

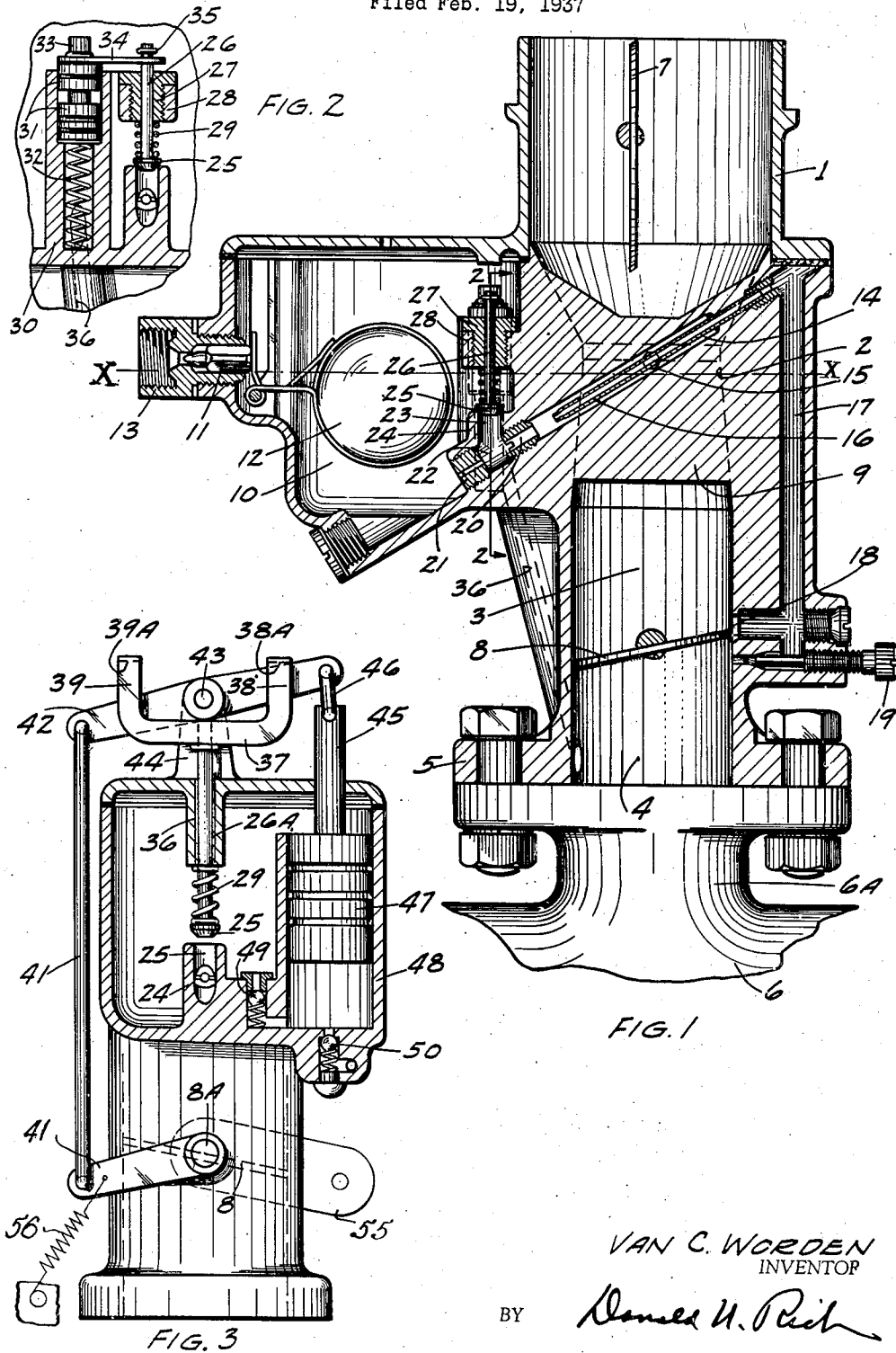
April 23, 1940.

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2,198,100

CARBURETOR DEVICE

Filed Feb. 19, 1937



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2,198,100

CARBURETOR DEVICE

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Application February 19, 1937. Serial No. 126,650

6 Claims. (Cl. 261-41)

This invention relates to carburetors for internal combustion engines and consists particularly in novel combination anti-percolation and so-called step-up or economizer means therefor.

