

PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

Improvements in and relating to Internal Combustion Engines.

We, FRANK STONER, of Fort Mills, Corregider Island, Philippine Islands, and CHARLES HENRY WILLIAM ATKEN, of Box 760, Manila, Phillipine Islands, Gentlemen, citizens of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in internal combustion engines of the type comprising a rotatable cylindrical valve member having a port extending diametrically therethrough, a chamber on either side of said port, ports in the periphery of said chamber, a casing for said valve member having ports in communication with the ports in the said valve member and with a single port for both the inlet and outlet communicating with the engine cylinder, and a valve adapted to reverse the direction of rotation of the engine.

According to this invention an internal combustion engine of the above type is provided with cylinders having pistons adapted to be reciprocated in the same direction simultaneously, and the hollow valve is disposed vertically and formed with communicating chambers at the sides of the port extending diametrically therethrough. Additional exhaust ports are arranged in the cylinders positioned at the end of the down stroke of the pistons and the reversing valve is cylindrical and rotatable and formed with an inlet port extending diametrically therethrough and with exhaust ports on either side of said inlet port.

The invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional view through

the internal combustion engine of the two cylinder four cycle type, parts being left out to more clearly show the invention.

Figure 2 is a sectional view on the line 2—2 of Figure 1;

Figure 3 is a similar view on the line 3—3 of Figure 1;

Figure 4 is a fragmentary section on the line 4—4 of Figure 3;

Figures 5, 6, 7 and 8 are detail sectional views, illustrating the different positions of the valve for controlling the intake and exhaust ports during the operation of the engine;

Figure 9 is an elevation of the said valve;

Figure 10 is a side elevation of the valve cage or chamber;

Figure 11 is a similar view looking at the opposite side of the valve cage or chamber;

Figure 12 is a horizontal sectional view illustrating the inlet manifold of the reversing valve, and

Figure 13 is a sectional view on the line 13—13 of Figure 12.

Referring to the drawings in detail, there is illustrated a two cylinder engine of the four cycle type, the cylinders being indicated at 15 and 16. Pistons 17 operate within these cylinders and have their rods connected to cranks 18 of a shaft 19, the latter operating within the bearings in the crank case, as will be readily understood. The positions of the cranks 18 differ from the usual type of engine, in that both cranks are in alignment, or extend in the same direction, the purpose being to reciprocate the pistons in the same direction simultaneously, instead of operating alternately, as is usual in explosive engines.

Housed within the engine casting, is a valve chamber or cage 20, which is of



cylindrical formation, and is provided with ports 21 and 22, which communicate with ports 23 and 24, respectively, which in turn communicate with the interior of the cylinders 15 and 16. The valve chamber or cage 20 is further provided with ports 25, which are located substantially opposite the ports 21 and 22, to receive pressure plates 37.

Mounted for rotation within the chamber 20, is a valve 26, which is of hollow cylindrical construction and is provided with a passage 27 extending diametrically there-through, while chambers 28 and 29 are located upon opposite sides of this passage. These chambers are provided with ports 30 and 31, which are adapted to be brought into register with the ports 21 and 22 in the rotation of the valve, so as to alternately open and close communication with the interior of the cylinders 15 and 16 through the ports 23 and 24. The valve 26 is formed at one end with a socket 32, which is adapted to surround a vertically disposed shaft 33, the latter being mounted for rotation in suitable bearings provided in the engine casting and surrounded by a packing gland 34 to prevent leakage from the valve chamber 20. The socket 32 has extending there across a diametrically disposed pin 35, which is seated in a notch 36, formed in the end of the shaft 33 and provides a slipping connection between the shaft and valve. It is, therefore, impossible to incorrectly place the valve, it being only necessary to place the pin within the slot or notch 36. Located within the ports 25 in the valve chamber 20 and bearing upon the valve 26, are two pressure plates 37, which act to take up any wear due to the operation of the valve. These plates are adjustable through the medium of bolts 37^a and nut locks 38, so that proper pressure may be placed upon the valve to insure its proper operation.

