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2,546,263

VALVE-OPERATING MECHANISM

Filed June 10, 1946

4 Sheets-Sheet 1

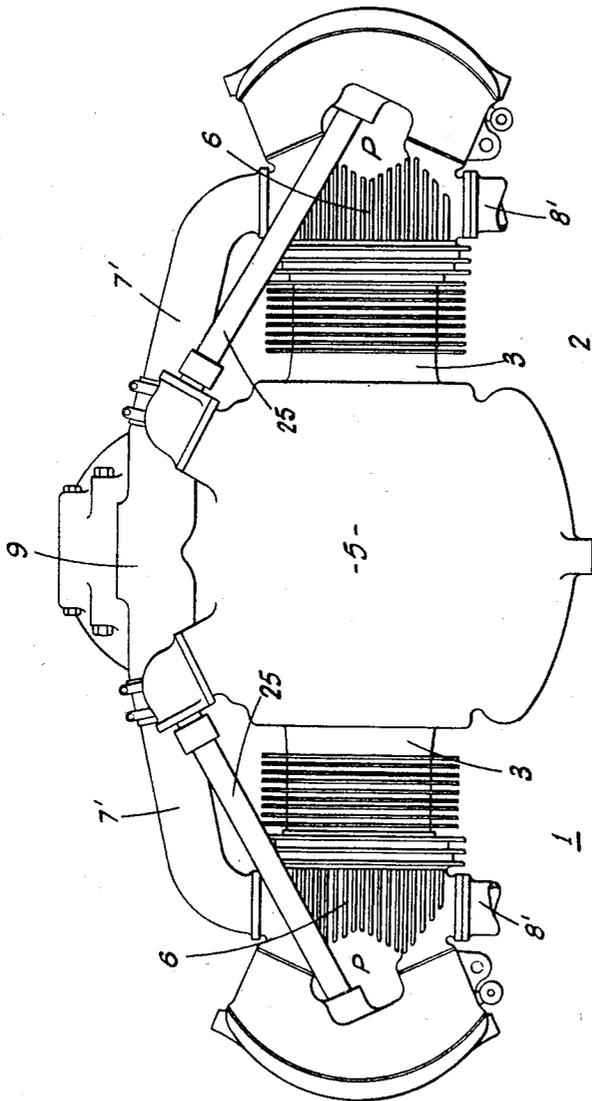


FIG. 1.

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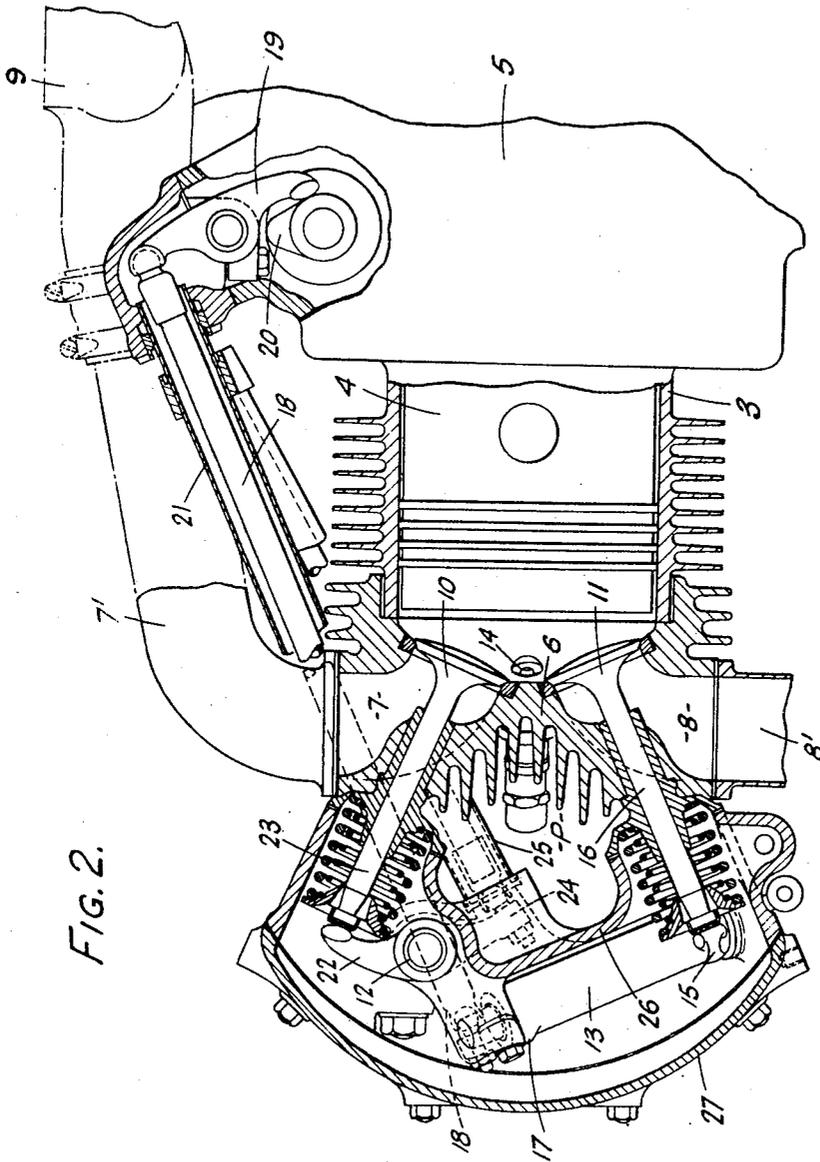


