L. W. PORTER.

GAS ENGINE.

APPLICATION FILED JUNE 30, 1919.

**1,338,039.** **Patented Apr. 27, 1920.**

3 SHEETS—SHEET 1.

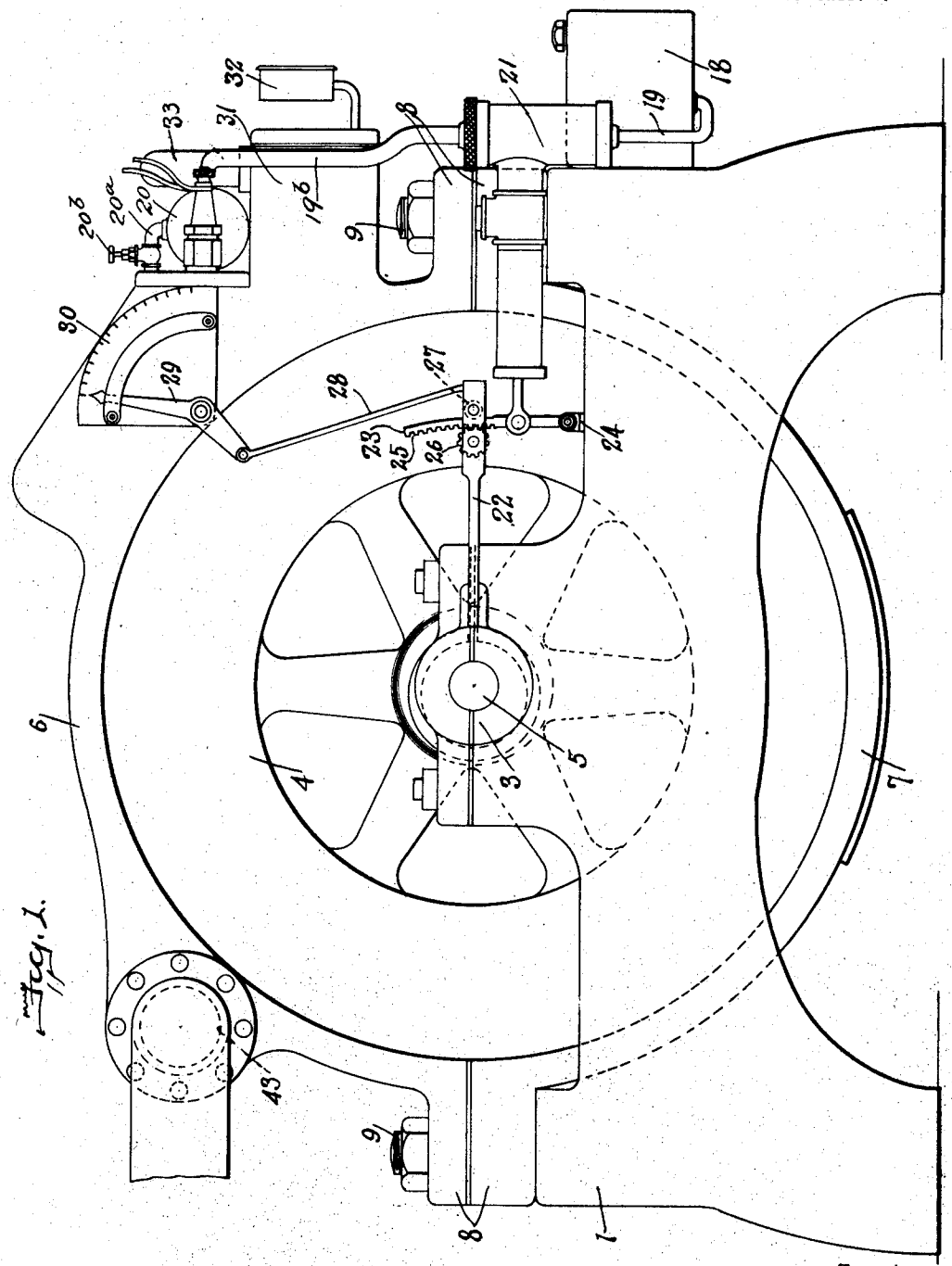



Fig. 1.