Secured upon the opposite end of the shaft 33, is a worm gear 39, which is engaged and driven by a worm 40, mounted upon the crank shaft. The gear 39 is preferably provided with twenty teeth and the worm 40 with five teeth, so that a ratio of one to four is provided, the crank shaft making four complete revolutions to one complete revolution of the valve 26.

Communicating with the interior of the valve 26, are passages 41 and 42, the said passages being in communication with an intake manifold 43, through the medium of passages 44 and 45 respectively. These

passages 44 and 45 are controlled by a valve 46, which will be hereinafter referred to as the reversing valve. This valve is also of hollow cylindrical shape and rotates within the chamber 47 which communicates with the passages 44 and 45. The reversing valve 46 is provided with a central passage 48, upon each side of which is located chambers 49 for communication with the atmosphere through the medium of an outlet 50. Extending from the intake manifold 43, is a suitable connection 51, to which may be connected a carburetter (not shown) of any suitable type. The passage 48 in the reversing valve 46 is adapted to be moved into communication with either of the passages 44 or 45, by means of a hand operated lever 52. The reversing valve 46 is further provided with ports 53, located upon opposite sides of the passage 48, and as shown in Figure 2, when the last mentioned passage is in communication with the passage 44, one of the ports 53 will be in register with the other port 45.

In the operation of the engine, the cylinders fire alternately, as is usual in internal combustion engines, the operation being as follows: Gas is fed from the carburetter through the passage 48 of the reversing valve and through the valve 26 to the cylinders of the engine. Both pistons move downward and upward simultaneously, while the explosions occur alternately. When both pistons are at the limit of the down stroke and starting upward, the valve 26 will be in the position shown in Figure 5, cylinder 15 exhausting through 23, 21, 27, 45, 53, and 50 to the atmosphere, and cylinder 16 then starting on the compression stroke with the valve 20 covering port 22, which leads through the port 24 to cylinder 16. When the pistons arrive at the limit of the up stroke, cylinder 15 has entirely exhausted the exploded gases and cylinder 16 has reached full compression and is ready for firing. When this occurs the valves 26 are in the position shown in Figure 6. After firing the pistons start downward and cylinder 15 sucks in the fresh charge of fuel through the carburetter, the passage 48 of the reversing valve 46, the passage 44 of the intake manifold 43, the port 30, the port 21 and the port 23 to cylinder 15. When the pistons again reach the limit of the down stroke, the valve 26 is in the position shown in Figure 7. The pistons again move upward or outward with the ports 21 and 23 closed to the chambers 41 and

42. During this upward movement the cylinder 16 will exhaust through the ports 24, 22, 27, 42, 53, and 50 to the atmosphere. When the piston again arrives at the limit of the up stroke, the valve 26 is in the position shown in Figure 8, cylinder 15 being again ready to fire. When this occurs the pistons move downward and cylinder 16 takes in a fresh charge through the ports 48, 44, 30, 22, and 24. This completes the four cycle of operation, the crank shaft having made two complete revolutions, while the valve 26 has made only half.

15 To reverse the direction of operation of the engine, the lever 52 is operated to rotate the reversing valve, so that the passage 48 will communicate with the passage 45, and one of the ports 53 with the passage 43. The fuel and exhaust gases will then enter and leave the valve 26 in an opposite direction, from that above explained, that is to say the exhaust ports become the inlet ports and *vice versa*, so that a reverse motion of the engine is obtained. As the explosions occur in one or other of the cylinders the exhaust always takes place at the end of the inner or bottom stroke of the pistons through the ports 60 provided in each of the engine cylinders. This reduces the charge in the cylinders to atmospheric pressure and leaves only the burnt charge to be expelled through valve 26 to the atmosphere and thereby entirely empties the cylinders, leaving them ready for a full charge of fresh fuel.

The invention is susceptible of various changes in its form, proportions and minor details of construction and the right is herein reserved to make such changes as properly fall within the scope of the appended claims.

