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L. J. BAZZONI

INTERNAL COMBUSTION ENGINE

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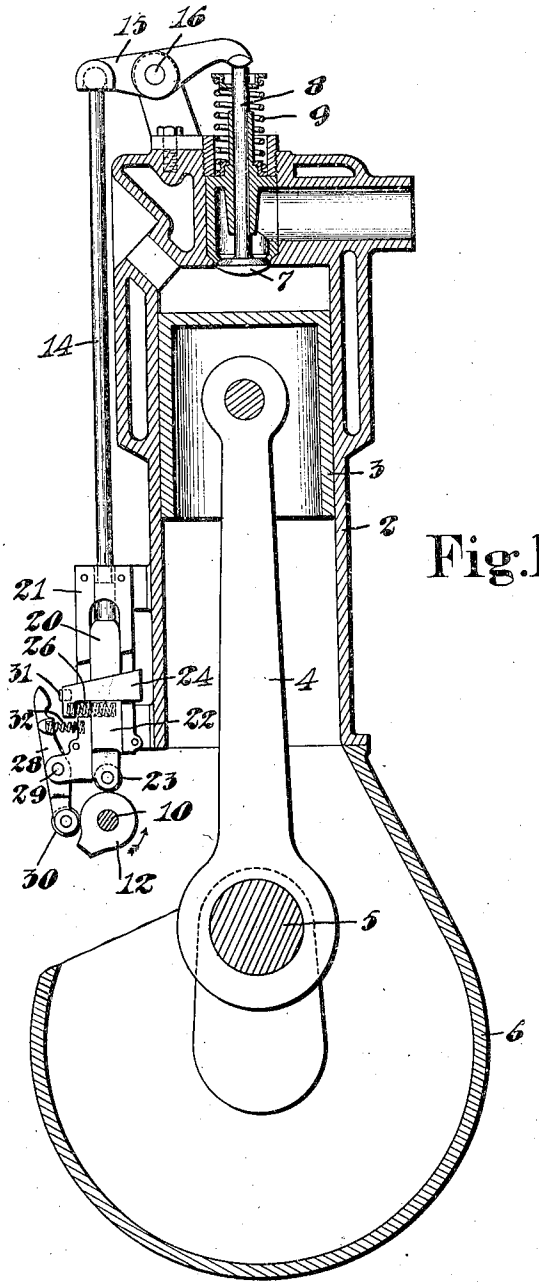


Fig.1.

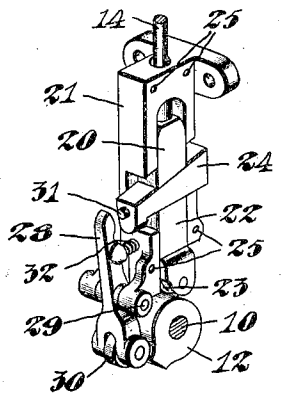


Fig.2.

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INTERNAL-COMBUSTION ENGINE.

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To all whom it may concern:

Be it known that I, LEWIS J. BAZZONI, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and more particularly to the valve mechanisms of such engines. The invention will be herein disclosed as embodied in an overhead valve type of motor or engine since it is of particular utility in engines of this kind, although it will be understood that the invention is not limited in its application to this type of engine.

The overhead valve type of motor is widely used commercially in motor vehicles and it has certain advantages which are well recognized in the trade. It is, however, open to the objection that it is noisier than engines of the L-head or T-head type. This additional noise is due almost entirely to the valve mechanism and to the fact that a greater clearance or lost motion is required in the valve operating mechanism of motors of this type than in motors of the other types mentioned. That is, the connections through which motion is transmitted from the valve operating cams to the valves are so long that the temperature changes to which they are subjected make a substantial difference in the lengths of these connections. This fact must be borne in mind in adjusting the valve tappets, ample clearance being allowed in these connections so that the valve can seat properly under all temperature conditions. Usually it is customary to allow from ten to fifteen thousandths of an inch clearance or lost motion in these connections for this purpose, and this necessarily results in a certain amount of noise, particularly while the engine is warming up.

It is the chief object of the present invention to devise a valve operating mechanism for internal combustion engines which will overcome the difficulties just described. Stated more specifically, the invention aims to provide an automatic mechanism for adjusting the length of the connections through which the valves are operated to compensate for expansion and contraction in these connections due to temperature changes, and to maintain the length of these connections substantially constant notwithstanding such changes.

The invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

Referring now to the drawings,

Figure 1 is a vertical cross sectional view through an internal combustion engine showing a single valve operated by a mechanism embodying the present invention; and

Fig. 2 is a perspective view of the automatic adjusting mechanism provided by this invention.

The engine shown has the general features of an ordinary overhead valve motor, including a cylinder 2, a piston 3 working in said cylinder, and connected by a connecting rod 4 with a crank shaft 5 located in a base 6. A single valve is shown at 7, this valve having a stem 8 which is encircled by a spring 9 that operates normally to hold the valve 7 in its closed or seated position. A cam shaft 10 carrying cams that operate the valves, one of these cams being indicated at 12, is mounted in the usual manner and is driven through gear or chain connections with the crank shaft 5. Motion is transmitted from the cam 12 to the valve 7 through a vertical thrust rod 14 connected at its upper end to one end of a rocker arm 15 mounted on a rock shaft 16, the opposite end of this arm bearing on the upper end of the valve stem 8.

All of the constructions so far described, with the exception of the parts of the lower end of the thrust rod 14, are exactly like those in overhead valve motors of the present commercial type. No attempt has been made to show the details of construction of the engine since they are not essential to an understanding of the present invention. As above stated, it has been customary to allow a certain amount of lost motion usually between ten and fifteen thousandths per inch, between the upper end of the valve stem 8 and the rocker arm 15 that bears on it. That is, nuts are usually provided in these connections which may be adjusted to give

a certain amount of play, lost motion, or clearance at this point for the reasons above stated. The present invention avoids the necessity for this excessive clearance.

In the construction shown the lower end of the thrust rod 14 rests on a slide having a shank 20 of rectangular cross section which is guided in a suitable way formed in a bracket 21 bolted to the engine cylinder. Another part 22, similar to the part 20, is mounted in this guideway and carries a roll 23 at its lower end which runs on the peripheral surface of the cam 12. Between the adjacent ends of these two parts 20 and 22 is mounted a wedge 24, the upper end of the part 22 having a flat face on which the lower edge of the wedge rests, and the lower end face of the shank 20 being inclined to rest on the upper inclined edge of the wedge. A plate (not shown) normally is secured to the right-hand face, Fig. 2, of the bracket 21, by screws entering the holes 25, to cover the guideway in which the parts 20, 22 and 24 are mounted, it being observed that the front and rear walls of the bracket are cut away to receive the wedge.

A spring 26 having one end seated in a horizontal socket formed in the part 22 and its opposite end located in a similar socket formed in the forward depending portion of the wedge 24, tends to move the wedge toward the left, Fig. 1, and thus to take up any lost motion in the connections between the cam 12 of the valve stem 8. This spring is made strong enough to move the wedge 24 with sufficient force to lift the thrust rod 14 and to tip the rocker arm 15, but is not strong enough to exert any appreciable opening action on the valve. Consequently, this spring moves the wedge to take up any looseness or lost motion in the connections between the cam 12 and the valve 7.

For the purpose of moving the wedge 24 periodically in opposition to the spring 26, a lever 28 is fulcrumed at 29 in a forked extension of the bracket 21 and carries a roll 30 at its lower end that runs on the periphery of the cam 12. A coiled spring 32 acts on the upper part of this lever 28 to hold it normally away from the wedge 24 and to keep the roll 30 in contact with the cam 12. The upper end of this lever is positioned directly opposite the forward end of the wedge 24 and it operates when tipped by the rise in the cam 12 to strike a fibre block 31 set into the wedge and force this wedge backward, toward the right, Fig. 1. This movement releases the wedge 24 and leaves the thrust rod 14 free to drop into a lower position. As soon, however, as the rise or high point in the cam 12 passes out of contact with the roll 30, the spring 32 returns the lever 28 to its normal position, as shown in the drawings, the spring 26 acting in the meantime to slide the wedge 24 forward and cause it to take up any looseness, clearance, or lost motion between the cam 12 and the valve 7.