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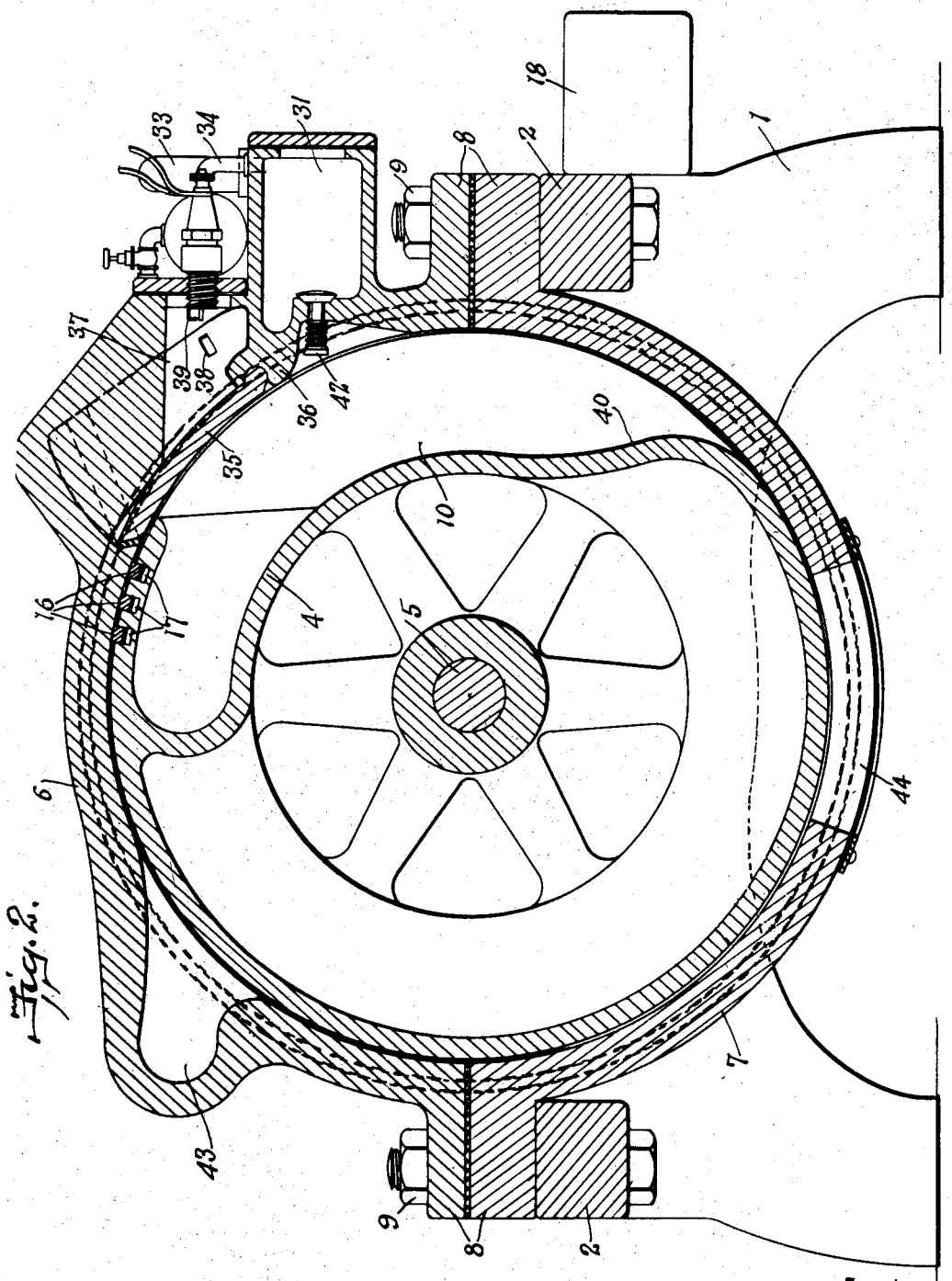



Fig. 2.

