Aug. 25, 1931. W. R. SPILLER 1,820,891

VALVE ACTUATING MECHANISM

Filed July 30, 1929 2 Sheets-Sheet 1

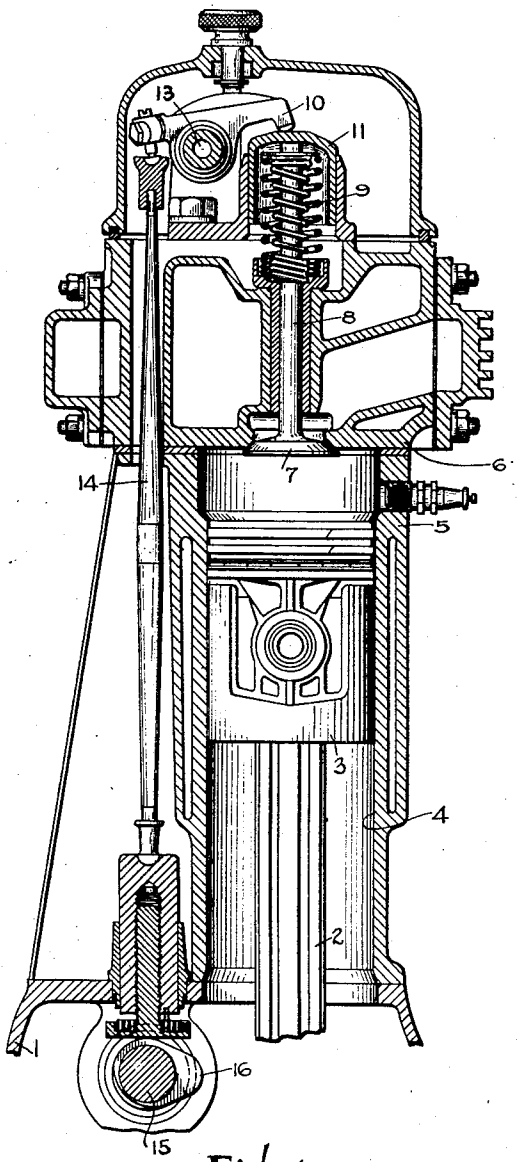


Fig. 1.

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VALVE ACTUATING MECHANISM

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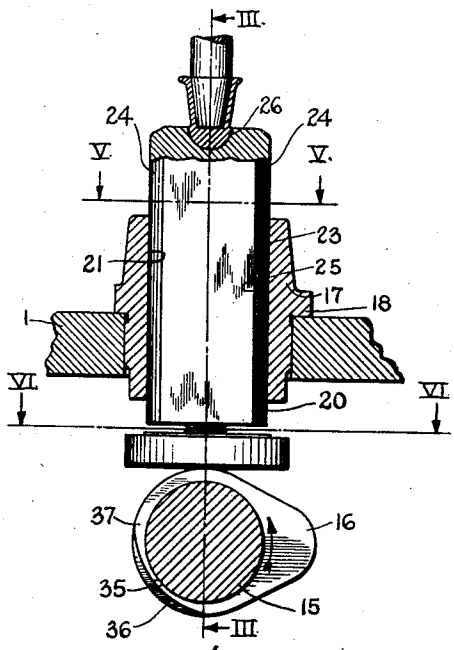


Fig. 2.

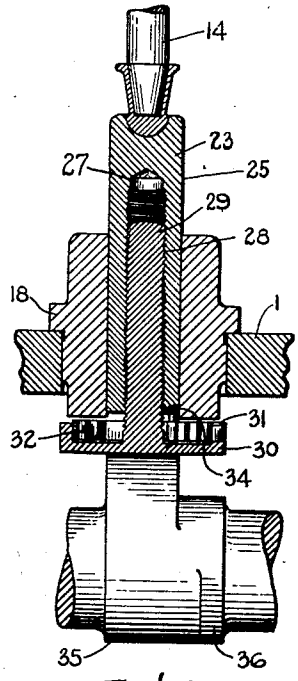


Fig. 3.

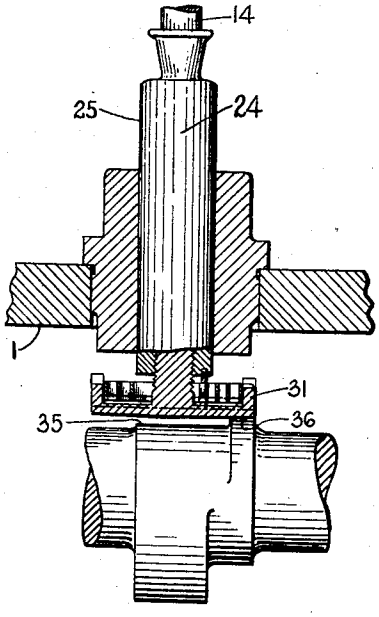


Fig. 4.

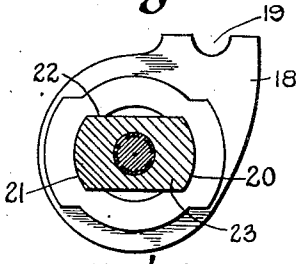


Fig. 5.

