E. F. FISHER.

SELF ADJUSTING VALVE LIFTER.

APPLICATION FILED SEPT. 3, 1919.

1,353,993. **Patented Sept. 28, 1920.**

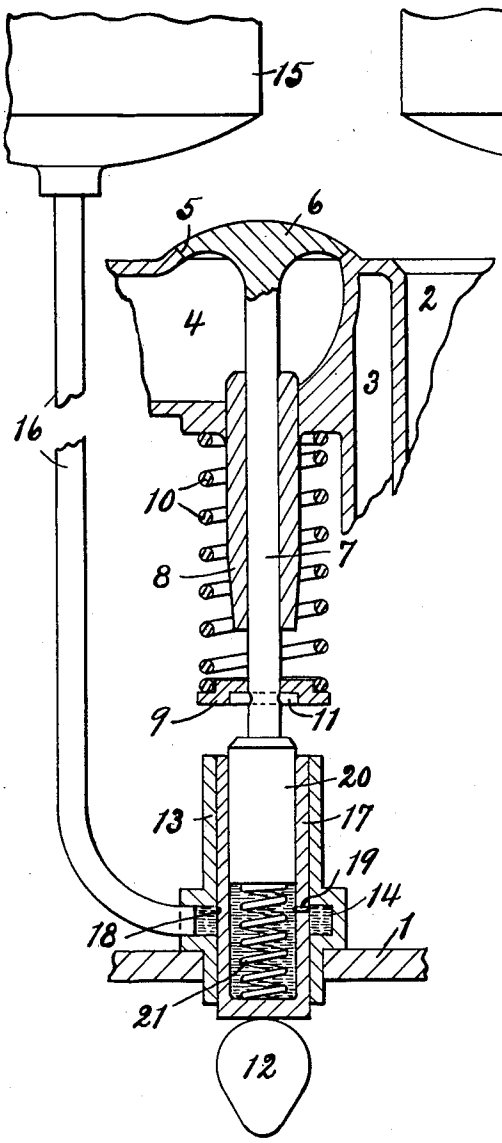


FIG. 1.

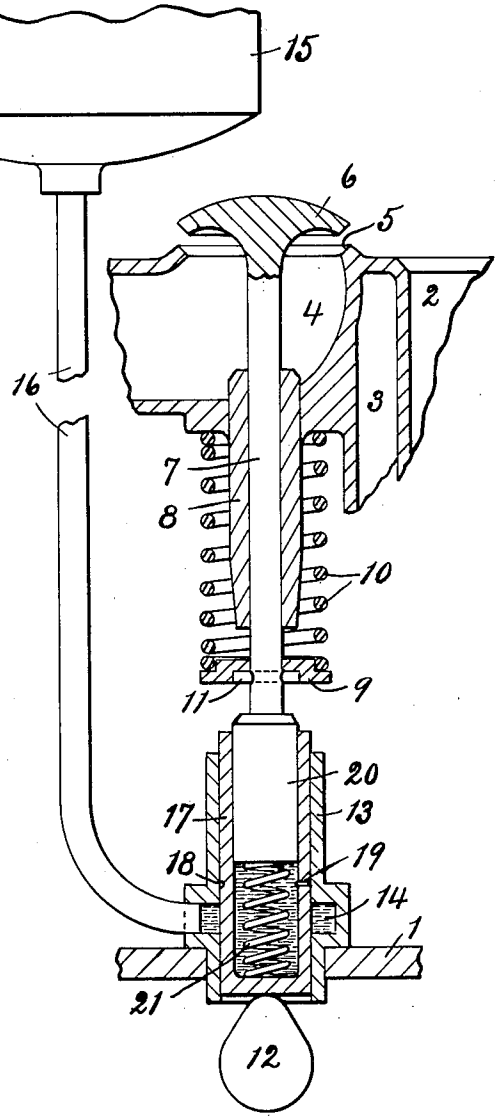


FIG. 2.

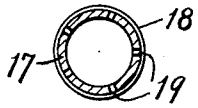


FIG. 3.

