May 29, 1951 H. A. CARLSON 2,554,660

CARBURETOR

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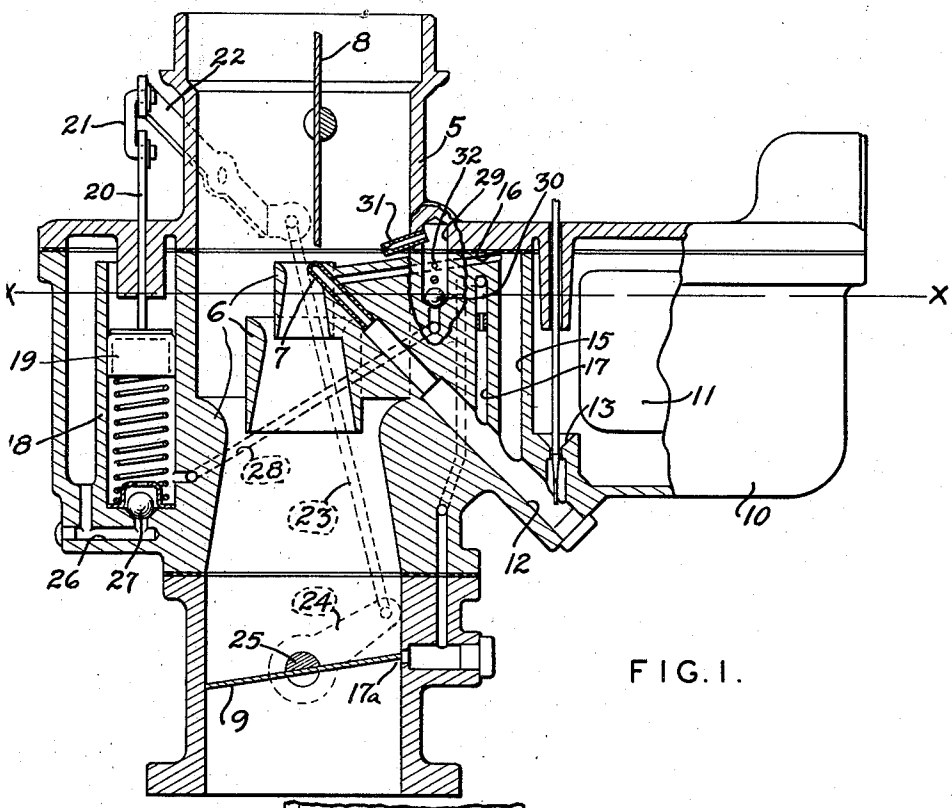

FIG. 1.

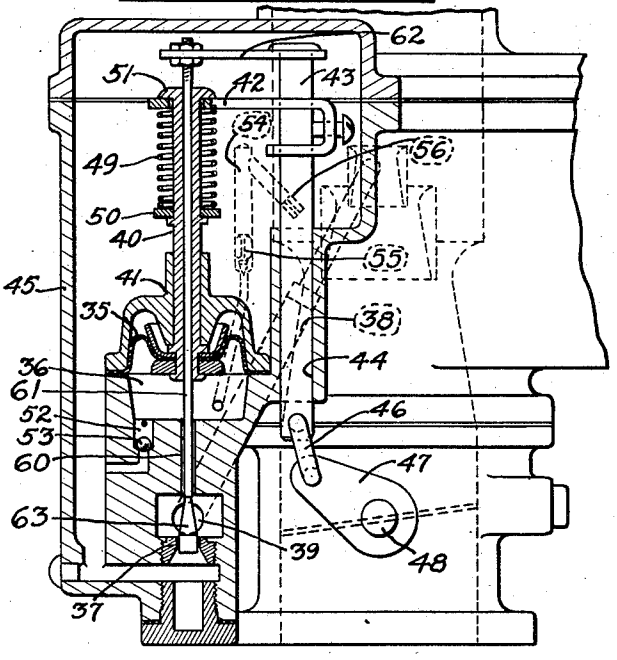

FIG. 2.

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CARBURETOR

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6 Claims. (Cl. 261—34)

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This invention relates to carburetors for internal combustion engines and consists particularly in novel means for accelerating the discharge from the main nozzle as the throttle valve is opened.

In an induction carburetor where the main nozzle discharges anterior to the throttle, fuel is supplied when the throttle is closed, through an idling port posterior to the throttle. As the throttle is opened, the effective fuel discharge is transferred from the port to the main nozzle because of changed suction conditions. There is usually a slight lag in the fuel discharge from the main nozzle during the transfer period because of the greater inertia effect in the liquid fuel than in the air component. Furthermore, where the idling port is interconnected with the main nozzle suction through the idling system tends to retard the main nozzle discharge. In order to eliminate a lean or "flat" condition such carburetors are customarily provided with an accelerating pump operated either by the throttle or by a suction responsive device for injecting an auxiliary charge into the carburetor barrel and engine intake conduit as the throttle is opened or the intake suction drops. It is desirable, however, to accelerate the main nozzle discharge under transfer conditions as much as possible.

