G. E. IRELAND.

GAS OR VAPOR ENGINE.

APPLICATION FILED JAN. 30, 1909.

963,573.

Patented July 5, 1910.

2 SHEETS—SHEET 1.

Fig. 1

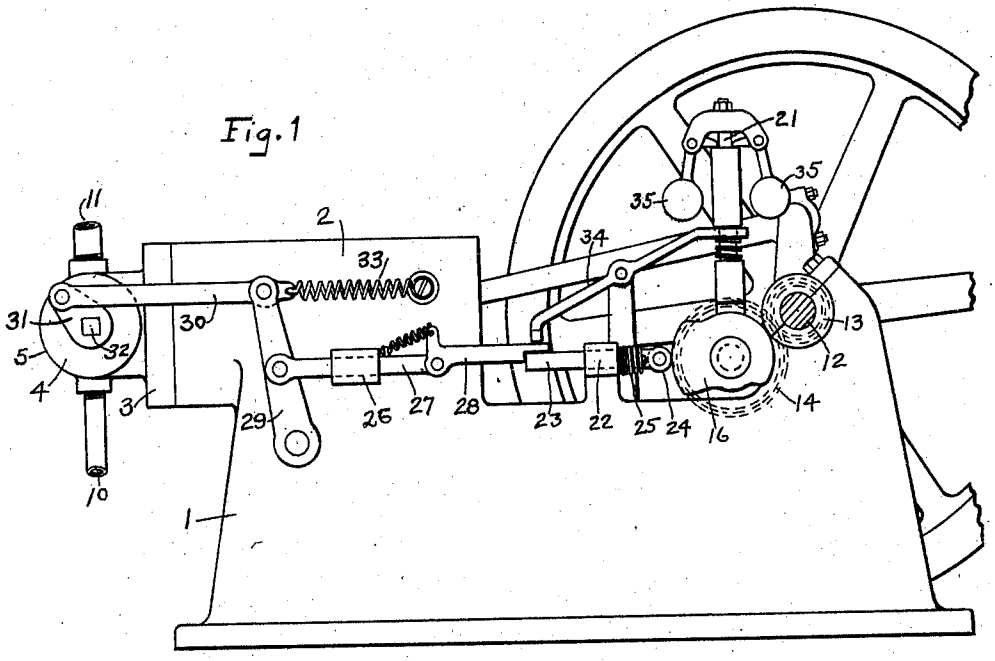
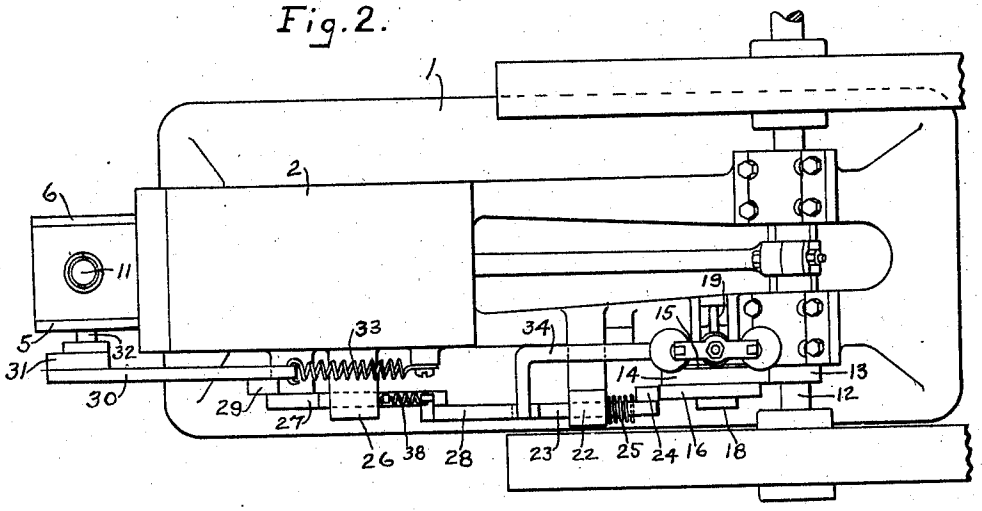


Fig. 2.



WITNESSES.

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2 SHEETS—SHEET 2.

Fig. 3.

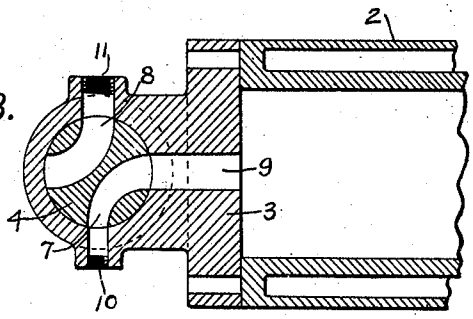


Fig. 4.

