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H. FORD

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ENGINE VALVE

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Fig. 2

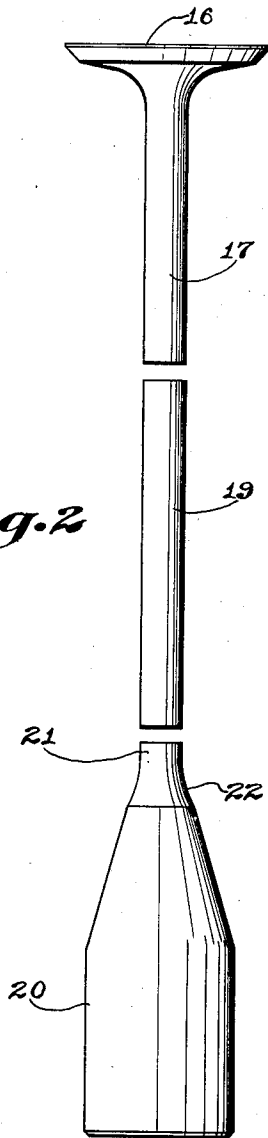
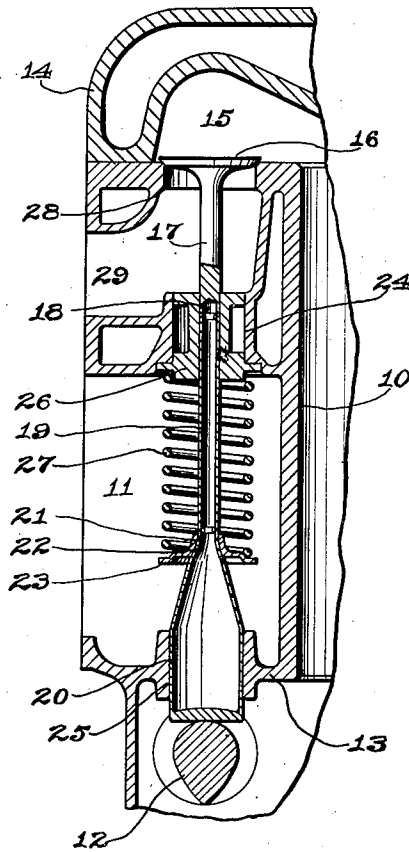


Fig. 1



Witness
E. C. McRae.

BY

INVENTOR.
Henry Ford.

ATTORNEY.
E. C. Davis

UNITED STATES PATENT OFFICE

HENRY FORD, OF DEARBORN, MICHIGAN, ASSIGNOR TO FORD MOTOR COMPANY, OF DEARBORN, MICHIGAN, A CORPORATION OF DELAWARE

ENGINE VALVE

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The object of my invention is to provide an engine valve of simple, durable and inexpensive construction, and especially adapted for use in connection with internal combustion engines.

A further object of my invention is to provide an engine valve particularly adapted for high-speed automobile engines which valve will have a longer life and will remain quiet in operation over longer periods than the ordinary valve. My improved valve is designed for L-head engines wherein a horizontal cam shaft is provided which reciprocates all of the valves in the engine, these valves extending from the cam shaft up through the side of the engine to the combustion chambers.

Heretofore in this type of engine, valve tappets have universally been provided for each valve, which tappets were reciprocally mounted in the lower part of the cylinder block in position to act as cam followers for the cams of the cam shaft. Each valve proper extended from the combustion chamber down through one side of the cylinder block to position adjacent to the upper end of its respective valve tappet and a valve spring was arranged to urge the valve down against the valve seat in the combustion chamber and the tappet against the respective cam on the cam shaft.

Still a further object of my invention is to provide a valve for an L-head type engine, the lower end of which valve bears directly on the cam shaft while the upper end is disposed in the combustion chamber. I am thus able to provide a closer commercial tolerance for the clearance between the cam shaft and the valve for the reason that only two finished surfaces, the valve seat and the end of the valve, need be held to accurate spaced dimensions. It will be apparent that it is easier to maintain an accurate overall dimension for the valve and tappet when it is formed in one piece than when it is formed in two separate parts.

With these and other objects in view my invention consists in the arrangement, construction and combination of the various parts of my improved device, as described

in the specification, claimed in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 shows a vertical cross-sectional view through an engine having my improved valve incorporated therein, and

Figure 2 shows an elevation of the various parts comprising my improved valve, the parts being shown before they are welded together.

