

UNITED STATES PATENT OFFICE.

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HUMIDIFIER FOR INTERNAL-COMBUSTION ENGINES.

Application filed September 13, 1922. Serial No. 588,002.

To all whom it may concern:

Be it known that I, JAMES E. WOODWARD, a citizen of the United States, and resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Humidifiers for Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines and has particular reference to means for increasing the efficiency of the engine and minimizing the deposit of carbon within the parts thereof. Incidentally, the invention provides for improving the circulation of water through the water-cooled parts of the engine and the radiator by maintaining a partial vacuum in the latter.

One of the objects of the invention is to provide a practical device which may be readily applied to well-known types of popular motor vehicles, and which will enable the operator to, at will, increase the speed of the vehicle without increasing the amount of fuel, by ensuring the admission of a regulatable amount of vapor to the carbureter to mix with the fuel, such vapor being conveniently obtained from the radiator.

Another object is to provide a valve structure for controlling the passage of the vapor, the structure being such that the valve is held seated by the suction of the engine and close seating of the valve is not diminished by wear of the valve and seat. In this aspect the invention is a continuation in part of my application 477,261, filed June 13, 1921.

Another object is to provide, in a passageway for vapor to an internal combustion engine, a pair of valves both of which control the passageway, connections whereby one of the valves will be actuated simultaneously with the throttle control of the engine, the other valve being free for manual actuation.

With the above and other objects in view, my invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawings:

Figure 1 conventionally illustrates sufficient parts of a motor vehicle, including

my improved attachments and connections, to enable the invention to be understood.

Figure 2 represents a vertical section through the valve mechanism.

Figure 3 represents, in perspective, the different parts shown in Figure 2.

Figure 4 is a detail view of the spring connection between the throttle rod and a rod which actuates one of the valves.

Similar reference characters indicate similar parts in all of the views.

The radiator 12, dash board 13, engine or motor 14, intake manifold 15, and carbureter 16 may be of any well-known construction. While Figure 1 illustrates the mechanism as installed in a land vehicle, it is to be understood that I do not limit myself thereto. My invention may be employed in connection with the engine of a motor boat or aeroplane.

In gas-tight connection with the manifold 15 is the nipple 20 of the lower section or member 21 of the valve casing to which the upper casing section or member 22 is suitably connected as by screws passing through flanges of the two sections. The nipple 20, besides providing for the passage through it of vapor as hereinafter described, serves, in the embodiment of the invention illustrated, to support the entire controlling device in position for use, said device requiring no alteration in the motor or any other means for supporting it.

The upper section 22 has a nipple 24 which is connected by a pipe 25 with the interior of the radiator 12 above the level of the water therein. Said section 22 also has, integral with it or rigidly secured thereto, an arm 26 having an eye 27 for a purpose presently described.

Supported by an internal shoulder 28 of the casing member 21 is a removable diaphragm or valve seat 29 having its upper surface recessed and having two opposite arc-shaped slots 30, and a hole 31 near one edge fitting on a pin 32 rising from the member 21, said pin and hole being provided to prevent the valve seat 29 from rotating when the valve above it is rotated.

Rotatably seated in the recess of the valve seat 29 is a disk valve 33 having two opposite arc-shaped slots 34 adapted to register

with the slots 30 of the seat 29, and having an edge recess 35 the ends of which coact with the pin 32 in limiting rotary movements of the valve to open and closed positions. Extending down from the center of the disk valve 33, through a central hole in the seat 29, is a short bifurcated stem 36 which is engaged by the tongue or lip 37 of an actuating stem 38 which extends through the bottom of the member 21 and has an arm 39 to enable the said lower valve 33 to be actuated as hereinafter described.

Above the valve 33 is a diaphragm or valve seat 40 having two opposite arc-shaped slots 41 and a hole 42 which latter fits the fixed pin 32, thereby preventing the said seat from rotating while permitting it to move down to compensate for wear as hereinafter explained. The upper surface of the valve seat 40 is recessed and in said recess is seated a disk valve 43 having two opposite arc-shaped slots 44 adapted to register with the slots 41 of the seat 40 and having an edge recess 45 the ends of which coact with the upper end of the fixed pin 32 in limiting rotary movements of said valve to open and closed positions. Extending up from the center of the valve 43 is a short bifurcated stem 46 which is engaged by the tongue or lip 47 of an actuating stem 48 which extends through the top of the casing member 22 and has an arm 49 to enable the upper valve 43 to be actuated as hereinafter described.

A spring 50, coiled around the stem members 46, 47, exerts a downward pressure to hold the upper valve on its seat and in proper surface contact therewith. An important feature of my invention is that the valves and valve seats are flat. Also it will be noticed that the two valves are duplicates in form and that the two valve seats are duplicates in form. Therefore considerable economy in production is effected.

As indicated in Figure 2, the lower seat 29 is supported by the internal shoulder 23 of the casing, and the upper seat 40 is supported by the marginal rim of said lower seat within which the lower valve 33 is mounted to oscillate on the seat 29. Therefore there can be no such binding pressure on the valve 33 between the two seats as to interfere with the oscillating movements thereof. The one fixed pin 32 functions for both valves and both valve seats, since it prevents any rotative movements of the seats and defines the limits of rotative movements of the valves.

The spring 50 is not exactly essential because the suction strokes of the engine always tend to hold the flat valves and seats in tight superposed relationship. As wear in use occurs, the sliding connection between the tongue 47 and the recess in the short stem 46 permits compensating downward

movement of the upper valve without disturbing the actuating connection therefor. The use of the device ensures permanency of tight relationship between the valves and their seats so that there can be no leakage, because any wear resulting from such use can do no more than enhance the smoothness of the contacting surfaces.