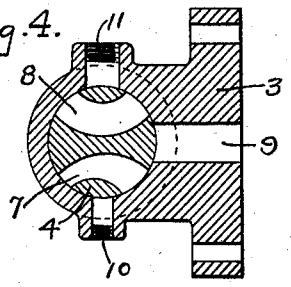


Fig. 5.

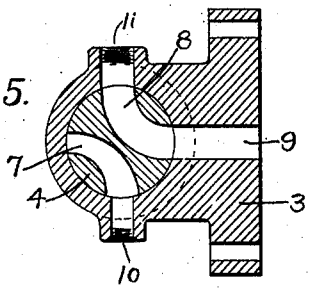


Fig. 6.

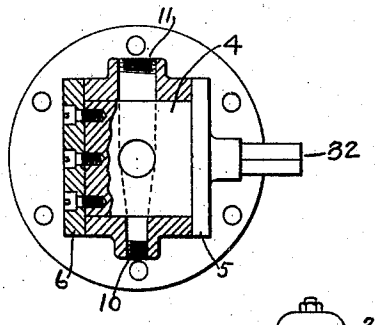


Fig. 7.

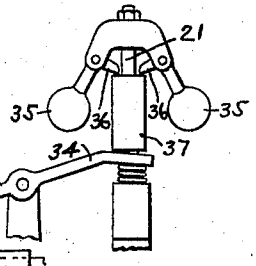


Fig. 8.

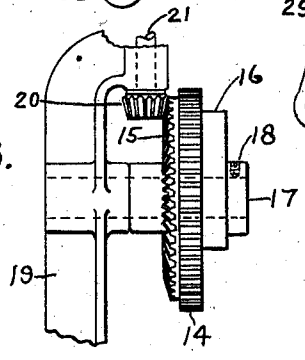
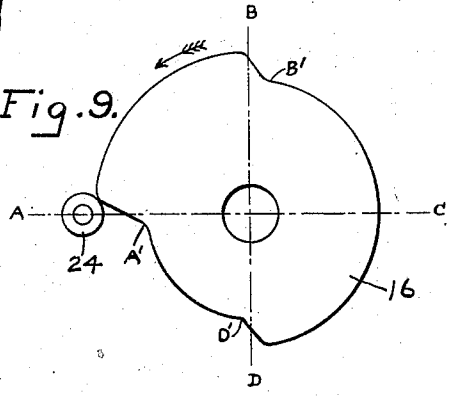


Fig. 9.



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GAS OR VAPOR ENGINE.

963,573. Specification of Letters Patent. Patented July 5, 1910.

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To all whom it may concern:

Be it known that I, GEORGE E. IRELAND, a citizen of the United States, residing at Dayton, in the county of Montgomery and the State of Ohio, have invented a new and Improved Gas or Vapor Engine, of which the following is a full, clear, and exact description.

My invention relates to four stroke cycle explosive engines, and its object is to provide a new and improved gas or vapor engine which shall be simple and durable in construction and very effective in operation.

The invention consists principally of a rocking valve, cylindrical in form and provided with inlet and exhaust ports, a revolving cam, a valve gear mechanism operated by said cam and a governor arranged to break the connection between the valve gear mechanism and its actuating cam whenever the speed of the engine exceeds the normal velocity, in which case, the gas inlet will be cut off and the exhaust port held wide open; but while the said engine is running at or below normal speed the said governor will maintain the connection between the said cam and the said valve gear mechanism whereby the said cam will continue to actuate the said valve gear to cause the valve ports to be opened at the proper time, to remain open during the proper period and also to be closed at the proper time in relation to the periods of the engine.

Referring to the accompanying drawings: Figure 1 represents a side elevation of a gas engine embodying my invention; Fig. 2 is a plan view of the same; Fig. 3 is a vertical central section through the valve and part of the cylinder; Fig. 4 is a similar section of the valve alone; Fig. 5 is similar to Fig. 4 excepting the position of the valve cylinder and ports; Fig. 6 is a front view of the valve; Fig. 7 shows the governor action when the engine is running above normal speed and the mechanism by which the cam operates the valve; Fig. 8 shows the cam 16, the spur gear 14 and the bevel gears 15 and 20 assembled; Fig. 9 represents the cam 16.

