

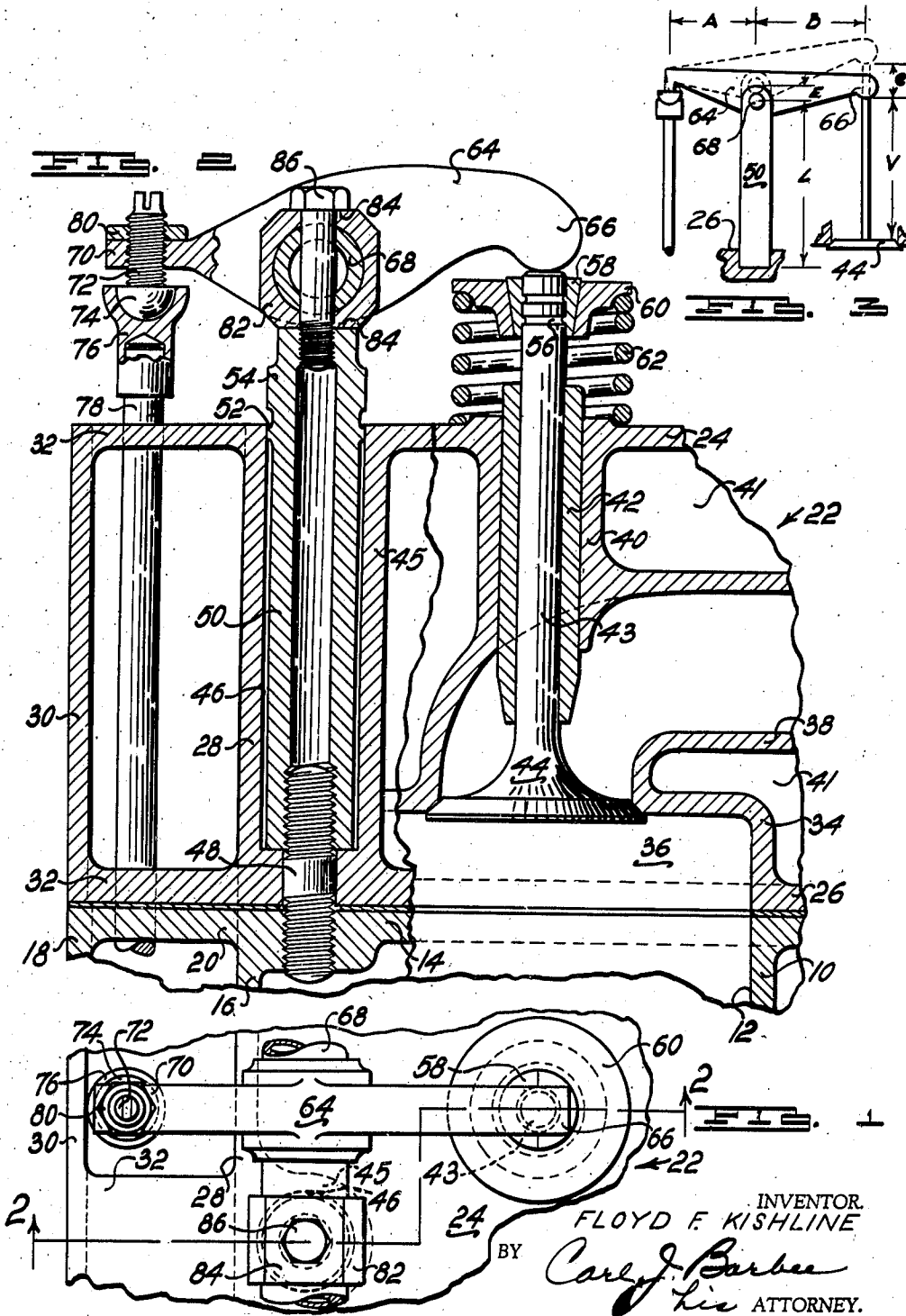
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ROCKER ARM SUPPORT

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ROCKER ARM SUPPORT

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3 Claims. (CL 123—90)

This invention relates to rocker arm supports and has particular reference to means for supporting a rocker arm shaft upon the head of a valve-in-head motor.

In the past it has been the practice to support the rocker arm shaft of a valve-in-head motor directly upon the cast iron head of the motor. Due to the differentials in temperature existing between the valve stems and the portion of the head which supports the rocker arm shaft and due to the differentials between the co-efficients of expansion of the steel valves and the cast iron head, the clearance between the end of the valve stems and the rocker arms mounted on the rocker arm shaft has been subject to considerable change depending upon the temperature at which the motor is operating. If the motor is adjusted with proper clearance when cold, it will have insufficient clearance when the motor becomes heated. If, on the other hand, the motor is adjusted for proper clearance when operating at a high temperature, it will be noisy in operation when operating at a low temperature such as exists when the motor is started. As a result, it has been the general practice to adjust the valves and rocker arms of the motor to obtain an average clearance which is correct for neither hot nor cold operation of the motor.

