Sept. 14, 1926. 1,599,430

F. W. OFELDT

VALVE

Filed March 11, 1924 2 Sheets-Sheet 1

Fig. 1.

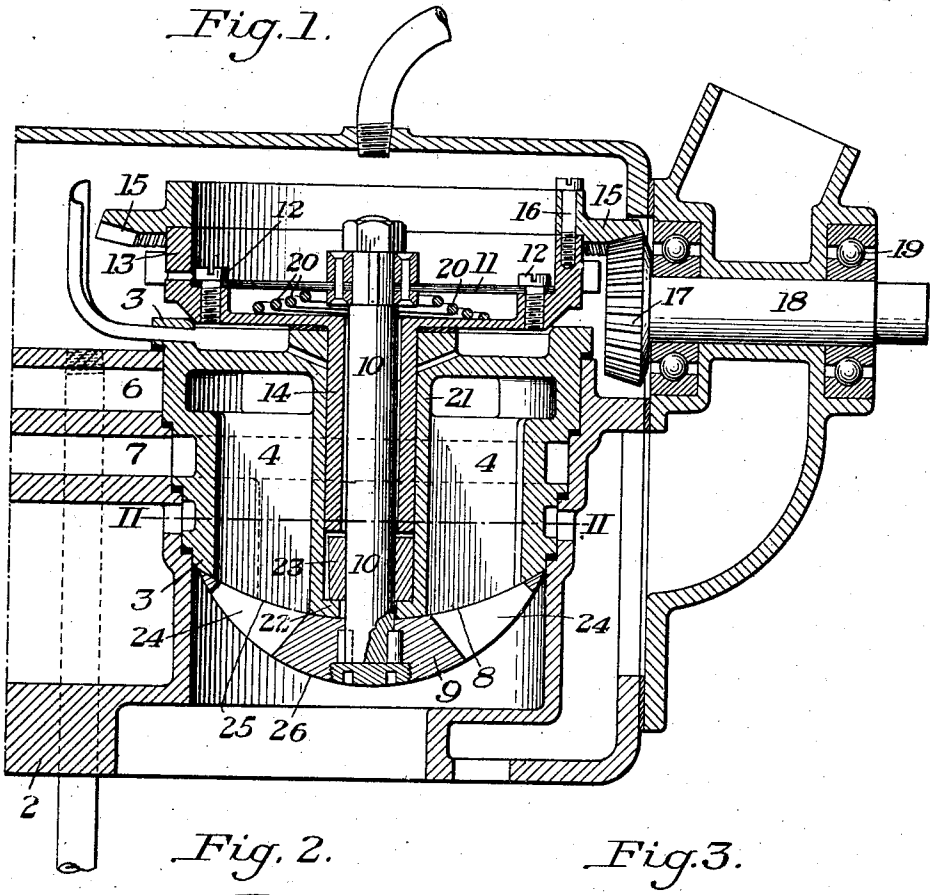


Fig. 2.

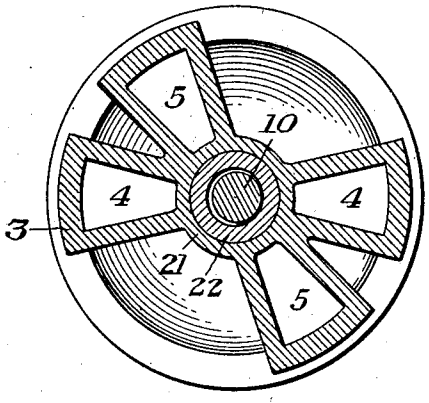
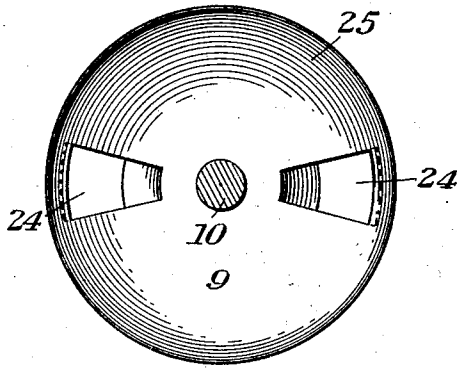


Fig. 3.



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Fig. 4.