Referring to the accompanying drawing, I have used the reference numeral 10 to indicate generally the cylinder block of an automobile engine having a horizontal valve spring chamber 11 cast along one side thereof. A cam shaft 12 extends horizontally through the lower portion of the block 10 just below the valve spring chamber 11, a wall 13 separating the chamber 11 from the cam shaft chamber. A cylinder head 14 is bolted to the top of the cylinder block 10 so that combustion chambers 15 are formed therebetween in the conventional manner.

In the ordinary structure the weight of the valve and valve tappet was considerable. The valve springs were required to overcome the inertia of both the valve and valve tappet so that stiff springs were necessary to prevent floating of the valves at high engine speeds. It will be apparent that as the speed of the engine increases the size of the valve spring must be increased to more quickly overcome the inertia of the valve and tappet. In my improved valve structure I combine the valve and valve tappet so that my structure weighs only a fraction of the weight of the former separate valve and tappet. A much lighter valve spring may be used with my device and still secure positive operation of the valves at high engine speeds. The use of this lighter valve spring reduces the wear on the cam and adjacent cam follower surfaces so that the valve retains its adjustment over a much longer period of operation.

Still a further object of my invention is to provide a valve which will have a pair of aligned spaced bearing surfaces to thereby secure the valve in correct alignment during the life of the engine. The ordinary valve is provided with a valve bushing which pilots

the center portion of the valve stem only. The valve tappet is also piloted in its center portion, but these two members being separate units, one forms no support for the other. During the operation of the engine the valve tappet bearing wears at the lower edge at one side, and the upper edge at the opposite side, due to the torque of the cam shaft, so that the tappet does not remain in a vertical position. The valve stem likewise wears unevenly because the push of the tappet is on one side of the valve stem. The perfect valve seat originally formed on the valve is thus destroyed by the non-alignment of the valve and tappet. In my improved structure, the valve tappet and valve being a unitary structure, the one supports the other so that a pair of spaced and aligned reciprocating bearings are provided to thereby always maintain the valve in an absolutely vertical position so that the valve seat has a much longer life.

My improved valve extends from the combustion chamber 15 down through the cylinder block 10, valve spring chamber 11 and wall 13, to position where its lower end may ride upon the cam shaft 12. My improved valve is a built up structure consisting of a poppet type valve head 16 having a short stem 17 extending downwardly therefrom. The lower end of the stem 17 is drilled out at 18 so that it may be butt welded to a tubular stem section 19. The drilling at 18 facilitates the butt welding of these two parts, as is well known in the welding art.

The lower end of my valve structure consists of a cup shaped steel member 20, the bottom of which is flattened to form a cam follower for the shaft 12. The upper portion of this member 20 is drawn in at 21 to a cone shape, the upper end of which is substantially the same size as the tube 19. This conical portion 21 is butt welded to the lower end of the tube 19 so that a unitary tappet and valve member results.

I prefer to form my improved valve structure by forging the head 16 and stem 17, then drawing the member 20, and then butt welding these two members to the respective ends of the seamless steel tube 19. The tube 19 is preferably ground in a centerless grinder before welding so that the welded valve can be piloted from this finished portion during the trimming operation and the forming of the valve seat on the head 16. The outer cylindrical surface of the cup 20 is ground in alignment with the stem 19 after welding to insure aligned bearing surfaces. The upper end of the cup member 20 forms a spring retaining washer seat 22 upon which a U shaped washer 23 is seated.

As has been stated, the valve and tappet structures extend from the combustion chambers 15 down to the cam shaft 12. I have provided valve seats 28 in the block 10 upon which the valve heads 16 rest so as to close the

chambers 15 from gas ports 29 which are cast in the cylinder block. Aligned with these seats 28 suitable bores 24 are provided in the upper wall forming the valve spring chamber 11, these bores being slightly larger than the diameter of the members 20. Integral bearings 25 are provided in the wall 13 aligned with the bores 24 so that the valve may be inserted from the top of the cylinder block down against the cam shaft.

