Nov. 18, 1924. 1,516,178

W. FALWELL

VALVE OPERATING DEVICE FOR INTERNAL COMBUSTION ENGINES

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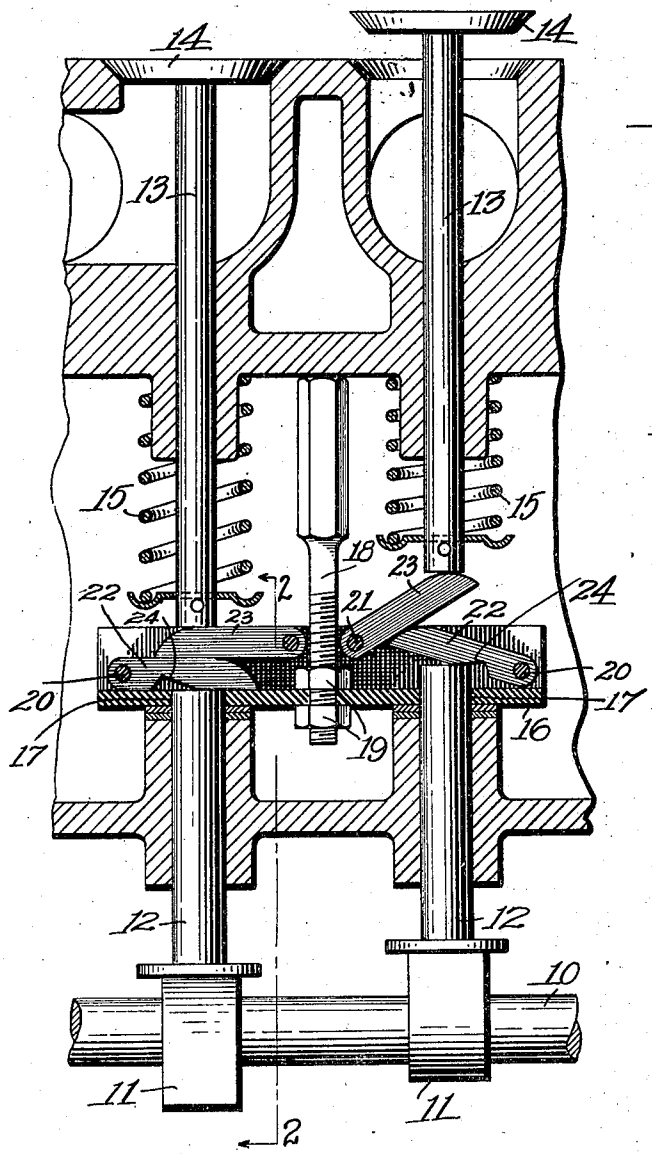
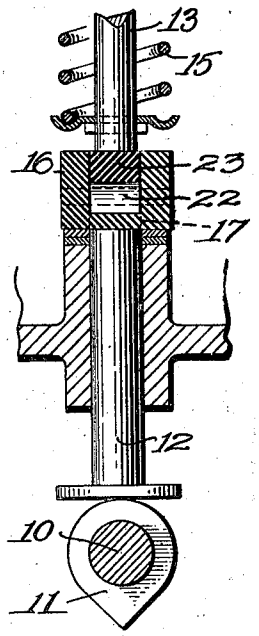


Fig. 1

Fig. 2.



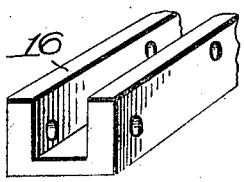


Fig. 3.

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UNITED STATES PATENT OFFICE.

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VALVE-OPERATING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed December 1, 1922. Serial No. 604,353.

To all whom it may concern:

Be it known that I, WRAY FALWELL, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented a new and useful Valve-Operating Device for Internal-Combustion Engines, of which the following is a specification.

This invention relates to a device for increasing the speed of the valve opening and closing of an internal combustion engine.