It is an object of this invention to provide a motor in which the valves may be adjusted for proper clearance at all operating temperatures of the motor.

It is another object of this invention to provide means for compensating for the expansion of the valve stems of a motor when the motor becomes heated.

It is another object of this invention to provide means for supporting the rocker arm shaft of a motor, which means will expand as the motor is heated to compensate for expansion of the valve stems of the motor.

Other objects and advantages of this invention will be apparent from a consideration of the following description and claims and the attached drawing, of which there is one sheet, and in which—

Figure 1 represents a plan view of a portion of the head of a valve-in-head motor;

Figure 2 represents a vertical transverse sectional view, partially broken away, taken along planes indicated by the broken line 2—2 in Figure 1 and looking in the direction of the arrows; and

Figure 3 represents a diagrammatic view of the valve and rocker arm structure shown in Figure 1.

Illustrated in the drawing is a motor of the valve-in-head type having a motor block 10 within which is formed a series of cylinders, one of which is illustrated at 12. The block 10 is provided with a top wall 14 and a side wall 16. Spaced from the side wall 16 is a false wall 18 which is connected to the side wall 16 by a series of ribs, one of which is illustrated at 20.

Positioned on top of the block 10 is a cylinder head casting generally indicated at 22 which is provided with an upper wall 24 and a lower wall 26. The upper and lower walls of the head casting 22 are connected by a side wall 28 and a spaced false wall 30 which is arranged to overlie the false wall 18 formed on the cylinder block 10 and which is connected to the side wall 28 by a series of ribs 32 positioned along the top and bottom of the false wall 30. The bottom wall 26 is recessed upwardly as at 34 over each of the cylinders 12 to form a combustion chamber 36, and the upper portion of the recessed wall 34 is apertured and connected to suitable intake and exhaust ducts, one of which is illustrated at 38. Cylindrical columns 40 are integrally cast with the head 22 and extend between the top wall 24 and the ducts 38. The space between the walls 24, 26, 28 and other side wall (not shown) forms a cooling jacket 41 through which a cooling medium may be circulated around the combustion chambers 34, ducts 38 and columns 40.

The columns 40 each define a vertical passage arranged to receive a valve guide 42 within which the stem 43 of a valve 44 is arranged to slide to control the flow of fuel mixture and exhaust gases through the ducts 38.

The side wall 28 of the head casting has a series of vertical bosses 45 formed therealong, which bosses extend from the top wall 24 to the lower wall 26. The bosses 45 each define a vertical cylindrical well 46 which extends downwardly to a point just over the lower wall 26 of the head. The wall 26 below the well 46 is apertured to pass a stud bolt 48 which has its lower end threaded into the top wall 14 of the cylinder block 10 and its upper end projecting upwardly into the well 46. The upper end of the stud bolt 48 is threaded to be received in the lower end of a hollow cylindrical column 50 which may be made of brass or some substance having a higher co-efficient of expansion than cast iron and steel. It will be noted that the column 50 has an outside diameter which is slightly smaller than the diameter of the well 46 and that it is provided with an annular flange 52 near its upper end which is arranged to close the upper end of the well 46. Just above the

flange 52 the column 50 has a hexagonal head 54 formed thereon so that it may be screwed tightly onto the upper end of the stud bolt 48. The lower end of the column 50 bearing against the bottom of the well 46 serves to hold the head 22 on the block 10.

The upper end of the valve stem 43 is provided with annular grooves 56 which are arranged to engage mating ribs formed on the inside of a split ring 58. The outer surface of the split ring 58 is tapered downwardly to fit within a tapered aperture formed in a valve spring seat 60 so that the spring seat 60 and split ring 58 will restrain the upper end of a valve spring 62 relative to the upper end of the valve stem 43. The valve 44 is thus held in closed position until the valve stem is pushed downwardly by a rocker arm 64 provided with a nose 66 which bears against the upper end of the valve stem 43.

The rocker arm 64 is pivotally supported intermediate of its ends upon a rocker arm shaft 68 and is provided with a generally flat outer end 70 which is provided with a tapped aperture for receiving the threaded pin 72. The lower end of the pin 72 is provided with a hemispherical head 74 which is received in a hemispherical socket formed in a fixture 76 carried on the upper end of a push rod 78. The push rod 78 extends downwardly between the side walls 23 and 16 and the false walls 39 and 18 to suitable cam mechanism (not shown) positioned in the motor block 10. The position of the threaded pin 72 relative to the rocker arm 64 may be adjusted to determine the clearance between the nose 66 and the valve stem 43 by turning the pin in the threaded aperture and locking the pin in place by means of the lock nut 80.

The rocker arm shaft 68 is supported in a series of rocker arm support blocks, one of which is illustrated at 82. The support blocks 82 are provided with upper and lower parallel surfaces 84 defining apertures through which a cap screw 66 may be passed and threaded into the internally tapped upper end of the column 50 to secure the support block 82 on the upper end of the column. It will be noted that the rocker arm shaft 68 is provided with vertical apertures arranged to pass the cap screws 86 and that the rocker arm shaft is hollow so that lubricant may be pumped therethrough to lubricate the bearing surfaces between the rocker arms and the rocker arm shafts.