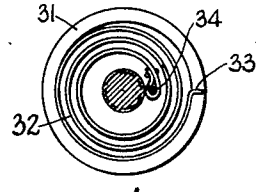


Fig. 6.

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UNITED STATES PATENT OFFICE

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VALVE ACTUATING MECHANISM

Application filed July 30, 1929. Serial No. 382,265.

This invention relates to valve actuating mechanism, and is particularly adapted for use with valves such as are used in internal combustion motors.

An object of the invention is to provide an improved valve mechanism which will automatically adjust itself.

Another object is to provide a self-adjusting valve mechanism which will compensate for expansion and contraction of its parts and of the associated parts of the motor.

Another object is to provide a self-adjusting valve mechanism in which the adjustment is entirely effected while the valve is seated.

Other objects will hereinafter appear.

The invention will be better understood from the description of one practical embodiment thereof illustrated in the accompanying drawings, in which;

Figure 1 is a fragmentary transverse sectional view of a motor of the valve-in-head type, having a valve operating mechanism embodying the invention;

Figure 2 is a fragmentary transverse sectional view of the valve tappet and cam shaft of Figure 1 but showing the parts to a larger scale and in the position they occupy immediately preceding the opening of the valve;

Figures 3 and 4 are views taken on the line III—III of Figure 2, showing the parts in positions that they occupy, respectively, when the valve is opened or unseated, and when the adjustment of the mechanism is being effected; and

Figures 5 and 6 are transverse sectional views taken on the lines V—V and VI—VI respectively of Figure 2.

The motor illustrated has a crank case 1 within which is journaled a crank shaft (not shown) arranged to be rotated by connecting rods 2 attached at their upper ends to pistons 3 which reciprocate in cylinders 4 formed within a cylinder block 5. The upper end of the cylinder block is closed by cylinder head 6 provided with valves 7 each having a stem 8 by which it may be actuated. The valves are maintained closed by springs 9 surrounding the stems.

A rocker arm 10 bears, through closure 11, upon the upper end of the valve stem, the rocker being pivoted at 13 to the cylinder head. A push rod 14 is arranged to raise the opposite end of the arm, and is actuated from cam shaft 15, journaled within the crank case by means of a cam 16.

Between the cam 16 and the push rod 14 is located the tappet mechanism, best shown in Figures 2 to 7, which is so designed that it will automatically adjust itself to compensate for expansion or contraction of the valve mechanism or associated parts of the motor, thereby insuring proper operation of the valve at all times.

This tappet operates in a guide 17 having a generally cylindrical outer surface provided with a flange 18 which seats upon the upper surface of the crank case, and is retained in position by a bolt threaded into the crank case and extending through a notch 19 in the flange.

Interiorly, the guide is formed with two cylindrical bearing faces 20 and 21 terminating at chordally extending faces 22, the cylindrical faces being arranged to take the side thrust imposed upon the tappet by the pressure of the cam. The upper part of the tappet consists of a bar 23 having two cylindrical edges 24 fitting the cylindrical surfaces 20 and 21, and intermediate flat surfaces 25 which engage the chordal surfaces 22 and so prevent the bar from turning. The upper end of the bar is formed with a recess 26 receiving the lower end of push rod 14. An axial bore 27 extends from the bottom of the rod to near its top, and is threaded with a thread of small pitch 28. Threaded into this bore is the shank 29 of a bolt, the head 30 of which bears upon the cam 16. The head 30 is of large diameter and of almost flat convex conical shape on its under surface, being provided with an upwardly extending marginal flange 31. Surrounding the shank and positioned upon the upper surface of the head 30 is a spiral spring 32 having one end connected as at 33 with the marginal flange of the head, and its other end connected as by means of a dowel pin 34 to the bar 23. This spring is arranged to rotate the screw 29 in a manner to extend it from the bar, the cam

16 has a point substantially in alinement with the center of the screw, so that when this point travels across the under surface of the head there is no appreciable tendency to rotate the latter. The tendency to rotate the head is further reduced by its conical shape, as the cam travels along an element of the cone in alinement with the axis of the tappet. The low side of the cam is cut away at 35 on the part of this side which contacts the tappet first, so that a projecting flange 36 is left, which is disposed to one side so that it will contact with the head 30 adjacent its edge at the side which will allow friction between the cam and the head to rotate the screw in a manner to cause the screw to enter the bar and shorten the tappet.

The operation of the tappet is as follows: The head 30 rests upon the cam and is elevated thereby as the cam shaft rotates, there being no relative rotation between the screw and bar until after the point of the cam has passed beyond the head and the valve is seated. When this has happened, the head bears only upon the flange 36 and the friction between these surfaces rotates the screw, shortening the tappet as long as there is any pressure between the head and the cam, or even further, if there is sufficient inertia in the head, so that the head assumes the position somewhat like that shown in dotted lines in Figure 4. After the flange 36 has passed the head, the spring 32 rotates the screw in the opposite direction, extending the same until the head just bears upon the base circle portion 37 of the cam, at which time all slack has been taken out of the valve actuating mechanism, and as the point of the cam comes in contact with the head the tappet is raised and the valve is again opened. It will be noted that not only is the tappet self-adjusting but that all adjustment takes place during the time that the valve is closed, and the tappet operates as one integral part during the opening and closing of the valve.

