April 20, 1926. 1,581,942

E. RICH

ROTARY VALVE TIGHTENING MECHANISM

Filed Jan. 23, 1925

Fig. 1.

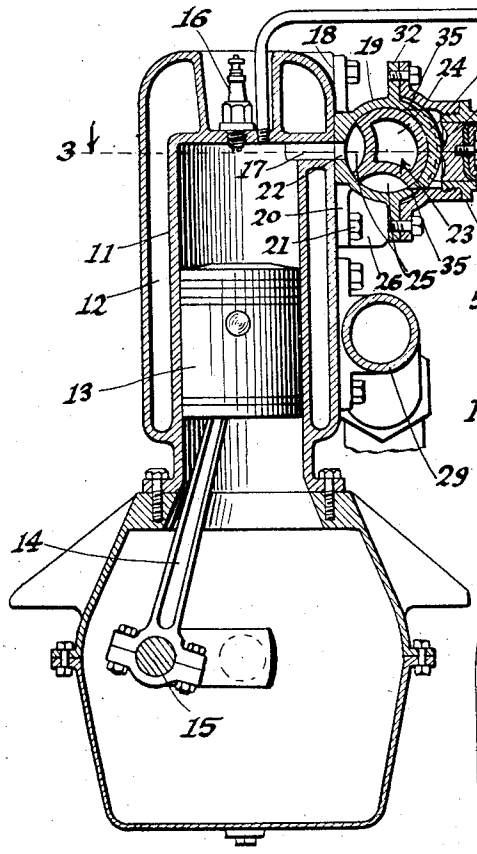


Fig. 4.

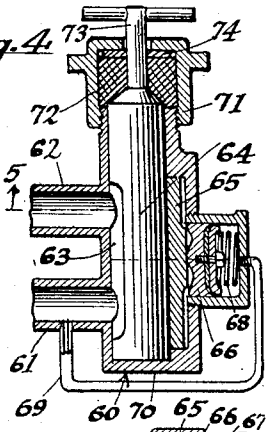


Fig. 5.

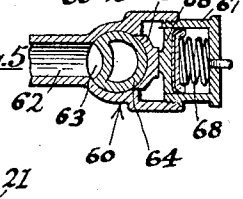


Fig. 2.

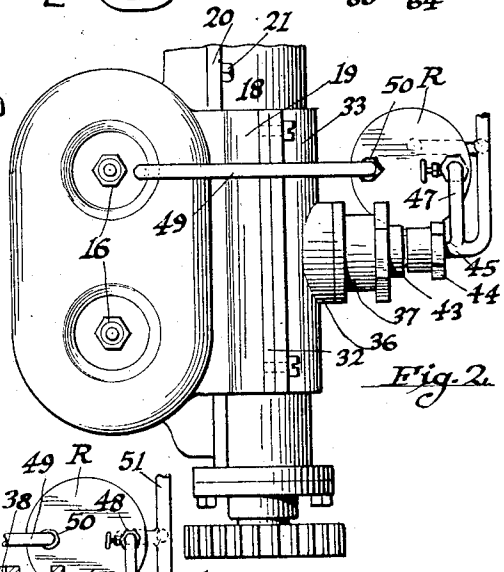
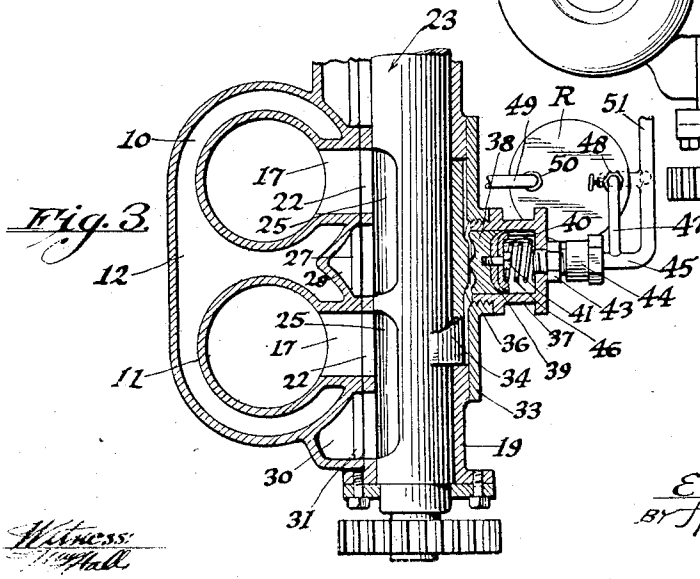


