

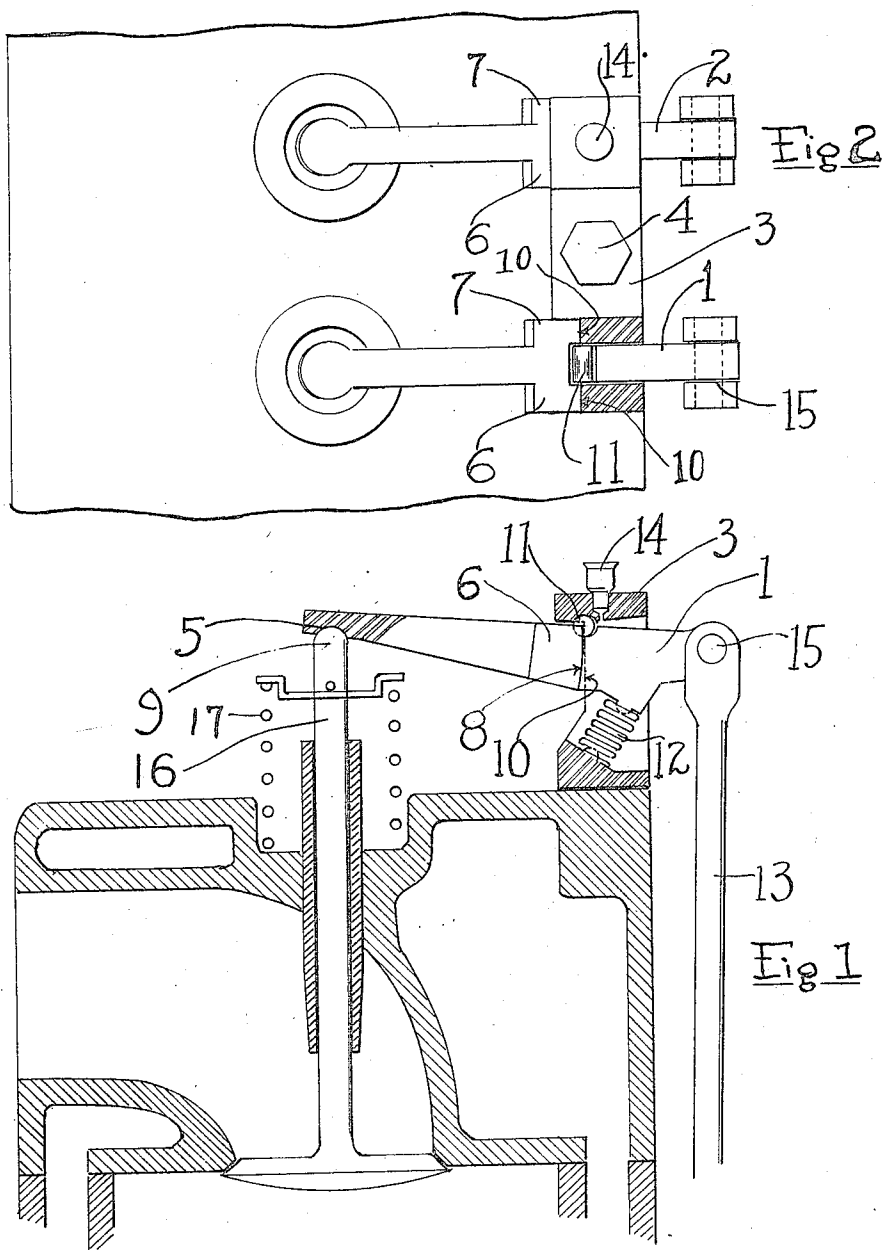
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ROCKER ARM

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Inventor

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UNITED STATES PATENT OFFICE.

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ROCKER ARM.

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To all whom it may concern:

Be it known that I, SIDNEY B. SHAW, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented a new and useful Improvement in Rocker Arms, of which the following is a specification.

My invention relates to rocker arms as used for the operation of the valves of an internal combustion or other engine of the reciprocating type, particularly where the said valves are of the poppet type; and the object of my invention is to provide a means for delivering a thrust force to the stem of a poppet valve in a straight line and parallel to the axis of the said valve stem, through a lever of the first, second, or third class.

I attain my object by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a sectional elevation of a portion of the cylinder-head of a typical internal combustion engine of the valve-in-head type, with rocker arm of this invention mounted thereon;

Figure 2 is a plan of the same portion of the same engine.

Similar numerals refer to similar parts throughout the two views.

The rocker arms 1 and 2 are supported in the cage 3, which is rigidly attached to the engine head as by the cap screw 4. The rocker arms are connected to the valve stems 16, through ball and socket joints 5.

On either side of the rocker arms are provided bosses 6 and 7. These bosses are so shaped that their faces are portions of a cylinder, the said cylinder being of such radius that its axis passes thru the point 9, which point is the geometric center of the ball and socket joint 5.

