A. C. DAM & A. MARSHALL.

VALVE DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JUNE 19, 1912.

1,068,632. Patented July 29, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

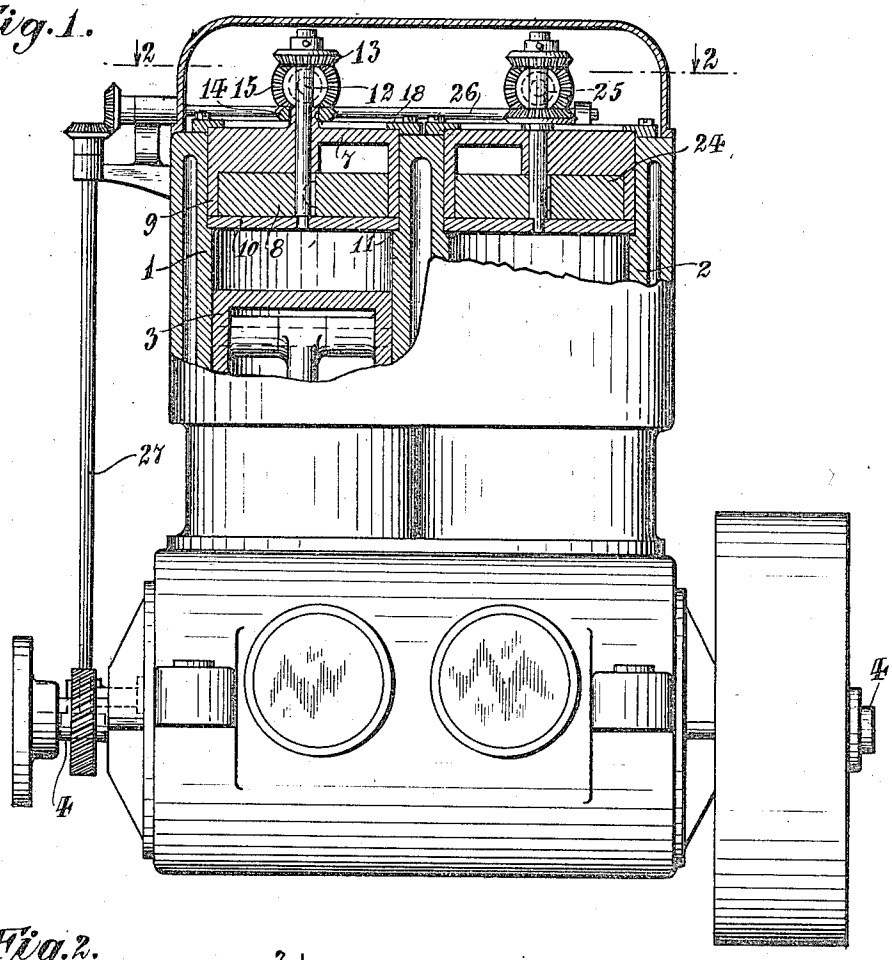
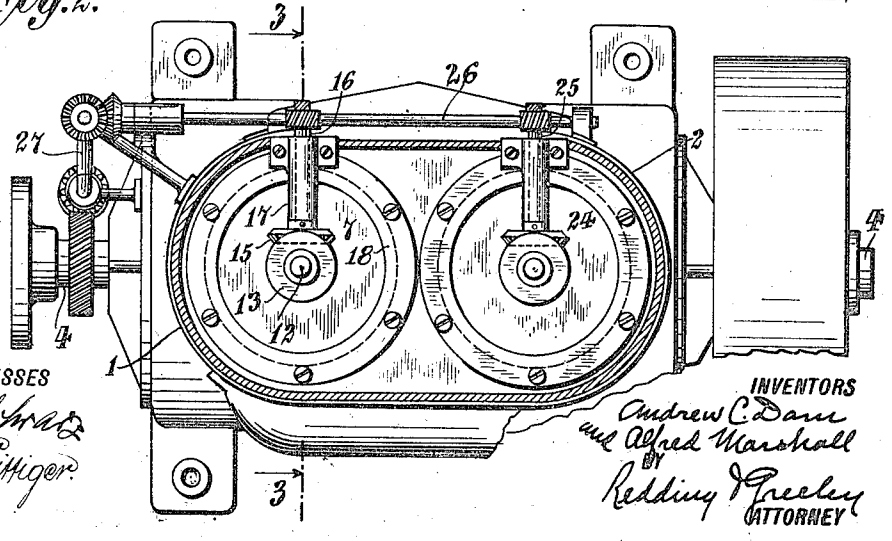