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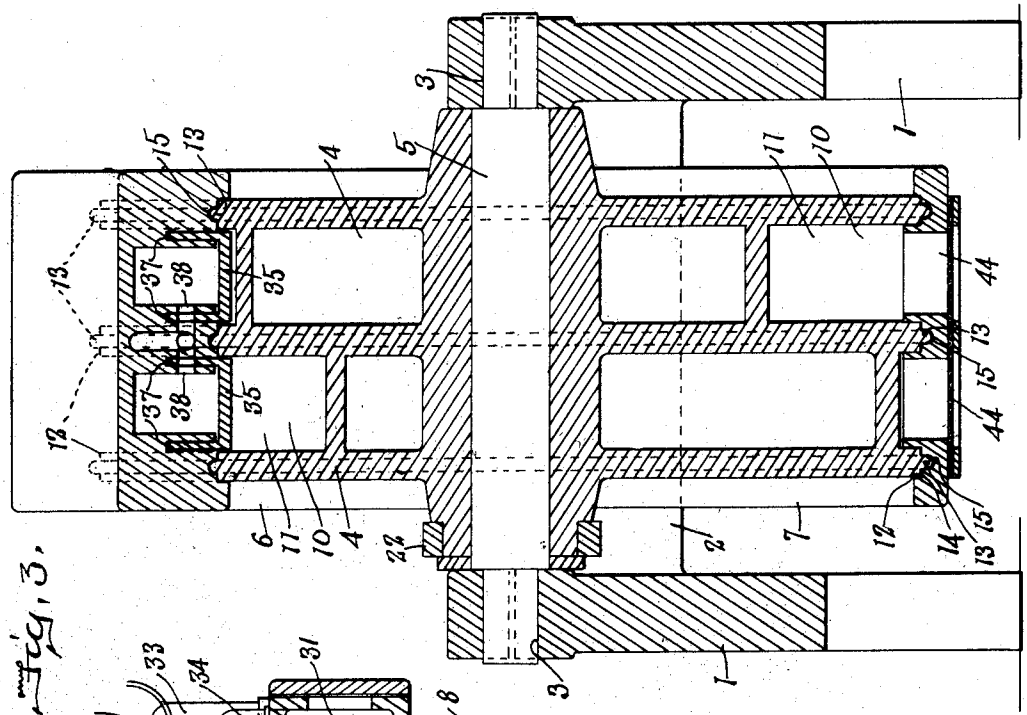


Fig. 3.

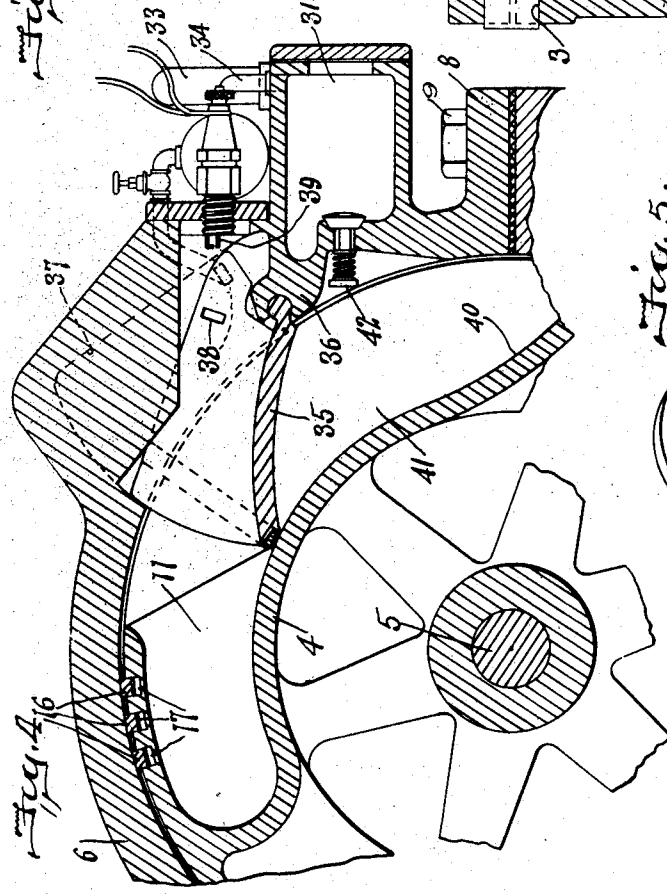


Fig. 4.

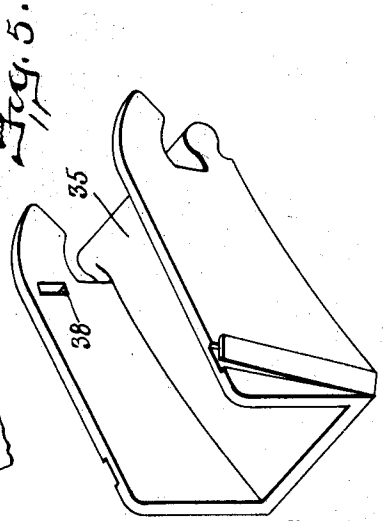


Fig. 5.

