

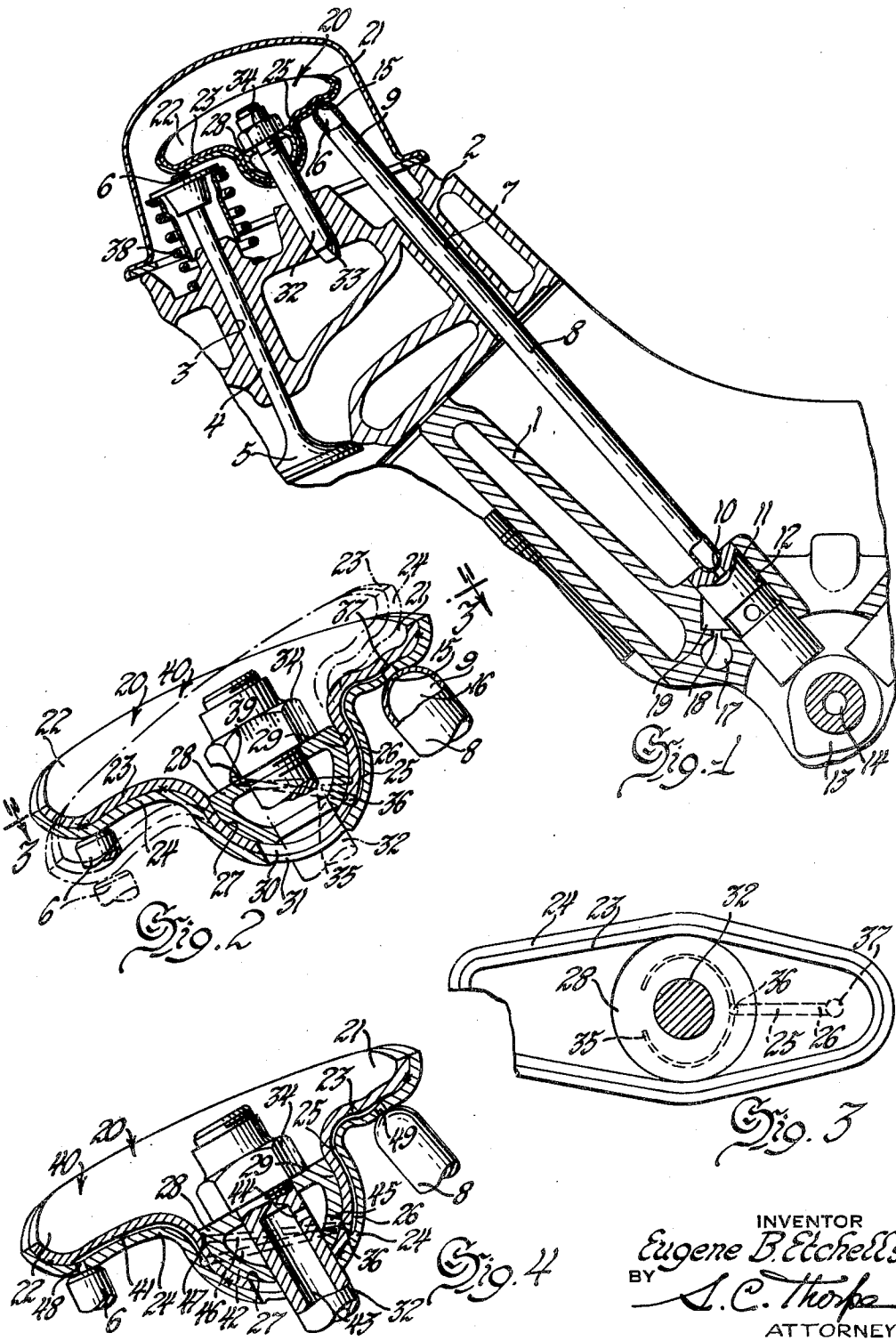
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VALVE ACTUATING MECHANISM

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VALVE ACTUATING MECHANISM

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This invention relates to valve operating mechanisms for internal combustion engines and the like, and particularly to unique and simplified rocker assemblies including novel lubrication means therefor of overhead-type valve operating mechanisms.