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

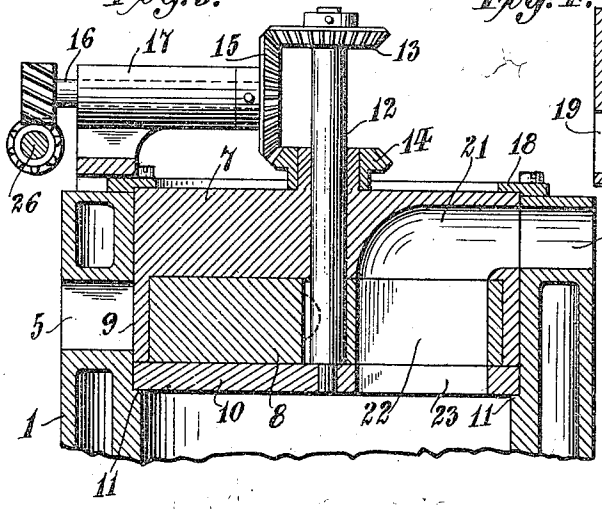


Fig. 4.

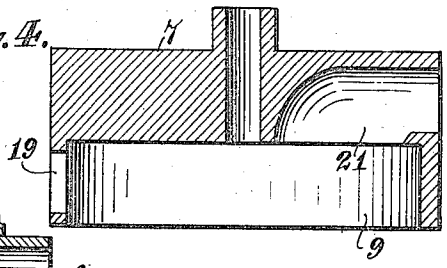


Fig. 5.

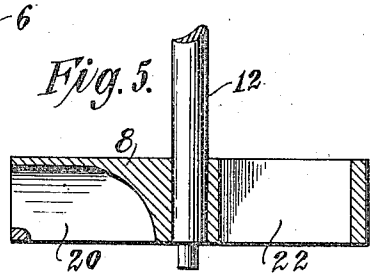


Fig. 6.

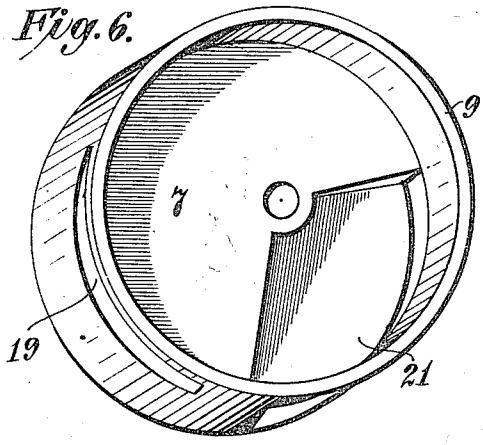


Fig. 7.

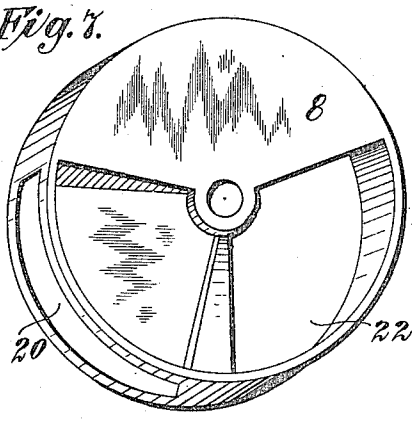


Fig. 8.

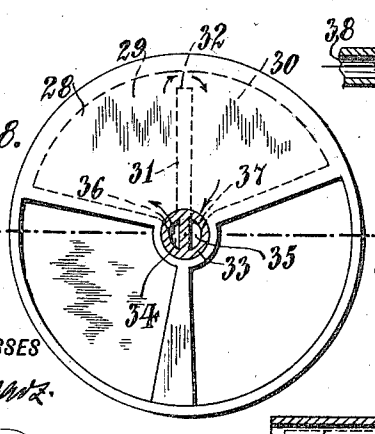
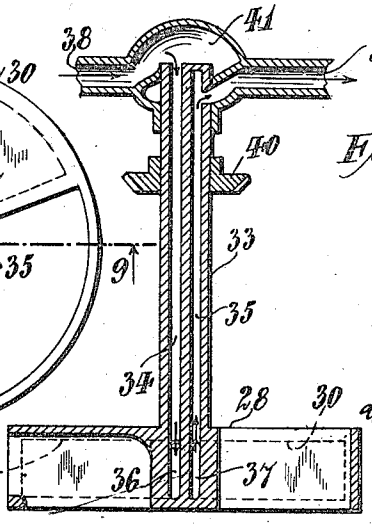


Fig. 9.



