Jan. 31, 1939. C. E. JOHNSON 2,145,485

VALVE ADJUSTMENT

Filed Jan. 28, 1937

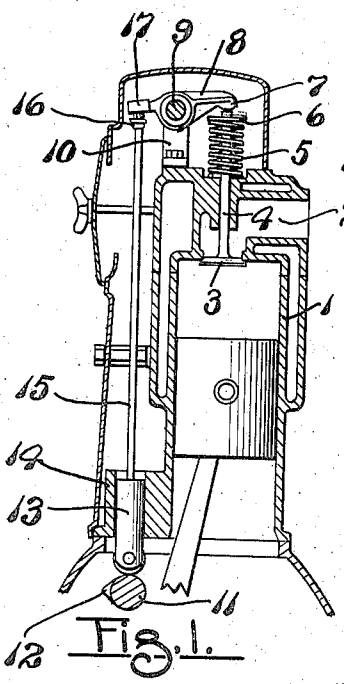


Fig. 1.

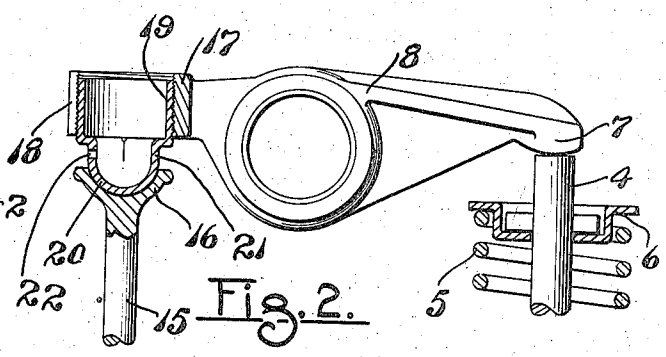


Fig. 2.

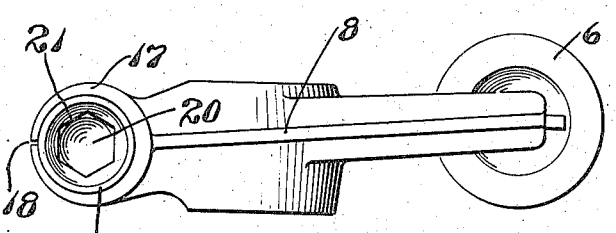


Fig. 3.

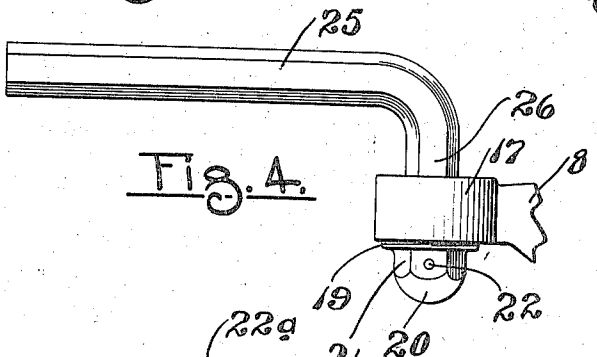


Fig. 4.

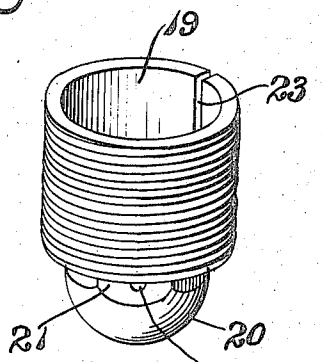


Fig. 5.

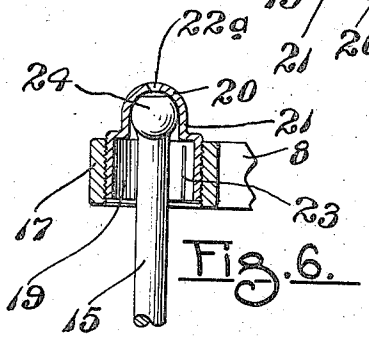


Fig. 6.

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Patented Jan. 31, 1939 2,145,485

UNITED STATES PATENT OFFICE

2,145,485

VALVE ADJUSTMENT

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Application January 28, 1937, Serial No. 122,685

3 Claims. (Cl. 123—90)

This invention relates to valve adjustment and is particularly concerned with an adjustment between the cam on a cam shaft which, in its rotation, operates to open the valve and the operating means directly associated with the valve to open it, whereby the valve will be properly adjusted with respect to its seat. This invention is particularly useful in conjunction with internal combustion engines used in motor vehicles, in which the engines are equipped with so-called "valves in the head", that is, the port which is opened and closed by the movements of each valve is located directly over an engine cylinder, the valve stem passing through the cylinder cover or head.