It is well known that the fuel and air mixture which must be supplied to the cylinders of an internal combustion engine in order to produce the greatest power of which the engine is capable, is substantially richer in fuel than the mixture which results in the greatest economy of operation. It is, therefore, desirable in carburetors of the above type to provide for an additional supply of fuel to the main induction or mixture conduit when the associated engine is subjected to increased power demands, or, in other words, is operating in the power range. This additional supply should be restricted or cut off during so-called part throttle or economy range operation of the carburetor during which time the associated engine is developing substantially less power than it is capable of producing. Means for enriching the mixture only as long as load conditions exist are known as "step-up devices" or "economizers". When increased power is required of an automobile engine, the driver instinctively opens the throttle so as to attain the desired engine speed. Accordingly, the extra fuel may be supplied manually by movement of the throttle to a predetermined degree of opening, or by suction posterior to the throttle. Since the intake suction and degree of throttle opening are closely related, varying, in general, in the inverse ratio, both types of step-up devices are considered broadly equivalent so far as the present invention is concerned.

Another problem in modern carburetor construction arises from the fact that such carburetors are ordinarily located immediately above the engine manifolds and thus directly exposed to the heat thereof. This heat frequently causes fuel in the carburetor and, particularly, in the discharge passages thereof, to boil or percolate, the resulting gaseous bubbles passing out through the discharge nozzle and causing substantial quantities of unvaporized fuel to be spilled into the intake manifold. This condition occurs more readily immediately after a hot engine is stopped and results in "loading" which hinders re-starting of the engine, causes excessive carbon deposits, and has other injurious effects until the excessive charge is dissipated.

Separate means have heretofore been suggested for solving both of the above described carburetion problems. The step-up and econo-

mizer arrangements though, frequently, involving an opening between the main fuel supply system and the fuel reservoir in addition to the main metering orifice, have been ineffective as anti-percolating devices due to the relatively small sized auxiliary fuel orifices used for this purpose and to the fact that the orifices were cut off or substantially restricted when the carburetor was inoperative. When an additional opening has been provided at the base of the main fuel nozzle for releasing percolation bubbles, this opening was carried above the fuel level and, moreover, was usually completely cut off, so as not to affect the fuel mixture, except when the carburetor was inoperative and percolation most likely to result.

An object of the present invention is to combine effective step-up and anti-percolating means in a simplified, unitary structure.

A more detailed object is to provide a step-up device of the above type, either suction or throttle operated and so constructed and arranged as to function also as an anti-percolation instrumentality.

These objects and other more detailed objects hereafter appearing are attained in the accompanying drawing in which:

Figure 1 is a vertical sectional view of a carburetor illustrating one form of the invention.

Figure 2 is a detailed section taken at 90 degrees to Figure 1 and substantially on line 2-2 thereof.

Figure 3 is an enlarged sectional view taken on substantially the same plane as Figure 2 but illustrating a modification.

The carburetor illustrated in Figure 1 is in general of a more or less conventional type having a downdraft mixture conduit or barrel including air inlet horn 1, venturi 2, mixing chamber 3, and outlet portion 4, flanged as at 5 for attachment to riser portion 6a of intake manifold 6. A choke valve 7 is pivotally mounted in the air horn and a butterfly throttle valve 8 controls the outlet portion. Extending across the venturi between the air horn and mixing chamber is a jet bar 9. A crank 55 is provided for manually opening the throttle by means of the usual throttle pedal and a return spring 56 closes the throttle when the throttle pedal is released by the operator, as is the case when the carburetor is not in operation.

Adjacent the barrel portion of the carburetor is a bowl 10 within which fuel is maintained at a substantially constant level by needle valve mechanism 11, controlled by float 12. Valve 11 controls fitting 13 for connecting the car-

buretor with a remote fuel tank, not shown. Extending upwardly at an angle from bowl 10 through jet bar 9 is a fuel discharge passage 14 communicating in its upper portion with the downdraft mixture conduit by means of laterally disposed diffuser openings 15 substantially at the throat of venturi 3. Fuel discharge means of this type are well known in the art, being illustrated in many patents, such as Chandler Patent No. 1,957,631 and Ball et al. Patent No. 2,108,281, and having been widely used for a number of years on the "B. B." carburetors manufactured by applicant's assignee. Extending downwardly through passage 14 is an idling

15 tube 16 communicating at its upper end with vertical passage 17 leading downwardly to idle port 18 adjacent the throttle valve. The usual idle adjustment needle is provided at 19.

A plug 20, threadedly secured near the lower 20 end of passage 14 has a central aperture sufficiently large to care for the maximum liquid fuel requirements of the carburetor. Secured beneath or anterior to plug 20 at the base of passage 14 and connecting the passage with the 25 fuel bowl is a second plug 21 having a substantially smaller bore than plug 20 and calibrated to supply only sufficient fuel for the economy range operation of the carburetor. The small chamber 22 between plugs 20 and 21 also communicates with the fuel in bowl 10 through upwardly facing opening 23 in boss 24, this opening terminating substantially beneath the normal fuel level $x-x$ in bowl 10. Operatively associated with opening 23 is a valve 25 which has 30 a seat on the upper end of boss 24. Valve stem 26 is slidable within guide plug 27 secured in an apertured boss 28 projecting into bowl 10 from the carburetor barrel. The valve is constantly urged downwardly by a coiled spring 29 seated at its upper end against guide plug 27.