WITNESSES

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ANDREW C. DAM AND ALFRED MARSHALL, OF NEW YORK, N. Y.

VALVE DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,068,632. Specification of Letters Patent. Patented July 29, 1913.

Application filed June 19, 1912. Serial No. 704,561.

To all whom it may concern:

Be it known that we, ANDREW C. DAM and ALFRED MARSHALL, both citizens of the United States, and residing in the city, county, and State of New York, have invented certain new and useful Improvements in Valve Devices for Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings, which form a part thereof.

This invention relates to valve devices for internal combustion engines.

The invention seeks to provide a valve device of the rotary type which shall have the advantage of a quick opening of the valve ports to their maximum and a quick closing of the ports.

The invention also seeks to provide a valve device of the rotary type in which the leakage of gas shall be effectually prevented or reduced to a minimum.

The invention further seeks to provide an efficient arrangement for water-cooling that part of the valve device which is most exposed to the firing.

In the accompanying drawings forming part of this specification, and in which like reference numerals designate corresponding parts, Figure 1 is a side elevation, partly in section, of a four cycle internal combustion engine provided with our rotary valves. Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1. Fig. 3 is an enlarged vertical section taken on the line 3—3 of Fig. 2 and showing the upper end of a cylinder provided with one of our valve devices. Figs. 4 and 5 are vertical sectional elevations of the valve elements included in the valve device. Figs. 6 and 7 are perspective views of these valve elements. Fig. 8 is a plan view showing a modified form of one of said elements, and Fig. 9 is a vertical sectional elevation taken on the line 9—9 of Fig. 8.

Referring now to the particular embodiment of the invention, as shown in the drawings, 1 and 2 are the cylinders of the engine which are preferably made in one casting as shown.

3 is the piston of cylinder 1. The pistons are operated in the usual manner from the crank shaft 4. The cylinder 1 near its upper end or head is provided with the inlet port 5 and the exhaust port 6 which are controlled by the valve device for this cylinder. The valve device consists of two superposed cylindrical valve-members 7 and 8, the valve-member 7 being provided with a flange 9 which surrounds the periphery of the valve-member 8.

10 is a ported plate which rests on the annular shoulder 11 formed in the inner periphery of the cylinder. Stepped on this plate is the valve shaft 12 to which is rigidly secured the valve-member 8. The valve-shaft 12 extends outward through the valve-member 7 and is provided with a beveled gear 13. Valve-member 7 is provided with a beveled gear 14 which surrounds valve shaft 12. Gears 13 and 14 are driven in opposite directions by beveled gear 15 fixed on the drive shaft 16 which turns in a bearing 17 fixed to the upper end of the cylinder. The valve-members are held in place within the cylinder by the removable plate 18 which is bolted to the end of the cylinder. The valve-member 7 is provided with an inlet port 19 through the flange 9 and the valve-member 8 is provided with an inlet port 20 which opens through the periphery and through the lower face thereof and is adapted to register with the port 19. The ports 19 and 20 register with the inlet port 5. Valve-member 7 is also provided with an exhaust port 21 which opens through its periphery above the flange 9 and registers with the cylinder exhaust port 6. This port 21 also opens through the lower face of the valve-member 7 and registers with the exhaust port 22 of valve-member 8 which extends entirely through this valve-member. The plate 10 which is fixed securely in place has a port, not shown, which registers with port 20 and a port 23 which registers with port 22. When the inlet ports 19 and 20 register with each other and with the cylinder port 5, gas is admitted to the cylinder. When the exhaust ports 21 and 22 register with each other and with cylinder port 6 the combustion products are exhausted from the cylinder. It will be seen that, by the arrangement of the valve-members described and their rotation in opposite directions, a very quick opening of the ports to their maximum and a very quick closing of the ports takes place thereby enabling the cylinder to be very quickly charged and exhausted. The plate 10 not only supports the valve-members but, acting in conjunction with its shoulder 11, serves to prevent the escape of gas around the periphery of

the valve-member 7. It also protects the exposed valve-member 8 from injury arising from the explosions.

In the timing of the valve device with reference to the stroke of the piston, the exhaust closes when the shaft crank is on center. When the crank has moved through 10° the intake opens and upon the further crank movement of 180° the intake closes. The compression stroke begins when the inlet valve closes and ends when the crank is on center. The firing stroke begins with the crank on center and ends when the crank has moved through 140°. The exhaust then opens and closes when the crank is on center.