45 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to

be performed, we declare that what we claim is:—

1. An internal combustion engine comprising cylinders having pistons adapted to be reciprocated in the same direction simultaneously, each cylinder having a single port adapted to act as an inlet and exhaust port to each cylinder, a vertically disposed cylindrical valve secured to one end of a vertical and rotatable shaft driven from the crankshaft of the engine, a port extending diametrically through said valve, a chamber on either side of said port, said chambers communicating one with the other, ports in said chambers, a valve casing having ports registering with the valve ports and with the single ports in engine cylinders, additional exhaust ports in the cylinders positioned adjacent the end of the down stroke of the pistons, and a rotatable cylindrical reversing valve having an inlet port arranged diametrically there-through and exhaust ports on either side of said inlet port, substantially as described.

2. An engine as claimed in Claim 1, wherein the valve is secured to the cylindrical shaft by means of a pin engaging in a socket in the valve and a notch in the shaft, substantially as and for the purpose described.

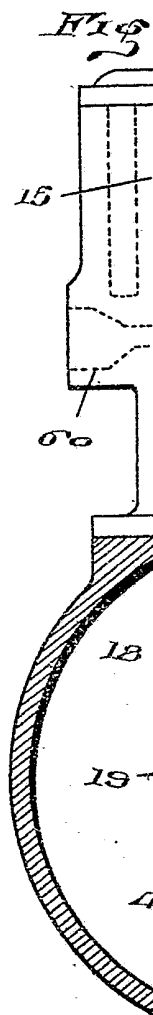
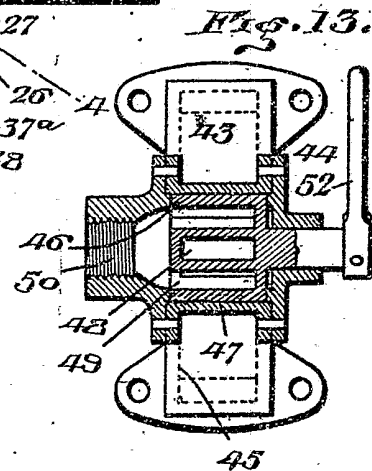
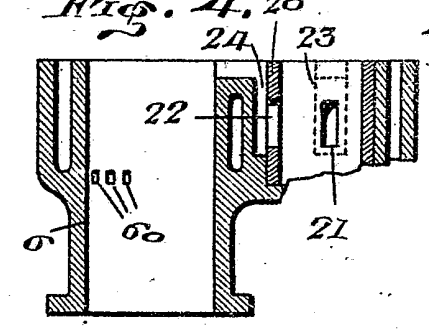
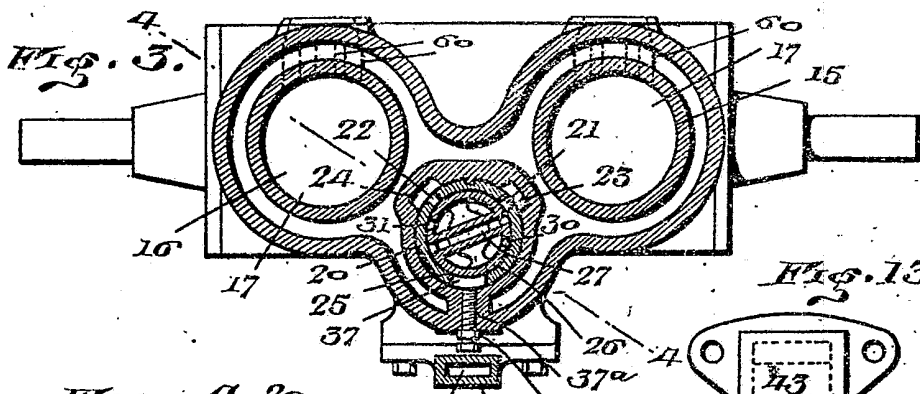
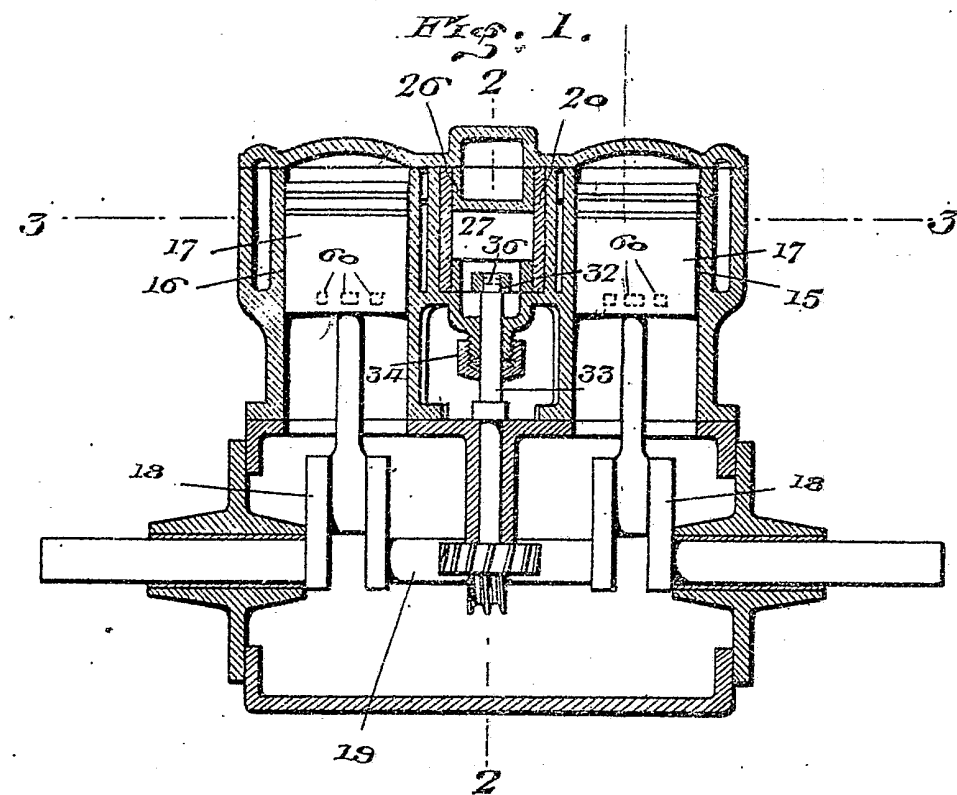
3. In an engine as claimed in Claim 1, the provision of adjustable pressure plates to take up wear on the valve, substantially as described.