A difficulty in current types of accelerating pumps is that when the pump is inactive, the body of fuel trapped in its pressure chamber may become excessively heated and vaporize with the results that upon the next pump discharge, the trapped vapor is merely compressed and very little of the liquid fuel injected into the carburetor. Also, heating of the fuel in the main nozzle causes spilling or "percolation" into the intake manifold.

Accordingly, it is an object of the present invention to provide means for accelerating the discharge from the main fuel nozzle as the throttle valve is opened.

A more detailed object is to utilize the accelerating pump for injecting the usual atomized stream of fuel into the carburetor mixture conduit and, simultaneously, to raise the fuel level in the main nozzle.

Another object is to provide means for eliminating or reducing vaporization of fuel in the pump pressure chamber.

Another detailed object is to provide means causing constant circulation through the pump chamber so that cool fuel is maintained therein without substantially reducing the effectiveness of the pump.

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These objects and other more detailed objects hereafter appearing are attained by the device illustrated in the accompanying drawing in which

Fig. 1 is a vertical section illustrating an automotive carburetor embodying the invention.

Fig. 2 is a side view and section of a carburetor embodying a modification.

The carburetor in Fig. 1 comprises a downdraft mixture barrel or conduit 5 enclosing a series of Venturi tubes 6 into the smallest of which discharges the main fuel nozzle 7. The admission of air to the upper end of the conduit is controlled by a choke valve 8 and the discharge of mixture is controlled by a throttle valve 9. Adjacent the mixture conduit there is provided a constant level chamber 10 enclosing the usual constant level mechanism including a float 11. An upwardly inclined main fuel passage 12 communicates with the lower part of the constant level chamber through a metering orifice element 13 and, at its upper extremity, terminates in main fuel nozzle 7. A vapor relief duct 15 of ample proportions extends vertically from main fuel passage 12 and its upper extremity is connected by a cross duct 16 to main fuel nozzle 7 above normal fuel level X—X. Ducts 15 and 16 cooperate to release vapor bubbles formed in the base of passage 12 as disclosed and claimed in my Patent No. 2,241,655. Idling fuel is supplied through passages 17 and port 17a discharging adjacent and posterior to the edge of the throttle when closed.

Formed in another portion of the constant level chamber is an accelerating pump cylinder 18 in which works a pump piston 19 connected by a rod 20 and link 21 to a pivoted lever 22 operated by a link 23 and arm 24 rigid with throttle shaft 25. The pump cylinder is connected by a passage 26 controlled by inlet check 27 to the constant level chamber. A pump discharge passage 28 extends to a chamber 29 receiving outlet check 30, and restricted pump nozzle 31. A cross port 32 connects chamber 29 and the pump outlet passage to vapor relief cross duct 16 and the main nozzle.

In operation of the accelerating pump, closing of the throttle valve raises the pump piston and draws a charge of fuel past inlet check 27 into the pump pressure chamber. Upon opening of the throttle, a charge of fuel is forced through passage 28, chamber 29, and restricted outlet nozzle 31 into the mixture conduit. The pump discharge enters the mixture conduit in the form of a fine, atomized stream and with considerable force so as to enrich the mixture supplied

to the engine during the short interval when the fuel discharge is transferring from the idle port to the main nozzle. In order to accelerate the functioning of the main nozzle at this time, a portion of the accelerating pump discharge passes through port 32 into cross duct 16 and the upper part of the main nozzle so as to raise the level therein and consequently accelerate the main nozzle discharge. Excessive pressure in the pump, due to heating of the fuel, may be relieved through passages 28 and 16 and nozzle 7.

In the form in Fig. 2, an accelerating pump diaphragm 35 is mounted in a chamber 36 formed directly above main metering orifice element 37 communicating with the base 39 of main fuel passage 38. Diaphragm 35 has an actuating plunger 40 rigidly attached thereto which slides in a closely fitting opening in pump chamber cap 41. A bracket 42 is rigidly connected to the upper portion of a link 43 which slides in a guide opening 44 formed in constant level chambers 45 and is connected by a link 46 and arm 47 to throttle shaft 48. The bracket slidably receives plunger 40. A coiled spring 49 compressed between bracket 42 and a washer 50 on the plunger provides for yielding actuation of the pump diaphragm in the discharging direction as the throttle valve is opened. As the throttle is closed, bracket 42 engages the enlarged head 51 on plunger 40 to move the diaphragm in the upward or charging direction. Fuel is drawn into pressure chamber 36 through passage 52 past an inlet check valve 53 and is discharged through passage 54 past outlet check 55 and through restricted nozzle 56 into the mixture conduit.