The principal object of the invention is to provide an improved means for accomplishing this result in such form that the entire additional mechanism can be constructed in the form of an attachment readily applied to an existing engine after it has been in use and capable of being installed in a new engine without materially increasing the cost and to provide a device in such form that it will not project out at the side of the engine but will be contained within its ordinary boundaries and will involve no parts unfamiliar to the mechanics who are familiar with the engine.

This invention improves the engine by increasing the speed at which the valve opens without changing the time when it starts to open and by increasing the speed of closing but getting it entirely closed at the same time as before. It also has the advantage that no change in the present or usual cams is necessitated and therefore the adjustments of the engine are not interfered with by the application of this device thereto.

I find that by the use of this device the power of the engine is very greatly increased so that the increase is obvious to all and furthermore that the mileage per gallon of gas is also increased.

Reference is to be had to the accompanying drawings, in which—

Fig. 1 is a sectional view through the valves of a motor for a Ford car showing a preferred form of this invention applied thereto;

Fig. 2 is a sectional view of the same on the line 2—2 of Fig. 1, and

Fig. 3 is a perspective view of the bracket or frame in which the attachment is located.

Of course, it is understood that the efficiency of the ordinary engine of the internal combustion type having the form of valves shown in the drawings can be materially increased by increasing the speed of operation of the valves and increasing the opening of the valves so as to provide for full intake of combustible fuel and also leaving them open long enough so that the spent gases can have full chance to escape. This invention does not increase the time during which the valve is opened because it increases the speed of opening and allows the valves to get fully opened at an earlier time with the same operating cams and also increases the speed of closing so that the valve may be opened wider and yet come to a fully closed position at the same time that it would if this attachment were not provided. In other words, no change in timing is contemplated but only change in the speed of operation in the valve.

For the purpose of securing these results I use the ordinary cam shaft 10 with its cams 11 and also the ordinary tappet 12. These are not changed or modified in any way. In certain types of engines a lever has been provided over each tappet which, when raised by the tappet, would engage the valve stem 13 directly and lift the valve 14 against the action of the spring 15 which tends to close the valve and keep it closed. The parts so far described are well understood in some types of motors especially those used in connection with Ford cars.

With my invention I provide a frame or casing 16 of channel form extending far enough to include two or more cylinders of an engine and having at the proper distance apart perforations 17 for receiving the tappets 12. This frame is inserted in the engine over the tappets and brought down into position so that the tappets will pass through the perforations 17. A bolt 18 is screwed up with its head firmly against the wall of the space in which the valve springs are located and a pair of nuts 19 on it are then adjusted firmly against the bottom or floor of the casing 16 so as to get a strong thrust to hold the casing firmly fixed in position. The tappets themselves help to hold it in position because of the perforations in which they fit. Here ordinarily only one of the bolts 18 is necessary. The bolts 18 hold the casing 16 vertically while the tappets hold it against swinging on the axis of the bolt 18.

Through the walls of this casing I provide perforations for horizontal pins 20 and

21. On these pins are pivoted two sets of levers 22 and 23. The levers 22 are pivoted on pins near the bottom or floor of the casing 16 so that these levers 22 will lie horizontally on this floor when the tappets are down in the lowermost position as shown at the left in Fig. 1. These levers 22 are each provided with a notch 24 for receiving the wear from the tappet when they are raised, as shown at the right in Fig. 1.

The upper lever 23 is located horizontally, when in its lowermost position. That is, it is spaced above the floor of the casing 16 a distance equal to the thickness of the lever 22 below it. It will be noticed that one lever is pivoted one side of the tappet and the other at a greater distance from the tappet and on the other side thereof and at a higher elevation. The lever 22 has a rounded end and when the tappet rises this engages the flat lower side of the lever 23 and raises it and multiplies its action according to the length of the lever 23, in the present case about twice. This lever has a rounded end which engages under the end of the valve stem 13 and directly lifts it so it will be obvious that as the cam is rising the total motion of the valve stem 13 and consequently the valve stem 14, beginning at the same time and ending at the same time, will be much greater and faster than it has been heretofore. In other words, much more rapid opening of the valve is secured and a wider opening finally. On the return stroke the same thing takes place because the valve, starting at a higher point and starting to close at the same instant as would be the case under the ordinary construction, comes to an entirely closed position at the same instant as has been the case heretofore but must move considerably more rapidly in order to do it.

