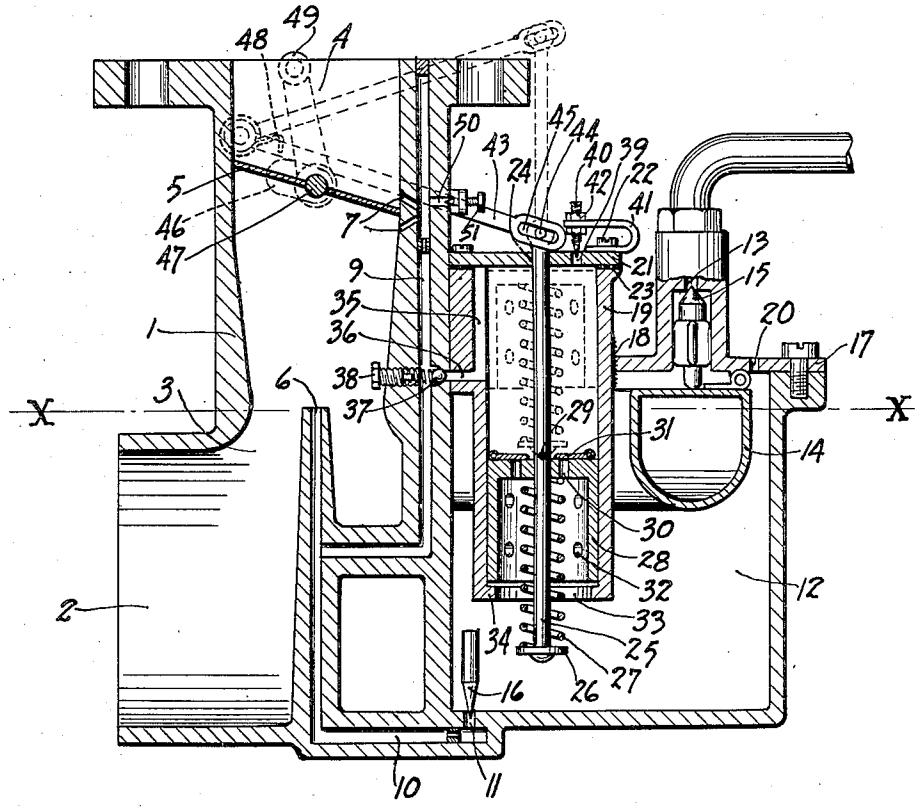
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CARBURETOR

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CARBURETOR

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This invention relates to carburetors and more particularly has reference to acceleration devices therefor that are controlled in accordance with the temperature of the carburetor.

For quick and powerful acceleration of an internal combustion engine, the desirability of delivering an additional fuel charge to the intake manifold in the minimum of time after the throttle is opened has long been recognized in the art, but the various schemes heretofore proposed for this purpose have not given satisfactory results because they have all fed the accelerating fuel charge through the main jet nozzle or a separate nozzle leading into the mixing chamber closely adjacent to the main nozzle. Both of the nozzles are in the region of low suction when the throttle is closed and are also so far distant from the throttle that a considerable time lag is inevitable between the opening of the throttle and the arrival of the accelerating fuel at the intake manifold. The advantage of proportioning the amount of the accelerating fuel charge to the throw of the throttle and to the temperature of the carburetor is also generally appreciated, but so far as I am aware, no one has as yet devised an acceleration device which achieves all these desirable results in a single mechanism which is simple and effective.

An object of this invention is to devise a carburetor that reduces to a minimum the time required to deliver the accelerating fuel charge to the outlet of the carburetor by feeding said charge direct to the mixture outlet in the region of high suction above the throttle without passing through the main nozzle or mixing chamber of the carburetor.

Another object of this invention is to provide a carburetor wherein the accelerating fuel charge is proportioned to the throw of the throttle when same is suddenly opened.

Still another object of this invention is to devise an acceleration device for carburetors wherein the feed of accelerating fuel is partly by gravity and partly by superimposed pressure.

A still further object of my invention is to devise an acceleration pump in which the output is regulated in accordance with the temperature of the carburetor.

With these and other objects in view which may be incident to my improvements, my inventions consists in the combination and arrangement of elements hereinafter described and illustrated in the accompanying drawing which shows in central longitudinal section a carburetor embodying my improvements.