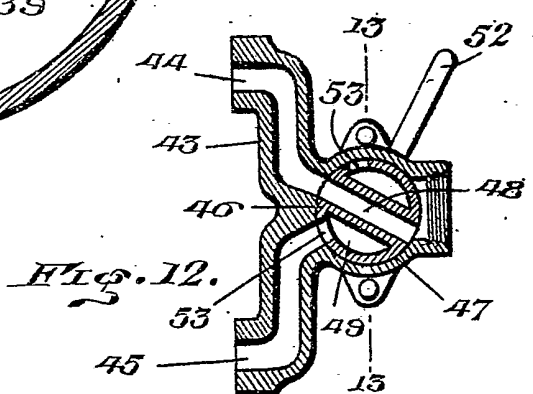
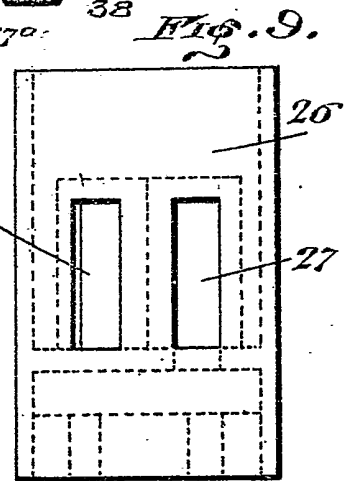
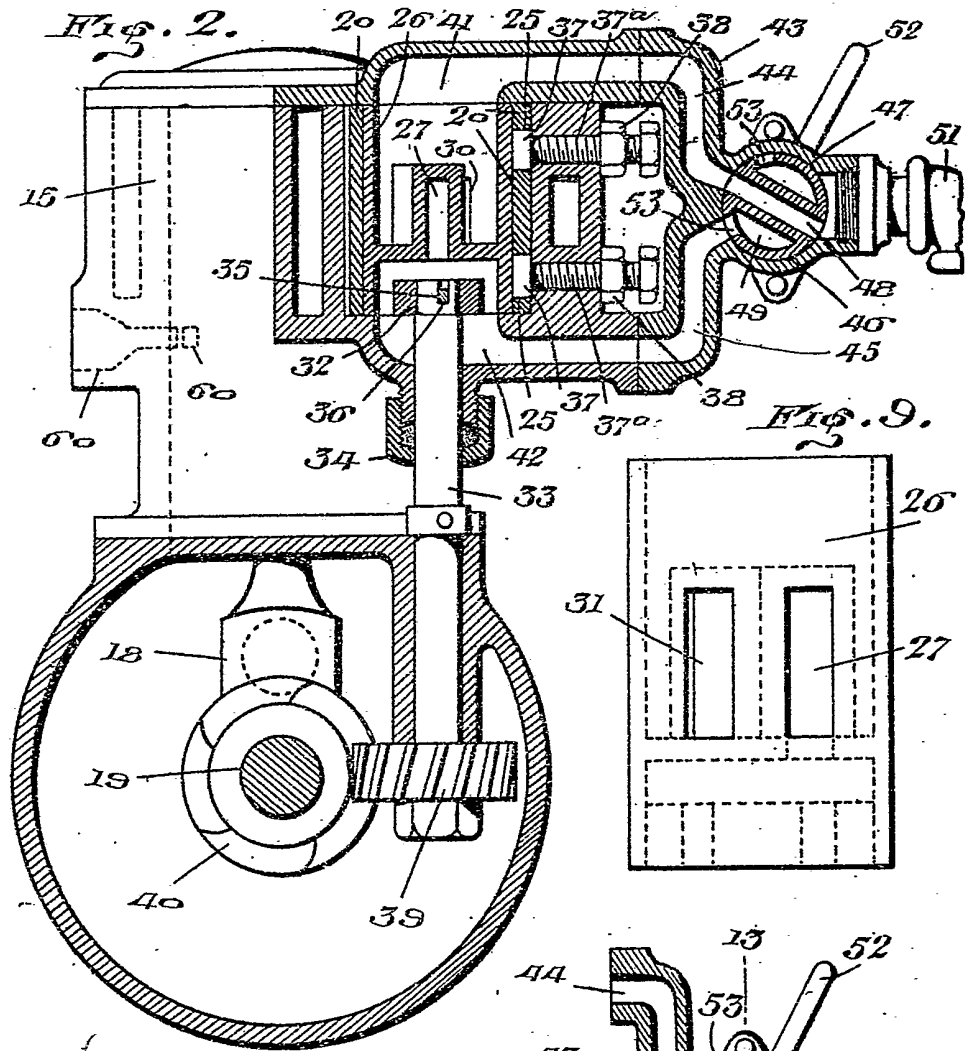
4. The improved internal combustion engine substantially as described with reference to the accompanying drawings.