This provides for permitting a larger charge of combustible fuel to be taken into the cylinder while the valve is opening and as it opens to a wider extent also a larger total quantity of fuel is admitted by the end of the opening movement. Furthermore, having the valve opened wider and therefore giving a greater opening for the exhausted gases to escape through after the explosion, there is less back pressure and the efficiency is increased in both ways.

I have found in practice that a Ford car provided with this device will be capable of running at a considerably greater speed than has been the case heretofore because of the increase in power and I also find by actual experiment that the same car with this attachment will go several miles farther on one gallon of gasoline than without it.

Although I have illustrated and described only a single form of the invention I am aware of the fact that modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claims.

Therefore, I do not wish to be limited to all the details of construction herein shown and described, but what I do claim is:—

1. The combination with a combustion engine valve and its actuating tappet, of a lever of the third class pivoted between them on one side, a second lever of the third class pivoted on the other side of the tappet beyond the first lever and in position to be engaged and operated by the first lever when the tappet moves and also in position to engage the valve stem.

2. The combination with a combustion engine valve and its actuating tappet, of a lever of the third class pivoted above the level of the tappet on one side thereof lying over the tappet, a second lever of the third class pivoted on the other side of the tappet above the first lever and in position to be engaged and operated by the first lever when the tappet moves and also in position to engage the bottom of the valve stem and to receive the thrust of the valve spring.

3. The combination with a combustion engine valve and its actuating tappet, said parts being in alinement but spaced apart, of a pair of levers of the third class of about the same length, one pivoted on one side of the tappet and the other on the other side at a point between the tappet and valve stem and one lying over the other in normal position, the lower lever resting on the tappet and the end of the valve stem resting upon the upper lever, whereby when the tappet is raised by the eccentric the lower lever will swing upwardly and force the upper lever upwardly and move the valve stem several times as far and as fast as it would be moved by the lower lever if the valve stem were in contact with that.

4. The combination with an internal combustion engine having a tappet and valve stem in alignment, of a casing adapted to be inserted between the tappet and valve stem, a pair of levers of the third class carried by said casing, one being pivoted near the level of the top of the tappet on the casing and engaging the tappet, the other being pivoted at a distance from the tappet on the other side thereof and engaging the first lever and also engaging the valve stem on the other side, whereby the movement of the tappet is miultiplied as transmitted to the valve stem.

5. As an article of manufacture, an attachment for an internal combustion engine comprising a casing adapted to be inserted in the engine between the valve stem and its tappet, a bolt on said casing extending into a position to engage the wall of the engine and having nuts thereon for holding it in position, said casing also having a perfora-

tion for the tappet, whereby the tappet itself will hold it against turning about the bolt as a center, and a pair of levers carried by the casing and contacting with each other normally, one adapted to contact with the floor of the casing over the perforation, the other lying over it.

6. The combination with a valve and its actuator, of means interposed between said parts for procuring a valve lift greater in extent than the throw of said actuator, said means comprising cooperating superposed oppositely extending movement multiplying levers, one for engagement with the valve stem and the other for engagement with the actuator.

7. The combination with a cam shaft and a tappet operated valve of an internal combustion engine, of a casing containing a plurality of levers, the levers being pivotally mounted in the casing to move in a plane passing through the axis of the cam shaft, whereby said casing may be contained entirely within the valve stem space and supported on the tappet guide, the levers being adapted to transmit the tappet movement with a multiplied effect to the valve.

8. The combination with the tappet operated valve of an internal combustion engine, of movement-multiplying mechanism, interposed between said valve and its tappet, and held in place by a compression member disposed in opposition to the thrust of said tappet.

In testimony whereof I have hereunto affixed my signature.

WRAY FALWELL.