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SELF ADJUSTING VALVE MECHANISM

Filed April 30, 1928

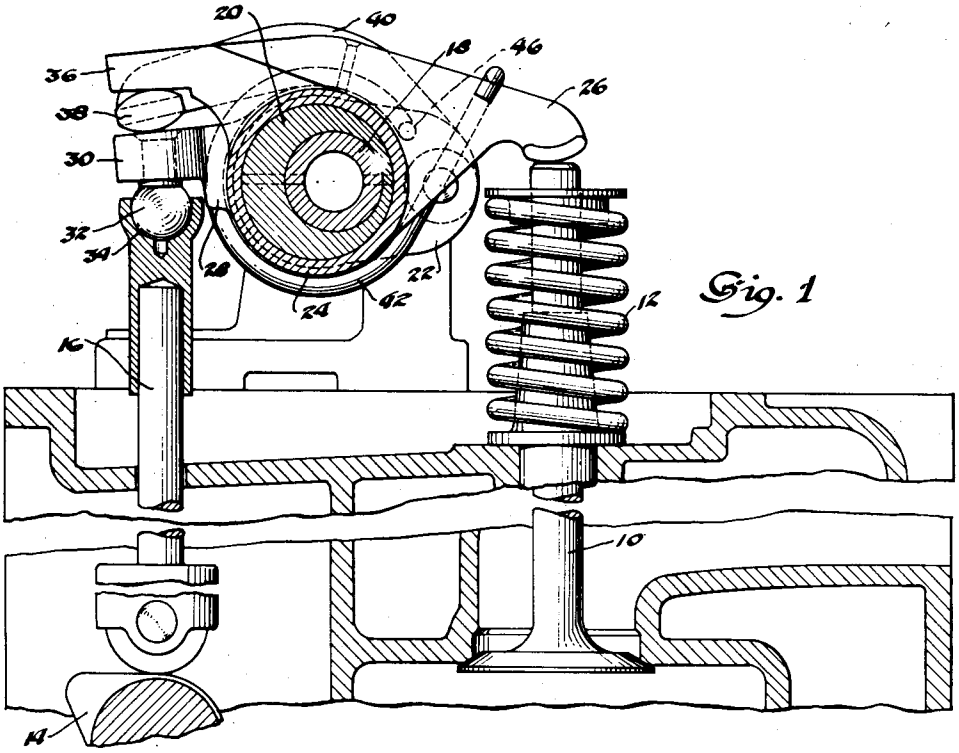

Fig. 1

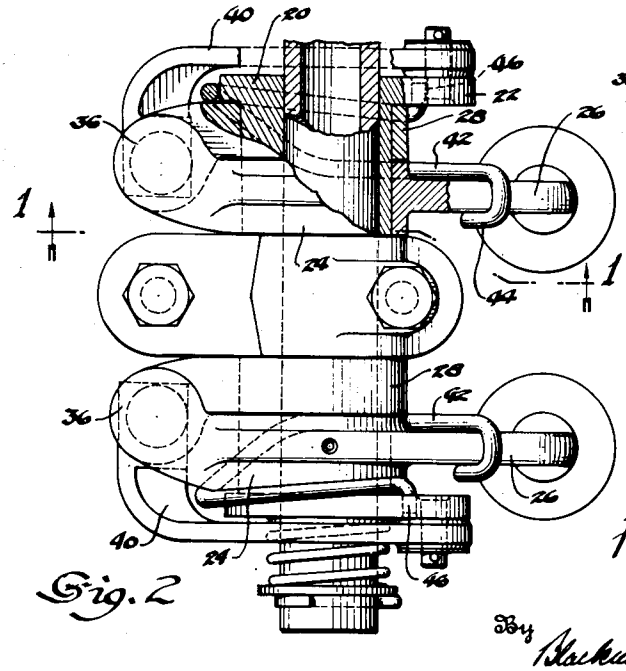

Fig. 2

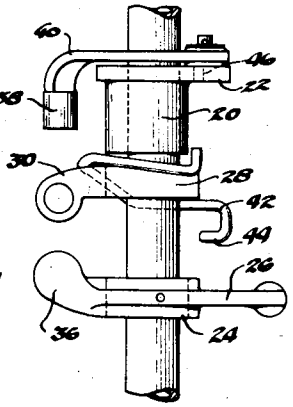

Fig. 3

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UNITED STATES PATENT OFFICE.