The main object of the invention is to provide a simplified rocker made up of a plurality of similarly dished sheet metal stampings which when assembled together form therebetween at least one lubricating oil conducting passage for conducting lubricant to one or more bearing surfaces on the rocker.

Another object of the invention is to provide an oil conducting groove in the fulcrum bearing surface of the rocker the ends of which for predetermined portions of the rocker oscillations are uncovered to measure the amount of oil per rocker oscillation supplied to the dished space in the rocker above the bearing seat against which the rocker bears.

These and other objects are attained in accordance with my invention with the structures hereinafter shown and described in the drawings by use of a rocker, formed from a pair of dished out sheet metal stampings having oil conducting grooves formed therein, the rocker bearing downwardly at opposite ends upon the push rod and valve stem and being fulcrumed intermediate its ends by means of a stud fixedly anchored at one end of the cylinder head and extending through the rocker to provide support for a bearing seat about which the rocker may oscillate during reciprocation of the push rod and the valve.

In the drawings:

Fig. 1 is a view partly in section and in elevation showing a portion of an internal combustion engine incorporating a valve rocker and lubricating means in accordance with my invention.

Fig. 2 is a view similar to Fig. 1 but enlarged to show the formation of the novel rocker and also the oil conducting grooves in the members and the passage formed between the sheet metal members and how oil is transmitted from a hollow push rod and metered to the area above the bearing surfaces about which the rocker fulcrums.

Fig. 3 is a view taken on the line 3—3 of Fig. 2 illustrating the elongated configuration of the rocker, the oil lubricating grooves in the members forming the oil conducting passages, and how the members are similar and telescopically nested together.

Fig. 4 is a modified showing of the invention similar to Fig. 2, but with the oil being supplied through the stud anchored in the head which provides a bearing seat for the rocker instead of the hollow push rod.

In the drawings there is shown an engine frame structure of conventional overhead valve-type including a cylinder block 1 and a cylinder head 2. Slidably guided for axial reciprocation in the bore 3 of the cylinder head is the stem 4 of a poppet valve 5, the upper end 6 of which projects above the cylinder head. Similarly extending through the bore 7 of the head is a push rod 8

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which is disposed laterally of the valve stem and has its upper end 9 also projecting above the cylinder head. The lower end 10 of the push rod abuts the upper end of a valve tappet 11 which is slidably guided for axial reciprocation in the tappet bore 12 provided in the cylinder block 1. A cam 13 is shown on which rests the lower end of the tappet 11 and whose shaft 14 is rotatably driven in any desired manner (not shown) to effect reciprocation of the tappet and push rod.

It will be observed that the push rod is hollow and is provided at its upper end with a port 15 which communicates with the interior thereof having the designation 16. Oil may be supplied to a passage 17 from the lubricating oil pressure source of the engine (not shown). Oil is conducted from passage 17 through a port 18 communicating with a small chamber 19. Chamber 19 communicates with the interior of the tappet 11 in a well-known way which in turn allows oil to enter the lower end 10 of the push rod 8 through a port similar to the port 15 located in the upper end of the rod. The manner of supplying oil under pressure to the push rod 8 is conventional and forms no part of the present invention and, therefore, no further description is deemed necessary with respect thereto.

Operatively connecting push rod 8 and the valve stem is the novel valve rocker or rocker arm 20 having arms 21 and 22 overlying and resting upon the upper ends 9 and 6 of the push rod and valve stem, respectively. The rocker 20, as best seen in Fig. 2, is formed of a pair of dished members 23 and 24 telescopically nested together and secured as, for example, by spot welding. The members 23 and 24 are stamped so as to obtain the configurations shown with the outer member 24 being suitably recessed to form a groove 25 which when the inner member 23 is nested therein forms a lubricating oil conducting passage 26 leading from adjacent the periphery of the members toward the centers thereof. Adjacent the outer end of the arm 21 of the rocker 20, the bottom surface of the member 24 is spherically dished to socketably receive the upper end of the push rod 9 in bearing relation. Intermediate the push rod and valve the rocker 20 is provided on the upper surface of the member 23 with a spherically dished bearing surface 27 which socketably receives a washer 28 having a correspondingly shaped bottom surface 29 forming the seating for the rocker. Centrally of the bearing surface 27 the members 23 and 24 are provided with aligned apertures 30 and 31 through which extends an elongated member 32 in the form of a stud having its lower end fixedly anchored as by a press fit in a hole 33 in the cylinder head, the stud being provided at its upper end with a threaded nut 34 which serves to retain the washer 28. Located in the spherical bearing surface 27 of member 23 is a diagonally and substantially annularly extending groove 35. The groove 35 is connected by a port 36, also in member 23, to the passage 26 formed by members 23 and 24, the port 36 being located adjacent the center of the rocker. The member 24 adjacent the outer periphery of the arm 21 of rocker 20 is also provided with a port 37 which is large enough to remain in continuous register with the port 15 provided in the upper end 9 of the push rod 8 during oscillation of the rocker.