Fig. 3.



Witness:

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UNITED STATES PATENT OFFICE.

EVERT RICH, OF LOS ANGELES, CALIFORNIA.

ROTARY-VALVE-TIGHTENING MECHANISM.

Application filed January 23, 1925. Serial No. 4,189.

To all whom it may concern:

Be it known that I, EVERT RICH, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Rotary-Valve-Tightening Mechanism, of which the following is a specification.

This invention relates to improvements in rotary valves.

An object of the invention is to provide a rotary valve adapted to open and close ports which are all located upon the same side of the valve so as to control the flow of fluid therethrough, and to provide means for applying a force upon the valve upon the opposite side from the ports so that the valve will be urged toward its ports and will in this manner maintain a tight seat.

A further object of the invention is to provide a rotary valve adapted to control the fluid flow through ports, all of which are located upon the same side of the valve, and to provide means for transferring pressure from the fluid pressure supply adapted to flow through the ports to the opposite side of the valve in such a manner as to cause this pressure to apply to the valve upon the opposite side of the ports a force greater than that which is developed by the fluid pressure supply upon the port side of the valve.

Although the invention is designed to be applied to rotary valves in general, it is especially adapted to be used in conjunction with the rotary valve of an internal combustion engine, and the device is especially an improvement over the rotary valve construction disclosed in my co-pending application, Serial No. 698,040, filed March 10, 1924.

With the foregoing and other objects in view which will be made manifest in the following detailed description and pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a vertical section through an internal combustion engine, to which the improved valve construction has been applied;

Fig. 2 is a top plan view of a portion of the engine shown in Fig. 1;

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a section taken through a rotary valve of conventional construction adapted to be used for any of a variety of purposes; and

Fig. 5 is a section taken substantially on the line 5—5 of Fig. 4.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, in Fig. 1, I have disclosed an internal combustion engine having cylinders 10 and 11, about which there is disposed a water jacket 12. Although I have only illustrated two cylinders of the internal combustion engine, it is to be understood that the engine may have any number of cylinders and may be of any know construction. Within the cylinders 10 and 11 there is disposed pistons 13 connected by connecting rods 14 to a crank pin 15. The cylinders are adapted to be fired by means of spark plugs 16. Each of the cylinders 10 and 11 is provided with a conducting duct 17, which constitutes an inlet and an exhaust passage for each of the cylinders.

The side of the block in which the cylinders are formed is provided with a flat face 18 against which is secured a valve housing 19, the valve housing 19 being shown as provided with flanges 20 bearing against the flat face 18 and secured thereto as by bolts 21. In the valve housing 19 there are formed ports 22 which, when the valve housing is mounted upon the side of the cylinder block, register with the conducting ducts 17. Within the valve housing 19 there is disposed a rotary valve member 23 which may be hollow, as indicated at 24, and which has passages 25 formed therein, as in the rotary valve disclosed in my co-pending application above referred to. Beneath the valve housing 19 there is disposed an intake manifold 26 secured upon the side of the cylinder block and which communicates with passages 27 formed in the cylinder block. The passages 27 communicate with ports 28 formed in the valve housing 19, and when the valve member 23 is so rotated that one of its passages 25 establishes communication between a port 28 and a port 22, fuel may pass into a cylinder. Disposed beneath the intake manifold 26 there is an exhaust manifold 29 communicating with passages 30 formed in the cylinder block, which passages communicate with ports 31 formed in the valve

housing 19. When the valve 19 is so rotated that one of its passages 25 establishes communication between a conducting duct 17 and a port 31, exhaust gases may be discharged from the cylinders of the engine into the exhaust manifold 29.