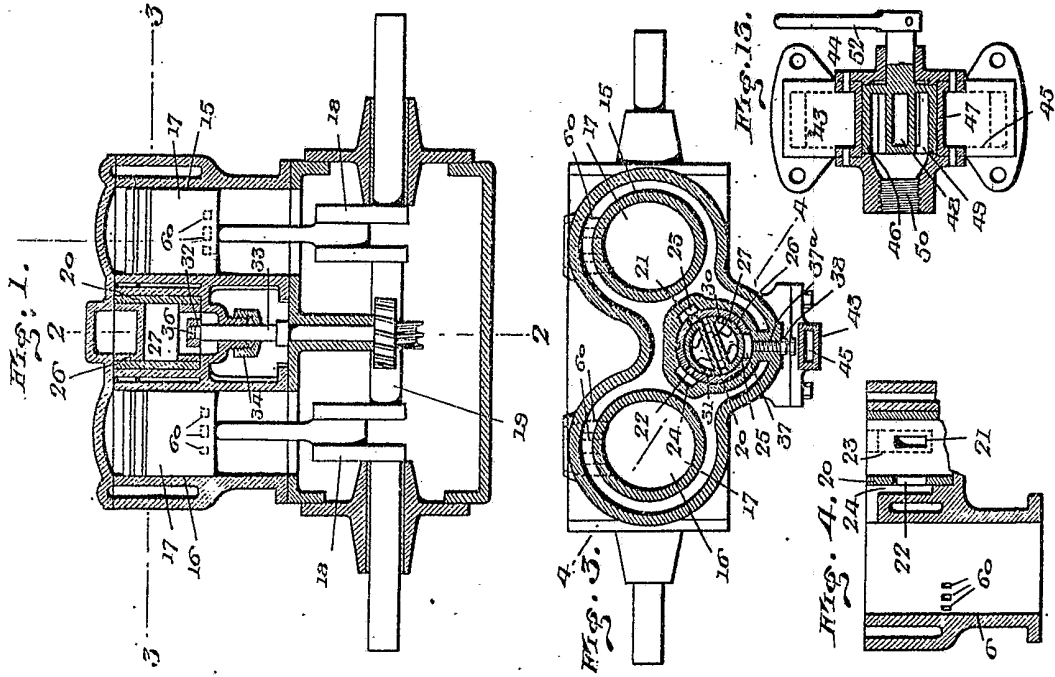
Dated this 13th day of September, 1920.

