R. J. LEACH.

TWO-CYCLE GAS ENGINE.

APPLICATION FILED OCT. 12, 1909.

968,244. Patented Aug. 23, 1910.

Fig. 1.

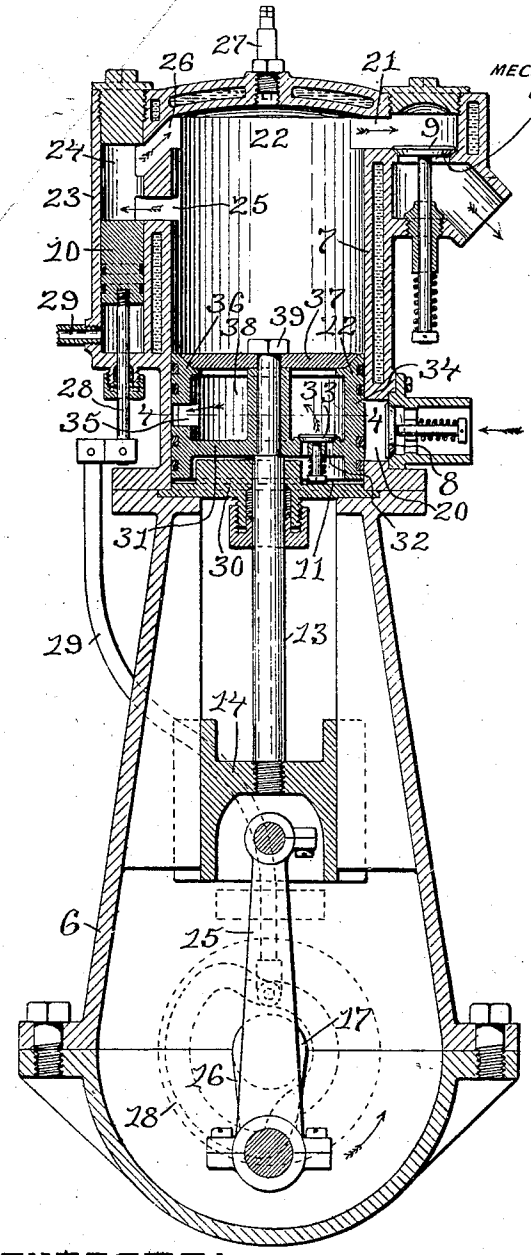


Fig. 2.

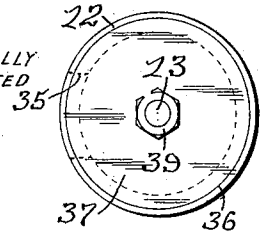


Fig. 3.

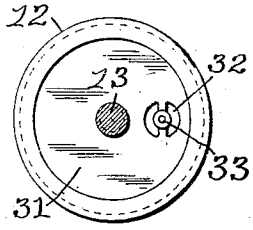
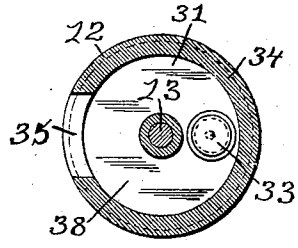


Fig. 4.



WITNESSES:

Julia Rice

Bennie Giacciarelo

INVENTOR:

Raymond Jacob Leach.

Charles H. Luther

ATTORNEY.

UNITED STATES PATENT OFFICE.

RAYMOND JACOB LEACH, OF SEEKONK, MASSACHUSETTS.

TWO-CYCLE GAS-ENGINE.

968,244. Specification of Letters Patent. **Patented Aug. 23, 1910.**

Application filed October 12, 1909. Serial No. 522,296.

To all whom it may concern:

Be it known that I, RAYMOND JACOB LEACH, a citizen of the United States, residing at Seekonk, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Two-Cycle Gas-Engines, of which the following is a specification.

My invention has reference to an improvement in gas engines and more particularly to an improvement in two-cycle gas engines.

In the usual construction of two-cycle gas engines, the products of combustion are partly exhausted from the cylinder simultaneously with the entrance of the compressed gas into the cylinder, the expansion of the gas assisting the function of exhausting. In this construction all of the products of combustion are not exhausted from the cylinder consequently the incoming charge of gas mixes with a large portion of the products of combustion of the previous charge thereby giving an extremely poor mixture, materially reducing the power of the engine and quickly fouling the interior of the cylinder and the spark plug.