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# UNITED STATES PATENT OFFICE.

LEWIS W. PORTER, OF NEAR NEW CARLISLE, OHIO.

## GAS-ENGINE.

1,338,039. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed June 30, 1919. Serial No. 307,642.

*To all whom it may concern:*

Be it known that I, LEWIS W. PORTER, a citizen of the United States, residing near New Carlisle, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to gas engines, and has for its particular object to provide an improved type of rotary gas engine.

The problem to which my invention is directed is the common problem of the art of ways and means to improve gas engines, or internal combustion engines generally having in view the common objects of the production of greater power relative to weight and fuel consumption.

To realize this, the main object of my invention, means are provided to accomplish better compression and expansion of the gaseous explosion charges, less frictional resistance in the power transmission mechanism, less mechanism and less weight, etc., tending in all respects to produce the maximum horse power with the minimum of parts, weight and fuel consumption.

Special features of the invention relate to novel construction and operation of the valves which control the admission of fuel to the explosion chamber, means to prevent back fire, means to restore full normal or atmospheric pressure in the explosion chamber after each spent charge therein, and means to automatically maintain normal pressure in the compressed air chamber, thereby providing for greater uniformity in the volume and volatility of the gaseous charges.

As in other forms of rotary gas engines, I employ a rotary piston, or cylindrical wheel connected directly or indirectly to the drive shaft of the engine and having one or more explosion chambers arranged in the periphery thereof at right angles to its axis and which may be more or less tangential to the axis. Thus the power is directed to the drive shaft at an angle of greatest advantage to the operation of the engine and without depletion thereof incident to the operation of intervening mechanism as is the case in the operation of engines having stationary cylinders and reciprocating pistons.

Special features of novelty of my improved engine as a whole consist in the particular form of the tangential explosion chamber, or chambers, one or more being used as desired, and the location and functioning thereof relative to the gas charge intake ports; novel means for restoring normal atmospheric pressure in the explosion chamber after each spent charge therein and a novel feature of the slide valve coöperating with the explosion chamber to deliver the charge thereto, whereby a compression of air in each chamber following the explosion will act to restore the air compressor to normal pressure with the result that substantial uniformity is maintained with respect to both the volume and volatility of the gaseous charges delivered to the explosion chamber, thereby tending to both economy and effectiveness of operation.

An object of the invention is to provide a rotary gas engine of improved design and construction, having the particular features and objects of construction and operation above stated in view, and consisting of simple, substantial parts so constructed and organized that the mechanism will withstand the common hard usage of gas engines generally and which will not readily be rendered out of adjustment or inoperative by such operation.

In the accompanying drawings, in which my improved engine is illustrated in one preferred form of construction,

Figure 1 is a side elevation of my improved engine showing the relative relation of external parts;

Fig. 2 is a longitudinal section taken substantially on the vertical center line of one unit of the engine;

Fig. 3 is a cross section taken substantially on the vertical center line of the engine;

Fig. 4 is a detail view in longitudinal section showing the floating valve of the explosion chamber in the opposite extreme position from that shown in Fig. 2;

Fig. 5 is a perspective view of the floating valve.

Referring to the drawings, my improved engine may be provided with a suitable base, such as the rectangular shaped base shown in Fig. 1, the base being formed of side frame members 1 and end frame members 2 joined together in any suitable manner or cast integrally one with another.

Supported in suitable bearings 3 secured to the frame members 1 are two oppositely disposed piston wheels 4 which are secured

to and rotate with a shaft 5 having its opposite ends supported in the bearings 3.

Secured to the end frame members 2 and supported in a substantially vertical plane between the side frame members 1 is the cylinder or piston casing consisting of an upper half section 6 and a lower half section 7; the half sections being suitably joined together on the opposite sides of the casing longitudinally by an extension 8 thereof and secured to the end frame members 2 by bolts 9.

As here shown, the engine consists of the double pistons 4 both mounted upon a common drive shaft 5, the piston casing being made accordingly to accommodate the double pistons. It will be understood that any number of pistons within practical limitations may be thus combined in the construction and operation of a single engine, a two-unit engine being here shown for the purpose of illustration only.

