, presses this contact downwards to meet the fixed contact —10— supported in the frame 30, and insulated therefrom by the insulation 33. This frame is mounted in bearings 26, 26, on the shaft and may be turned thereupon to time the spark. It is locked to a sector 11, placed on the frame of the engine and is secured in its adjusted position by a lock 32.

The cam 3 operates a pump piston —13— through its stem 5, yoke 51, and roller bearing 7. This piston is pressed upwards by its spring —14—. The cams 2 and 3 are adjusted so that the spark break between 9 and 10 occurs just after the piston 13 reaches its lowest position, as in Fig. 1. When not in use this governor piston is caught and held in its depressed position by engagement of a lug 18, with the end 17, of the releasing lever 49. The governor is placed in operation by depressing the lever handle 25, and release

of the lug 18. The piston 13, will then be reciprocated so long as the handle 25, is depressed.

Above the piston 13, is an air tight chamber 21, provided with an elastically supported wall constituting the piston head 35. This piston is pressed upwards by its spring 20 and its movement is limited by its engagement with the supporting bracket 34, through which its stem 19 slides. The upper end of this piston stem terminates in an electrode 15. The electrode 16 is placed above 15 upon a support 23 within an insulating ring 42 and supported by a spring 24 which permits a slight rearward movement to relieve these parts from shock. The chamber 50 above the piston 35 is in communication through a port 52 with the atmosphere.

The air chamber 21 is provided with a passage 22, communicating with the outside air. A needle valve 23 furnished with a screw thread for adjusting its position closes this passage more or less as adjusted. Another passage 36, leads from the top of the chamber 21 to a point slightly beyond the rear end of the piston 13 so as to be open to the air when the piston is at the end of its upward movement as shown by dotted lines, and closed after a slight downward movement of this piston.

In operation the downward movement of the piston 13, first closes the passage 36 and then tends to produce a vacuum in the chamber 21 and this tends to draw the piston head 35 downward against the upward pressure of its spring 20 so as to separate the electrodes 15 and 16, and to open the spark circuit. The valve 23 is set so as to permit the outside air to pass slowly into the chamber 21 to restore the pressure to normal. The rate of admission of the exterior air should be such that at all speeds of revolution of the engine above that at which it is desirable to make the reversal ignition the rarefaction of the air in the chamber 21 will cause the electrode 15 to be drawn out of contact with the electrode 16 at the time when the break in the spark circuit occurs between the electrodes 9 and 10.

As the engine speed decreases the longer period of admission of air through the passage 22 will so far restore the pressure in 21 to the normal pressure as to permit contact to be made between the electrodes 15 and 16 in spite of the rarefaction of the air in 21 caused by the downward movement of the piston 13. By adjustment of the valve 23 such contact will only be made when the engine speed is at the right point for the reversal ignition. At such time the contact between 15 and 16 being established, the sparking circuit is closed and a break now

occurring between the electrodes 9 and 10 in said circuit (9 and 15 being grounded on the engine frame) and a suitable source of electrical energy being supplied, as by the battery 37, induction coil 38 and condenser 39, a spark will be made at the spark plug 40 igniting the gases in the cylinder. The spark plug shown at 40 represents one of the plugs which are employed in the respective cylinders. This being properly timed in the stroke by the setting of the governor by means of the handle 41 and locking sector 11, the reversal of the engine is accomplished with certainty and without undue strains. It will be understood that the "proper timing" in the stroke will be obtained by such setting of the governor as will cause the spark to ignite the cylinder gases during the latter part of the compression stroke thus accomplishing a "back kick" reversal by design. The engine, being now reversed by such ignition the spark will be advanced in the stroke as the engine increases in speed in the new direction of rotation. These adjustments which are made by the handle 41 and securing sector 11, and lock 32, are well known to the users of engines of this class.

I claim,

1. An ignition governor for internal combustion engines comprising an air pump having a chamber connected to the engine so as to be driven at a rate proportional to the speed of the latter to rarefy the air within its chamber, an air admission passage for said chamber, and an electric ignition circuit for igniting the fuel gases having means for producing a break therein between two electrodes, one of which is operatively connected to an elastic member adjacent to said pump chamber, so as to be caused to reciprocate by the rarefaction of the air therein.

2. An ignition governor for internal combustion engines comprising an air pump having a chamber connected to the engine so as to be driven at a rate proportional to the speed of the latter to rarefy the air within its chamber, an air admission passage for said chamber provided with adjustable means for controlling the rate of admission of air through the same, and an electric ignition circuit for igniting the fuel gases having means for producing a break therein between two electrodes, one of which is operatively connected to an elastic member adjacent to said pump chamber, so as to be caused to reciprocate by the rarefaction of the air therein.

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