FIG. 2.

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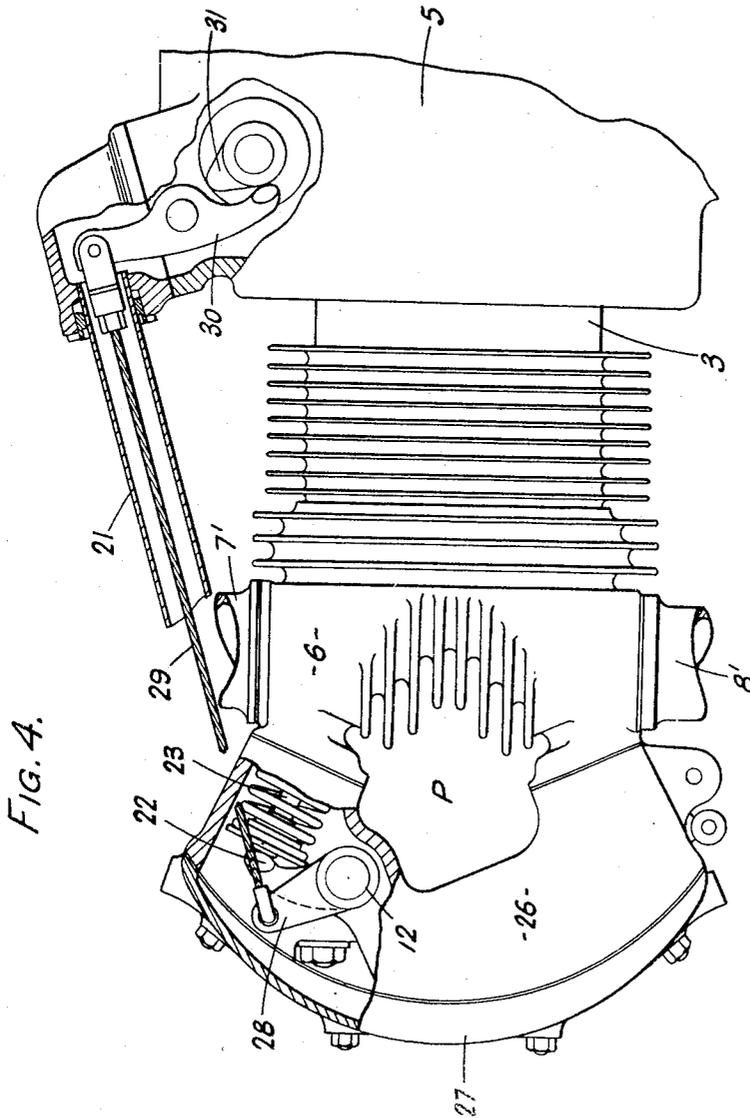
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VALVE-OPERATING MECHANISM

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VALVE-OPERATING MECHANISM

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4 Claims. (Cl. 123-90)

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This invention relates to internal combustion engines of the air-cooled type; the invention is more especially concerned with such engines employing a cylinder equipped with inlet and exhaust valves of the poppet type e. g. mushroom valves and disposed at the head of the cylinder, the valves being operated through rocker assemblies from operating cams disposed at the inlet valve side of the cylinder.