40 Adjacent boss 24 in bowl 10 is a vertical, hollow cylinder 30 having an internal bore which at its enlarged upper end slidably receives a closely fitting, double piston 31 constantly urged upwardly by coiled spring 32 seating against the 45 closed bottom of the cylinder. Secured to the upper portion of the stem 33 projecting from piston 31 is a lateral arm 34 which at its opposite end loosely receives valve stem 26. Stem 26 has a collar or key 35 at its upper extremity and above arm 34 whereby raising of this arm tends to raise the valve stem and valve 25.

The interior of cylinder 30 communicates with the carburetor mixture conduit posterior to throttle 8 through the suction connection 36. Piston 31 and valve 25 are accordingly controlled by 50 spring 32 and the pressure difference on the upper and lower portions of piston 31, the top of the piston being exposed to atmosphere in the fuel bowl. In other words, piston 31 and valve 25 are said to be responsive to suction posterior to the throttle.

In practice, spring 32 is made strong enough to hold valve 25 in its upper or non-restricting 55 position whenever the carburetor or the associated engine is inoperative or the engine is subjected to power demands requiring more gasoline than can be supplied through plug 21. This condition of the valve may be maintained throughout any desired vacuum range, depending upon 60 the characteristics of the particular carburetor and engine. In a well known installation, the vacuum step-up device is opened or rendered operative when the suction prevailing in the intake manifold corresponds with not more than

3½ or 4 inches of mercury. Such conditions prevail when the engine pistons are either immobile or moving at a relatively slow rate of speed due to the engine being subjected to a heavy load. Ordinarily the throttle valve will be substantially 5 fully opened when the engine is loaded to this extent, but this is not necessarily so. During the power range operation, fuel will be supplied to passage 14 through perforated plug 21 and also through the large, upwardly facing opening 23, 10 the only restriction being at plug 20. At all other times when the intake suction may extend to a value corresponding with as high as 24" of mercury, auxiliary valve 25 will be closed for economy operation. 15

Chamber 22 between plugs 20 and 21 is directly exposed to heat from the engine and manifold 6 through the metal of the carburetor body. This heat may cause fuel in chamber 22 to boil, 20 forming bubbles which, according to well known principles of physics, tend to seek the easiest and most direct upward passage. Opening 23 is made substantially larger than the aperture in plug 20 and faces more sharply upwardly than passage 14, in this case being vertical, so as to readily 25 release the percolation bubbles in chamber 22, provided valve 25 is lifted. Obviously, the anti-percolating device will be effective when the associated engine is inoperative, at which time percolation constitutes the greatest problem, due to 30 the upward pressure applied to piston 31 and the valve by spring 32.

In Figure 3 valve 25, controlling the auxiliary fuel supply orifice 23, has a valve stem 26a extending upwardly through the fuel bowl cover and guided by an apertured boss 36 depending 35 therefrom. At the upper end of stem 26a is a yoke 37 having arms 38 and 39 bent over at their upper ends to form lips 38a and 39a. Rigidly secured to throttle shaft 8a is an arm 40 connected by means of a link 41 to one end of lever 42 40 pivoted at 43 to post 44 on the bowl cover. The accelerating pump piston rod 45 is secured to the other end of lever 42 by means of a short link 46. The accelerating pump piston 47 reciprocates in a cylinder 48 within the bowl provided with the usual inlet check 49 and outlet check 50 controlling communication between the pump cylinder and the bowl and the cylinder and the mixture conduit, respectively.

Lever 42 extends immediately adjacent yoke 37 and beneath lips 38a and 39a thereof and is disposed to engage lip 38a to open valve 25 when the throttle is fully closed, as shown. When the throttle is fully opened, lever 42 engages lip 39a 55 so as to lift yoke 37 and valve 25. Ordinarily, when the associated engine is inoperative, throttle valve 8 will be closed and valve 25, accordingly, opened so as to release percolation bubbles. Similarly when the associated engine is subjected to a heavy load and the carburetor is operating in its power range, the throttle valve will ordinarily be substantially fully opened so as to withdraw 60 valve 25 from step up opening 23 to supply additional fuel to the discharge passage 14. During part throttle operation valve 25 will be held against its seat by coiled spring 29. 65

In each case, valve 25 preferably functions so as to gradually vary the auxiliary fuel supply, but the orifice for releasing percolation bubbles 70 should be fully open when the engine is inoperative. Both the manual and suction controlled "step-up" devices are conventionally arranged to be closed when the carburetor is operating with the throttle partially open, that is in the economy 75

range, when relatively high suctions prevail posterior to the throttle, regardless of speed, and to be opened during substantially full throttle operation, that is, in the power range, when relatively low suctions exist in the carburetor. The return spring normally insures the closed position of the throttle whenever the carburetor is not in operation.