WITNESS:

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SELF-ADJUSTING VALVE-LIFTER.

1,353,993. Specification of Letters Patent. Patented Sept. 28, 1920.

Application filed September 3, 1919. Serial No. 321,489.

To all whom it may concern:

Be it known that I, ELMER F. FISHER, a citizen of the United States of America, and a resident of Brookfield, in the county of Worcester and State of Massachusetts, have invented a new and useful Self-Adjusting Valve-Lifter, of which the following is a specification.

My invention relates to improvements in lifting mechanisms for puppet valves in internal-combustion engines, and especially to mechanisms of this type which are self-adjusting, and consists essentially in certain peculiar, fluid-controlling means interposed between the lifter or cam and the valve-stem, as hereinafter more fully set forth.

The primary object of my invention is to provide, in mechanism of the character described above, means to compensate for any and all wear that may occur between the lifter or cam and the member which contacts therewith, between the valve-stem and its contacting member, and between the puppet valve and the valve-seat, and also for the expansion and contraction of said valve-stem, to the end that said valve is properly seated at every revolution of said cam, or each time that the low part of the cam moves under the reciprocating members. By thus insuring proper or complete closing of the valve, the defective action caused by the incomplete closing of the valve is eliminated, and the efficiency of the engine is consequently enhanced in a most pronounced degree.

A further object is to provide lifting mechanism which is noiseless. That the present mechanism is noiseless is due to the fact that all parts are in proper contact at all times, so that there is no shock incident to the coming together of parts in which there is lost motion or independent action or movement.

My lifter is quick-acting, simple, durable, and not liable to get out of order.

Other objects and advantages will appear in the course of the following description.

I attain the objects and secure the advantages of my invention by the means or mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a central, vertical section through a self-adjusting valve lifter which embodies a practical form of my invention, the puppet valve being closed; Fig. 2, a similar view showing said valve opened, and, Fig. 3, a cross section through the hollow plunger.

Similar reference characters designate similar parts throughout the several views.

Referring to the first two views it would be observed that I therein show fragmentary portions of a motor base at 1 and a motor cylinder at 2, respectively, and of a water jacket at 3, and a valve chamber at 4. At the top of the valve chamber 4 is a valve-seat 5, for which a puppet valve 6 is provided, the latter opening upwardly. The valve 6 has a vertical stem 7 which operates through a sleeve 8 as usual, and said stem is provided with a supporting member 9 between which and the bottom of the chamber 4 is a spring 10. The member 9 rests on a transverse pin 11 in the valve-stem 7 near the bottom thereof. The spring 10 encircles the sleeve 8, and has a tendency to urge the valve 6 toward and onto the valve-seat 5. A lifter or cam for the valve 6 is represented at 12, said cam being below the horizontal plane of the motor base 1 with the vertical plane of its axial center in line with the axial center of said valve and its stem 7. These parts and members are all old and of usual and well-known construction, and the moving elements function in the usual manner.

I will now proceed to describe in detail the new elements which, in combination with the old elements or their equivalents, constitute the present invention.

Securely seated in and mounted on the motor base 1 is a vertical, tubular member or casing 13, the axis of the casing 13 is in line with the axis of the valve 6 and its stem 7, and, therefore, in line with the vertical plane of the axial center of the cam 12. The casing 13 has an annular chamber 14 therein directly above the base 1. A tank 15, preferably located above the horizontal

plane of the valve 6, is connected by a pipe 16 with the chamber 14.

The tank 15 is designed to contain the fluid, which is usually oil, that is employed in connection with the lifter. Ordinarily the supply of oil is sufficient to maintain a quantity in the tank 15 at all times.

