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O. E. DAVIS

SILENCER FOR VALVE-IN-HEAD MOTORS

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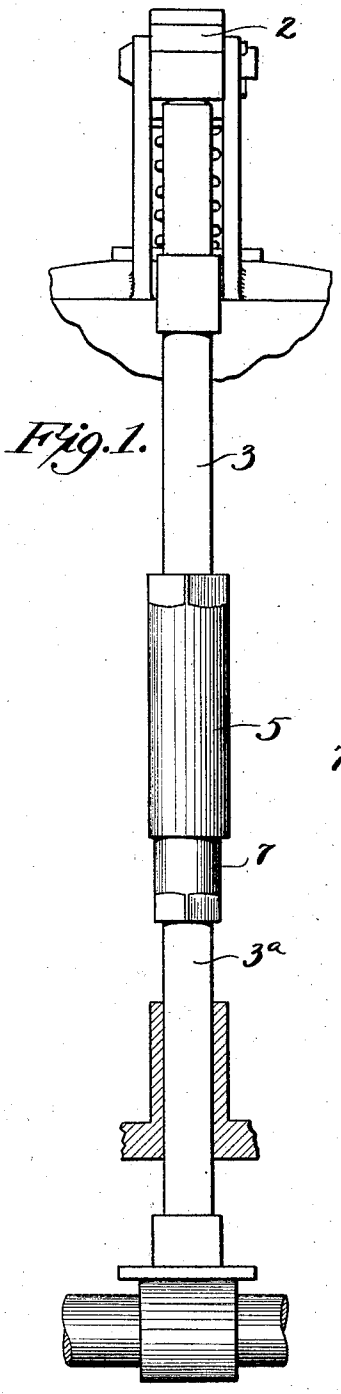


Fig. 1.

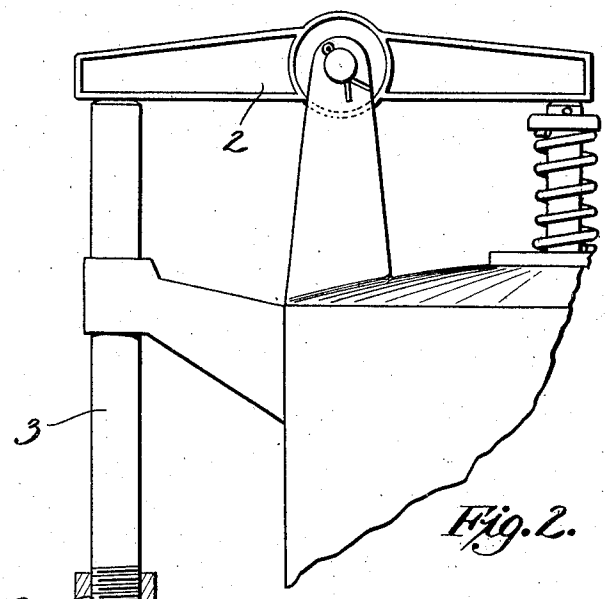


Fig. 2.

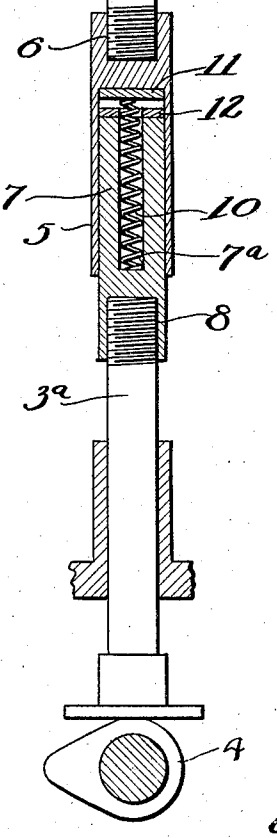


Fig. 3.

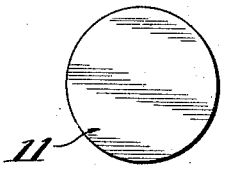
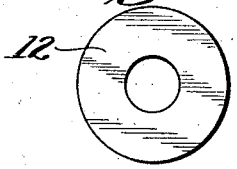


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SILENCER FOR VALVE-IN-HEAD MOTORS.

Application filed May 31, 1923. Serial No. 642,595.

This invention relates to internal combustion engines, and more particularly to internal combustion engines of the valve-in-the-head type in which valve lever arm tappet rods extend from a cam mechanism to the levers at the head of the engine, and whereby the levers are actuated and operate their respective valves.

The invention pertains more particularly to means adapted to be introduced between the valve levers and the cam mechanism for substantially eliminating the noise produced by the rapid tapping action occurring between the tappet rods and the contiguous ends of the valve levers, which is a common source of annoyance in nearly all forms of valve-in-head motors.

An object of my invention is to provide a means that may be readily introduced between the cam mechanism and the valve levers of the motor, and more particularly that may be readily introduced in the valve lever tappet rods to practically wholly eliminate the annoying noise as produced by the hammer-like or tapping blows incident to the movement of the operating parts into engagement as the lost motion, which is essential in order to protect the valves from burning out, is taken up by the cams. This lost motion is designed in order to insure the full seating of the valves and therefore prevent the hot gases from burning out the valves and their seats, as is the case if the valves do not fully close. The necessary amount of lost motion between the tappet rods and the valve levers is rapidly increased because of the wear of the several elements of the lever train between the cams and the valve stems, and this wear must be frequently taken up by proper adjustment of the parts in order to avoid excessive lost play, which, moreover, is accompanied with constantly increasing noise as the parts wear.