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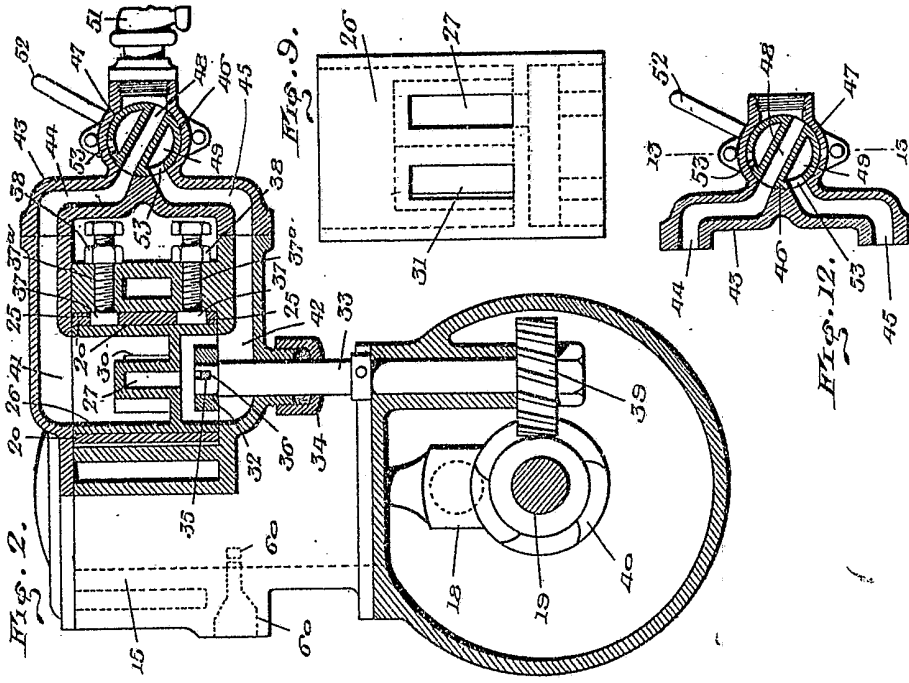
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