For the reason that the stem 19 is considerably smaller than the bore 24, I have provided vertically split bushings 26 which take up the space between the valve stems and bores. Each of these split bushings consists of two identical halves which are clamped around the stem 19 after the valve is in place and then pushed upwardly from within the chamber 11 into the bore 24. A valve spring 27 is disposed between the lower end of the bushing 26 and the washer 23 so that the valve structure will be urged downwardly at all times against the cam shaft 12 or valve seat 28.

It will be noted, that I preferably formed the member 20 as a drawn steel cup, the base thereof being hardened to co-operate with the cam shaft. It may be desirable to use a cast iron cam shaft 12 so that advantage may be taken of the better coefficient of friction between cast iron and steel.

When the engine is in operation the valve structure is reciprocated by the cam shaft 12 against the action of the spring 27. Due to the guiding of the stem 19 in the split bushing 26 and the member 20 in the bearing 25, the valve is positively supported in a vertical position so that the valve head and valve seat always form a perfect joint.

My valve structure, consisting of a tubular stem 19 and the relatively light hollow member 20, weighs only a fraction of that of the conventional valve and tappet construction. I am thus enabled to use a very much lighter valve spring 27 than would otherwise be possible because the inertia of this light valve structure is much less than the ordinary valve and tappet.

Still further, due to the valve extending in one piece from the seat to the cam shaft, I am more readily able to retain the desired valve clearance.

Some changes may be made in the arrangement, construction and combination of the various parts of my improved device without departing from the spirit of my invention, and it is my intention to cover by my claims such changes as may reasonably be included within the scope thereof.

I claim as my invention:

1. An engine valve comprising, an integral head and stem and enlarged foot, a spring retaining washer seat formed on said valve at the junction of said stem and foot, and bearing surfaces adapted to guide said

valve formed thereon on each side of said seat.

2. An engine valve comprising, an integral head and stem and enlarged foot, a spring retaining washer seat formed on said valve at the junction of said stem and foot, and spaced bearing surfaces adapted to guide said valve, one of said surfaces being formed on said stem and the other formed on said foot.

3. In a device of the character described, an engine block, a valve comprising an integral head and stem and foot, and a pair of spaced bearings formed in said block one of which reciprocally receives said stem and the other of which reciprocally receives said foot.

4. In a device of the character described, an engine block, a valve comprising an integral head and stem and enlarged foot, and a pair of spaced bearings formed in said block one of which reciprocally receives said stem and the other of which reciprocally receives said foot.

5. In a device of the character described, an engine block, a valve comprising a head and stem and foot, a valve spring chamber formed in said block, a split bearing secured in the upper wall of said chamber in which said stem is reciprocally mounted, an integral bearing formed in the lower wall of said chamber in which said foot is reciprocally mounted, and a valve spring disposed in said chamber and co-acting with said valve at the junction of said foot and stem.

6. In a device of the character described, an engine block, a valve comprising an integral head and stem and enlarged foot, a valve spring chamber formed in said block, a split bearing secured in the upper wall of said chamber in which said stem is reciprocally mounted, and a valve spring disposed in said chamber around said stem, one end of which co-acts with said valve at the junction of said foot and stem and the other end of which co-acts with said split bearing to resiliently secure it in place.

7. In a device of the character described, an engine block, a valve comprising an integral head and relatively small stem and enlarged foot, a valve spring chamber formed in said block, a split bearing secured in the upper wall of said chamber in which said stem is reciprocally mounted, an integral bearing formed in the lower wall of said chamber in which said foot is reciprocally mounted, and a valve spring disposed in said chamber around said stem, one end of which co-acts with said valve at the junction of said stem and foot and the other end of which co-acts with said split bearing to resiliently secure the bearing in place.

8. An engine valve comprising, a valve stem of relatively small diameter having a valve head integral with one end thereof and an enlarged foot integral with the other end

thereof, the adjoining end of said foot being frustum shaped to form a valve spring retaining washer seat.

9. An engine valve comprising, a valve stem of relatively small diameter having a valve head integral with one end thereof and an enlarged hollow foot portion integral with the other end thereof, the adjoining end of said hollow foot being drawn down to a frustum shape to form a valve spring retaining washer seat.

10. An engine valve comprising, a valve stem of relatively small diameter having a valve head integral with one end thereof and an enlarged cylindrical foot integral with the other end thereof the adjoining end of said cylinder being of conical shape to form a tapered valve spring retaining washer seat.

HENRY FORD.