In the drawing, the reference numeral 1 indicates the body of a conventional carburetor comprising the usual air intake 2, mixing chamber 3, and mixture outlet 4 controlled by a throttle valve 5. The main nozzle 6 and idle feed 7 communicate through passageways 9 and 10 and port 11 with float chamber 12 which is supplied with liquid fuel through inlet 13 from the main fuel tank (not shown). Float 14 and valve 15 maintain the liquid fuel at a constant level indicated by the line X—X in the well known manner, while a valve 16 seating in port 11 controls the main flow of liquid fuel to nozzle 6 and idle ports 7 through suitable calibrated metering restrictions as shown in passageways 9 and 10. The float chamber 12 has a cover 17 which is provided with a threaded opening 18 into which is threaded a cylinder 19 which is supported by cover 17 and extends partly into float chamber 12 and partly above cover 17 as clearly shown in the drawing. Cover 17 is also provided with a vent 20 through which atmospheric pressure is maintained on the liquid fuel in the float chamber at all times.

Cylinder 19 is closed at its upper end by a cover 21 which is securely held in place by screws 22 and made liquid tight by the interposition of a gasket 23 as shown. Cover 20 is provided with a central aperture 24 through which reciprocates a closely fitted piston rod 25 which is provided at its lower end with a washer 26 forming a seat for a helical spring 27 which surrounds piston 25 and bears against the lower face of a piston 28 slidably mounted on piston rod 25. A pin 29 limits the upward travel of piston 28 on rod 25 while spring 27 opposes its downward travel thereon. Piston 28 is provided with a plurality of passageways 30 each controlled by a flap check valve 31 so that while liquid fuel may ascend through piston 28 it is prevented from returning by valves 31. Piston 28 is also provided with a series of surge holes 32 which permit the escape of any air or vapor that might be trapped under the piston while it is descending from its uppermost position back into float chamber 12.

Cylinder 19 is provided at its lower end with an aperture 33 which permits the free entrance of spring 27 and liquid fuel from float chamber 12 to the interior of the cylinder. An integral flange 34 on the lower end of cylinder 19 provides a bottom rest for piston 28 when in its lowermost position. A grooved channel 35 in the inner face of cylinder 19 adjacent mixing chamber 3, extends from the top of the cylinder to a point near its mid-section where it merges with a passage-

way 36 which in turn communicates with passageway 9 of the idle feed system. Groove 35 permits the continuous escape of liquid fuel from cylinder 19 through passageway 36 from the time the top of the liquid in the cylinder reaches the level of passageway 36 until piston 19 completes its upward stroke while the skirt of the piston prevents any escape of liquid fuel from groove 35 back into cylinder 19.

Passageway 36 is provided with a spring pressed ball check valve 37 which is adjusted by screw 38 and prevents the return of any liquid fuel or air from passageway 9 into cylinder 19 when piston 28 is descending.

The admission of air and the escape of air and vapor from cylinder 19 is regulated by a vent 39 in cover 21 and a thermostatically controlled valve 40 which seats in vent 39 and determines its free opening. Valve 40 is actuated by a thermal element 41 which is fixed to cover 21 by screw 22 and attached to valve 40 by means of a pair of screw threaded nuts 42 which engage the stem of valve 40 and bestride element 41 in such a manner as to permit valve 40 to be readily adjusted with reference to element 41. Thermostat 41 is so arranged and calibrated as to raise or lower valve 40 a predetermined amount for each degree change in temperature of the carburetor so that the amount of air escaping through vent 39 is regulated in accordance with temperature by valve 40.

Piston rod 25 is connected at its upper end with a lever 43 by means of a pin 44 which engages in a slot 45 near the free end of the lever. Lever 43 is pivoted at its other end in a boss on the outer wall of the carburetor body 1 and is engaged by a cam 46 which is fixed on throttle shaft 47 so that as throttle 5 is opened lever 43 is raised and in turn lifts piston rod 25 and piston 28 as clearly shown in the drawing. A helical spring 48 coiled around the axis of lever 43 engages said lever so as to force it down whenever cam 46 is lowered by closing throttle 5. Spring 48 thus keeps lever 43 always in contact with cam 46. When throttle 5 is closed lever 43 descends and carries piston rod 25 and piston 28 down always as far as cam 46 permits and no more. Thus the travel of piston 28 is proportioned to the throw of throttle 5 and throttle lever 49, which is fixed to shaft 47 and connected to the accelerator pedal (not shown). As cylinder 19 is of constant cross section, it is obvious that the volume of liquid fuel trapped above piston 28 is proportioned to the travel of the piston below the level of the liquid fuel in chamber 12, so that the amount of accelerating fuel charge is thus proportioned to the throw of the throttle. That is to say, the nearer the throttle is brought to closed position, the deeper the submergence of piston 28 below the liquid fuel level X—X in chamber 12 and the greater the volume of liquid fuel trapped above piston 28 and forced by said piston from cylinder 19. At the same time the fit of piston 28 in cylinder 19 is made so that liquid fuel may escape between the walls of the piston and cylinder at such a rate that when the throttle is opened slowly so liquid remains in cylinder 19 by the time the top of piston 28 reaches the level of passageway 36 and thus no accelerating liquid fuel is discharged into the carburetor. If, however, the throttle is opened quickly, the travel of piston 28 is so rapid there is no time for the escape of liquid fuel in cylinder 19 past the piston and an accelerating fuel charge is delivered to the carburetor in proportion to the throw of the throttle.