Each of the pistons 4 is circular or wheel-shaped and is provided in its periphery with an annular channel 10 having an aperture 11 therein which may be tangential to the axis of the pistons, and which constitutes the explosion chamber of the engine. To form a close fitting relation between the piston and the inner surface of the piston casing 6 and 7, the pistons are provided with circumferential surfaces 12 and radially extending flanges 13, and the casings 6 and 7 are provided with corresponding surfaces 14 and radial grooves 15 which coöperate respectively with the surfaces 12 and flanges 13 of the pistons.

To make the close fitting relation between the pistons and piston casing effective to prevent leakage between the respective walls thereof, suitable plates 16 may be yieldingly secured in the peripheral surfaces 12 of the pistons, or may be mounted inversely in the piston casing 6, the plates being pressed outwardly by compression springs 17, or other resilient elements, to maintain close fitting contact with the peripheral surfaces 12 or 14 accordingly as the plates may be mounted in the piston or in the piston casing. As here shown, the plates 16 are preferably mounted directly forward of the explosion chambers 11, or if mounted in the piston casing the plates are preferably located directly forward of the explosion chamber at the point where the explosion takes place.

It will be understood that each piston 4 may be provided with one or more of the explosion chambers 11 so that a compound explosion may be exerted upon the piston at each rotation thereof, the coöperating mechanism of the engine being constructed and timed accordingly to the number of explosions produced to each revolution of the pistons.

As here shown a fuel tank 18 is mounted on one of the end frames 2 and is connected by pipes 19 and $19^b$ to a carbureter 20, or other suitable device for effecting a suitable intermixture of fuel and air, the mixing device being here shown conventionally for illustrative purposes only, no novelty being claimed relative to its specific form.

The fuel, which may consist of any suitable gas or liquid, is delivered to the mixer in measured charges by a piston pump 21 which as here shown is operated by a pitman 22 eccentrically connected to the main drive shaft 5 by the usual crank shaft and pitman construction.

To adjust the amount of fuel delivered to the mixer upon each action of the pump any suitable throttle mechanism may be provided, the mechanism here shown consisting of a rocker arm 23 which is pivoted to one of the side frames 1 by a suitable bracket 24. The rocker arm has provided at its upper free end a rack 25 and is operably connected to the pitman 22 by means of a gear 26 meshing with the rack 25 and a retaining roller 27 which serves to hold the rack and gear in operable relation, the pitman 22 having its free end bifurcated, preferably as shown, to provide a suitable mounting therein of the gear and roller.

The free end of the pitman 22 is connected by means of a rod 28 to a throttle 29 cooperating with a dial 30 whereby the end of the pitman may be adjusted relative to the rocker arm 23, thereby to lengthen or shorten the stroke of the pump 21 and thus increase or decrease, respectively, the amount of fuel delivered to the mixer 20 upon each stroke of the pump.

As here shown the upper cylinder casing 6 has secured thereto a suitable compressed air chamber 31 provided with a pressure gage 32, safety valve 33, and communicating with the carbureter or mixer 20 by means of a pipe 34, these features being shown more or less conventionally for illustration purposes. The air in the chamber 31 may be compressed before starting the engine to the required pressure in any suitable manner, the mechanism acting to maintain the pressure automatically while the engine is running as will presently be described. The inlet pipe $20^a$ from the carbureter 20 to the explosion chamber of the engine may be provided with any suitable means for regulating the discharge of the fuel therethrough, one means being here shown as a hand valve $20^b$.

Thus it will be seen that the fuel is delivered to the mixer in measured quantities under pressure and that the air meets the fuel in the mixer under pressure in excess of atmospheric pressure, the relative pressures of air and fuel being regulated to suit the volatile properties of the fuel and the

general conditions of operation. By this arrangement conditions best suitable to the volatilization of the gaseous charge and effective operation of the engine may be obtained.

A suitable slide or floating valve 35 is pivoted in the walls of a housing 36 of the piston casing 6. The valve is of suitable dimension in width to fit closely the channel 10 and explosion chamber 11 when it is in open position, as shown in Fig. 4, and to fit closely in an aperture 37, in the casing 6, as shown in Fig. 2, when it is in closed position.

