C. G. WRIDGWAY.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 31, 1908

942,124. Patented Dec. 7, 1909.

Fig. 1.

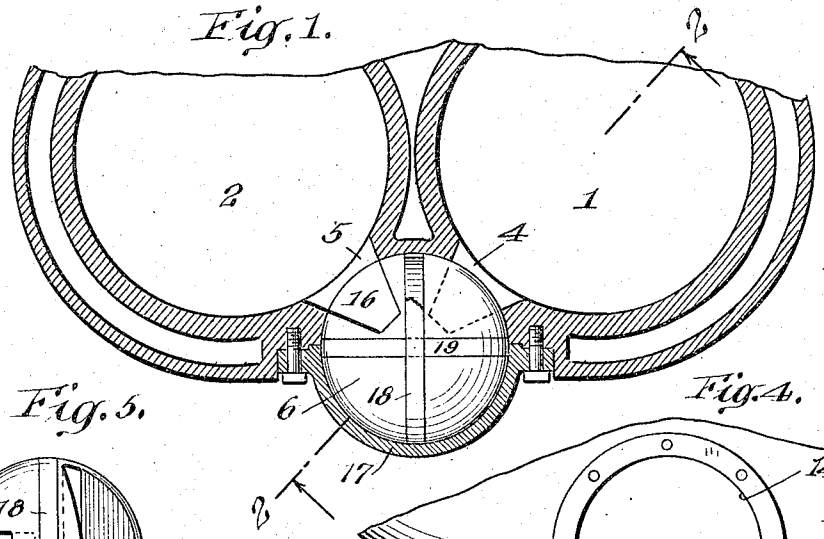


Fig. 5.

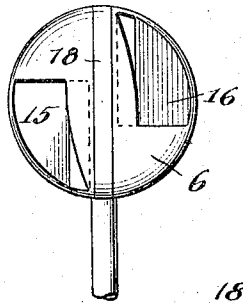


Fig. 4.

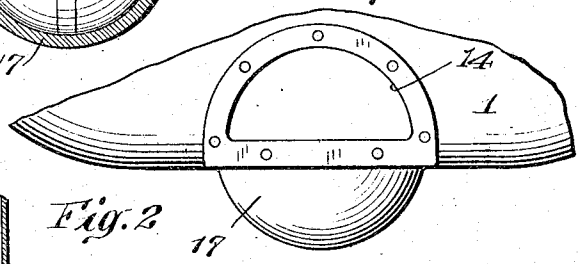


Fig. 2.

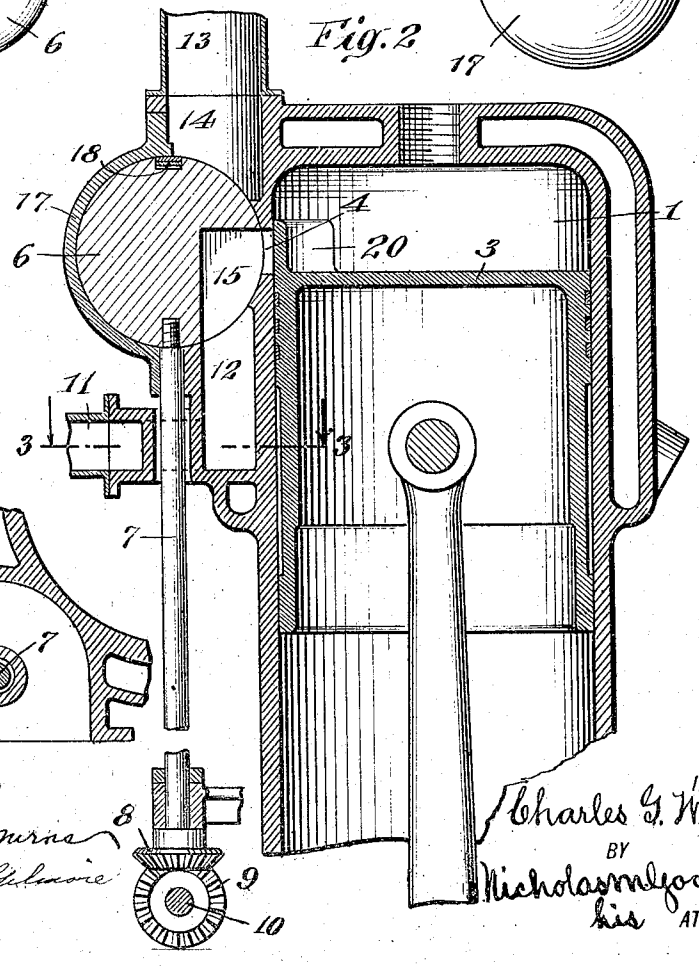
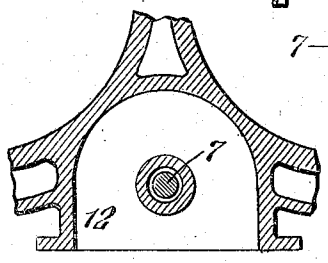


Fig. 3.