As shown upon the drawing, the valve housing 19 is somewhat semi-cylindrical in construction, having top and bottom flanges 32 upon which is secured a somewhat semi-cylindrical cap 33, which encloses a semi cylindrical member 34, which cooperates with the valve housing 19 to form a valve cylinder in which the valve 23 rotates. The top and bottom edges of the semi-cylindrical member 34 are slidable upon parallel surfaces 35 provided upon the valve housing 19. The cap 33 is provided with a stem portion 36 into which is screwed or otherwise secured a fitting 37 providing a cylinder in which a piston 38 formed upon the semi-cylindrical member 34 is slidable. The piston 38 may be formed integral with the semi-cylindrical member 34, or may be otherwise secured thereto, and a washer or other packing material, indicated at 39, may be secured upon the outer end of the piston 38 by a plate 40 secured in place by a cap screw 41. The outer end of the fitting 37 has an aperture 42 formed therein, which receives a nipple 43, and a coupling 44 is threaded on to the nipple and couples a pipe 45 to it. A coil spring 46 is disposed within the fitting 37 and is compressed between the piston 38 and the end of the fitting 37, so as to normally urge the piston 38 and the semi-cylindrical member 34 against the valve. The pipe 45 communicates with the bottom of a liquid reservoir R adapted to hold a liquid L, and a branch conduit 47 provided with a valve 48 preferably is employed, which communicates with the pipe 45 and the top of the liquid reservoir R. From the top of the liquid reservoir there leads a second pipe 49 provided with a check valve 50, which communicates with one of the cylinders of the internal combustion engine. As shown in Fig. 3, this pipe communicates with the cylinder 10 formed in the internal combustion engine.

The operation of the device upon the internal combustion engine is as follows: Upon the compression stroke of the piston 13 within the cylinder 10, gas is forced through the second pipe 49 past the check valve 50 and into the liquid reservoir R. Under usual circumstances, the valve 48 in the branch conduit 47 is closed, and the pressure developed within the liquid reservoir R above the liquid L forces the liquid through the pipe 45 and the nipple 43 and into the cylinder provided by the fitting 37. This fluid pressure is exerted upon the face of the piston 38 and urges the semi-cylindrical member 34 against the valve 23 so as to force it towards the ports 22, 28 and 31, all of which, it will be noted, are upon the same side of the valve. In this manner, the valve 23 may be placed in the valve housing 19 with a considerable amount of clearance so as to prevent freezing, or sticking of the valve, when heated; but the valve will not leak because of the fluid pressure urging the valve against its seat across the ports. The fluid pressure in reality constitutes a resilient means for resiliently forcing the valve toward the port side of the housing 19. Preferably, the exposed area upon the piston 38 is greater than the area of the cylinder ports 22, so that the force developed upon the piston side of the valve 23 will at all times be greater than the force developed upon the port side of the valve by the engine cylinder pressure acting thereon, so that the resultant of all forces acting upon the valve 23 is in a direction toward the port side of the valve. The spring 46 may additionally exert a sufficient force to urge the valve toward its ports, so that regardless of the pressure developed within a cylinder of the internal combustion engine, the valve will always be proportionately urged towards its ports, so as to provide a tight seat thereabout. The check valve 50 prevents the backward flow of fluid pressure developed within the liquid reservoir R toward the cylinders, and as the pressure developed within the reservoir quickly reaches the amount of the maximum pressure developed within a cylinder of the internal combustion engine, namely, that which is developed upon the explosion stroke, the additional gas which is forced into the reservoir R will be practically negligible, and in this manner the loss of compression within the cylinder 10 is unnoticeable for all practical purposes. Because of the fact that the liquid L is forced against the piston 38, which liquid is preferably oil, the slight escape of liquid about the packing 39 is usually sufficient to lubricate the valve. If not sufficient, a small hole may be made through the piston or a separate and independent lubrication feed brought through the cap 33. However, in some cases, if for any reason, it should be undesirable to use the liquid L, the valve 48 may be opened, and the gas pressure may be applied directly upon the piston 38. On an internal combustion engine having a large number of cylinders, a liquid reservoir R may be used for each cylinder or pair of cylinders, if so desired. However, in the preferred form of construction, a pipe 51 leads to pistons similar to the piston 38, located along the valve 23 opposite other pairs of cylinders, and only one cylinder is used for maintaining the pressure within the liquid reservoir R. In case of a number of cylinders, the valve 23 may be divided into sections coupled together for rotation.