The main object of this invention is so to improve the lay-out or disposition of the valve operating mechanism as to provide for a clean sweep of cooling air over the cylinder head and to provide for easy accessibility to components such as sparking plugs in the head.

According to this invention the inlet and exhaust valves are arranged to diverge from one another and the rocker shaft of the rocker assembly for the exhaust valve extends above and across the cylinder head from the exhaust valve side to a push or pull rod which extends down the inlet valve side of the cylinder to an operating cam, the shaft having rocker arms associated with the exhaust valve and with the rod.

The rocker shaft is contained or substantially contained in a plane which is normal to the axis of the exhaust valve and the push or pull rod extends in a direction which is sensibly parallel with that axis. In order to enable the push or pull rod to be contained together with a similar rod for the inlet valve, within the lateral confines of the cylinder, the rocker shaft for the exhaust valve is preferably inclined in the plane referred to, this disposition enabling the push or pull-rods for the inlet as well as the exhaust valves to be disposed about an inlet pipe to convey explosive mixture to the inlet valve.

The inlet valve is also operated through a rocker shaft disposed on the inlet side of the head and it is to be understood that in referring to the inlet "side" of the head is meant that part of the head lying on the inlet valve side of a plane passing centrally between the inlet and exhaust valves and at right angles to the plane containing the valve axes.

With such an arrangement, there is provided, especially on the "hot" exhaust valve side of the head ample space for the free flow of cooling air over the head which in virtue of the arrangement is not encumbered by the rocker arms as with the usual arrangement.

The invention affords especial benefit in those engines where there are three or more cylinders in line and the heads of the cylinders are provided with two sparking plugs each; with the

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normal lay-out of overhead valve gear there is some difficulty in providing for ready access to the plugs.

The invention is illustrated in the accompanying drawings, in which Figures 1-3 illustrate one arrangement and Figure 4 a modified arrangement.

Figure 1 is an end elevation;

Figure 2 is a sectional elevation to a scale larger than that of Figure 1, of a part of the engine shown in that figure;

Figure 3 is a part plan view; and

Figure 4 is a sectional elevation.

The engine in the arrangement shown is of the multi-cylinder air-cooled type and has as seen in Figure 1 a pair of opposed banks 1, 2 of cylinders 3, each bank consisting of a plurality of cylinders 3 in line. Each cylinder has a piston 4 coupled in any usual manner to a crank-shaft mounted in a crank-case 5; each cylinder has a detachable cylinder head 6 in which is formed an inlet passage 7 and an exhaust passage 8 open respectively to inlet and exhaust pipes 7', 8', the inlet pipes 7' extending to a manifold 9. The inlet and exhaust passages 7, 8 are respectively provided with inlet and exhaust valves 10, 11 which are inclined outwardly away from one another in a plane transverse to the cylinder banks.

For the purpose of operating the valves 10, 11 there are provided two rockers 12, 13, and these rockers and associated mechanism are so arranged as to provide a maximum of free space in the region of the head to permit adequate cooling air flow over it and easy accessibility to components such as sparking plugs of which one is indicated at 14. Thus, the exhaust-valve rocker 13 extends as seen in Figure 2 between the stems of the diverging inlet and exhaust valves and has at one end a rocker arm 15 which extends outwardly from the rocker to over the upper end of the stem 16 of the exhaust valve 11. At the other end of the rocker is a second rocker arm 17 which extends from the rocker 13 in the opposite sense to the first rocker arm, the second rocker arm 17 being engageable by a push rod 18 which extends past the inlet side of the head to a cam gear in the crank case and comprising a rocker 19 and cam 20.

The axis of the rocker 13 is disposed obliquely so as to lie in a plane which is normal to the axis of the inclined exhaust valve and in addition the push-rod 18 is parallel with the axis of the valve; this enables the rocker arms 15 and 17 to receive and transmit forces in line

With their arcuate movement; in addition, to enable the push rod 18 to be accommodated snugly within the lateral dimension of the cylinder, the rocker 13 is disposed obliquely in the plane referred to across the cylinder head as seen in Figure 3; by this arrangement the push rod 18 can pass snugly down beside the inlet pipe 7' or more precisely an enclosing tube 21 can be so arranged.

The rocker 12 for the inlet valve 10 is arranged as seen in Figure 3 at right angles to the plane containing the inlet and exhaust valves and has at one end a rocker arm 22 extending over the end of the stem 23 of the outwardly inclined inlet valve, and at the other end a second rocker arm 24 which is engageable by a second push rod housed in an enclosing tube 25 which extends on the other side of the inlet pipe 7' along the inlet side of the head towards the cam shaft referred to.