A hollow plunger 17 is arranged with a sliding fit in the casing 13. The plunger 17 is closed at the bottom and bears at all times on the cam 12. The chamber 14 encircles the plunger 17. There is an annular groove in the outer surface of the chamber 17, and said plunger is provided with a plurality of openings or ports 19 which communicate at their inner ends with the interior of said plunger and at their outer ends with said groove. The groove 18 and ports 19 are located in the plunger 17 at such an elevation that they clear the top of the chamber 14 when said plunger is in its low position, as clearly shown in Fig. 1. It is desirable and even necessary for the oil in the plunger 17 to find a ready means of escape into the chamber 14 as soon as the ports 19 begin to descend into said chamber, or begin to pass below the horizontal plane of the top of said chamber, and to this end the groove 18 is provided. Said groove and the ports are closed immediately they pass upwardly above the aforesaid plane. See Fig. 2.

The hollow plunger 17 is open at the top, and there is located in the upper part of said plunger a plunger 20. The plunger 20 has a sliding fit in the plunger 17, and the upper end of said first-named plunger is in contact with the bottom of the valve-stem 7, being maintained in such contact by means of a spring 21 and the oil column in the plunger 17. The spring 21 is interposed between the closed bottom of the plunger 17 and the bottom of the plunger 20, and said spring serves to force said plunger 20 into contact with the valve-stem 7 when said plungers descend and the groove 18 and ports 19 are uncovered. The lengths of the valve-stem 7 and the plunger 20 are such that the latter is always supported, either by the oil or the spring 21 or both, above the horizontal plane of the ports 19. The spring 21 is, of course, much weaker than is the spring 10.

In assembling the lifter, oil is poured into the top of the plunger 17 before the plunger 20 is inserted therein.

When the plunger 17 rests on the low part of the cam 12, the groove 18 and ports 19 are in open communication with the chamber 14, and the space in said plunger below the plunger 20 is filled with oil. As the cam 12 revolves and the high part of said cam passes beneath and elevates the plunger 17, the spring 21, being weaker than the spring 10, is first compressed, and there is no upward movement on the part of the members directly above said first-named spring. But, as the plunger 17 moves upwardly, it quickly carries the groove 18 and ports 19 into closed position, so that said plunger becomes sealed and the oil therein being unable to escape forms a stable column beneath the plunger 20. This oil then carries upwardly, with the plunger 17, the plunger 20, and the valve-stem 7 and valve 6, thus opening the valve-seat 5. As the cam 12 continues its revolution and the plunger 17 rides down on to the low part of said cam, the plunger 20 and the valve-stem 7 with the valve 6 move down with said first-named plunger, being supported by the oil column until the groove 18 and ports 19 arrive at the chamber 14, when said column is broken or released, and opportunity is afforded for said plunger 20 to descend far enough to enable said valve to be seated, even though the descent of said plunger 17 be arrested too soon to enable said valve to become seated in the absence of the relief afforded by the broken column of oil. It will now be seen that, while the communication between the chamber 14 and the interior of the plunger 17 is open, the plunger 20 is able freely to adjust itself to any conditions arising from or due to expansion or contraction or wear of the parts either above or below the plunger 17. Any oil that may be forced by the plunger 20 out of the plunger 17 through the ports 19 into the chamber 14 makes room for itself in said chamber by forcing oil from the latter through the pipe 16 into the tank 15. As previously stated, the spring 21 holds the plunger 20 up against the valve-stem 7 when the valve 6 is closed.

Ample provision is made for any required movement of the plunger 20 indedently of the plunger 17. As a rule such movement is comparatively slight.

In the event the valve 6 or the valve-stem 5, or both, become worn, the plunger 20 must necessarily descend farther or continue its descent in the plunger 17 after the latter has arrived at the end of its downward movement, than would be the case if such wear had not occurred. The same thing is true in case of contraction of the valve-stem 7. Expansion of the valve-stem 7 is absorbed by the spring 21. And wear on the part of the cam 20 or the bottom of the plunger 17, or both, is taken care of by the spring 21; so, also, with regard to any wear that may occur at the place of contact between the plunger 20 and the valve-stem 7.

Any oil that may pass into the plunger 17 from the chamber 14 is instantly replaced with oil from the tank 15 through the pipe

16. From this and the foregoing it is clear that the supply of oil to the lifter is automatically regulated.

Obviously the lifter is noiseless in its operation, as would not be the case if contacting parts were permitted to separate from each other and then come together again violently as in mechanism of this type. Even the noise usually attending the closing of the valve 6 is practically eliminated because of the ease of operation and smoothness of action of the parts during the closing operation and at the instant of closing.