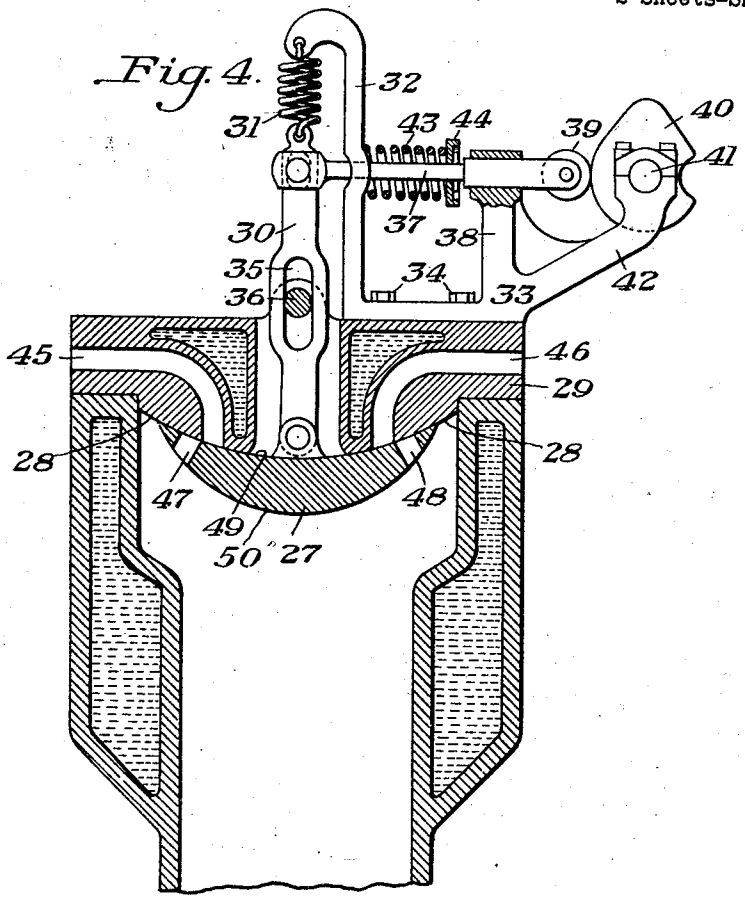
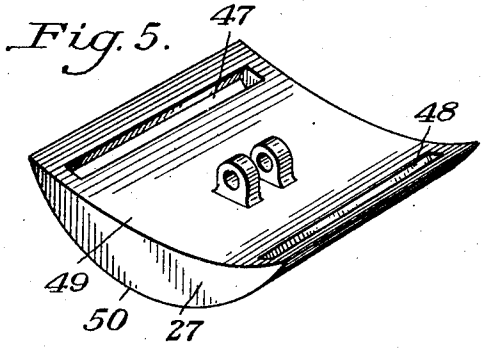


Fig. 5.



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his attys

Patented Sept. 14, 1926. 1,599,430

UNITED STATES PATENT OFFICE.

FRANK W. OFELDT, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO O. & B. COMPANY, INCORPORATED, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF DELAWARE.

VALVE.

Application filed March 11, 1924. Serial No. 698,466.

The present invention relates broadly to valves for internal combustion engines, and more particularly to valves of the rotary and sliding types.

A serious difficulty encountered in the use of valves of various types with internal combustion engines is their tendency to warp due to the fact that different portions of the valves are subjected to different amounts of heat, thereby causing non-uniform expansion or contraction throughout the bodies of the valves.

By the present invention I have provided a valve construction of such character that expansion and contraction of the valve under temperature conditions to which it may be subjected in use will tend to maintain the seating surface of the valve true.

In the accompanying drawings, there are shown, for purposes of illustration only, certain embodiments of my invention, it being understood that the drawings do not define the limits of the invention, as changes may be made in the construction therein disclosed without departing from the spirit of the invention or scope of my broader claims.

In the drawings,—

Figure 1 is a vertical sectional view through a portion of a cylinder head equipped with a rotary valve embodying my invention;

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

Figure 3 is a plan view of the valve shown in Figure 1;

Figure 4 is a vertical sectional view through a portion of an engine cylinder equipped with a sliding valve embodying my invention; and

Figure 5 is a plan view of the valve shown in Figure 4.

Figures 1, 2 and 3 illustrate my invention embodied in a valve of the rotary type. Referring to Figure 1, the reference character 2 designates a cylinder head in which is mounted a valve cage 3 provided with two diametrically opposite intake ports 4 and two diametrically opposite exhaust ports 5. The intake ports communicate with an intake manifold 6 and the exhaust ports with an exhaust manifold 7.

At its lower end the cage 3 has a convex or spherical seating surface 8 engaged by a valve 9 carried by a valve stem 10. The latter is connected at its upper end to a diaphragm 11 which in turn is secured by screws 12 to the enlarged upper portion 13 of a sleeve 14 in which the valve stem rotates. A main bevel gear 15 is mounted upon the upper end of the portion 13 by screws 16. This bevel gear is driven by a pinion 17, the shaft 18 of which rotates in a suitable bearing 19. Interposed between the diaphragm 11 and the bottom of the portion 13 is a spring 20 which holds the valve in engagement with its seat and counteracts any tendency of the same to move away from its seat.

The sleeve 14 rotates in a bearing 21 formed integral with the cage 3 but terminates short of the lower end of said bearing. The valve stem 10 fits loosely in the sleeve 14 and has mounted thereon between the lower end of the sleeve and a shoulder 22, at the lower end of the bearing 21, a roller 23 fitting loosely in the bearing.