The object of my invention is to improve the construction of a two-cycle gas engine whereby the products of combustion are entirely exhausted from the explosion chamber before the incoming charge of gas enters the explosion chamber.

A further object of my invention is to construct a two-cycle gas engine with a compression chamber below the piston, an explosion chamber above the piston, means for moving the compressed charge of gas from the compression chamber to the explosion chamber and means for completely exhausting the products of combustion from the explosion chamber before the compressed charge of gas enters the explosion chamber.

Another object of my invention is to eliminate (in a two-cycle gas engine having a chambered piston) back firing of the charge in the chambered piston.

Another object of my invention is to provide a gas engine with a plunger valve which operates to open and close a port in the cylinder and also operates as a pump to feed oil to the engine or to circulate water in the cooling system of the engine.

My invention consists in the peculiar and novel construction of a two-cycle gas engine having details of construction, as will be more fully set forth hereinafter and claimed.

Figure 1. is a vertical sectional view through my improved two-cycle gas engine, showing the chambered piston at the end of its downward stroke. Fig. 2. is an upper end view of the piston, removed from the cylinder. Fig. 3. is a lower end view of the piston and Fig. 4. is a transverse sectional view through the piston, taken on line 4. 4. of Fig. 1.

In the drawings 6. indicates the frame of the engine, 7. the cylinder, 8. the intake valve, 9. the exhaust valve, 10. the plunger valve, 11. the compression chamber, 12. the chambered piston, 13. the piston rod, 14. the cross head, 15. the connecting rod, 16. the crank, 17. the crank shaft, 18. a cam shown in dotted lines and secured to the crank shaft, and 19. a rod operatively connecting the cam 18. with the plunger valve 10. as shown in Fig. 1. The cylinder 7. has a lower intake port 20. controlled by the intake valve 8. an upper exhaust port 21. controlled by the exhaust valve 9. an explosion chamber 22. a vertical valve housing 23. on the side having a cylindrical bore 24, a port 25. leading from the interior of the cylinder to the bore 24. in a position to coincide with a port in the piston when the piston is at or near the upward end of its stroke, a by-pass 26. leading from the bore 24. into the explosion chamber 22, and a spark plug 27. extending through the upper end of the cylinder into the explosion chamber 22. The intake valve 8. operates automatically and the exhaust valve 9. is operated in the usual way. The plunger valve 10. has the stem 28. extending downward through a stuffing box and operatively connected to the rod 19. A pipe 29. connects with the bore 24. under the valve 10. and this pipe 29. may form a part of the oiling or water circulating system of the engine. The compression chamber 11. is formed by the walls of the lower end of the cylinder 7. the lower end of the piston 12. and a head 30. having a packing box through which the piston rod 13. extends. The head 30 is preferably secured to the lower end of the cylinder by clamping the head between the ends of the frame 6. and the cylinder 7. as shown in Fig. 1. The chambered piston 12. is constructed to have a closed bottom 31. with an inlet port 32. controlled by an automatic valve 33. the cylindrical side walls 34 in which is an outlet port 35. an open top 36. closed by a circular plate 37, the whole forming a circular

chamber 38 in the piston. The upper end of the piston rod 13, extends through the piston and the plate 37. and a nut 39 on the end of the piston rod secures the piston to the rod and the plate 37. to the piston as shown in Fig. 1.

