F. I. TONE.

VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED SEPT. 16, 1916.

1,291,264. Patented Jan. 14, 1919

Fig. 3.

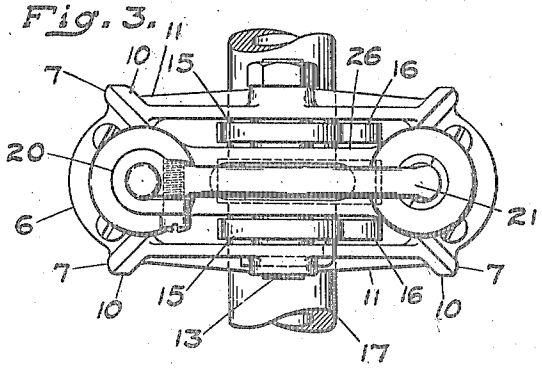


Fig. 1.

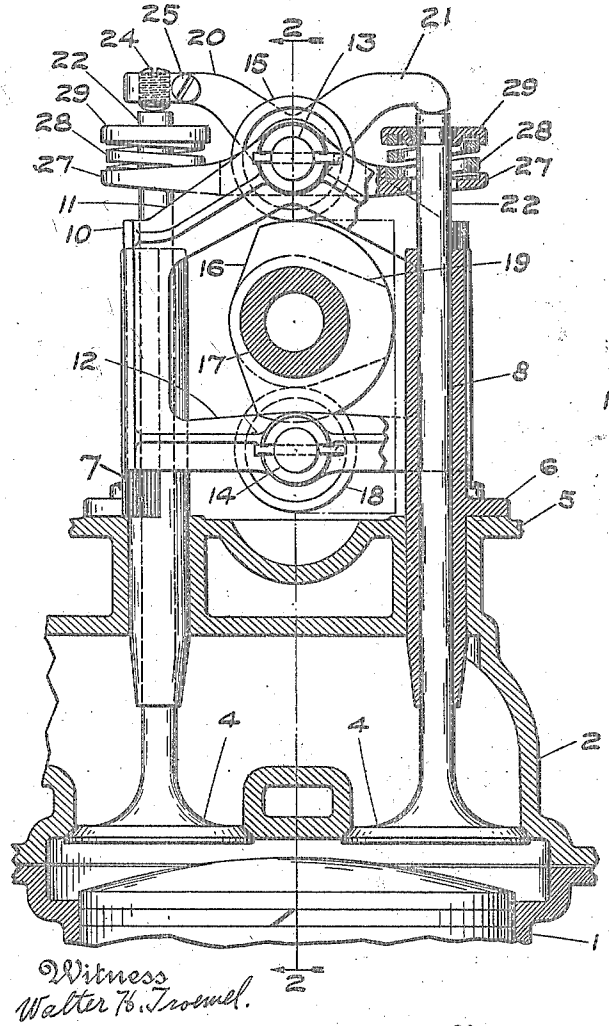
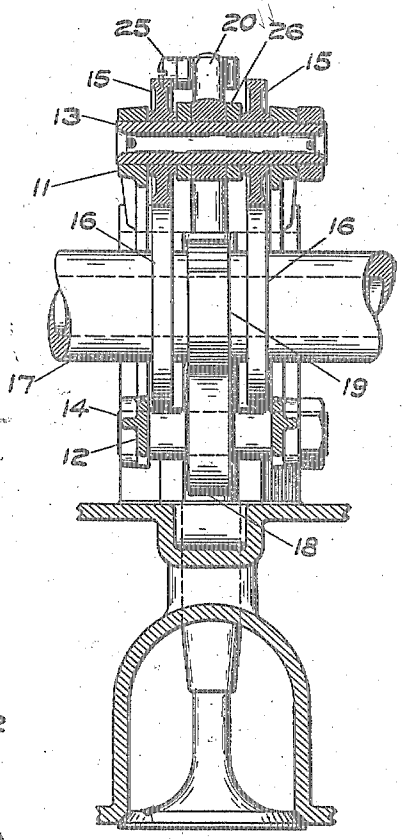


Fig. 2.



Witness
Walter H. Troemel.

By

Inventor
Fred O. Tone
Bradford & Dodge
Attorneys

UNITED STATES PATENT OFFICE.

FRED I. TONE, OF INDIANAPOLIS, INDIANA.

VALVE MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

1,291,264. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed September 16, 1916. Serial No. 120,499.

To all whom it may concern:

Be it known that I, FRED I. TONE, a citizen of the United States, residing at Indianapolis, Marion county, and State of Indiana, have invented and discovered certain new and useful Improvements in Valve Mechanisms for Internal-Combustion Engines, of which the following is a specification.

My invention relates to valve mechanisms for internal combustion engines and its objects are to provide positively driven means for operating the valves and at the same time insuring the correct seating of the valves without danger of injury to the operating means; to provide means for guiding the valve stems in their reciprocating movement, to provide common equalizing means between said operating means and a pair of valves and to provide a construction adapted to obtain the above ends which shall be capable of being mounted above the cylinder head.

With these objects in view, my invention is embodied in preferable form in the construction and arrangement hereinafter described and illustrated in the accompanying drawings.

In these drawings Figure 1 is a central vertical section through a valve head and a part of an engine cylinder; Fig. 2, is a vertical section on line 2—2 of Fig. 1, and Fig. 3, a top plan view.