The engine shown in the drawings is of the twin cylinder type and the valve device 24 in cylinder 2 is identical with the valve device of cylinder 1 and is similarly arranged and operated by drive shaft 25. Drive shafts 16 and 25 are actuated by a counter-shaft 26 geared with shaft 27 which is geared with crank shaft 4.

In Figs. 8 and 9 the inner valve-member and its shaft are shown in modified form to provide for water-cooling of the valve-member. This valve-member 28 corresponds to the valve-member 8. The imperforate part of the valve-member is provided with two chambers 29 and 30 which are separated by a plate 31 having a port 32 connecting the chambers. The valve-member is secured to a shaft 33 provided with two longitudinal passageways 34 and 35. The passageway 34 connects with the chamber 29 through the port 36 and the passageway 35 connects with the chamber 30 through the port 37. The upper end of the passageway 34 connects with the inlet pipe 38 and the upper end of the passageway 35 connects with the outlet pipe 39. The circuit of the water is from pipe 38 through passageway 34, port 36, chamber 29, port 32, chamber 30, port 37, passageway 35 and out through the pipe 39. The shaft 33 is driven by means of the beveled gear 40 which corresponds to the beveled gear 13 in Fig. 3. The upper end of this shaft turns in a bearing which is provided in the head or coupling 41.

While we have shown the various features of the invention in what we consider to be their best form, it is to be understood that various changes in the embodiment of the invention may be made without departing from the scope of the invention.

What we claim is:

1. In a valve device for internal combustion engines, the combination of a piston cylinder having inlet and exhaust ports, two superposed cylindrical valve-members controlling said cylinder ports, one of said valve-members being provided with a peripheral flange surrounding the periphery of the other valve-member, said valve-members having inlet and exhaust ports adapted to register with each other; and means for rotating the valve-members in opposite directions.

2. In a valve device for internal combustion engines, the combination of a piston cylinder having inlet and exhaust ports, two superposed cylindrical valve-members controlling said cylinder ports, one of said valve-members being provided with a peripheral flange surrounding the periphery of the other valve-member, the flanged valve-member having inlet and exhaust ports in its periphery and the other valve-member having corresponding ports to register therewith; and means for rotating the valve-members in opposite directions.

3. In a valve device for internal combustion engines, the combination of a piston cylinder having inlet and exhaust ports in its side wall near the head, two superposed cylindrical valve-members closing the head of the cylinder and controlling said cylinder ports, one of said valve-members being provided with a peripheral flange surrounding the periphery of the other valve-member, the flanged valve-member having inlet and exhaust ports in its periphery and the other valve-member having corresponding ports to register therewith; and means for rotating the valve-members in opposite directions.

4. In a valve device for internal combustion engines, the combination of a piston cylinder having inlet and exhaust ports in its side wall near the head, two superposed cylindrical valve-members closing the head of the cylinder and controlling said cylinder ports, one of said valve-members being provided with a peripheral flange surrounding the periphery of the other valve-member, the flanged valve-member having inlet and exhaust ports in its periphery and the other valve-member having corresponding ports to register therewith; a stationary ported plate within the cylinder between the explosion chamber thereof and the valve-members; a valve shaft fixed to the innermost valve-member and extending outward through the outermost valve-member; and a driving shaft having provision for engaging said valve shaft and outermost valve-member and operating to rotate the valve-members in opposite directions.

5. In a valve device for internal combustion engines, the combination of a piston cylinder having inlet and exhaust ports in its side wall near the head, two superposed cylindrical valve-members closing the head of the cylinder and controlling said cylinder ports, one of said valve-members being provided with a peripheral flange surrounding the periphery of the other valve-member, the flanged valve-member having inlet and exhaust ports in its periphery and the other valve-member having corresponding ports

to register therewith; a shoulder formed on the inner wall of the cylinder; a stationary ported plate resting on said shoulder in contact with the valve members; a valve-shaft stepped in said plate and fixed to the innermost valve-member and extending outward through the outermost valve-member; and a driving shaft having provisions for engaging said valve-shaft and outermost valve-member and operating to drive said valve-members in opposite directions.

6. In a valve device for internal combustion engines, the combination of a rotary valve disk provided with a plurality of communicating chambers; and a shaft secured to said valve disk and having formed therein inlet and outlet passageways which respectively communicate with said chambers for the flow of water to and from the chambers of the valve.

This specification signed and witnessed this 12th day of June, A. D., 1912.

ANDREW C. DAM.
ALFRED MARSHALL.

Witnesses:
E. M. TAYLOR,
WORTHINGTON CAMPBELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."