It will now be evident that the valve opening movement is produced by the cam 12 in the same way that it is produced in the ordinary valve mechanisms, the rod 14 and the parts 20, 22 and 24 acting as a solid unit to transmit movement to the rocker arm 15. Immediately after the valve has been seated again, however, the cam 12 operates through the lever 28 to knock the wedge 24 inwardly and thus to cause the spring 26 to produce a new adjusting movement of the wedge before the next valve opening movement takes place. This mechanism, therefore, operates automatically between successive valve opening movements to adjust the connections between the cam 12 and valve 7 to any change in conditions that may have taken place. Obviously the expansion or contraction between two successive valve opening movements will be infinitesimal, so that no appreciable difference in the position of the wedge 24, while such two successive valve opening movements are being produced, could be observed; but during the interval required for an engine to warm up, a considerable change in the length of these connections takes place, and the mechanism just described automatically adjusts the wedge 24 to compensate for these changes.

The same mechanism can be used for both exhaust and intake valves, and it should be noted that if for any reason a valve did not seat properly during its closing movement the inward movement of the wedge which takes place immediately after the valve has been seated would introduce temporarily sufficient lost motion into the connections to leave the valve entirely under control of the spring 9. The proper seating of the valves with this mechanism thus is made even more certain than with the usual valve operating mechanisms where the adjustment is fixed.

It will now be appreciated that the construction provided by this invention eliminates lost motion in the valve operating mechanism, and that it automatically adjusts this mechanism so long as the engine is in operation to maintain this condition regardless of changes that otherwise would vary this lost motion or clearance under different operating conditions. It, therefore, not only eliminates the noise which otherwise would be produced by excessive lost motion in the mechanism, but it also reduces the wear of the parts. Furthermore, it avoids the necessity for adjusting the valves by hand, which is an operation requiring considerable skill, patience and experience, and it maintains constantly and under variable

conditions an excellence of adjustment which could be approached by a hand adjustment for one condition only.

A further advantage of this construction is that in case an overthrow of the valve or the thrust rod should take place when the engine is running at high speeds, the spring 26 will move the wedge 24 to take up this overthrow. While this will result in preventing the valve from seating immediately after the usual closing movement has been completed, it will be allowed to seat an instant later when the wedge 24 is knocked backwardly by the lever 28. This mechanism, therefore, will allow the valve to seat properly but will prevent the excessive noise which would be produced under similar operating conditions if an automatic mechanism of this character were not used.

While I have herein shown and described the best embodiment of the invention of which I am at present aware, it will be evident that this invention may be embodied in other forms differing in details from the construction shown and described without departing from the spirit or scope of this invention.

What is claimed as new is:

1. In an internal combustion engine, the combination with a valve, of operating mechanism for said valve including a spring for seating said valve, a cam, mechanism for transmitting motion from said cam to said valve to open the valve, and means including power driven parts for automatically effecting a positive adjustment of the connections between said cam and valve to take up lost motion in said connections without interfering with the seating of the valve.

2. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, mechanism for transmitting motion from said cam to said valve, and means acting automatically at predetermined periods to adjust the connections between said cam and valve to take up lost motion in said connections.

3. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, and connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a part adjustable to take up lost motion in said connections, and mechanism for automatically adjusting said part between successive opening movements of said valve.

4. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a part adjustable to take up lost motion between said cam and valve, and automatic means for adjusting said part in opposite directions.

5. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a wedge adjustable to take up lost motion in the connections, and means for automatically adjusting said wedge between successive opening movements of said valve.

6. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a part adjustable to take up lost motion between said cam and valve, a spring for adjusting said part, and driven means for moving said part periodically to enable the spring to make a new adjustment of said part.

7. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a wedge adjustable to take up lost motion between said valve and cam, a spring for producing said adjusting movement of the wedge and means operated by said cam for moving said wedge at predetermined times in a direction opposite to that of said adjusting movement.

8. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections between said cam and valve for transmitting motion from the cam to the valve, said connections including a wedge adjustable to take up lost motion, a spring acting on said wedge to produce said adjusting movement, and a lever arranged to be actuated by said cam for moving said wedge periodically in a direction opposite to that of said adjusting movement.

9. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections for transmitting motion from said cam to said valve, and means for automatically adjusting said connections periodically to compensate for variations introduced in said connections by temperature changes.

10. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections for transmitting motion from said cam to said valve, and mechanism for automatically adjusting said connections prior to each valve opening movement to take up lost motion in the connections and for sub-

sequently introducing lost motion in said connections to enable the valve to seat again.

11. In an internal combustion engine, the combination with a valve, of operating mechanism therefor including a cam, connections for transmitting motion from said cam to said valve, and mechanism for automatically adjusting said connections prior to each valve opening movement to take up lost motion in the connections and for introducing lost motion in said connections immediately after the valve has seated.

LEWIS J. BAZZONI.