It will be noted that the shape of cam 46 is such that lever 43 (and piston 28) move a relatively great distance as compared to the throttle movement at the beginning of the opening of the throttle and thereafter at a relatively smaller ratio. This is for the reason that the first part of the upward stroke of piston 28 discharges no accelerating liquid fuel from cylinder 19 but merely raises its level in said cylinder, and it is therefore desirable that this part of the stroke of piston 28 be accomplished with a very small opening movement of the throttle, that is, during the transitional stage when the carburetor feed passes from the idle nozzle 7 over to the main jet 6.

It will be further noted that the accelerating liquid fuel is discharged direct into the idle feed passageway where it supplements the idle feed and thus reaches the mixture outlet of the carburetor (and intake manifold) in the minimum of time. By discharging the accelerating fuel through the idle feed system instead of through the main jet system, a two-fold advantage is secured. Not only is its path to the outlet of the carburetor greatly reduced by not having to traverse the mixing chamber, but also the idle feed nozzle being located in the region of high vacuum beyond the throttle, the suction inducing the accelerating fuel feed is greatly increased. The result of these two effects is to so reduce the lag of the accelerating fuel in reaching the engine intake that lean spots during acceleration are eliminated.

Spring 27 is interposed between piston 28 and rod 25 for the dual purpose of cushioning the strain upon the lever 43 and cam 46 during the initial opening movement of the throttle when the pitch of the cam is greatest, and also to prolong the pumping action of the piston 28 after rod 25 has come to rest. This latter effect is secured by the release of the energy stored up in the spring during its compression at the beginning of the upward stroke of rod 25.

Communicating with idle feed passage 9 at a point opposite feed ports 7 is an air bleed 50 controlled by a manually adjustable regulating valve 51. The purpose of this air bleed is to admit a regulated amount of atmospheric air to the idle feed passageway 9 to form a mixture of proper proportions for the idling operation of the engine. As soon however, as the throttle is opened a sufficient amount to clear the lower idle feed port 7, the suction on the idle feed system rapidly drops, and as the throttle is opened wider, it reduces the suction on the idle nozzles 7 and becomes less than that on the main jet nozzle 6, whereupon no further feed takes place through ports 7, but the entire feed is supplied by main nozzle 6. By discharging the entire accelerating fuel charge into passageway 9, I thus supplement first the idle feed as long as it lasts and then the main feed. That is to say, when the throttle is first cracked, the suction being stronger on ports 7 than on nozzle 6, the accelerating fuel discharged from cylinder 19 ascends passageway 9 and enters the carburetor through ports 7, but when the throttle is further opened, the suction becomes stronger on nozzle 6, than upon ports 7, whereupon the accelerating fuel from cylinder 19 descends passageway 9 and enters the carburetor through the main nozzle 6. In this manner, I obtain a continuous augmentation of liquid fuel during acceleration and there is no lean spot in the transition from idle to main feed.

The foregoing functions and operations have been described without considering the effect of changes in temperature of the carburetor. In

order that the amount of accelerating charge may be reduced as the temperature of the engine (and carburetor) increases, I have provided in the top of cylinder 19 a vent 39 regulated by a thermostatic valve 40. The functioning of this device is as follows: When vent 39 is fully open, it permits air to enter and leave cylinder 19 freely, so that, notwithstanding the movements of piston 28, substantially atmospheric pressure exists in cylinder 19 at all times when vent 39 is fully open. Under these conditions, due to the lifting of the fuel above the level of passage 36 by the piston 28, the feed of accelerating fuel from cylinder 19 to the carburetor is entirely by gravity, and is at a minimum rate. At the same time, thermostat valve 40 is so arranged and calibrated that vent 39 is only fully open at the highest operating temperature of the carburetor, and as this temperature drops, vent 39 is correspondingly restricted, until it is fully closed at the lowest operating temperature of the carburetor. As vent 39 is thus restricted, the air and vapor in cylinder 19 above piston 28 cannot freely escape upon the upward movement of piston 23, but is trapped in the upper part of cylinder 19 where it exerts a superatmospheric pressure upon the liquid fuel therein. This pressure augments the gravity head mentioned above and causes an increase in the discharge of accelerating fuel from cylinder 19 depending upon the degree to which vent 39 is restricted. In this way the discharge of accelerating fuel is regulated in inverse proportion to the temperature of the carburetor, as it should be for best operating results. It is to be particularly noted, however, that the supply of accelerating fuel is never reduced below the constant flow produced by gravity alone, although the temperature at which this constant flow is established is determined by the adjustment of valve 40.