The valve is provided with two diametrically opposite ports 24. It will be apparent that when the valve is rotated the ports 24 will be brought into communication first with the intake ports 4 and then with the exhaust ports 5 once for every 180 degrees of rotation of the valve. Furthermore, the valve not only rotates about the axis of the valve stem 10, but also is allowed to move bodily due to the loose fit of the stem 10 and roller 23 in the sleeve 14 and bearing 21, respectively. The valve, therefore, has a gyratory motion which insures a shifting area of contact and uniform grinding action between the valve and its seat tending to constantly keep the parts to a proper seating fit and properly lubricated. I make no claim, however, in the present application to the diaphragm drive for the valve, the spring for counteracting the tendency of the valve to move away from its seat, or to the loose mounting of the valve stem enabling the valve to have a gyratory motion, as these features constitute the subject-matter of my Patent No. 1,551,209.

As has already been pointed out, when a valve is subjected to the temperature conditions in actual use, there is a tendency for the valve to become warped. I have discovered a way to obviate this action by so constructing the valve that any tendency of the seating surface thereof to deviate from

a true seating surface in expanding or contracting is counteracted by the corresponding expansion or contraction of its opposite surface. I have found that if the surface 26 of the valve opposite its concave seating surface 25 is formed convex, any tendency of the seating surface to flatten out or otherwise change its curvature when expanding or contracting is counteracted by the expansion or contraction of the convex opposite surface 26. In order to insure the maintenance of a true seating surface on the valve during expansion or contraction thereof, it is preferable to form its concave seating surface and its opposite convex surface of such relative curvatures that the two surfaces either actually intersect at the periphery of the valve or would intersect if extended. In other words, the seating surface 25 when expanding tends to become less concave or to flatten out, whereas the tendency of the surface 26 when expanding is to become more convex and to correspondingly increase the concavity of the seating surface 25. The tendency of the seating surface to change its curvature in expanding is, therefore, neutralized by the expansion of the opposite surface 26, and the same thing is true upon contraction of these surfaces.

In Figures 4 and 5, I have shown my invention embodied in a valve of the sliding type. The valve 27 shown in these figures, cooperates with a valve seat 28 formed on a cylinder head 29. The valve is carried by a stem 30 which is pivoted at its lower end to the valve and has its upper end connected to one end of a coil spring 31, the other end of said spring being connected to the end of a standard 32 forming part of a bracket 33 secured to the cylinder head by means of screws 34. Intermediate its ends the stem 30 is provided with a longitudinally extending slot 35 through which passes a pin 36 carried by the cylinder head. A stem 37 is slidably mounted in an arm 38 of the bracket and has one end pivotally connected to the upper end of the valve stem 30 and carries at its other end a roller 39. The roller 39 is engaged by a cam 40 carried on a shaft 41 journaled in an arm 42 of the bracket, said cam being driven in any suitable manner from the engine crank-shaft. A coil spring 43 surrounds the stem 57 and abuts at one end against the standard 32 and at the other end against a washer 44 on said stem. The spring 43 maintains the roller 39 at all times in contact with the peripheral edge of the cam. The cylinder head 29 is provided with intake and exhaust ports 45 and 46, and the valve 27 is provided with ports 47 and 48 adapted to be moved into and out of communication with the ports 45 and 46 upon reciprocation of the valve 27 by the cam 40 and spring 43. It will be apparent that the spring 31 will maintain the valve against its seat at all times and counteract any tendency of said valve to move away from its seat.

The construction of the valve 27 is similar to that of the valve 9, shown in Figures 1 and 3, except that the valve 27 is of rectangular shape instead of being disk-shaped. The seating surface 49 of the valve 27 is concave and the opposite surface 50 is convex, and the relative curvatures of these surfaces are such that they intersect at the opposite end edges of the valve. The valve 27 functions in the same manner as explained for the valve 29 to counteract any tendency of the seating surface 49 to deviate from a true seating surface when the valve expands and contracts.

The advantages of the present invention arise from the provision of a valve structure for rotary or sliding valves of such character that any tendency of the valve to warp in use is counteracted.

I claim:

1. A valve having a concave seating surface and a convex opposite surface, the curvatures of the two surfaces being eccentric to each other, and having radii of different lengths, the convex surface having a shorter radius of curvature than the concaved surface, substantially as described.

2. A valve having a concave seating surface and a convex opposite surface, the relative curvatures of the two surfaces being such that they intersect at the periphery of the valve, substantially as described.

3. A disk-shaped valve having a concave seating surface and a convex opposite surface, the relative curvatures of the two surfaces being such that they intersect, substantially as described.

4. A disk-shaped valve having a concave seating surface and a convex opposite surface, the curvature of the convex surface intersecting the concaved surface at the periphery of the valve, substantially as described.

5. A gyratory valve having a concave seating surface and an eccentric convex opposite surface whose radius of curvature is shorter than that of the concave surface whereby the valve is thicker at the center than at its periphery and wherein the relative curvatures of the two surfaces are such that the valve tends to maintain a true seating surface upon expansion or contraction thereof, substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK W. OFELDT.