A vertical duct 60 connects pump pressure chamber 36 with main nozzle cross passage 39 and loosely receive an elongated metering pin 61 which slidably extends through the diaphragm and plunger 40 and is adjustably connected at its upper extremity to a bracket 62 secured to previously mentioned pump actuating link 43. Pin 61 has a conical part 63 at its lower extremity cooperating with main metering orifice element 37 for varying the effective opening therein in accordance with the throttle position.

Pump inlet passage 52 is of ample size and inlet check 53 is relatively light so that during normal operation of the carburetor with the pump diaphragm stationary, fuel is constantly drawn through duct 52, the pump chamber, passage 60 and the main nozzle into the carburetor. This circulation in the pump chamber insures the presence of relatively cool fuel in the chamber as long as the carburetor is operating. When the throttle is opened, a portion of the pump discharge is injected into the mixture conduit through pump nozzle 56 and another portion passes downwardly through passage 60 into the main nozzle so as to raise the level thereof and, consequently, cause the main nozzle to discharge sooner during opening of the throttle than would be the case, otherwise.

Very little clearance is provided between metering pin 61 and the wall of plunger 40 but this is sufficient to relieve the excess pressure of vapor formed in the diaphragm chamber and which may rise thereinto from duct 60. This relief, together with the circulation mentioned above, substantially avoids the possibility of vapors being trapped in the pump chamber and also serves as an "anti-percolation" device for the main nozzle. However, there is no substantial loss around the pin during actuation of the pump and air cannot bleed downwardly into chamber 36 and the main nozzle because any suction in the chamber will be amply satisfied through the large pump inlet passage.

In both forms of the invention, the accelerating pump functions in its normal manner to inject a fine stream into the mixture conduit, but a portion of the discharge thereof also serves to accelerate the discharge from the main nozzle during the transfer period in a desirable manner. Various features illustrated are not essential and others may be modified as will occur to those skilled in the art. Exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a carburetor, a mixture conduit, a constant level fuel chamber, a main fuel nozzle extending from the lower part of said chamber upwardly at an angle into said conduit, a vapor releasing passage extending upwardly from the base of said nozzle and then sidewardly into the upper extremity thereof, and an accelerating pump having a discharge nozzle opening into said conduit and a second discharge passage opening into said vapor release passage adjacent its terminus in the upper extremity of said main nozzle.

2. In a carburetor, a mixture conduit having a throttle, a constant level fuel chamber, a main fuel passage extending upwardly at an angle from said chamber into said conduit, a metering orifice element in said passage, an idling passage connecting said nozzle downstream of said orifice element and said mixture conduit posterior of said throttle, a vapor relief duct projecting from said main nozzle more sharply upwardly than the same, and an accelerating pump having a discharge passage communicating directly with said conduit and having a restricted connection to said duct adjacent said nozzle for simultaneously injecting a charge of fuel directly into said conduit and accelerating the discharge from said nozzle when said pump is discharged and for releasing gas pressures from said pump.

3. In a carburetor, a mixture conduit having a throttle, a constant level fuel chamber, a main fuel nozzle extending upwardly at an angle from said chamber into said conduit, a metering orifice element in the lower part of said nozzle, an idling passage connecting said nozzle downstream of said orifice element and said mixture conduit posterior to said throttle, an anti-percolator duct projecting from the lower part of said nozzle more sharply upwardly than the same and a throttle operated accelerating pump having a discharge passage communicating directly with said conduit and also, through a restricted orifice, with said duct and said nozzle for simultaneously injecting a charge of fuel directly into said conduit and into said main nozzle so as to accelerate the discharge from said main nozzle when said throttle is opened from idle position and for venting gas pressure from said pump through said duct.

4. In a carburetor, a mixture conduit, a fuel chamber, a main fuel supply passage extending upwardly at an angle between horizontal and vertical from said chamber into said conduit, an accelerating pump chamber located above said main passage, a duct connecting said main passage and said pump chamber and extending more sharply upwardly than said main passage for venting gases from said main passage into said pump chamber, and a restricted pressure relief passage in the upper wall of said pump

chamber for venting gases from said pump chamber.

5. In a carburetor, a mixture conduit, a fuel chamber, a main fuel discharge passage extending upwardly at an angle between horizontal and vertical from said chamber into said conduit, an accelerating pump pressure chamber located directly above the lower portion of said main passage, a duct connecting said pump chamber and a part of said main passage located immediately therebelow, a fuel metering orifice for said main passage in line with said duct, a vent opening in the upper wall of said pump chamber, and a metering pin extending through and closely fitting within said opening and also extending through said duct and controlling said metering orifice, said vent opening serving to release vapors rising from the lower part of said main nozzle and from said pump chamber without substantial loss of liquid fuel from said pump chamber around said metering pin.

6. In a carburetor, a mixture conduit, a fuel bowl, a main fuel supply passage extending from said bowl upwardly into said conduit, a vapor relief duct extending upwardly from said passage, an accelerating pump, a discharge passage connecting said pump and said conduit, and a fluid connection between said pump and said main passage and including said duct for directing a part of the pump discharge into said main passage.

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