While I have shown and described the preferred form of my invention, I desire it to be understood that I do not limit myself to the constructional details disclosed by way of illustration, as it is apparent that these may be changed and modified by those skilled in the art without departing from the spirit of my invention or exceeding the scope of the appended claims.

I claim:

1. In a carburetor having a mixing chamber, an accelerating device comprising means for feeding accelerating fuel into said chamber by hydrostatic pressure alone under certain operating conditions and by hydrostatic pressure and pneumatic pressure combined under other operating conditions, depending upon the temperature of the carburetor.

2. In a carburetor having a main fuel nozzle and an idle fuel feed, an accelerating device comprising means for mechanically and bodily, without hydraulic pressure, lifting accelerating fuel above the outlet of said nozzle and means for feeding said accelerating fuel by gravity to said nozzle, and by suction to said idle feed.

3. In a carburetor having a throttle, a main fuel and an idle fuel feed nozzle, an accelerating device comprising means for mechanically and bodily, without hydraulic pressure, lifting a quantity of accelerating fuel proportional to the throw of said throttle above the outlet of said nozzle and means for feeding said accelerating fuel by gravity to said nozzle and by suction to said idle feed.

4. In a carburetor having a throttle, a main fuel nozzle and an idle fuel feed, an accelerating device comprising means for mechanically and bodily, without hydraulic pressure, lifting a quantity of accelerating fuel proportional to the throw of said throttle above the outlet of said nozzle, and means for feeding said accelerating fuel by gravity to said nozzle, and by suction to said idle feed.

5. In a carburetor having a main fuel feed nozzle and an idle fuel feed nozzle, an accelerating device comprising means for feeding accelerating fuel to one or both of said nozzles by gravity and suction under certain operating conditions and by gravity and air pressure combined under other operating conditions.

6. In a carburetor having an idle fuel feed passageway, an accelerating pump comprising combined gravity and compressed air means for discharging the output of said pump into the carburetor through said passageway.

7. In a carburetor having a mixing chamber, an accelerating device comprising combined gravity and pneumatic means for feeding accelerating fuel into said chamber and means for regulating said feed in accordance with the temperature of the carburetor.

8. In a carburetor having a mixing chamber and a main fuel nozzle, an accelerating device comprising means for lifting all of the accelerating fuel above said nozzle and feeding said fuel by gravity into said chamber, and pneumatic means for augmenting said gravity feed as the temperature of the carburetor increases.

9. In a carburetor having a throttle and a main fuel nozzle, an acceleration pump comprising means for lifting all of the accelerating fuel from below to above said nozzle and feeding said fuel into the carburetor, at least partly through said nozzle, by gravity and compressed air pressure, and means for varying said pressure in accordance with the movements of said throttle.

10. In a carburetor having a throttle and a main fuel nozzle, an acceleration pump comprising means for lifting all of the accelerating fuel above said nozzle and feeding said fuel into the carburetor by gravity and pneumatic pressure, means for varying said pressure in accordance with the movements of said throttle, and means for prolonging the pressure in said pump after said throttle is brought to rest.

11. In a carburetor having a main fuel nozzle, an acceleration pump comprising means for lifting all of the accelerating fuel above said nozzle and feeding said fuel by gravity and pneumatic pressure, and means for modifying said pressure so that the output of said pump is inversely proportional to the temperature of the carburetor.

12. In a carburetor having a main fuel nozzle, an acceleration pump comprising means for lifting all of the accelerating fuel above said nozzle and feeding said fuel by gravity and pneumatic pressure, and means for gradually reducing said pressure as the temperature of the carburetor increases, whereby the output of said pump is a maximum at the lowest operating temperature of the carburetor and is gradually reduced to a minimum at the highest operating temperature of the carburetor.

13. In a carburetor having a throttle, a main fuel feed nozzle and an idle fuel feed nozzle, an accelerating fuel pump comprising combined gravity and compressed air means for temporarily increasing the fuel feeds from said nozzles inversely as the temperature of the carburetor, when said throttle is opened.

14. In a carburetor having a throttle, a main fuel feed nozzle and an idle fuel feed nozzle, an

accelerating fuel pump comprising combined gravity and compressed air means for temporarily increasing the fuel feeds from said nozzles when said throttle is opened.

15. In a carburetor having a main fuel feed nozzle and an idle fuel feed nozzle, an accelerating fuel pump comprising combined gravity and compressed air means for temporarily increasing the fuel feed through said idle nozzle, until the suction on said main nozzle exceeds the suction of said idle nozzle, and thereafter increasing the fuel feed through said main nozzle.

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