During the lift stroke of the cam 13, the upward movement of the push rod 8 will cause the rocker 20 to rotate about the washer 28 in a counterclockwise direction as viewed in Fig. 1 to transmit the push rod thrust to the valve stem 4 and effect opening of the valve against the biasing force of a valve spring 38 provided for the valve 5. On the return stroke the force of the spring 38 will drive the rocker clockwise about the washer 28 and effect the return of the push rod. Since, at all times, an upward thrust is exerted upon each end of the rocker, the

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bearing surface 27 is maintained in contact at all times with the washer 28 and the rocker is restrained from rotation about the axis of the stud 32.

As previously mentioned, the members 23 and 24 are sheet metal stampings similar in configuration and dished out so that they snugly fit together one within the other to form the lubricating oil passage 26. As also previously mentioned, the push rod 8 is always filled with oil under pressure supplied from the passage 17 connected to the engine lubricating oil pressure source. Since during rocking of the rocker 20 by the push rod 8 and the valve stem 4 and spring 38 the port 15 in the upper end of the rocker arm is large enough to be constantly in register with the port 37 there will always be a supply of lubricating oil in the passage 26 and in the port 36 and this will, of course, supply oil under pressure between the surfaces 27 and 29 in the groove 35. When the rocker is in the position shown in solid lines, i. e., with the valve 5 closed, the ends 39 of the groove 35 in spherical surface 27 will not be covered by the spherical surface 29 of washer 28 and oil can spill or dump into the dished out area 40 of the rocker located above washer 28. During counterclockwise movement of the rocker 20 to the position shown by the phantom lines of Fig. 2 (when valve is fully open), however, there will be relative movement between the surfaces 27 and 29 which will cause surface 29 to increasingly cover the ends 39 of the groove 35 until no more oil is supplied to area 40. When rocker 20 has nearly completed an oscillation and valve 5 is approaching its seat due to clockwise rotation of the rocker the ends 39 of groove 35 will again be uncovered and oil will again be supplied to area 40. From the foregoing it may be appreciated that the amount of oil supplied to area 40 is regulated by how much and how long the ends 39 are not covered by the surface 29 during each rocker oscillation. It should be mentioned at this point that it is important to regulate the amount of oil supplied to area 40 since the oil supplied thereto is relied on in part to lubricate spherical surfaces 27, 29 and also to lubricate the abutting surfaces between valve stem end 6 and arm 22, valve spring 38, valve stem 4 in guide 3 and other parts. This is accomplished by the oil in area 40 spilling out on the surfaces to be lubricated. If, however, too much oil is supplied, then large amounts will spill out of area 40 and run down stem 4 into the combustion chamber. This results in an excessive loss of lubricating oil and undesirable exhaust smoking. It will be appreciated, of course, that the passage 26 and port 36 may be relied on to a large extent to lubricate the surfaces 27, 29 and it is felt that this is an important feature of the invention. The addition of groove 35, however, improves lubrication between surfaces 27, 29 and also makes it possible to supply metered quantities of oil to area 40 for further lubricating purposes, the ported ends 39 serving to regulate the amount.

The use of the two stampings 23 and 24 considerably simplifies the formation of the rocker including the passage 26 and groove 35 which enables the bearing surfaces of the rocker and washer 28, as well as other bearing surfaces, to have regulated amounts of oil supplied thereto.

It is felt from the foregoing that it may now be appreciated that a new and improved rocker has been provided which improves the lubrication in a valve rocker assembly and the valve means which such a rocker assembly actuates.