Various changes in the shape, size, construction, and arrangement of some or all of the parts of the lifter may be made without departing from the spirit of my invention or exceeding the scope of what is claimed.

What I claim as my invention, and I desire to secure by Letters Patent, is—

1. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, and actuating means, of reciprocating members interposed between said actuating means and said stem, one of said members being imperforate and adapted to rest directly upon a fluid column in the other of said members, and means automatically to seal and unseal said last-mentioned member for the purpose respectively of making and breaking said fluid column.

2. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, and actuating means, of reciprocating members interposed between said actuating means and said stem, one of said members being imperforate, spring pressed, and adapted to rest directly upon a fluid column in the other of said members, and means automatically to seal and unseal said last-mentioned member for the purpose respectively of making and breaking said fluid column.

3. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, actuating means and a casing seated in the motor base above said actuating means, and having a fluid chamber therein, of reciprocating members in said casing between said actuating means and said stem, one of said members being imperforate and adapted to rest directly upon a fluid column in the other of said members, and the latter having openings therein which are closed by said casing when said member ascends, and brought into communication with said chamber when said member descends.

4. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, actuating means, and a casing seated in the motor base above said actuating means, and having a fluid chamber therein, of reciprocating members in said casing between said actuating means and said stem, one of said members being imperforate, spring pressed, and adapted to rest directly upon the fluid column in the other of said members, and the latter having openings therein which are closed by said casing when said member ascends, and brought into communication with said chamber when said member descends.

5. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, a cam, and a casing seated in the motor base above said cam, and provided with an annular fluid chamber, of a hollow plunger arranged to slide in said casing and riding on said cam, said plunger having openings therein which communicate with said chamber, when said plunger is down, and are closed by the walls of said casing, when said plunger is up, and an imperforate plunger in said first-named plunger and in contact with said stem, said second-named plunger being supported directly on the fluid column formed in said first-named plunger by the closing of said openings when said first-named plunger ascends.

6. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, a cam, and a casing seated in the motor base above said cam, and provided with an annular fluid chamber, of a hollow plunger riding on said cam and arranged to slide in said casing, said plunger having an exterior annular groove and ports therein, the latter communicating with the interior of said plunger and with said groove, and said groove communicating with said chamber, when said plunger is down, and being closed by the walls of said casing, when said plunger is up, and an imperforate plunger in said first-named plunger and in contact with said stem, said second-named plunger being supported directly on the fluid column formed in said first-named plunger by the closing of said groove and ports when said first-named plunger ascends.

7. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, a cam, and a casing seated in the motor base above said cam and provided with an annular fluid chamber, of a hollow plunger riding on said cam and arranged to slide in said casing, said plunger having openings therein which communicate with said chamber, when said plunger is down, and are closed by the walls of said casing, when said plunger is up, an imperforate plunger in said first-named plunger, and a spring arranged to retain said second-named plunger in contact with said stem, said second-named plunger being above said openings normally, and supported directly

on the fluid column formed in said first-named plunger by the closing of said openings when said first-named plunger ascends.

8. The combination, in a self-adjusting valve lifter, with a spring-pressed valve and its stem, a cam, a casing seated in the motor base above said cam, and provided with an annular chamber, a fluid tank, and a pipe connecting said chamber with said tank, of a hollow plunger riding on said cam and arranged to slide in said casing, said plunger having openings therein which communicate with said chamber, when said plunger is down, and are closed by the walls of said casing, when said plunger is up, an imperforate plunger in said first-named plunger, and a spring arranged to retain said second-named plunger in contact with said stem, said second-named plunger being normally above said openings, and supported directly on the fluid column formed in said first-named plunger by the closing of said openings when said first-named plunger ascends.

ELMER F. FISHER.

Witnesses:
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A. C. FAIRBANKS.