The arm 49 of the stem of the upper valve is connected with a knob or button 51 mounted in suitable accessible position, as on the dash board 13. Said connection is conveniently made by a wire rod 52 leading through and guided by a tube 53 the lower end of which is secured in the eye 27 of the fixed arm 26. The connection is such that by pushing or pulling the knob 51, the upper valve may be closed or may be opened to permit the passage of more or less vapor from the radiator according to the extent of movement of the arc slots 44 of the valve relatively to the arc slots 41 in the non-rotary valve seat 40.

The arm 39 of the stem of the lower valve 33, in the particular arrangement illustrated, is connected by a rod 54 to the conventional throttle rod or accelerator rod 55 which is connected at one end to the arm 56 of the butterfly or throttle valve, and at the other end is connected to an arm of a rock shaft 58 parallel with the steering post 59 and having the usual throttle control lever 60 adjacent to the steering wheel.

As hereinafter described, the rod 55, in practice, moves longitudinally to a greater extent, at times, than the rod 54. Hence the connection between the two is a yielding one. This is effected by a spring 61 interposed under some compression between a stop 62 on the rod 54 and a block 63 slidable on the rod 54 and secured to rod 55. To limit the movement of the block 63 in one direction on the rod 54, a stop 64 is secured to the rod 54.

In operation, assuming that the engine is warm so as to cause the presence of vapor mixed with the atmosphere in the radiator, the upper valve 43 may be opened without permitting the passage of any vapor through the casing 21, 22, so long as the lower valve 33 is left closed. This is because all of the arc-shaped slots in the valves and valve seats must register more or less to permit any vapor at all to pass. If now it is desired to speed up, actuation of the accelerator or throttle mechanism so as to open the valve 33 will result in admitting vapor through the pipe 25 and down through the slots in the valves and valve seats and through the nipple 20 into the manifold 15.

On the other hand, if one is travelling with the throttle open to a given extent so that the lower valve is open more or less, but the upper valve is closed, a pull of the knob 51 in the dash board results in in-

stantly admitting vapor to the manifold and effecting a marked increase in speed or power.

By means of the throttle control the driver is able to effect injection of vapor into the manifold in quantities to suit his requirements as to speed. In other words, if he leaves the upper valve open, then variations in the throttle control will vary the quantity of both gas and vapor without varying the proportions of the mixture.

When the throttle is closed to idling position, the lower valve is necessarily closed owing to its connection with the throttle rod described. Then, if the upper valve happens to be opened, no vapor can pass and consequently there can be no racing of the engine. The several features of advantage just described are due to the fact both of the valves control one passageway for the vapor, one valve being connected for simultaneous operation with the throttle, the other being manually actuated.

The reason for the yielding connection between the rods 54, 55, is that the full amount of vapor should pass before the throttle is wide open. With the structure illustrated, the first movement of the rod 55 is a throttle-opening direction immediately transmits movement to the rod 54 through the spring 61 so as to open the lower valve 33. But when said valve has opened as far as permitted by one end of its edge recess 35 contacting with the stop pin 32, so that said valve 33 is wide open, the spring 61 will permit the rod 55 to continue moving until the throttle is wide open, so as to supply more gas without moving the lower valve. This is under the assumption that the upper valve has been opened. Then a partial movement of the throttle control lever 60 gives both gas and vapor, and a further movement of said lever increases the supply of gas, but no more vapor, because the valves in the casing can open no wider.

Reference has been made to the device improving the circulation of the water through the water-cooled parts of the engine and the radiator. This is due to the fact that when the engine is running and the valves in the casing are open, the suction strokes of the engine produce a partial vacuum in the radiator which is so nearly closed to the atmosphere that the reduced pressure above the level of the water in the radiator tends to draw the water entering the upper portion thereof, and which is

the warmest, so as to aid the natural tendency of the water to circulate in that direction.

Having now described my invention, I claim:

1. A device of the character described, comprising a passageway for vapor, a casing interposed in said passageway, a pair of flat valves and cooperating flat valve seats superimposed upon each other in said casing and having ports all of which must register to permit the passage of vapor, means for actuating one of said valves in synchronism with the throttle control of an internal combustion engine, and means for manually actuating the other valve.

2. The combination with an internal combustion engine, of a passageway for vapor leading to the intake thereof, a casing interposed in said passageway, a pair of flat valves and cooperating flat valve seats superimposed upon each other in said casing and having ports all of which must register to permit the passage of vapor, means for manually actuating one of said valves, and connections between the throttle control of the engine and the other valve whereby variations in the throttle control will vary the quantity of both gas and vapor without varying the proportions of the mixture.

3. A device of the character described, comprising a passageway for vapor, a casing interposed in said passageway, a pair of valve seats having recessed upper surfaces mounted in the casing, a valve mounted in the recess of each of said seats, means for actuating one of said valves in synchronism with the throttle control of an internal combustion engine, and means for manually actuating the other valve.

4. A device of the character described, comprising a passageway for vapor, a casing interposed in said passageway and having a fixed pin, a pair of ported valve seats mounted in the casing and engaged with said pin, a pair of ported valves mounted on the valve seats and having edge recesses cooperating with said fixed pin to limit rotary movements of the valves, means for actuating one of the valves in synchronism with the throttle control of an internal combustion engine, and means for manually actuating the other valve.

In testimony whereof I have affixed my signature.

JAMES E. WOODWARD.