

F. MACVICAR.
INTERNAL COMBUSTION ENGINE.
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1,232,352.

Patented July 3, 1917.

Fig. 1.

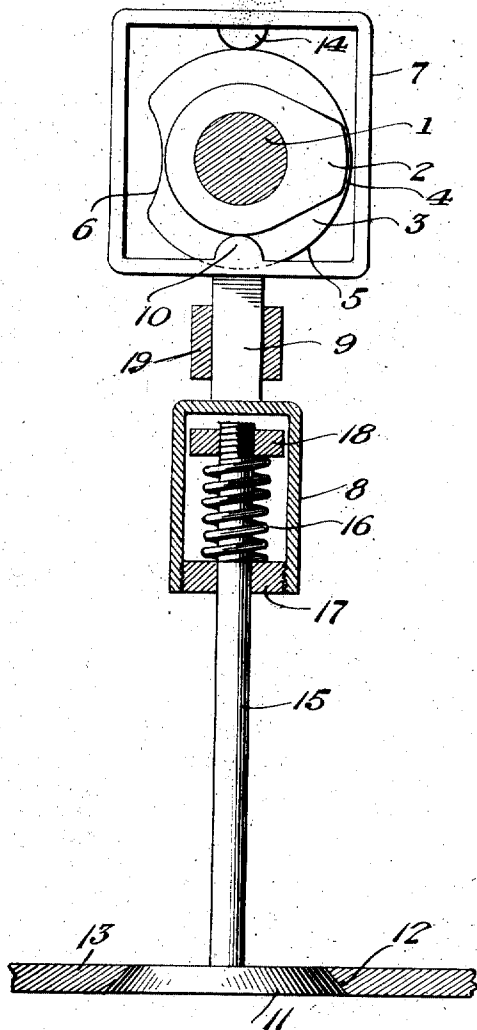
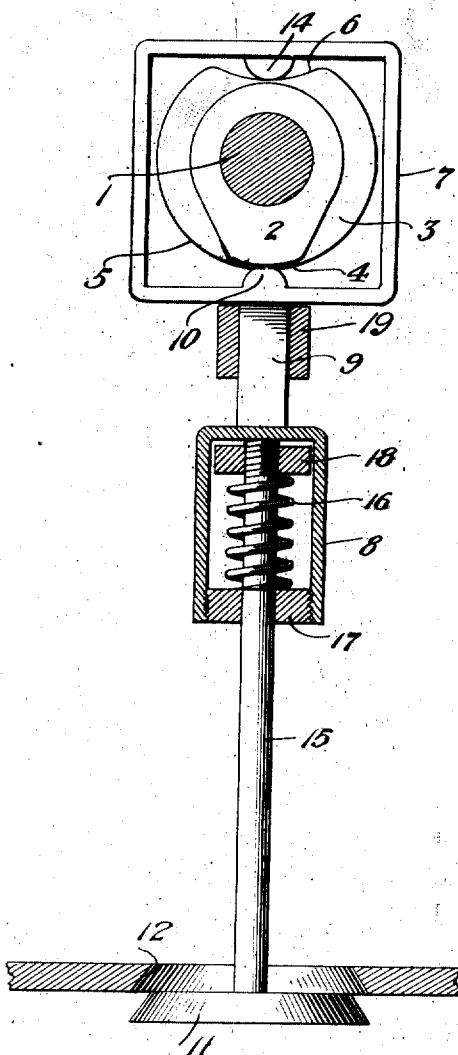


Fig. 2.



Witnesses

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INTERNAL-COMBUSTION ENGINE.

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To all whom it may concern:

Be it known that I, FRANK MACVICAR, citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and particularly to mechanism for positively controlling the opening and closing movements of the valve therefor.

The chief object of the present invention is to provide cam mechanism for positively opening and closing either the intake or exhaust valve of an engine of the class described and at the same time prevent the closing cam from bottoming in case any obstructing material such as carbon prevents the valve from properly seating, thereby avoiding the consequent friction or binding between the valve closing cam and the valve actuating member.

A further object of the invention is to provide yieldable means between the intake or exhaust valve and the closing cam therefor which will prevent the cam from bottoming and which will also insure continuous coöperative contact between the cam and valve actuating member.

The nature and advantages of the invention will be thoroughly understood when the following description is taken in connection with the accompanying drawings, the invention residing in the construction, combination and arrangement of parts as claimed.

In the accompanying drawings:

Figure 1 is a view partly in elevation and partly in section of the improved valve mechanism, showing the closed position of the valve.

Fig. 2 is a similar view showing the position of the parts when the valve is open. Referring to the drawings 1 designates a rotary shaft, ordinarily termed the cam shaft.

In carrying out this invention, I employ a valve opening cam 2 and a valve closing cam 3. Both of these cams have a fixed relation to the shaft 1 so as to rotate with and be actuated by said shaft. Ordinarily the

opening and closing cams will be formed integrally with the shaft 1, in accordance with the present day automobile practice in which the valve opening cams are formed integrally with the valve shaft.

The opening cam 2 has an arcuate working face 4 of sufficient length only to open the valve and sustain the valve in an open position for a short period of time. The closing cam has a working face 5 of much greater length for the purpose of holding the valve closed for a correspondingly greater period of time. The closing cam 3 is also formed with a depression 6 concaved or deepest at the center as shown, the purpose of which will presently appear.

