

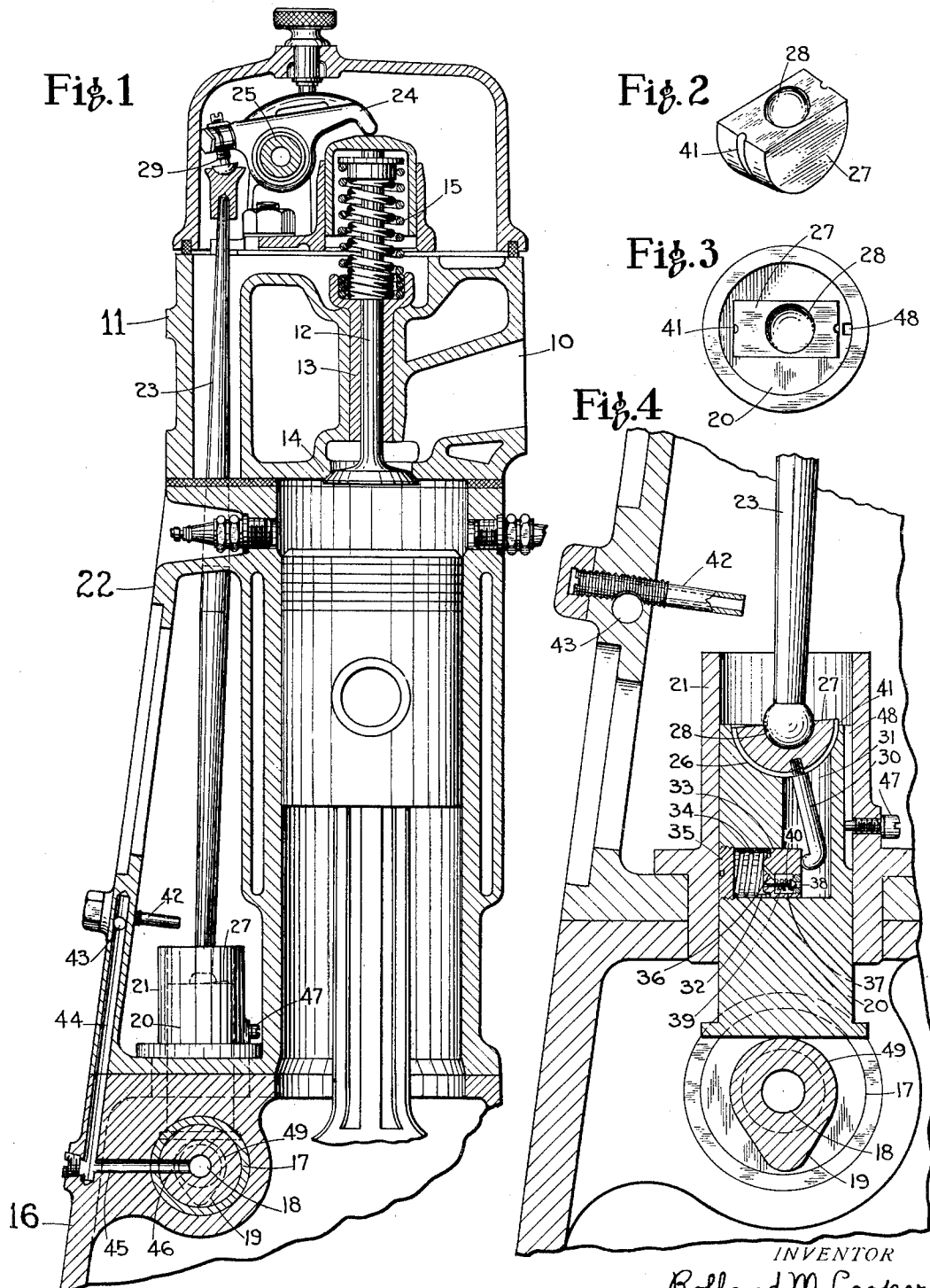
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VALVE ACTUATING MECHANISM

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VALVE ACTUATING MECHANISM

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3 Claims. (Cl. 123—90)

This invention relates to valve actuating mechanisms of the type employed in internal combustion engines.

It is an object of this invention to provide a simple and efficient valve actuating mechanism which will automatically adjust itself to compensate for expansion or contraction of its parts and the parts of the structure which supports it.

It is a further object of this invention to provide a valve actuating mechanism in which the parts are constantly maintained in engagement, and which for that reason is noiseless in its operation.

It is a further object of this invention to provide a valve actuating mechanism embodying a fluidic compensating apparatus in which the fluid is subjected to a relatively small force as compared to the thrust imposed upon the parts of the mechanism which transmit the valve opening movement.