Referring to the drawings, 1 is an engine cylinder of the usual type and 2 is a head mounted above said cylinder. Within this head are adapted to be mounted vertically reciprocable exhaust valves 4, and similar in-take valves, (not shown). In Fig. 1, the valves there shown are both exhaust valves, a pair of such valves being preferably employed for each cylinder. Extending upwardly from the horizontal head plate 5 are guides 6 which are provided with vertical angle arms 7. These guides have openings 8 in which the valve rods reciprocate and by which they are guided. Against these arms 7 are adapted to bear similarly shaped arms 10 which are connected by upper and lower cross bars 11 and 12, said parts forming together one member of a sliding frame which is adapted to vertically reciprocate on the arms 7. Two similar frame members are provided and they are adapted to be joined and held against the fixed bracket angle arms by means of upper and lower adjusting bolts or pins 13 and 14. The upper cross bar 11 comprises two arch shaped upwardly extending arms, carried by each member of the sliding frame and the bolt 13 passes through the junction of these arms. On this bolt are mounted two upper rollers 15 which are adapted to bear against female cams 16, mounted on a cam shaft 17 which may be operated in any suitable manner. Mounted on the lower bolt 14 is a single roller 18 which is adapted to bear against and be operated by a male cam 19 also mounted on the cam shaft 17.

Pivoted on the bolt 13 is a valve operating presser member or tappet having two arms 20 and 21 which are curved upwardly and the outer ends of which bear against the upper ends of the stems 22, of the valves 4. This member is common to both valves of the pair, and it has an equalizing action owing to its pivotal mounting.

The arm 20 is provided with an adjustable screw 24 inserted in a split socket and adapted to bear against the end of the valve stem and the screw is adapted to be locked in its socket after adjustment, by a clamping screw 25. The arms 20 and 21 serve to force the valves downward to open the same when the sliding frame 10—11—12 is carried downward.

In order to lift the valves so as to carry them against their seats a lifter member 26 is provided which consists of a horizontal, freely movable bar which is arch-shaped and pivotally engages the bolt 13, and is provided with apertured circular ends 27 surrounding the respective valve stems. Each end is formed with an annular groove to receive a spiral spring 28 surrounding the valve stem and the other end of which spring bears against an inverted cup-shaped disk 29 which is held in place on the stem by a split spring washer or other suitable means. Owing to its central pivotal mounting the lifter bar 26 likewise has an equalizing action against the valve stems, through the springs.

The pair of intake valves for each cylinder is operated by mechanism similar to that above described and by cams on the same cam shaft 17.

In the operation of the mechanism, the cam shaft 17 being driven by any suitable means, in the rotation thereof the cam 19 will ride against the roller 18 and carry the frame 10—11 downward, the arms 10 slid-

ing on and being guided by the fixed vertical arms 7. As the frame moves downward it will carry the ends of the arms 20 and 21 against the upper ends of the valve stems thus forcing the valves downward and uncovering the ports. The valves are moved out to their extreme distance from their seats when the highest point of the cam bears against the roller, and as such highest part thereof passes out of engagement with its roller, the raised part of the cams 16 will begin to engage the rollers 15, and such rollers will be then raised, lifting the frame 10—11, and carrying the lifter bar 26 against the springs 28, lifting the valve rods through the springs.

Since the springs 28 move with the frame, they will merely serve to provide a cushioning effect in the slight relative equalizing action between the arms 20—21 and 27, when the frame moves downward.

In the upward movement of the frame, the members 27 first contact with the springs and compress the same, a yielding, cushioning action being thus provided between the frame and valves which will prevent injury to the latter, and also the springs are placed under compression, which compression acts after the cam has passed its highest part to carry the valves to their seats.

The entire assemblage may be housed within and protected by a cap (not shown) above the head and may be easily removed for repair or replacement. The valves although driven in one direction through the springs are operated by positively driven mechanism, in both their opening and closing movements, while at the same time they are cushioned while being seated.

The reciprocable valve operating frame is guided effectively by the vertical brackets and is also adjustable laterally. The frame may be readily adjusted relatively to the brackets by means of the bolts 13 and 14, and the angle faces of the brackets and frame.

Having thus described my invention, what I claim is:

1. In an internal combustion engine, in combination with a plurality of valves, positively driven means for operating said valves to both open and close the same, springs between said operating means and said valves through which the valves are driven to close the same, a common equalizing member between said valves and said operating means, and means for pivotally mounting said equalizing member.

2. In an internal combustion engine, a pair of valves, a sliding frame common to said valves for reciprocating the same, cams for bearing on said frame for raising and lowering the same to open and close the valves, means for driving said cams, said cams being mounted between the upper and lower ends of the valve stems and between the stems of the respective valves.

3. In an internal combustion engine, in combination with a reciprocable valve and its stem, a sliding valve operating frame, means for driving said frame, and a fixed guide member adapted to serve as a guide for both said frame and said valve stem in the movements of the same.

4. In an internal combustion engine, in combination with an explosion cylinder, a pair of valves and their valve stems, a head above the cylinder in which said valves and their stems are mounted, hollow standards through which said valve stems project, a vertically reciprocable frame slidably mounted on said standards and adapted to be guided thereby, means of operative connection between said frame and said valve stems, and operating cams located below the upper ends of the valve stems and between said stems for imparting movement to said frame.

5. In an internal combustion engine, in combination with a pair of valves, a sliding frame common to the stems of both valves for effecting movement of the same to both open and close the valves, said frame having two pivoted equalizing contact members adapted to engage the valve stems near the upper ends of the latter for operating said stems, a common center for said members, driven rollers for the frame mounted on said center and lifting and lowering cams mounted below said rollers, and a roller carried by the frame below said cams.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 13th day of September, A. D. nineteeen hundred and sixteen.

FRED I. TONE. [L. S.]

Witnesses:
H. P. DOOLITTLE.
L. BAILEY.