It will be seen that the whole arrangement is such as to provide a "clean" lay-out for an overhead valve gear; the operating parts are removed from the exhaust side of the head so as to leave this side unencumbered and affording an ample flow of cooling air; the rocker 13 extends away from the head and affords an ample space P for cooling-air flow as is clearly seen in Figure 1. It will be understood that such a free space P exists on each of the in-line cylinders of the engine and thus the flow of cooling air is promoted right across the heads of those cylinders.

The rocker mechanism described is housed in a casing 26, one for each cylinder head, and this casing, which has a detachable cover 27, is formed snugly to the form of the rocker mechanism, this casing having formed in it the bearings for the two rockers.

Reference will now be made to Figure 4 which shows an arrangement employing, instead of the usual push-rod which operates under compression to effect valve opening, a "pull" member which is tensioned to open the valve; thus, Figure 4 shows the arrangement applied to the inlet valve of the engine described with reference to Figures 1-3 and in this figure an arm 28 on the rocker 12 has connected to it one end of a wire 29 which extends through the enclosing tube 21 to a lever 30 controlled by a cam 31.

This arrangement renders it possible to reduce weight by placing the rod in tension instead of compression. It may also be observed that, the "pull-rod" arrangement has a further advantage in that it leaves even more free the space P for, as the operating force for the inlet valve is applied as a tension force and not a compressional one, the arm 28 and the rocker arm 22 for the inlet valve 10 extend in the same direction as one another and away from the space P.

What I claim is:

1. In an air cooled internal combustion engine, a cylinder having divergent overhead inlet and exhaust valves of the poppet type, an operating component for the inlet valve and an operating component for the exhaust valve, both operating components being disposed on the inlet valve side of the cylinder, a rocker shaft for the inlet valve, the said shaft being within the confines of the cylinder head and having rocker arms associated with the operating component for the inlet valve and with that valve, and a rocker shaft for the exhaust valve, the said rocker shaft for the exhaust valve extending across the head from the inlet valve side to the exhaust valve side and

having rocker arms associated with the operating component for the exhaust valve and with that valve.

2. In an air cooled internal combustion engine, a cylinder having divergent overhead inlet and exhaust valves of the poppet type, an operating component for the inlet valve and an operating component for the exhaust valve both operating components being disposed on the inlet valve side of the cylinder, a rocker shaft for the inlet valve, the said shaft being within the confines of the cylinder head and having rocker arms associated with the operating component for the inlet valve and with that valve, a rocker shaft for the exhaust valve, the said rocker shaft for the exhaust valve extending across the head from the inlet valve side to the exhaust valve side with its axis contained in a plane normal to the axis of the exhaust valve and at an angle to the plane containing the axes of the two valves and the rocker shaft for the exhaust valve having rocker arms associated with the operating component for the exhaust valve and with that valve.

3. In an air-cooled internal combustion engine a cylinder having divergent overhead inlet and exhaust valves of the poppet type, push-rods to operate the inlet and exhaust valves, both push rods being disposed on the inlet-valve side of the cylinder and the push-rod for the exhaust valve being parallel with the stem of that valve, a rocker shaft for the inlet valve, the said shaft having rocker arms operatively associated with the stem of the inlet valve and with its push-rod, and a rocker shaft for the exhaust valve, the said rocker shaft for the exhaust valve extending across the cylinder head in a plane normal to the stem of the exhaust valve and to the push-rod for that valve and the rocker shaft for the exhaust valve having rocker arms operatively associated with the stem of the exhaust valve and with the push rod for that valve.

4. In an air-cooled internal combustion engine, opposed cylinders having divergent overhead inlet and exhaust valves, a valve operating cam assembly disposed at the central zone of the engine and on the inlet valve side thereof, push-rods extending from the cam assembly out towards the cylinder heads and all being disposed on the inlet valve side of the cylinders, the push-rods for the exhaust valves being parallel with the stems of those valves, rocker shafts for the exhaust valves, the said shafts extending across the cylinder heads from the inlet valve side to the exhaust valve side and having rocker arms operatively associated with the stems of the exhaust valves and with the push-rods for those valves and rocker shafts for the inlet valves, the said latter shafts having rocker arms operatively associated with the inlet valves and the push-rods for those valves.

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