Other objects and attendant advantages will appear in the following description when read in connection with the accompanying drawing, in which:

Figure 1 is a fragmentary transverse section of an internal combustion engine provided with a valve actuating mechanism embodying this invention.

Figure 2 is a perspective view, drawn to a large scale, of a member of the valve actuating mechanism illustrated in Figure 1.

Figure 3 is a plan view, drawn to a large scale, of the member illustrated in Figure 2, and of the subjacent valve tappet which supports it.

Figure 4 is a fragmentary transverse section of large scale of the engine illustrated in Figure 1, the section being taken through center line of the valve tappet shown in Figure 1.

Referring to the drawing, the numeral 10 indicates an exhaust passage formed in the cylinder head 11 of the engine therein illustrated. The exhaust passage 10 is controlled by a valve 12 mounted in a guide 13 set in the upper part of the cylinder head. The valve 12 cooperates with a seat 14 formed in the lower surface of the cylinder head, and is provided with closing springs 15.

Mounted in the side of the crank case 16 of the engine, there is a cam shaft 17 formed with a bore 18 which forms part of a lubricating system of the type disclosed in United States Patent 1,265,145. This shaft is driven from the engine crank shaft by means of a driving connection (not shown), and operates the valve 12 through the instrumentality of an integrally formed cam 19, and an intermediate disposed train of mech-

anism comprising a tappet 20 mounted in a guide 21 secured in an aperture formed in the abutting walls of the engine cylinder block 22 and crank case 16, an upwardly extending push rod 23, and a rocker arm 24 journaled on a shaft 25 mounted on the upper end of the cylinder head.

The tappet 22 is constructed with an arcuate groove 26 formed in its upper end; and mounted in the groove 26, there is a semi-circular member 27 formed with an eccentrically disposed recess 28. The recess 28 receives the lower spherical end of the push rod 23, the upper end of which is pivotally supported in position by means of an adjusting screw 29 mounted in the end of the rocker arm 24 and extending into a recess in the end of the push rod.

Screwed into the periphery of the member 27, there is an arm 30 which extends downward into a vertical bore 31 formed in the tappet 20. The bore 31 joins with a lateral bore 32 in the tappet; and mounted in the bore 32, there is a piston 33 maintained in engagement with the arm 30 by a spring 34 mounted within the bore 32 intermediate the piston 33 and a plug 35 screwed into the outer end of the bore. The bore 32 is sealed at its outer end by the plug 35, and is maintained filled with oil in a manner to be hereinafter described.

The piston 33 is constructed with a passage way leading therethrough consisting of a duct 36, a bore 37, and a duct 38 formed in a valve seat insert screwed into the outer end of the bore 37. Communication between the duct 38 and the bore 37 is controlled by a valve 39 pressed in the direction of its seat by means of a spring 40 mounted within the bore 37. The bore 31 serves as an oil reservoir, and during operation of the valve actuating mechanism both supplies oil to the bore 32 and receives oil from the bore 32. It communicates through a groove 41 in the member 27 with the superadjacent bore of the guide 21, and is maintained substantially filled with oil by an intermittent flow of oil delivered into the upper end of the guide 21 through a pipe 42 mounted in the side wall of the cylinder block. Oil is delivered to the pipe 42 from the bore 18 of the cam shaft through a longitudinal manifold 43 formed in the side wall of the cylinder block, a vertically extending duct 44 formed in the side walls of the crank case and cylinder block, a laterally extending duct 45 formed in a web of the crank case, and a radially extending duct 46 formed in the cam shaft 17.

In order to prevent variations in the operative length of the valve actuating mechanism, which

otherwise might be produced by rotation of the tappet 20 and the member 27, the tappet is secured against rotation by means of a screw 47 mounted in the side walls of the guide 21 and extending into a groove 48 formed in the side of the tappet.

Assuming that the bores 31 and 32 have been filled with oil the operation of the valve actuating mechanism is as follows:

During the opening and closing periods of the valve 12 the thrust imposed upon the valve actuating mechanism tends to cause the member 27 to rotate in a direction to decrease the operative length of the valve actuating mechanism, the turning couple consisting of two oppositely directed forces acting respectively through the center of curvature of the recess 28, and center of curvature of the semi-circular lower periphery of the member 27. Rotation of the member 27 in response to the thrust imposed upon the valve actuating mechanism is resisted by the spring 34 and the oil confined within the bore 32, the valve 39 having been closed prior to the valve opening movement by its spring 40.