The invention is not limited to the structure as shown, but may be modified in various respects as will occur to those skilled in the art, and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a carburetor having a downdraft mixture conduit, a throttle in said conduit, a fuel chamber, an upwardly extending fuel passage connecting said chamber and said conduit, said passage communicating with said chamber through an upwardly facing orifice, a valve in said orifice having a projecting actuator, a lever pivoted adjacent said actuator and operated by said throttle, said actuator having a branch on each side of the pivotal support of said lever and disposed to be moved by said lever so as to open said valve when said throttle is closed or opened beyond a predetermined degree, and means for closing said valve in intermediate positions of said throttle, said orifice and said valves being constructed and arranged so that when said valve is open, the free space in said orifice is sufficient to permit release of gas bubbles formed therebeneath in said passage.

2. In a carburetor for an internal combustion engine, a mixture conduit, a fuel reservoir, an upwardly inclined fuel discharge passage communicating with said reservoir by means of an orifice and extending into said conduit, said passage also communicating with said reservoir by means of a second upwardly facing orifice directly above the base of said passage, a valve for said second orifice, means for moving said valve to its most restricting position when said carburetor is being operated in its economy range, and means for urging said valve open when the carburetor is being operated in the power range and also when the carburetor is not in operation, said second orifice and said valve being constructed and arranged so that when said valve is open, the free space in said orifice is sufficient to permit release of gas bubbles formed therebeneath in said passage.

3. In a carburetor for an internal combustion engine, a mixture conduit, a throttle valve therein, a constant level fuel reservoir, manual means for opening said throttle and a return spring for closing the same, a fuel passage extending upwardly at an angle from said reservoir and discharging into said conduit anterior to said throttle, said passage communicating with said reservoir through a metered orifice, there being a second, upwardly facing orifice in the wall of said passage directly above the base thereof, the carburetor above said second orifice being constructed to provide substantially a direct passage to space above the fuel level for the release of gas bubbles formed in said passage beneath said second orifice, a metered restriction in said passage posterior to said second orifice, a valve for said second orifice, said valve and said orifice being constructed and arranged so that when said valve is open, the free space in said orifice is sufficient to permit release of gas bubbles formed therebeneath in said passage, means responsive to suction posterior to said throttle for moving said valve to its most restricting position at relatively high suction, and means for fully opening said valve when there is no suction posterior to said throttle.

being constructed and arranged so that when said valve is open, the free space in said orifice is sufficient to permit release of gas bubbles formed therebeneath in said passage, means for moving said valve to its most restricting position when the carburetor is operating under conditions with said throttle open less than a predetermined degree, and means for urging said valve fully open under conditions when the carburetor is not in operation.

4. In a carburetor for an internal combustion engine having a throttle and a fuel reservoir, a member operable by said throttle, a main fuel passage having communication with said reservoir through a calibrated orifice and a second, upwardly facing orifice, both below the normal fuel level in said reservoir, a valve for said second orifice, and a valve operating device between said throttle operated member and said valve constructed and arranged to open said valve when said throttle is fully closed and to close said valve when said throttle is opened less than a predetermined degree, the free space in said orifice being of sufficient size, when said valve is open, to permit the escape of gas bubbles formed therebeneath in said passage.

5. In a carburetor for an internal combustion engine, a mixture conduit, a throttle therein, a fuel chamber, an upwardly inclined fuel passage discharging into said conduit and communicating with said chamber through an upwardly facing, submerged orifice directly above the base of said passage, a metering restriction in said passage posterior to said orifice, a valve for said orifice, and means operated by said throttle for closing said valve when said throttle is opened less than a predetermined degree and for opening said valve when said throttle is fully closed or opened beyond said degree, said orifice and said valve being constructed to provide sufficient free space in said orifice, when said valve is open, for the release of gas bubbles in said passage.

6. In a carburetor for an internal combustion engine, a mixture conduit, a throttle valve therein, a constant level fuel reservoir, manual means for opening said throttle and a return spring for closing the same, a fuel passage extending upwardly at an angle from said reservoir and discharging into said conduit anterior to said throttle, said passage communicating with said reservoir through a metered orifice, there being a second, upwardly facing orifice in the wall of said passage substantially at the base thereof, the carburetor above said second orifice being constructed to provide substantially a direct passage to a space above the fuel level for the release of gas bubbles formed in said passage beneath said second orifice, a metered restriction in said passage posterior to said second orifice, a valve for said second orifice, said valve and said orifice being constructed and arranged so that when said valve is open, the free space in said orifice is sufficient to permit release of gas bubbles formed therebeneath in said passage, means responsive to suction posterior to said throttle for moving said valve to its most restricting position at relatively high suction, and means for fully opening said valve when there is no suction posterior to said throttle.

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