The improved engine is provided with a suitably constructed frame 1 on which is cast or otherwise secured the cylinder 2. Mounted on the end of the cylinder is the valve body 3 in which is rotatably mounted the valve cylinder 4 provided with flanges 5 and 6, by which it is securely held in position and closely fitted to the walls of the valve body 3. The valve cylinder 4 is perforated through its central section by two oppositely bent elbow shaped ports which lie in the same vertical plane. The port 7 is used for the inlet of gas and air and the port 8 for the exhaust. The port 9 connects the valve with the cylinder and I have chosen to name the same "cylinder port". Through the inlet 10 gas and air is supplied to the cylinder and through the outlet 11 the burned gases are exhausted. Mounted on the crank shaft 12 is the gear 13 meshing into the gear 14. The gear 14 having twice the number of teeth of gear 13 revolves only one half as fast. Secured to one side of gear 14 is the bevel gear 15 and to the other side is the cam 16. The gear 14, bevel gear 15 and cam 16 are securely fastened together and revolve as one piece on the stud 17, being retained thereon by the collar 18. The stud 17 is mounted in the bracket 19 which is secured to the frame 1. By the gears 13 and 14 the cam is made to revolve once to every two revolutions of the crank shaft. Meshing in the bevel gear 15 is the bevel pinion 20 which is mounted on the governor shaft 21. Slidably mounted in the bracket 22 is the rod 23 carrying the roller 24 which is held against the periphery of the cam by the compression spring 25. Similarly mounted in the bracket 26 is the bar 27 carrying the pawl 28.

While the engine is running at normal speed the rod 23 will be reciprocated back and forth by the cam 16 and the spring 25, impinging in its forward movement the pawl 28, which, in turn, carries the bar 27 attached to the vibrating arm 29, which actuates the connecting rod 30 and rocks the valve cylinder 4 approximately 90 degrees of a circle in one movement, the connecting rod 30 being attached to the rocking arm 31 which is mounted on the valve cylinder extension 32. The valve cylinder is rocked in the opposite direction by the spring 33. The arms, rods and connections interposed between the cam and the valve, by which the said valve is rocked, I have chosen to term "valve gear mechanism."

While the speed of the engine is normal the governor lever 34 assumes the position shown in Fig. 1 and holds the pawl 28 in the position shown therein and thereby maintains a connection between the cam 16 and the valve gear mechanism, so that each revolution of the cam will cause the valve cylin-

der to rock forward and backward, but when the engine speed rises above normal the governor balls 35—35 fly out as shown in Fig. 7 and the fingers 36—36 press down upon the sleeve 37 which causes the governor lever 34 to take the position shown therein and the pawl 28 is raised by the spring 38 so that the cam cannot rock the valve cylinder forward, the connection being broken but, by the spring 33, the valve is rocked backward as indicated by the arrangement of parts shown in Fig. 7.

The action of the cam 16 upon the valve cylinder 4 may be described by referring to Figs. 9, 3, 4 and 5. The cam revolves in the direction indicated by the arrow and for the purpose of description I have divided the cam into four quadrants by the lines A—C and B—D which correspond to the four periods of a four stroke cycle engine. When the roller 24 is in the position shown in Fig. 9 the valve cylinder has been rocked forward almost to its extreme position in which the gas port 7 will take gas. This position of the valve cylinder is shown in Fig. 3. As long as the port 7 is in this position the gas and air will enter through the inlet 10, the port 7 and the cylinder port 9 to the cylinder. This occurs during the first outward stroke of the piston, or first quarter of the cycle, while the roller 24 is traveling to the point marked "B." Then while the roller 24 is traveling from "B" to the point marked "B^1" the valve gear will rock the valve cylinder approximately 45 degrees, in which the rocking arm 31 will maintain a vertical position and the valve cylinder and ports will assume the position shown in Fig. 4. At this juncture the second quarter of the cycle commences and while the roller is traveling to the point marked "C" the gas and air is compressed. Then while the roller travels to the point marked "D" ignition takes place and this is during the third quarter of the cycle. During the compression and ignition, or second and third periods, the valve cylinder remains in the position shown in Fig. 4 with the inlet, exhaust and cylinder ports cut off. Then when the roller 24 travels to the point "D^1" the exhaust port is wide open as shown in Fig. 5 and remains in this position during the fourth quarter of the cycle, or while the roller is traveling to the point "A^1." While in this position the burned gases are exhausted through the exhaust outlet 11.

The above described operation of the valve applies while the engine is running at normal speed, or below the same, but whenever the speed of the engine exceeds the normal velocity the governor cuts off the gas supply and the valve is held with the exhaust port open as shown in Fig. 5 and the engine does not take gas again until the speed thereof drops to the normal velocity. This action of the valve is accomplished by the mechanism illustrated in Fig. 7.

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

1. In a gas or vapor engine the combination of a cylindrical rocking valve having inlet and exhaust ports, a revolving cam, a valve gear mechanism, interposed between said cam and said valve and actuated by said cam, comprising a rocking arm, a rod and a pawl connecting said rod to said rocking arm, and a governor for breaking the connection between said rod and said rocking arm whenever the speed of the engine exceeds a certain limit.

2. In a gas or vapor engine the combination of a cylindrical rocking valve having inlet and exhaust ports, a revolving cam, a valve gear mechanism interposed between said cam and said valve and actuated by said cam, comprising a rocking arm, a rod and a spring actuated pawl forming a breakable connection between said rocking arm and said rod and a governor for maintaining said connection while the speed of the engine is below a certain limit.

GEORGE E. IRELAND.

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CHAS. BUZZARD.