The piston 33 is so designed that a small amount of oil will leak past its sides during the valve opening and closing periods, the leakage being sufficient to allow a slightly greater contraction of the valve mechanism than is necessary to compensate for the greatest possible expansion that could occur therein during any one valve cycle. This leakage requires that the valve 12 be brought into engagement with its seat 14 prior to that point in the valve cycle in which the valve tappet 20 is brought to rest on the base circle 49 of the cam 19, and thereby insures against the valve 12 being held open by expansion of the valve actuating mechanism during that period in which it is intended to be closed.

Following the seating of the valve 12, and until the tappet is brought to rest on the base circle of the cam 19, the spring 34 acting through the instrumentality of the piston 33 and the arm 30 rotates the member 27 in a direction to extend the valve actuating mechanism, maintaining the various parts of the mechanism in active engagement. This extension of the valve actuating mechanism causes a forward movement of the piston 33, and the pressure having been removed from the oil within the bore 32 at the instant of the seating of the valve 12, the valve 39 is sucked open by the initial movement of the piston, after which oil flows through the passage in the piston filling the bore 32 as the piston moves forward. Upon cessation of the forward movement of the piston 33 and in advance of the valve opening movement of the tappet 20, the valve 39 is returned to its closing position by its closing spring 40, the pressures on the opposite sides of the piston then being equal.

It will be seen from the foregoing description that the valve actuating mechanism will automatically adjust itself during each cycle to compensate for expansion or contraction therein, the adjustment being effected through a successive contraction and expansion of the intermediate portion of the mechanism which produces a resultant increase or decrease in the operative length of the valve actuating mechanism equal to the change in the operative length of the mechanism caused by expansion or contraction of its parts and/or the associated parts of the engine.

Although the foregoing description is necessarily of a detailed character, in order that the

invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining and that various rearrangement of parts and structural details may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim as my invention:

1. In a valve actuating mechanism, a train of elements transmitting the valve opening and closing movements including a member movable with the remaining elements in said train to transmit the valve opening and closing movements, and separably movable to vary the operative length of said train, said member being so mounted that it is impelled to move in a direction to decrease the operative length of said train of elements by the thrust imposed thereon during the valve opening and closing periods, and being so arranged with respect to the other elements of said train that the force imposed thereon to overcome the resistance offered to its movement in the aforesaid direction is less than the thrust transmitted by said train, a fluid brake carried by said train arranged and designed to retard movement of said member in a direction to decrease the operative length of said train, and offering sufficient resistance to insure the transmission by said train of the thrust necessary to valve actuation, said fluid brake comprising a body of fluid placed under pressure in resisting the movement of said member in a direction to decrease the operative length of said train, means through which fluid from said body of fluid slowly escapes when said body of fluid is placed under pressure as aforesaid, and means for increasing said body of fluid when the pressure imposed thereon by said member is removed.

2. In a valve actuating mechanism, a train of elements transmitting the valve opening and closing movements including a member carried by a second member and mounted for oscillatory movement with respect to said second member, an a third member eccentrically associated with said first named member, said first, second, and third named members being so arranged and coordinated that the thrust imposed upon said train during valve opening and closing periods tends to cause an oscillatory movement of said first named member in a direction to decrease the operative length of said train of mechanism, a fluid brake carried by said train designed to retard movement of said first named member in a direction to decrease the operative length of said train, and being connected with said first named member in such a manner that it resists a force of less magnitude than the force imposed upon said first named member by said third named member, said brake comprising a body of fluid placed under pressure in resisting movement of said member in a direction to decrease the operative length of said train, means through which fluid from said body of fluid slowly escapes when said body of fluid is placed under pressure as aforesaid, and means for increasing said body of fluid when the pressure imposed thereon by said first named member is removed.

3. In combination, a rotatable cam, a valve, a closing spring for said valve, mechanism operable by said cam to open and close said valve, said mechanism comprising a reciprocating tappet associated with said cam, a member carried by said tappet and mounted for oscillatory movement with respect thereto, a push rod eccentrically associated with said member, a rock arm op-

eratively associated with said push rod and said valve, the members of said mechanism being so arranged and coordinated that the thrust imposed upon said mechanism during valve opening and closing periods tends to cause an oscillatory movement of said member in a direction to decrease the operative length of said mechanism, a fluid brake designed to retard movement of said member in a direction to decrease the operative length of said train, and being connected with said member in such a manner as to resist a force of less magnitude than the force imposed upon said member by said push rod, said brake comprising a body of fluid placed under pressure and resisting the movement of said member in a direction to decrease the operative length of said train, means through which fluid from said body of fluid slowly escapes when said body of fluid is placed under pressure as aforesaid, and means for increasing said body of fluid when the pressure imposed thereon by said member is removed.

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15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150