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SELF-ADJUSTING VALVE MECHANISM.

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It is well known that slack or clearance must be provided between the parts of engine valve gear to allow for their expansion when heated. If it were not provided the expansion would lift the valve off its seat and interfere with engine performance.

This invention has to do with providing the necessary amount of lost motion but at the same time avoiding the impact and resultant noise of conventional gear. The invention is specifically applied to the type of valve gear in which a rocker member is interposed between parts. According to my invention the rocker arm is made in a plurality of parts pivoted together and having overlying arms and between these arms is interposed a rocking cam urged by a spring in a direction to separate the parts and take up lost motion in the system. The spring employed is weaker than the valve spring so that the first portion of the movement of the engine cam turns the rocking cam to a position in which it merely acts as a rigid abutment, transmitting force between the two parts of the rocker arm. When the lost motion has been taken up movement is transmitted to the valve in the usual manner. This arrangement possesses the advantage that the parts of the gear are never out of contact so that there is never any possibility of impact and resultant noise.

In some cases it may be desirable to provide a greater amount of lost motion and in such event I may provide additional means operated by the rocking cam to give this result. To accomplish this I mount the rocker on an eccentric bushing, and connect the rocking cam to the eccentric in such manner that the spring which rocks the cam in a direction to take up lost motion also rocks the eccentric bushing in a direction to effect the same result. Initial movement of the engine cam in this event not only rocks the cam in a direction to take up lost motion but, through the arm connecting the cam to the eccentric, effects a similar movement of the latter.

In the drawing,

Figure 1 is a sectional view showing my mechanism applied to a common type of overhead valve gear.

Figure 2 is a top plan view of Figure 1 showing a pair of adjacent valves.

Figure 3 is a view showing the parts of my slack-adjusting mechanism spread out along the shaft.

I have shown at 10 one of the intake or exhaust valves of an internal combustion engine. The valve is held on its seat by a strong coil spring 12. 14 indicates one of the usual engine driven cams operating push rod 16. In conventional constructions the cam raises the push rod and the push rod raises the arm of a rocker, the other arm of which presses down on the valve stem and unseats the valve. 18 indicates the conventional shaft upon which the conventional rocker arm is pivoted. Upon the shaft is rotatably mounted the eccentric bushing 20 provided with an offset arm 22. 24 indicates a two-armed rocker member journaled on the eccentric bushing 20. The arm 26 of the rocker member 24 engages the valve stem 10. 28 indicates a second rocker also journaled on the eccentric bushing 20 and provided with an arm carrying a ball stud 32 received in socket 34 formed in the upper end of push rod 16. The other arm 36 of the rocker 24 overlies the arm 30 of the rocker 28 and between these is interposed an elliptical shaped cam 38. Resilient means is provided to rock the cam 38 in a direction to take up lost motion in the system. To accomplish this the cam 38 is carried by an arm 40 pivoted at its opposite end to the arm 22 of the eccentric 20. The torsion spring 42 has one end 44 engaging the arm 26 of rocker 24 while the other end of the spring is hooked in opening 46 in the arm 22 of the bushing 20. The spring 42 tends to rotate the eccentric 20 in counter-clockwise direction to a position in which the center of oscillation of the rocker arms is lower, and tends to tilt the cam 38 and thereby separate the arms 30 and 36. The effect of both of these movements is to take up the lost motion in the system.