In operation of the motor, the valves 44 and valve stems 43 will become heated to a relatively high temperature while the columns 50, which are further removed from the combustion chambers 36, will not be raised to such high temperature. The increased temperature of the valve stems 43 will cause them to expand in length by an amount determined by their co-efficient of expansion, initial length and the average rise in temperature of the valve stems. This increase in length tends to close the clearance between the nose 66 of the rocker arms 64 and the upper end of the valve stems 43. To counteract this increase in length in the valve stems 43, the columns 50 are made of some material such as brass which has a higher co-efficient of expansion than the steel material which forms the valve stems 43. The higher co-efficient of expansion of the columns 50 causes the length of the columns 50 to expand sufficiently to raise the rocker arm shaft support blocks 82 and the rocker arm shaft 68 to compensate for the elongation of the valve stems 43. It may be assumed

that the length of the push rods 78, while they may expand slightly, will remain approximately the same length as the distance between the ball heads 74 and the cam mechanism due to the slight expansion of the cast iron which forms the cylinder block 10 and the head 22. The push rods 78 may therefore be ignored in designing the columns 50.

By way of example and considering the diagrammatic view shown in Figure 3, let it be assumed that the valve 44 will operate through a temperature range of 600° while the column 50 will operate through a temperature range of only 200°. These temperature ranges can, of course, be measured in any motor. Assuming further that the length of the valve stem indicated at V is six inches and that it is made of steel having a co-efficient of expansion equal to .00000636 inch, per inch of length, per degree of temperature change; then the valve may be expected to increase in length by an amount, e , equal to $.00000636 \times 6 \times 600$ or .01 inch when the motor becomes heated.

Assuming the ratio of the right end of the rocker arm 64, indicated as B, to the total length of the rocker arm, indicated as A plus B, to be .75; then with the increased length, e , of the valve equal to .01, the rocker arm shaft 68 should be raised $.75 \times .01$ or .0075 inch indicated at E to compensate for the increased length, e , in the valve 44.

Now assuming that the material used to form the column 50 is brass having a co-efficient of expansion of .00000957 inch, per inch of length, per degree of temperature change and remembering that it is to operate through a temperature range of 200° and that it is to increase in length by .0075 inch; then the initial length of the column 50 at the temperature of the motor when cold should equal .0075 divided by $200 \times .00000957$ or, roughly, 7.83 inches.

It will be understood that the above figures are given by way of example only and that other materials may be used in the valve stem 43 and column 50 and that different valve lengths and column lengths may be used. By means of this invention the clearance between the nose 66 of the rocker arm 64 and the upper end of the valve stem 43 may be properly adjusted to the most desirable figure either while the motor is hot or cold and this clearance will remain the same as the valve 44 expands and contracts during different operating temperatures of the motor.

While I have described my invention in some detail, I intend this description to be an example only and not as a limitation of my invention, to which I make the following claims:

1. In an internal combustion engine, a cylinder block, a head casting having valve mechanism therein and defining a cooling jacket, a boss extending from the top of said head to the bottom thereof and through said cooling jacket, said boss defining a well open on the top of said head, a stud bolt threaded into the top of said cylinder block and projecting into the bottom of said well, a nut having an elongated lower end threaded on the upper end of said stud bolt and a head portion positioned above the top of said head casting, a rocker arm shaft supported upon the top of said nut and a rocker arm journaled on said shaft for operating said valve mechanism, said nut being formed of a material having a higher co-efficient of expansion than said valve mechanism.

2. In an internal combustion engine, a cylinder

block, a head casting having valve mechanism therein and defining a cooling jacket, a boss extending from the top of said head to the bottom thereof and through said cooling jacket, said boss defining a well open on the top of said head, a stud bolt threaded into the top of said cylinder block and projecting into the bottom of said well, a nut having an elongated lower end threaded on the upper end of said stud bolt and a head portion positioned above the top of said head casting, a rocker arm shaft supported upon the top of said nut and a rocker arm journaled on said shaft for operating said valve mechanism, said elongated portion of said nut being of smaller diameter than said well and being formed of material having a higher co-efficient of expansion than said valve mechanism.

3. In an internal combustion engine, a motor

block, a head casting having spaced upper and lower walls, means defining a recess through said upper wall to said lower wall, a stud bolt having a threaded connection with said cylinder block and projecting into the bottom of said recess, a nut having a head portion positioned above the top wall of said head and an elongated portion threaded onto said stud bolt and bearing against the bottom of said recess, a valve positioned in said head casting and having a stem projecting above the upper wall thereof, a rocker arm shaft supported upon the upper end of said nut, and a rocker arm journaled on said shaft and arranged to operate said valve, the elongated portion of said nut being formed of a material having a higher co-efficient of expansion than said valve stem.

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