While I have described the illustrated embodiment of my invention in some particularity, obviously many others will readily occur to those skilled in the art, and I do not, therefore, limit myself to the precise details shown and described, but claim as my invention all variations, modifications and embodiments thereof coming within the scope of the appended claims.

I claim:

1. Valve actuating mechanism including a two-part tappet, the parts of which are threaded together, means for rotating one of said parts immediately after the valve closes, and becoming inoperative before the valve commences to open, and a spring for rotating the parts relatively in the opposite direction.

2. In a valve actuating mechanism, a tappet comprising a reciprocating member held against rotation, a screw threaded therein and having a head above the cam shaft of the motor, a cam on said shaft having a point centrally alined with said screw, and a projecting flange on its base circle engaging said head near its outer edge while the valve is closed.

3. In a valve actuating mechanism, a tappet comprising a reciprocating member held against rotation, a screw threaded therein and having a head above the cam shaft of the motor, a cam on said shaft having a point centrally alined with said screw, a projecting flange on its base circle engaging said head near its outer edge while the valve is closed, and a spring between the reciprocating member and screw for rotating the parts relatively in a direction opposite that in which they are rotated by the flange.

4. A valve actuating mechanism comprising a tappet consisting of a reciprocating part slidable in a guide and prevented thereby from rotation, a screw threaded into the bottom of said reciprocating part having an enlarged head on its lower end, a spring surrounding said screw and connected to said head and to the said reciprocating part, a cam shaft beneath the head, a cam thereon having a point in alinement with said screw and having a flange on the base circle portion thereof first engaging the tappet and arranged to contact the head of the screw near the edge thereof.

5. In a valve actuating mechanism, a tappet comprising two telescopically arranged parts, rotating means telescoping the parts to shorten the tappet immediately after the valve has closed, and resilient means extending the parts thereafter and before the valve starts to open.

6. In an internal combustion motor, valve actuating mechanism comprising a two-part tappet, the parts of which are relatively rotatable, means rotating one of said parts relative the other to shorten the tappet operative while the valve is closed, and means thereafter rotating said first mentioned part in the opposite direction also operative while the valve is closed.

7. In a valve actuating mechanism, a two part tappet, the parts of which are rotatable relative each other, means for rotating one of said parts relative the other while the valve is closed and rendered inoperative for a portion of the time while the valve is closed, and spring means for returning said first mentioned part relative the second while the first mentioned means is inoperative.

8. Valve actuating mechanism comprising a two-part tappet, the parts of which are threaded together, means actuated by a cam rotating one of said parts immediately after the valve closes, and becoming inoperative before the valve commences to open.

9. In a valve actuating mechanism, a tap-

pet comprising two telescopically arranged parts, one of which bears upon a valve actuating cam, means carried by said cam for rotating said part to shorten the tappet immediately after the valve is closed, and means extending the parts thereafter, and before the valve starts to open.

10. In a valve actuating mechanism, a tappet comprising two telescopically arranged parts, one of which bears upon a valve actuating cam, means carried by said cam for rotating said part to shorten the tappet immediately after the valve is closed, and spring means extending the parts thereafter and before the valve starts to open.

11. In an internal combustion motor having a cam shaft, a cylinder, and a valve controlling communication with said cylinder, valve actuating mechanism including two parts which are relatively rotatable, means for rotating one of said parts relative the other while the valve is closed, and means thereafter rotating said first mentioned part in the opposite direction also operative while the valve is closed.

12. In an internal combustion motor having a cam shaft, a cylinder, and a valve controlling communication with said cylinder, valve actuating mechanism between said valve and shaft comprising two parts which are simultaneously relatively rotatable and translatable, means for rotating one of said parts relative the other while the valve is closed and rendered inoperative before the valve commences to open, and spring means for returning said first mentioned part relative the second before the valve commences to open.

13. In an internal combustion motor comprising a cam shaft, a cylinder, and a valve controlling communication with said cylinder, valve actuating mechanism between said shaft and valve comprising two relatively rotatable telescopically arranged parts, means carried by a cam for rotating one of said parts relative the other to cause them to telescope immediately after the valve is closed, and means extending the parts thereafter and before the valve commences to open.

14. In an internal combustion motor comprising a cam shaft, a cylinder, and valve controlling communication with the cylinder, valve actuating mechanism comprising two threaded parts, means actuated by the cam shaft for rotating one of said parts relative the other immediately after the valve closes, and becoming inoperative before the valve commences to open.

15. In an internal combustion motor comprising a cam shaft, a cylinder, and valve controlling communication with the cylinder, valve actuating mechanism comprising two threaded parts, means actuated by the cam shaft for rotating one of said parts relative the other immediately after the valve closes and becoming inoperative before the valve commences to open, and a spring for relatively rotating said parts in the opposite direction as soon as the first mentioned means has become inoperative.

In testimony whereof I hereunto affix my signature.

WILLIAM R. SPILLER.