WITNESSES

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CHARLES G. WRIDGWAY, OF NEW YORK, N. Y.

INTERNAL-COMBUSTION ENGINE.

942,124. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed December 31, 1908. Serial No. 470,201.

To all whom it may concern:

Be it known that I, CHARLES G. WRIDGWAY, a subject of the King of Great Britain, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in internal combustion engines.

This invention seeks particularly to improve the valve equipment whereby the number of valve parts required is reduced and whereby a greater compactness, efficiency and simplicity in structure and other advantages are attained.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which like reference numerals designate corresponding parts.

Figure 1 is a transverse section through a pair of upright engine cylinders, partly broken away, and showing the valve in full lines; Fig. 2 is a vertical section showing a cylinder and piston, the section being taken on the line 2—2 of Fig. 1; Fig. 3 is a fragmental section on the line 3—3 of Fig. 2; Fig. 4 is a fragmental plan view of Fig. 1 with the exhaust pipe removed; and Fig. 5 is a side elevation of the valve detached.

Referring now in detail to the particular embodiment, as shown in the drawings,—1 and 2 are two engine cylinders arranged in a pair and preferably cast in one piece, as shown, and provided with the usual water jacket.

3 is a piston working in the cylinder 1. The cylinder 2 is provided with a similar piston.

4 and 5 are ports formed in the sides of the respective cylinders, in close proximity, and opening into a valve cage in which works a rotary valve 6. The port 4 provides both the inlet and outlet for cylinder 1 and the port 5 provides both the inlet and outlet for cylinder 2. This valve is made in the form of a sphere, as shown, and is rotated on a vertical axis by means of the valve rod 7. The valve rod is actuated by suitable means which may be a beveled pinion 8 carried on the valve stem and meshing with a pinion 9 carried on an auxiliary shaft, such as the cam shaft 10.

11 is the inlet pipe whose mouth 12 communicates with both of the ports 4 and 5. 13 is the exhaust pipe having a mouth 14 which communicates with both of the ports 4 and 5. These inlet and exhaust pipes preferably have their mouths opening in opposite directions from the cylinder ports. In the present instance, the inlet pipe leads to the ports from below and the exhaust pipe leads to the ports from above.

The valve 6 is provided with two passages 15 and 16, each of which is arranged to communicate with both ports in turn. The engine shown in the drawings is of the four-cycle type and the valve may be termed a four-cycle valve, the cycles of its operation corresponding to those of the engine. The passage 15 in the valve is arranged to communicate with the supply pipe 11 but not with the exhaust pipe, and the passage 16 in the valve is arranged to communicate with the exhaust pipe 13 but not with the supply pipe. The valve is held in place by a removable keeper plate 17 which closely fits the surface of the valve and constitutes part of the valve cage. When the plate 17 is detached from place, the valve may be removed. The valve is preferably provided with bands of packing 18 and 19 which intersect each other and divide the surface of the valve into four sections. The passages 15 and 16 occupy two of these sections which adjoin each other. As the parts are shown in the drawings, the valve passage 15 is in register with port 4 of cylinder 1 and with the mouth of the inlet pipe 11, and the valve passage 16 is in register with port 5 of cylinder 2 and with the mouth of the exhaust pipe 13. The piston 3 has just completed its up-stroke for the exhaust of cylinder 1 and is ready to make its down-stroke for the intake of gas into the cylinder. The piston in cylinder 2 would be, at this time, at the bottom of the cylinder and is ready to make its up-stroke to exhaust the cylinder through port 5 and valve passage 16. The valve has four different positions and preferably it moves promptly step by step from one position to another halting in each position until it has discharged the function appropriate to that position whereupon it promptly moves to the next position. For this purpose its driving pinion 9 has a corresponding movement. During the downward movement of the piston 3 for the intake of gas to cylinder 1, the valve remains stationary in the position shown in the drawings in which it brings the supply pipe into communication with the port 4. The

passage 16, having brought the port 5 into communication with the exhaust pipe, enables the exhaust of cylinder 2 to be completed by the up-stroke of the piston of cylinder 2. When piston 3 has completed its down-stroke and piston of cylinder 2 has completed its up-stroke, the valve rotates one step so as to bring its passage 15 into register with port 5 for the intake of gas to cylinder 2. This brings the shut-off section of the valve immediately behind the passage 15 into register with port 4 so as to close the port. The valve remains in this second position during the up-stroke of piston 3 to compress the gas in cylinder 1, and for the down-stroke of piston in cylinder 2 for the intake of gas thereto. The valve then turns to its third position in which the cut-off section of the valve which has just been closing the port 4, now closes port 5 and the following cut-off section of the valve closes port 4. When the valve is in this position the firing of cylinder 1 takes place and the compression in cylinder 2 takes place. The valve then moves to its fourth position in which passage 16 registers with port 4 for the exhaust of cylinder 1 and the cut-off section of the valve immediately in advance of the passage 16 registers with port 5 during the firing of cylinder 2. The valve then moves to its initial position where it remains for the intake into the cylinder 1 through the valve passage 15 and for the exhaust of cylinder 2 through valve passage 16.