Turning now to the modification shown in Fig. 4, in addition to passage 35 formed between the members 23 and 24, a second passage 41 is also formed leading from the arm 22 adjacent the upper end 6 of the valve stem toward the central part of the rocker 20. A third passage 42 is also formed between the members 23 and 24 and connects passage 41 to passage 26. In order to transmit oil to the passages 41, 42 and 26 the stud 32 is provided with a passage 43 which communicates with a suitable oil pressure source and is in communication by means

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of a port 44 with the interior of the washer 28. The interior of washer 28, however, is maintained in constant communication by means of an enlarged port 45 with the port 36 located in the inner member 23. Ports 45 and 36 are also in communication with one end of a groove formed in the spherical surface 29 of the washer 28. This groove in cooperation with the spherical surface 27 of the inner member 28 forms a passage 46 leading to adjacent the upper part of the washer 28. Passage 46 has an end 47 which will be uncovered upon movement of rocker 20 to a position which opens the valve 6.

The operation of the modified assembly shown in Fig. 4, then, is as follows: Oil is supplied under pressure through the passage 43, through port 44 into the interior of the washer or spherical bearing seat 28. The oil then passes through the port 45 which is enlarged so that it is at all times in communication with the port 36. This means that there will always be lubricating oil present in the passages 41, 42, 26 and 46. Oil in passage 41 is transmitted by means of a port 48 to the engaging surfaces of the arm 22 and upper end 6 of valve stem 4 to thereby lubricate these surfaces. Oil in passage 26 will by means of a small port 49 lubricate the upper end of the push rod 8 (which may now be solid) and the bearing surface on the underside of lower or outer member 24 which is engaged by the upper end of the push rod. Oil in passage 46 will, of course, be periodically allowed to spill into area 40 by reason of an end 47 of passage 46 being uncovered by movement of rocker 20. Metering of oil into area 40 is thus accomplished as in the case of the embodiment shown in Fig. 2. In one case, however, the lubricating oil is supplied to the rocker assembly through a hollow push rod and in the other through the rocker arm bearing seat support.

What I claim is:

1. An engine valve rocker comprising inner and outer dish-shaped members telescopically nested together and secured to each other, said members together forming a lubricating oil passage leading from adjacent the outer peripheries of said members toward the centers thereof, the outer of said members having a port adapted to connect said passage to the interior of a hollow push rod engageable with the outer of said members, the inner of said members having a rocker fulcruming spherical bearing surface at center thereof and a port therethrough leading from said passage to said spherical bearing surface.

2. A rocker for transmitting the movement of an internal combustion engine push rod to an engine valve comprising a pair of similar elongated dish-shaped members telescopically nested and secured together to form a lubricating oil conducting passage therebetween leading from adjacent the outer periphery of said members toward the centers of said members, a port in the outer of said members communicating with said passage and adapted to communicate with the upper end of a lubricating oil conducting hollow push rod, the inner of said members having a spherical concave bearing surface and having a port connecting said bearing surface with said passage for the conduction of oil thereto.

3. In an internal combustion engine including an engine frame, a valve, and a lubricating oil conducting push rod; a rocker assembly adapted to transmit movement between said push rod and valve comprising a bearing member supported by said frame and having a convex spherical bearing surface located between said valve and push rod, and a rocker including a pair of dished members nested together one inside the other, the inner of said members having a concave spherical bearing surface in bearing engagement with said convex surface, the outer of said members engaging said push rod and said valve adjacent the periphery of said member, said members together forming a passage leading from the place of engagement of said push rod with the outer of said members to adjacent said bearing surfaces, said members having ports con-

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necting said passage with said push rod and said bearing surfaces.

4. A valve rocker assembly comprising a support, a bearing mounted on said support and having a bearing seating surface spaced from said support, a pair of dished members secured together to form a combined rocker and lubricant container, one of said members having a cooperating bearing surface in the dished portion thereof maintained in bearing engagement with said bearing seating surface by a valve and a push rod whose movements said rocker transmits, one of said surfaces having a groove therein between said surfaces, said members together forming therebetween a passage extending from adjacent the engagement of the push rod with said rocker arm to adjacent said groove, said members having ports connecting said passage with said groove and push rod, and means to conduct oil to said passage.