During the first portion of the unseating movement of the gear the cam 14 raises the push rod and with it the arm 30 applying pressure to the cam 38. Since the spring 42 is weaker than the spring 12 the cam 38 will be rotated until its minor axis is in alignment with the push rod. The rocking of the cam 38 exerts thrust on the arm 40 rotating the bushing 20 in a direction to raise the axis of the rocker arms, yielding further slack. When all slack has been taken up force is transmitted from the rocker 28 through the cam to the rocker 24 causing the arm 26 to press down on the valve stem and unseat the valve.

As the engine becomes heated the parts will expand but the only effect of this will be to reduce the amount of lost motion to be taken up by the action of the spring 42.

With this arrangement it will be apparent that the spring 42 will maintain the parts of the gear at all times in contact so that no clicking is possible whether the engine be hot or cold.

It is obvious that my apparatus may be reversed, the arm 26 then engaging the push rod while the arms 30, 36 and the interposed cam are arranged above the valve stem. In order that my claims may be broad enough to cover either arrangement I employ the generic term "valve operating part" to cover both the push rod or an equivalent member and the valve stem or other device which effects unseating of the valve proper.

Attention is called to the fact that my cam 38 is disposed between flat surfaces on the ends of the arms 30 and 36. This insures a true rolling action eliminating noise.

I claim:

1. Valve operating mechanism comprising a pair of pivoted members having overlying arms, a cam disposed between said arms and having oppositely arranged convex faces, and means tending to rotate said cam in a direction to separate said arms and take up lost motion in the system.

2. In the combination as defined in claim 1, said members being pivoted about a common axis.

3. In the combination as defined by claim 1, and additional means operated by said last named means for providing additional lost motion in the system.

4. Valve operating gear, including a rocker having oppositely extending arms, a valve operating part engaging one of said arms, a second rocker having an arm lying adjacent the other arm of the first rocker, a cam disposed between said arms and having oppositely arranged convex faces engaging the arms, means tending to rotate said cam in a direction to separate said arms, and a valve operating part engaging said second rocker.

5. The combination as defined by claim 4, said rockers being pivoted about a common axis.

6. In the combination as defined in claim 4 said rockers being mounted upon a common pivot, said pivot being provided with an eccentric bushing, and means for yieldingly urging said bushing in a direction to take up slack in the system.

7. In the combination as defined in claim 4, said rockers being mounted upon a common pivot, said pivot being provided with an eccentric bushing, said cam being connected to said bushing so as to rotate the latter when force is applied to the system in a direction to take up lost motion therein.

8. Valve operated gear comprising a plurality of valve operated parts, a cam interposed between said parts, means tending to rock said cam in a direction to take up lost motion in the gear, and additional means operated by said rocking means for further taking up slack in the system.

9. The combination as defined in claim 8, and means connecting said cam and said last named means so that when force is applied to the system said last named means is returned to no slack position.

10. In valve operated gear the combination of a plurality of concentrically arranged rockers, a rotatable eccentric on which said rockers are pivoted, a member pivoted to said eccentric and having an extension interposed between said arms and in rocking engagement therewith, and means for yieldingly urging said member and said eccentric in a direction to take up slack in the system.

11. In valve operating mechanism the combination of a pivot, an eccentric sleeve rotatable on said pivot, a rocker pivoted on said sleeve, and having one arm arranged for engagement with a valve operating part, said rocker being provided with an oppositely extending arm, a second rocker having an arm arranged adjacent said oppositely extending arm, a member pivoted to said eccentric sleeve and provided at its free end with a cam extending between the adjacent arms of the rocker members, and means for urging said member in a direction to take up lost motion in the system.

12. In valve operating mechanism the combination of a pivoted off center member, a rocker pivoted on said member, means for urging said member in a direction to take up slack in the system, and means operated by said last named means for taking up additional slack.

13. In valve operating mechanism the combination of a pair of pivoted members provided with superposed arms through which motion is transmitted for operating the valve, said arms being provided with opposed flat surfaces, a rocking cam member interposed between said surfaces, and means for rocking said cam in a direction to take up slack in the system.

In testimony whereof I affix my signature.

HAROLD V. ALMEN.