By the valve arrangement herein shown and described, it will be seen that one valve takes care of the supply and exhaust for each of the two cylinders, thus accomplishing the function of two inlet and two outlet valves with which each pair of cylinders has heretofore been usually provided. In the preferred arrangement the valve and the ports for the two cylinders are located as shown in the drawings, in which the ports 4 and 5 are located in the sides of the two cylinders and in the sides of the angle formed by the cylinder walls, the valve being located in said angle with its stem parallel to the axes of the cylinders. This arrangement has the advantages of compactness, convenience, economy of construction, etc. It is apparent, of course, that one valve, such as the valve 6, may be used in conjunction with each separate cylinder. In this case, the valve would take the place of the two inlet and outlet valves heretofore in general use for a cylinder. Furthermore, the valve arrangement herein shown and described, makes it feasible to construct the cylinders with a uniform internal diameter, as shown, so that the entire internal surface of the cylinder may be machined and finished, thus removing the roughness which has heretofore characterized the interior of the combustion end of a cylinder and which has led to the undue heating thereof. Again, by giving the cylinder a uniform internal diameter, the full force of the explosion may be directed upon the head of the piston.

For the purpose of protecting the valve from the force of the explosions, the piston 3 is arranged to close the cylinder port when it has reached its position of greatest gas compression. For this purpose the piston is provided with a lip 20 on its upper face which closes the port when it has reached its position of greatest gas compression and without materially diminishing the space above the piston.

Other advantages of the valve are the noiselessness and freedom from vibration and jarring which characterizes its operation.

What is claimed and what is desired to be secured by Letters Patent is:—

1. In an internal combustion engine, the combination of a piston cylinder having a port for both inlet and outlet; and a rotary spherical valve for said port, whereby one valve may control both the inlet and outlet at said port.

2. In an internal combustion engine, the combination of a piston cylinder having a port for both inlet and outlet; and a rotary spherical valve for said port having separate inlet and outlet passages to register with said port, whereby one valve may control both the inlet and outlet at said port.

3. In a four cycle internal combustion engine, the combination of a piston cylinder having a port for both inlet and outlet; and a four cycle rotary valve having separate inlet and outlet passages for said port, said valve being provided with suitable packing dividing it into four sections, whereby one valve may control both the inlet and outlet at said port.

4. In an internal combustion engine, the combination of two piston cylinders, each cylinder having a port for both inlet and outlet; and a rotary spherical valve having two passages for said ports, whereby one valve may control both the inlet and outlet at both of said ports.

5. In a four cycle internal combustion engine, the combination of two piston cylinders, each cylinder having a port for both inlet and outlet; and a rotary four cycle valve having two passages for said ports, said valve being provided with suitable packing dividing it into four sections, whereby one valve may control both the inlet and outlet of both of said ports.

6. In an internal combustion engine, the combination of two four cycle piston cylinders, each cylinder having a port for both inlet and outlet; a four cycle rotary valve having two passages for said ports, said

valve being provided with suitable packing dividing said valve into four sections; inlet and outlet pipes leading to said valve passages and each having a mouth communicating with both of said ports, whereby one valve may control the inlet and outlet at both of said ports.

7. In an internal combustion engine, the combination of two four cycle piston cylinders and pistons, each cylinder having a port for both inlet and outlet; a four cycle rotary valve having two passages for said ports, said valve being provided with suitable packing dividing said valve into four sections; inlet and outlet pipes leading to said valve passages and each having a mouth communicating with both of said ports, whereby one valve may control the inlet and outlet at both of said ports, each of said pistons operating to close its port at the position of greatest gas compression, substantially as set forth.

8. In an internal combustion engine, the combination of a piston cylinder having a port for both inlet and outlet; supply and exhaust pipes both communicating with said port; and a rotary spherical valve controlling the communication between said port and pipes.

9. In an internal combustion engine, the combination of a piston cylinder having a port for both inlet and outlet; supply and exhaust pipes both communicating with said port; and a rotary spherical valve having an inlet passage and a separate outlet passage controlling the communication between said port and pipes.

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

CHARLES G. WRIDGWAY.

Witnesses:

JOS. GIPSER,

CHARLES A. ANDERSON.