The aperture 37 communicates with the carbureter 20 by any suitable connections to receive the gaseous charge therefrom, and with a channel 38 extending longitudinally through the valve 35 to deliver the charge to the explosion chamber 10 of the piston; the aperture 37 being provided with suitable ignition devices 39 to effect the explosion of the charge.

The valve 35 is held in its closed position by contacting with the periphery of the piston, and is moved to open position when the explosion chamber 10 is brought with the rotation of the piston directly beneath the valve, by the combined forces of pressure exerted thereon within the aperture 37 and gravity movement, the opening movement of the valve being so timed that the full force of the explosion will be expended on the piston in the explosion chamber 10. Following the explosion of the charge the valve is closed by contacting with a shoulder or cam 40 formed in the periphery of the piston at the rear of the explosion chamber.

As shown in Fig. 4 when the valve is in the open position, an air space 41 is formed between the valve and the shoulder 40, and an air valve 42, extending through the wall of the casing 6, connects the air space 41 with the air chamber 31 when the slide valve 35 is in the open position. Thus when the pressure in the space 41 exceeds the pressure in the chamber 31, the valve 42 will open inwardly of the chamber and the air pressure therein will be increased and restored to normal by the inrushing air from the space 41.

An exhaust port 43 is provided in the casing 6 to lead off the spent charge after each explosion, and an air port 44 is provided in the casing 7 whereby the space 11 of the explosion chamber is filled with air at atmospheric pressure after each explosion.

In the construction of my engine, as here shown, I have dealt with certain principles of novel construction, rather than in detail features or refinements. These principles consist in the means for causing more complete volatilization of the gaseous charges by introducing both the fuel and air to the mixer under pressure; in delivering a measured quantity of the fuel for each charge; in restoring atmospheric pressure in the explosion chamber after each charge; in automatically restoring the pressure in the air chamber from pressure in the cylinder casing after each charge; and in novel details of construction; the construction as a whole tending to provide an engine which will function in all respects to produce maximum power and general effectiveness of operation at low fuel cost.

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

1. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein having a peripheral flange intersecting the wall of the cylinder and provided with a tangential explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, an exhaust port and means to restore normal atmospheric pressure in the explosion chamber after each spent charge therein.

2. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein having a peripheral flange intersecting the wall of the cylinder and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, an exhaust port and means communicating externally of the cylinder casing to restore normal atmospheric pressure in the explosion chamber after each spent charge therein.

3. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein having a peripheral flange intersecting the wall of the cylinder and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, an exhaust port and means communicating externally of the cylinder and responsive to the suction of the piston to restore normal atmospheric pressure in the explosion chamber after each spent charge therein.

4. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, and air pressure means within the cylinder and operable by the piston whereby said pressure source is restored to normal after each charge of gaseous fuel.

5. In an engine, the combination, of a cyl-

inder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, and means whereby air pressure in the cylinder after each spent charge therein will act to restore said pressure source.

6. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under pressure to said chamber, means for exploding the charge therein, and means whereby pressure in the cylinder increasing with the rotation of the piston after each spent charge will act to restore said pressure source.

7. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to effect a gaseous charge under combined fuel and air pressure, means to deliver the charge and explode the same in said chamber, and means whereby air pressure in the cylinder after each spent charge will act to restore the air pressure source.

8. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with a tangential explosion chamber open at the periphery of the piston, means to deliver a measured gaseous charge under combined fuel and air pressure effected by the operation of said engine, and means to deliver the charge and explode the same in said chamber.

9. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under combined fuel and air pressure effected by the operation of said engine, means to deliver the charge and explode the same in said chamber, and means controlled by the engine to restore said pressure means to normal after each spent charge.

10. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to deliver a gaseous charge under combined fuel and air pressure effected by the operation of said engine, means to deliver the charge and explode the same in said chamber, and manually operable means to regulate the volume of said charge.

11. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with an explosion chamber open at the periphery of the piston, means to effect a gaseous charge under combined fuel and air pressure by the operation of said engine, means to deliver the charge and explode the same in said chamber, an exhaust port and means to restore normal atmospheric pressure in the explosion chamber after each spent charge therein.

12. In an engine, the combination, of a cylinder, a cylindrical piston mounted to revolve therein and provided with a tangential explosion chamber open at the periphery of the piston, and means controlled by the operation of the engine to deliver a measured gaseous charge under combined fuel and air pressure effected by the engine to said chamber.

In testimony whereof I affix my signature.

LEWIS W. PORTER.