It is an object of the invention to provide a device that may be readily installed between the cam mechanism and the valve levers at small expense, and to provide a device of low cost and of long life, and which is effective and noiseless.

Other objects and advantages will be made manifest in the following specification of an embodiment of the invention illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of a tappet rod of a valve-in-head motor, showing the invention applied thereto.

Fig. 2 is a longitudinal section and elevation of the device and tappet rod.

Fig. 3 is a plan of one of the blind washers or bumpers, and

Fig. 4 is a plan of a perforated bumper.

A portion of a conventional type of valve-in-head motor is indicated as including a lever 2, mounted upon the head of the motor and having an arm engageable with the upper end of a tappet rod 3, the lower end of which is adapted for engagement with a cam 4 directly or indirectly. Ordinarily, the tappet rods are of a continuous piece, and it is the practice to provide a small amount of play, between .002 and .010 of an inch, between the upper end of the tappet rod and the lever arm, so that the opposite end of the arm will, when the valve is seated, rest lightly on the valve stem and thus permit the same to fully seat under explosive pressure, and therefore prevent the passage of high temperature gases around the valve edges.

The slight degree of clearance necessary results, during the operation of valve-in-head motors, in a quite perceptible noise which, as above stated, increases during the wear of the parts and must be frequently eliminated to the minimum.

My present invention includes means whereby the desired degree of clearance and the light degree of pressure of the valve lever on the seated valve is obtained, and at the same time the tappet noises wholly eliminated. My invention may be incorporated in various forms of combinations and designs of parts, but a simple and practicable form is here shown as including a cylinder 5, one end of which is threaded, in the present case internally, at 6 to receive the contiguous end of the tappet rod 3 which, in the application of my invention, is formed in two sections to the contiguous ends of which the present silencer is attached.

Snugly fitting in the cylinder 5 is a piston 7, this being shown as threaded internally at 8 to receive the contiguous end of a part 3^a of the divided tappet rod. The cylinder and the piston are preferably of ample length not only to provide for a good long bearing, one part on the other, but also to provide for strength of construction and enabling the employment of a very thin wall.

The sections of the tappet rod 3—3^a are yieldingly pressed apart by a spring 10 which, in the present case, is interposed be-

tween the piston and the cylinder and acts expansively, thus thrusting the upper section of the tappet rod 3 upwardly into engagement with the lever arm 2, whereby constant contact therebetween is made. Also, the spring 10 serves to take out the undesired play of the lever 2 and its bearing, and thrusts its opposite arm against the valve stem or interposed piece. The spring is shown in this embodiment of the invention as concealed in a longitudinal pocket 7^a in the piston 7, although it may be otherwise arranged.

Preferably, there is arranged between one end of the piston 7 and the contiguous end wall of the cylinder 5, cushioning means in the form of fibrous discs or bumpers, which are utilized because of their characteristic of bumping engagement in a noiseless manner or noise-reducing manner, as contrasted to the noise produced by metallic elements hammering against each other. An imperforate bumper or cushion 11 is shown as disposed against the head of the cylinder 5, and when the spring is of the concealed type, as shown, inside of the piston 7, a perforated bumper 12, in the form of a washer, is applied to the upper end of the piston 7, the aperture of the perforated bumper providing for the reception of the contiguous end of the spring 10.

It is obvious that during the operation of the motor there will be a very slight reciprocating movement of the piston in the cylinder 5, since the spring 10 serves to relatively separate the tappet sections 3—3^a, forcing one upwardly against the lever arm while the other naturally gravitates down to the cam or cam engaging part, which may be interposed between the tappet and the cam. The action of the mechanism is that the cam will thrust the lower section 3^a upwardly, slightly compress the spring, and drive the shock absorbing bumpers 11 and 12 into relative engagement, following which the upper section of the tappet 3 will be lifted while in engagement with the contiguous lever arm, and the latter will be locked to brace the valve.

During all times, the contact between the upper end of the tappet section 3 and the lever arm will not be broken, and any noise of abutment between the play providing elements, as the cylinder 5 and its piston, will be practically wholly absorbed within the parts and not be audible, since the surfaces which hammer upon each other are within the cylinder. It is obvious that the shock absorbing bumpers 11 and 12 may be eliminated, but preferably they are used to increase the efficiency of the device as a silencer.

My silencing device is readily adapted to use with present engines by merely cutting the tappet rod in proper lengths, threading the ends, and inserting my device in proper position. Therefore I provide a silencer which cannot only be supplied with new machines, but will be useful for those now in use.

Further embodiments, modifications and variations may be resorted to within the principle of the invention.

What is claimed is:

1. A silencer for valve rods of internal combustion engines, comprising a tappet rod having an upper and a lower section, screw threads on the ends of the sections, a cylinder having a socket in its base, screw threads therein engaging the screw threads of one of the tappet sections, a piston having a socket in one end, screw threads therein, engaging the screw threads on the other tappet section the piston having a longitudinal socket in axial alinement with the tappet sections, the said piston fitting in the cylinder having a spring in the pocket bearing against the end of the pocket of the piston and the base of the cylinder, the said screw threads on the tappet sections on the cylinder and the piston being arranged to allow relative rotation of the cylinder and piston to effect minute adjustments between the inner end of the piston and the base of the cylinder, and having a cushion in the base of the cylinder and the spring bearing on the cushion.

2. A silencer for valve rods of internal combustion engines as claimed in claim 1 having a perforated bumper on the end of the piston and the spring passing through the perforation.

In testimony whereof I have signed my name to this specification.

OLIN E. DAVIS.