Such valves are normally actuated to open the same by the rocking movement of rocker arms, one associated with each valve in the engine, the rocker arms in turn being moved in one direction through interposed tappets and push rods between the rocker arms and cams on the cam shaft of the engine.

The present invention is directed to a very simple, easily manufactured, readily assembled and installed, and very readily adjusted device preferably interposed between one end of the rocker arm and the upper end of a push rod disposed vertically between said rocker arm and the valve tappet which is in immediate engagement with a cam on the rotating cam shaft of the engine.

An understanding of the invention and of the objects and advantages thereof may be had from the following description, taken in connection with the accompanying drawing in which:

Fig. 1 is a vertical section illustrating my invention in its use in connection with one of the valves associated with a cylinder in an internal combustion engine.

Fig. 2 is an enlarged elevation and partial section showing the adjustable means of my invention.

Fig. 3 is a plan view looking downwardly upon the structure shown in Fig. 2.

Fig. 4 is a fragmentary elevation of the left hand end of the rocker arm shown in Figs. 2 and 3, showing the manner in which the adjustable means may be adjusted to different positions.

Fig. 5 is an enlarged perspective view of the adjusting member or element used in my invention, and

Fig. 6 is a fragmentary vertical section showing a slight modification in the manner of assembly and use of the adjusting member in connection with the valve actuating rocker arm.

Like reference characters refer to like parts in the different figures in the drawing.

As shown in Fig. 1, at the upper end of a vertical cylinder 1 of an internal combustion engine a port 2, which may be either an intake port or an exhaust port for the cylinder, is shown as having an opening closed by a valve 3 in the upper end of the cylinder. The valve has a vertically extending valve stem 4 which is guided through a suitable sleeve-like passage in the engine head and extends a distance above such head. A coiled compression spring 5 is disposed around the upper part of the valve stem 4, having its lower end against the engine head and its upper end against a sheet metal cap 6 through which the upper part of the stem 4 passes, with a suitable key passing through the stem above the cap 6, thereby holding the spring 5 in a compressed condition, whereby when free to do so the spring elevates the valve 3 to close the port with which it is associated.

The upper end of the valve stem 4 bears against a suitable bearing head 7 at the end of one arm of a rocker arm 8 mounted for rocking movement between its ends on a pivot 9, which is carried on supporting brackets 10 connected to the engine head as best shown in Fig. 1. Rocking the rocker arm in a clockwise direction moves the stem 4 and valve 3 downwardly and increases the pressure of the spring 5, which spring when it is free will elevate the valve parts and rock the rocker arm in the opposite direction.

The engine cam shaft 11, which is driven in timed relation to the engine crank shaft, has cams 12 thereon of the usual form. The cams bear against the lower ends of tappets 13, vertically guided in tappet guides 14, which are usually integral with the engine cylinder block, whereby the tappets are elevated when the outer points of the cams are at their uppermost positions. A push rod 15 at its lower end enters each tappet 13, which is usually of a hollowed out construction closed at its lower end, and such push rod extends vertically upward and terminates in a cup 16 having a concaved recess of a shape similar to the segment of a sphere at its upper end. The cup 16 comes immediately below the outer end of the rocker arm 8. Said outer end of the rocker arm is formed with a sleeve 17 having a substantially vertical axis and in the form shown in Figs. 2 and 3. It is vertically slotted at its outer side as indicated at 18. Sleeve 17 is interiorly threaded its full length.

The adjusting element used in my invention is a sheet metal member simulating a cup having a vertical cylindrical portion 19 at its upper part

exteriorly threaded to screw in the sleeve 17, and at its lower end having a rounded head 20 of a convex form which is shaped to correspond to the concave recess in the upper end of the cup member 16 at the upper end of the pusher rod 15. The rounded or partly spherical head 20 has a radius of curvature less than the radius of the cylindrical member 19 and has vertical extended walls 21 which at their upper ends extend horizontally outward to connect integrally with the lower ends of the part 19; and such vertical walls are shaped preferably to hexagonal form. In one side of the hexagonal wall 21 a horizontal opening 22 is made through the wall as shown.