Coöperating with the opening and closing cams 2 and 3, is a valve actuating member or means shown as comprising an open center frame or rectangular portion 7, a casing 8, and a shank or stem 9 which connect the parts 7 and 8 all of which therefore have a fixed and rigid relation to each other. The part 7 of the valve actuating member is provided on its inner face with a projection 10 which is acted upon by the opening cam 2 for the purpose of unseating or opening the valve indicated at 11, 12 representing the valve seat formed in a fixed part 13 of the engine cylinder. The part 7 is also provided with another projection 14 with which the closing cam 3 coöperates to close the valve 11. The depression 6 in the cam 3 is designed to receive the projection 14 when the opening cam 2 is coöperating with the projection 10.

The stem 15 of the valve extends into the casing 8 where it is surrounded by an expansion spring 16 one end of which bears against a guide plug 17 shown as threaded into one end of the casing 8 to which it has a fixed relation, while in operation. The upper end of the spring 16 bears against a stop 18 shown in the form of a nut threaded on the stem 15 and capable of being adjusted longitudinally of the valve stem for the purpose of increasing or diminishing the tension or compression of said spring 16; the spring 16 thus constitutes yieldable means for the purpose of preventing the closing cam 3 from bottoming. It also serves to sustain the valve 11 against its

seat and to press said valve as far as possible toward its seat in case any obstructing material such as carbon becomes lodged between the working face of the valve and the working face of the valve seat. 19 designates a guide through which the shank or stem 9 slides.

From the foregoing description taken in connection with the accompanying drawings the operation of the valve mechanism will now be understood. When the working faces of the valve and its seat are clean, enabling the valve to be properly seated, in the rotation of the shaft 1, the opening cam 2 operates with the projection 10 to move the valve actuating member in a direction to open the valve 11, said movement of the valve actuating member causing the closed end of the casing 8 to come in contact with the extremity of the stem 15 as shown in Fig. 2 and thereby force the valve 11 to an open position. After the opening cam 2 moves out of working relation to the projection 10, the closing cam 3 cooperates with the projection 14 to positively close the valve, restoring the parts in the position illustrated in Fig. 1. In case any obstructing matter should become lodged between the working faces of the valve and its seat, so as to prevent the valve from properly seating or completing a full return movement, the yieldable means 16 permits the valve actuating member comprising the parts 7, 8 and 9 to continue its movement and thus the opening cam 3 is prevented from bottoming against the projection 14 or in other words the opening cam is prevented from binding or jamming against the projection 14 and thereby creating excessive friction and consequent load upon the cam shaft and consequently upon the crank shaft and other parts of the engine. The spring 16 also holds the projections 10 and 14 in continuous working contact with the opening and closing cams, while also holding the valve against its seat during the time that the closing cam is cooperating with the valve actuating member.

The invention as a whole is designed for engines of various types and particularly high speed engines. Irrespective of the speed at which the engine is running, the valve is positively opened and closed and the opening and closing movements thereof are accurately timed. The closing of the valve does not depend upon the action of a spring as is now the usual practice. Under the present practice, a stiff valve closing spring is necessarily employed in order that the valve may be quickly closed as soon as the opening cam ceases to cooperate therewith; otherwise high speed could not be obtained in the ordinary type of engine in common use. Furthermore such stiff spring

throws a very considerable burden or load upon the cam shaft as the cam has to overcome the tension of said spring every time the valve is moved to an open position. This detracts from the power and efficiency of the engine and also causes rapid wear on the cam shaft. The present invention overcomes the serious objection referred to, the valve being positively opened and closed with an easy motion and a minimum amount of friction. It is impossible for the closing cam to bottom or bind in relation to the valve actuating member.

What is claimed is:

1. The combination with an engine valve, of opening and closing cams for said valve, a valve-actuating member common to both of said cams and embodying independent contacting portions for said cams at opposite sides of the axis on which the cams turn, and yieldable means between said valve and valve-actuating member, serving to prevent the closing cam from bottoming in relation to the valve-actuating member, one of said cams having a greater throw than the other for compressing and placing said yieldable means under tension.

2. The combination with an engine valve, of opening and closing cams for said valve arranged side by side, a valve-actuating member common to both of said cams, and yieldable means serving to prevent the closing cam from bottoming in relation to the valve-actuating member, one of said cams having a greater throw than the other for compressing and placing said yieldable means under tension.

3. The combination with an engine valve, of opening and closing cams for said valve having their working faces offset laterally with respect to each other, a valve-actuating member common to both of said cams, and yieldable means serving to sustain the valve-actuating member in working contact with the closing cam when the valve reaches the limit of its closing movement, one of said cams having a greater throw than the other for compressing and placing said yieldable means under tension.

4. The combination with an engine valve, of opening and closing cams for said valve, a valve-actuating member common to and embracing both of said cams, and yieldable means serving to permit the valve-actuating member to yield in relation to the valve and thereby prevent the bottoming of the closing cam in relation to the valve-actuating member, one of said cams having a greater throw than the other for compressing and placing said yieldable means under tension.

5. The combination with an engine valve, of opening and closing cams for said valve, a valve-actuating member common to both

of said cams and embodying an independent contacting portion for each of said cams, and yieldable means between said valve and valve-actuating member, serving to prevent
5 the closing cam from bottoming in relation to the valve-actuating member, said yieldable means having no effect between

the cams and valve-actuating member when the valve is unseated, one of said cams having a greater throw than the other for compressing and placing said yieldable means under tension. 10

In testimony whereof I affix my signature.
FRANK MacVICAR.