From the above it is seen that an improved mechanism is provided for tightening a rotary valve against its ports, which transmits pressure from the fluid pressure supply which passes through the ports to the opposite side of the valve from the ports, and that this pressure develops a force which is approximately equal to and is preferably greater than the force developed by the pressure upon the port side of the valve. Although I have above described the device as applied to a rotary valve of an internal combustion engine, the improvement is applicable upon other rotary valves.

In Fig. 4, I have disclosed a valve housing 60, with which communicate an intake passage 61 and an exhaust passage 62, there being a passage 63 formed in the rotary valve 64 disposed within the valve housing 60, which is adapted to establish communication between the intake passage 61 and the exhaust passage 62. The side of the valve housing 60 opposite the ports provided by the intake passage 61 and the exhaust passage 62 is cut away, and a semi-cylindrical member 65, similar to the semi-cylindrical member 34, is adapted to bear against the rotary valve 64, which semi-cylindrical member carries a piston 66, similar to the piston 38. A cap 67, similar to the fitting 37, is secured upon the valve housing 60 and a coil spring 68, similar to the coil spring 46, is compressed between the cap 67 and the piston 66. A pipe 69 establishes communication between the intake passage 61 and the cylinder provided within the cap 67 and in this manner transmits fluid pressure from the fluid pressure supply in the intake passage 61 to the piston 66. One end of the valve housing 60 is closed, as indicated at 70, and the opposite end carries a gland member 71, compressing packing 72 about the rotary valve 64. A handle 73 is formed integral with, or may be otherwise secured to, the rotary valve 64 whereby the valve may be rotated. A washer 74 fits snugly the stem 73 but is small enough in outside diameter to allow lateral movement. In this modification, the exposed area upon the piston 66 is preferably of such size that the force developed by the application of pressure upon the piston will be always greater than the force developed by the pressure upon the port side of the valve, and in this manner the resultant of forces acting upon the valve will always maintain it against the port side of the housing 60.

It will be understood that various changes in the detail of construction may be made without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. In an internal combustion engine, a rotary valve, intake and exhaust ports adapted to be opened and closed by said valve and arranged upon one side thereof, a conduit communicating with a cylinder of said engine, a liquid reservoir into which said conduit discharges, a member engageable upon said valve upon the opposite side of said ports, a piston associated with said member, and means for applying pressure developed within said reservoir to said piston as and for the purpose described.

2. In an internal combustion engine, a rotary valve, intake and exhaust ports adapted to be opened and closed by said valve and arranged upon one side thereof, a conduit communicating with a cylinder of said engine, a check valve mounted in said conduit, a liquid reservoir into which said conduit discharges, a member engageable upon said valve upon the opposite side of said ports, a piston associated with said member, and means for applying pressure developed within said reservoir to said piston as and for the purpose described.

In testimony whereof I have signed my name to this specification.

EVERT RICH.