5. A rocker for transmitting the movement of an internal combustion engine hollow lubricating oil conducting push rod to an engine valve comprising a pair of similar elongated dished sheet metal members, said members being telescopically nested together and secured to each other to form an oil container and an oil conducting passage therebetween leading from adjacent the outer peripheries of said members to adjacent the centers thereof, the outer of said members having a port adapted to connect said passage to the hollow push rod, which is engageable with the outer of said members, the inner of said members having a curved bearing surface and a port leading from said passage to said bearing surface.

6. A fulcrumed rocker comprising a pair of dished plate-like members forming an oil container and an oil conducting passage therebetween extending away from the fulcrum of said rocker, one of said members having a surface on one side of said rocker engageable by a push rod having an oil conducting passage therein and a valve stem on opposite sides of the fulcrum of said rocker, a bearing surface on one of said members, said members having ports therein connecting said passage to said surface and adapted to connect said passage to the push rod.

7. A rocker comprising a pair of dished plate-like members, a surface on one of said members engageable by a push rod having an oil conducting passage therein and a valve stem on opposite sides of the fulcrum of said rocker arm, said members forming an oil container and a lubricating oil conducting passage therebetween extending from adjacent the fulcrum of said rocker to adjacent where the push rod is adapted to engage said surface, a fulcrum bearing surface on the other of said members on the opposite side of said rocker, said members having ports therein connecting the passage formed by said members to said surfaces and container.

8. A rocker for transmitting reciprocating movement of an engine push rod to an engine valve wherein the push rod has a lubricating oil passage extending axially therealong comprising a pair of dished plate-like members, one of said members forming an oil container and having a bearing surface therein forming the fulcrum of said rocker, the other of said members having a surface adapted to be engaged by the push rod and valve, said members together forming an oil conducting passage therebetween adapted to connect the oil conducting passage of the push rod with said bearing surface and container.

9. A valve rocker comprising a pair of dished plate-like metallic stampings secured telescopically together so that the inner stamping forms an oil container, each of said stampings having a bearing surface thereon, said stampings together forming an oil conducting passage

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therebetween, said stampings having ports therein connecting said bearing surfaces and container together via said passage.

10. A valve rocker comprising at least one pair of dished members telescopically secured together wherein said pair of members has at least one pair of spaced bearing surfaces thereon, the inner of said members forming an oil container, said pair of members together forming a fluid conducting passage therebetween and having ports connecting said surfaces and container together via said passage.

11. A valve rocker comprising at least one pair of dished members secured together wherein said pair of members has at least one pair of spaced bearing surfaces thereon, the inner of said members forming an oil trough, one of said bearing surfaces having an oil conducting groove formed therein, said pair of members together forming a fluid conducting passage therebetween and having ports connecting one of said surfaces to the other of said surfaces and groove and trough via said passage.

12. A valve rocker assembly comprising a support, a bearing having a spherical bearing seating surface mounted on said support with said surface being spaced from said support, a pair of similar dished members concentrically nested together to form a rocker, the inner of said members having a cooperating spherical bearing surface maintained in bearing engagement with said spherical seating bearing surface by a valve and a lubricating oil conducting push rod whose movements said rocker transmits, said cooperating spherical bearing surface having an annular groove therein between said surfaces, said members together forming therebetween a passage extending from adjacent the engagement of the push rod with said rocker arm to adjacent said groove, said members having ports connecting said passage with said groove and push rod, said groove being coverable and uncoverable by said spherical seating bearing surface for a predetermined part of each rocker oscillation to thereby meter the oil which is supplied from said push rod through said ports passage and groove to the area formed by dishing said members.

13. A valve rocker assembly comprising a support, a bearing having a curved bearing seating surface mounted on said support with said surface being spaced from said support, a pair of similar dished members concentrically nested together to form a rocker, the inner of said members having a cooperating curved bearing surface maintained in bearing engagement with said curved seating bearing surface by a valve and a lubricating oil conducting push rod whose movements said rocker transmits, one of said surfaces having a groove therein between said surfaces, said members together forming therebetween a passage extending from adjacent the engagement of the push rod with said rocker arm to adjacent said groove, said members having ports connecting said passage with said groove and push rod, said groove being coverable and uncoverable by relative movement of said surfaces caused by oscillation of said rocker for predetermined portions of each oscillation of said rocker whereby oil may be supplied in metered quantities to the area formed by dishing of the inner of said members.

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