The pitch diameter of the threads cut exteriorly on the vertical part 19 is slightly greater than the pitch diameter of the interiorly cut threads in the sleeve 17. In practice the difference in pitch diameter amounts to a very few thousandths of an inch. The result is that the larger pitch diameter of the threads on the part 19, with respect to the interior threads on the sleeve 17, causes the sleeve to be spread open at the slot 18, with a resultant pressure or pinching of the two halves of the sleeve 17 against the part 19, providing, to all intents and purposes, a secure locking of the adjustable member in the sleeve 17. It is sufficiently secure that accidental change of position relative of the parts to each other does not occur under engine operation. Of course the degree of binding of the sleeve 17 upon the threaded part 19 may be increased by increasing the difference in pitch diameters of the threads on the two parts and decreased by lessening such difference. Instead of slotting the sleeve 17 vertically at one side, as at 18, the exteriorly threaded part 19 may be vertically slotted at 23 in Fig. 5, whereupon screwing such adjustable member into the sleeve 17, with the difference in pitch diameters in the threads of the two parts as stated, the vertical part 19 will be compressed to produce the same binding effect between the two threaded parts. Oil which is carried to the moving parts to lubricate bearings may condense or collect in the rounded spherical part 20 until the level of the opening at 22 is reached, and thereupon overflow to lubricate the bearing between the cup 16 and the part 20.

In Fig. 6 the member consisting of the exteriorly threaded vertical part 19 the curved or partly spherical head 20 and the connected hexagonal walls 21 is shown inverted and screwed into the sleeve 17 from the upper end downwardly instead of from the lower end upwardly as in Fig. 2. In such form the opening 22 is changed in position so as to be at the extreme upper part of the spherical section 20, and as shown at 22*a* in Fig. 6. The pusher rod 15 at its upper end is formed into a spherical ball 24, preferably slightly flattened at its upper side and adapted to seat in the concave underside of the part 20. Lubrication is through the opening at 22*a*.

For adjustment so as to properly locate the valve 3 with reference to its seat at the opening of the port 2 where it leads to the cylinder 1, an L-shaped wrench having a handle 25 and a head 26 at right angles to the handle is used as shown in Fig. 4. This wrench may conveniently be made from a length of hex bar stock, bent into the form shown in Fig. 4, and with the cross sectional dimension of the bar such that the end of the head 26 is received within the hexagonal walls 21, whereupon the adjustable member between the pusher rod 15 and the rocker arm 8 is very readily turned to secure the necessary and desired adjustment. When the assembly is as in Fig. 6, the head of a wrench will necessarily be such as to extend over the hexagonal section 21, the same as in any well known socket wrench.

The construction described is one of a simple character, readily manufactured, very quickly and easily assembled and with a substantially instant adjustment when desired which is very easily accomplished. Bearing parts of course may be hardened in the usual manner. One very desirable and important feature of the invention is that the adjusting parts used in reducing the weight to a minimum so that the reciprocating structure is of much lighter weight than heretofore. This is of value particularly where reciprocation is rapid and occurs with substantially continuous regularity as in the case of the parts described and as used in motor vehicle engines. The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A member of sheet metal having a cylindrical exteriorly threaded portion, one end being open and the other end pressed inwardly for a short distance and then continued in a part of polygonal form and of less cross sectional area than the cross sectional area of the threaded part of said member, said polygonal shaped part terminating in a closed end having an outer convex curved surface and an inner concave curved surface, as specified.

2. A device having a structure as defined in claim 1, with an opening through a wall of said polygonal part.

3. A pivotally mounted rocker arm adapted to turn about a horizontal axis, said rocker arm having a vertically positioned threaded sleeve therein at a distance from said axis, a sheet metal member of hollow form and open at one end and closed at its other end and threaded to screw into said sleeve for adjustment to different positions therein, the pitch diameter of the threads on said sheet metal member being greater than the pitch diameter of the threads on the sleeve, one of said parts having threaded connection with the other being vertically slotted, and the closed end of said sheet metal member having a curved surface, and a push rod formed with a cooperating curved head at its upper end, shaped to conform to the curved surface at the closed end of the sheet metal member, the closed end of the sheet metal member being at the lower end of said member and being of a less cross sectional area and dimensions than the upper threaded portion thereof and of a polygonal shape between the threaded portion and the closed end thereof, whereby a wrench is adapted to be inserted in and engage with said polygonal part of the member to turn the same and adjust it to different positions relative to the sleeve in which it is positioned.

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