The cage 3, is provided with a flat bearing surface 10, in a plane parallel to the axis of the valve stem 16. Mounted in a race formed by corresponding depressions in rocker arms 1 and 2, and cage 3, is a small roller bearing 11. This roller bearing is maintained in contact and alignment through the action of spring 12, which is so arranged that it will exert pressure tending at the same time to force the rocker arm against the bearing 11, and to force the bosses 6 and 7 against the cage face 10.

Push rod 13, transmits the action of the engine cam-shaft to the rocker arm through

the bearing 15. An oil cup 14, provides lubrication for the several bearings.

The operation of this invention is as follows:

Through the operation of the cam-shaft mechanism of the engine, the push rod 13 moves the end at 15 of the rocker arm 3 in an upward direction, thereby causing the rocker arm to rock against the roller bearing 11, and its end at 5 to move in a downward direction against the reaction of the valve stem 16 as produced by spring 17. The cylindrical faces 8 of the bosses 6 and 7, being maintained in contact with the plane faces 10 of the rocker arm cage 3, by means of the spring 12, will so control the motion of the rocker arm that the point 9 at the geometric center of the ball and socket joint 5 between rocker arm and valve stem, will move in a straight line along the axis of the valve stem 16, and impart to the latter, motion in a downward direction. As the pressure is removed from the push-rod 13, the valve spring 17 acts through the valve stem 16 to return the rocker arm to its initial position, the rocker arm being likewise so controlled in its return motion, through the action of the cylindrical boss faces 8 on the cage faces 10, that the point 9 moves in a straight line, and along the axis of the valve stem 16, thereby tending to control the motion of the valve stem and limit it to straight line motion.

The claim of usefulness for this invention is based on, first, its operation as a lever in such a manner as will eliminate circular arc motion of the point of the rocker arm which is in contact with the valve stem, thereby delivering a straight line force to the said valve stem and eliminating all tendency toward side thrust on the valve stem with its consequent wearing of parts and mis-alignment of valves; second, its freedom from friction in that it operates on a roller bearing.

While the particular construction of this invention as illustrated in the attached drawing and described in the foregoing paragraphs is believed to be the most practical, it is not intended that the invention shall be strictly limited to the form as shown, but shall be covered by the claims as made here below.

I claim:

1. In an internal combustion engine having inlet and exhaust valves of the poppet

type, rocker arms for the operation of the said valves each consisting of a lever having near its fulcrum projecting bosses with bearing faces which are portions of the curved surface of a cylinder having for its central axis a line passing through the center of the joint of engagement of the extremity of the lever arm with the valve stem, in combination with a supporting cage having plane bearing surfaces for engagement with the curved bearing faces of the bosses on the lever which are affixed parallel to the axis of the valve stem, together with an anti-friction bearing so disposed between the lever arm and its supporting cage as to serve as a fulcrum for the lever and at the same time permit limited motion of the lever arm in a direction along its own axis, the said lever being maintained in contact with its fulcrum by means of a spring so located opposite the fulcrum that it at the same time exerts a force tending to maintain the curved bearing surfaces of the lever bosses in engagement with the plane bearing faces of the supporting cage, all for the purpose of transmitting rectilinear and co-axial force for the operation of the valves, and substantially as described.

2. In an internal combustion engine having inlet and exhaust valves of the poppet type, rocker arms for the operation of the said valves each consisting of a lever arm having near its fulcrum a cam member, the face of which is circular and the axis of which passes through the point of the said lever arm which is in contact or connection with the stem of the valve which is to be operated together with a supporting cage arranged to control the motion of the lever arm by means of bearing surfaces parallel to the axis of the valve stem, which surfaces are in engagement with the aforesaid cam members on the lever arm, and a roller type anti-friction bearing which at the same time acts as a fulcrum for the lever

arm and permits limited longitudinal motion of the lever arm in its cage during its operation, the supporting cage so controlling the motion of the lever arm that the point of the latter which applies actuating force to the valve stem will move in a straight line co-axial with the latter, all substantially as described.

3. In an internal combustion engine having inlet and exhaust valves of the poppet type, rocker arms for the operation of the said inlet and exhaust valves, each of the said rocker arms consisting of the combination of a lever having toward its one extremity a hemispherical cavity to engage the end of the valve stem, and toward its central part or fulcrum projecting bosses having circular cam faces, which cam faces have for their central axis a line passing through the center of the aforesaid hemispherical cavity near the extremity of the lever, together with a cage for supporting the lever, the said cage having plane bearing surfaces in engagement with the circular cam faces of the lever, which bearing faces are so arranged as to be mounted parallel with the axis of the poppet valve, and containing a bearing race in which a bearing roller is placed, the same serving as a fulcrum for the support of the lever arm, with a spring placed opposite the roller bearing and exerting a constant pressure tending at the same time to maintain the lever in contact with its fulcrum and the cam faces in contact with their plane bearing faces, also the lever to be extended beyond the fulcrum a suitable distance for attachment or engagement of the necessary operating rods or cams, the said combination to result in the transmission of a rectilinear force to the valve stem in a direction parallel with the latter, all substantially as and for the purpose described.

SIDNEY B. SHAW.