In the operation of my improved two-cycle gas engine, an upward stroke of the piston draws a charge of gas through the port 20. into the compression chamber 11, and the next downward stroke of the piston compresses the gas in the compression chamber 11. As the gas starts to compress the pressure of the gas opens the valve 33. in the piston and the gas passes through the inlet port 32. and is compressed in the chamber 38. in the piston 12. As the piston starts to rise on its next upward stroke, the exhaust valve 9. opens and the burned products of combustion of the previous charge of gas are completely exhausted through the exhaust port 21. by the piston 12. and simultaneously the compressed charge of gas is carried by the piston to the upper end of the cylinder, in a position for the outlet port 35. in the piston to coincide with the port 25. in the cylinder. The exhaust valve 9. now closes and the compressed charge of gas passes from the chamber in the piston through the port 35, the port 25, the bore 24. and the by-pass 26. into the explosion chamber 22. The cam 18. on the crank shaft 17. now operates through the rod 19. and the stem 28 to move the plunger valve 10. upward and close the port 25. The compressed gas is then exploded in the explosion chamber 22 by the spark plug 27. in the usual way, driving the piston downward. The gas is compressed in the compression chamber 11. considerably in excess of the pressure required in the explosion chamber 22. to allow for the expansion of the gas and still give the necessary compression in the explosion chamber. The upward movement of the plunger valve also materially assists in compressing the gas in the explosion chamber and this upward movement of the valve may be increased so as to close the by-pass 26. if desired. The plunger valve 10. may be used as a pump to feed oil or circulate water, by connecting the pipe 29 to either of these systems.

By changing the position of the cam 18. on the crank shaft 17. the position of the plunger valve 10. may be adjusted relative to the position of the piston 12.

By the use of my improved construction I provide a gas engine with a power stroke for each revolution of the engine, which eliminates the mixing of the incoming gas with the products of combustion of the previous charge of gas and with practically all of the advantages of the four-cycle engine which has only one power stroke to two revolutions of the engine.

I do not wish to confine myself to the construction shown, as it is evident that the same could be varied, without materially affecting the spirit of my invention.

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

1. In a two-cycle gas engine, a cylinder, a chambered piston in the cylinder, a compression chamber below the piston, an explosion chamber above the piston, a cylindrical bore on the side, a port connecting the interior of the cylinder with the bore, a plunger valve in the bore controlling the port, a by-pass connecting the bore with the explosion chamber, means for moving a compressed charge of gas from the compression chamber to the explosion chamber, consisting of the chambered piston, a port in the side of the piston, the port in the cylinder, the bore on the side of the cylinder and the by-pass from the bore to the explosion chamber and means consisting of the piston, an exhaust port in the side of the cylinder and a mechanically operated exhaust valve controlling the exhaust port, for simultaneously and practically completely exhausting the burned products of the previous charge of gas from the explosion chamber, on the out or exhaust stroke of the piston.

2. In a two-cycle gas engine, a cylinder having a lower compression chamber, a lower intake port leading into the compression chamber, an upper explosion chamber, an upper exhaust port leading from the explosion chamber, a cylindrical bore on the side, a port connecting the interior of the cylinder with the bore, a plunger valve in the bore controlling the port, a by-pass connecting the bore with the explosion chamber, a piston intermediate the compression and the explosion chambers, a chamber in the piston, an inlet port in the piston opening into the compression chamber, a valve controlling the inlet port in the piston, an outlet port in the piston adapted to coincide with the port connecting the interior of the cylinder with the bore, at a predetermined position of the piston and means for operating the plunger valve.

3. In a two-cycle gas engine, a cylinder having a lower compression chamber, an intake port leading into the compression chamber, a valve controlling the intake port, an upper explosion chamber in the cylinder, an exhaust port leading from the explosion chamber, a valve controlling the exhaust port, a cylindrical bore on the side of the cylinder closed at both ends, a plunger valve in the bore, a pipe leading out from the bore below the valve and adapted for connection to a source of oil or water supply, a port connecting the interior of the cylinder with the bore above the valve, a by-pass connecting the bore above the port with the explo-

sion chamber, a piston intermediate the compression and the explosion chambers, a closed chamber in the piston, an inlet port in the piston opening into the compression chamber, a valve controlling the inlet port in the piston, an outlet port in the piston adapted to coincide with the port connecting the interior of the cylinder with the bore, at a predetermined position of the piston and means for operating the plunger valve.

4. In a gas engine, a cylinder, a piston in the cylinder, an explosion chamber in the cylinder above the piston, a bore on the side of the cylinder, a plunger valve in the bore, a port connecting the interior of the cylinder with the bore above the plunger valve, a pipe extending out from the bore below the valve and adapted for connection to a source of water or oil supply and means for simultaneously operating the plunger valve as a pump and to open or close the port in the bore.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

RAYMOND JACOB LEACH.

Witnesses:
JULIA RICCI,
C. PERRY WHITE.