

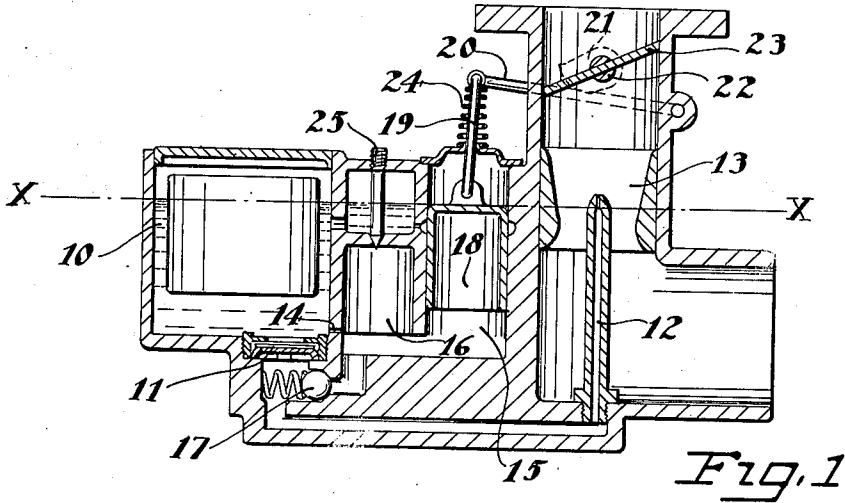
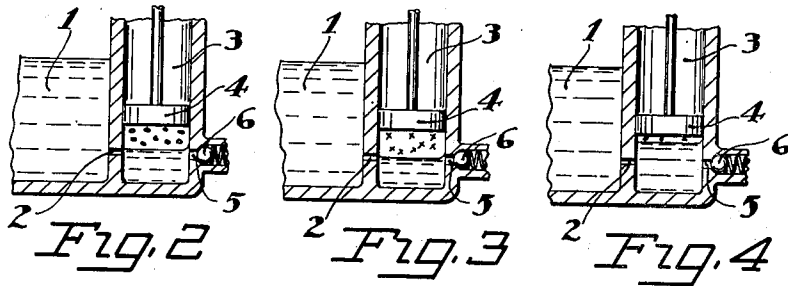
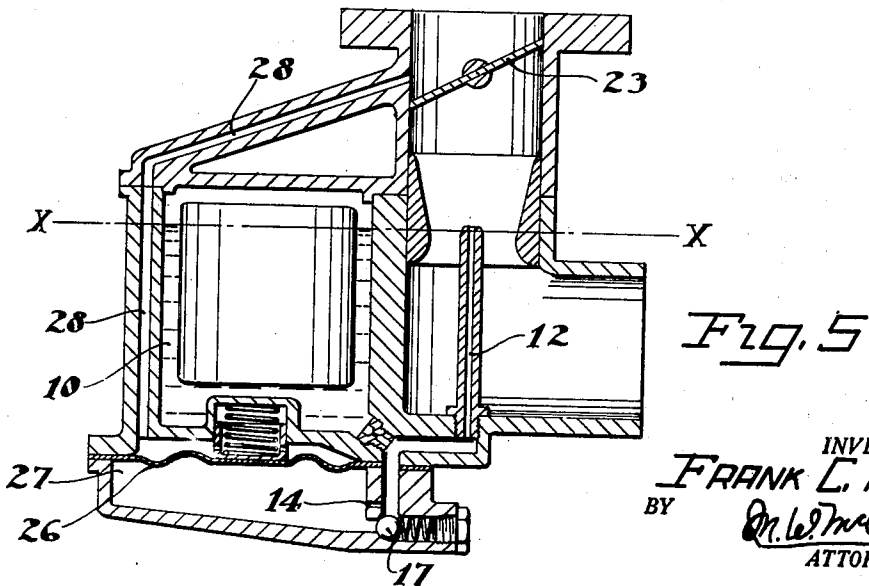
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CARBURETOR

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CARBURETOR

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3 Claims. (Cl. 261—34)

This invention pertains to carburetors for mobile internal combustion engines and more particularly has reference to accelerating devices for same.

It is well known in the carburetor art that a thermal control of the accelerating discharge is desirable. With an intake system too cool for instantaneous vaporization of the fuel, very much better operation and response to the throttle is obtained with an accelerating charge of volume equal to several cylinder charges, delivered when the throttle is open. With a properly designed carburetor, when the intake system is so warm that it contains no liquid gasoline, no accelerating charge is necessary and even a very little is highly detrimental.

There have been proposed for acceleration various piston and diaphragm pumps embodying in their construction a dome which contains air when gasoline is first admitted to the carburetor, and a little air and considerable gasoline vapor, after the carburetor has been heated and cooled a number of times. In this latter condition, the contents of the dome chamber of the pump would be liquid gasoline when the engine is cold and vapor when the engine is warm. In every case, however, the resistance to delivery from the pump is so slight that substantially the full volume of displacement is delivered as a discharge.

An object of this invention is to provide a carburetor in which the accelerating charge is controlled according to the operating temperature of the intake system.

Another object of this invention is to provide a carburetor in which the accelerating pump delivers a full accelerating charge equal in volume to several cylinder charges when the intake system is cool and substantially no accelerating charge when the intake system is warm.

Another object of my invention is to provide a carburetor in which the accelerating discharge is controlled according to the volatility of the fuel.

Still another object of my invention is to devise an acceleration pump in which the dome chamber is relatively large in proportion to the pump displacement, and the outlet valve is controlled by a spring of considerable resistance, say equivalent to seven pounds per square inch, so that when the dome chamber is filled with vapor, the outlet valve will not be open. With such an arrangement, the displacement of the pump will be largely or wholly taken up in compressing the vapor and little or no fuel will be delivered by the action of the pump. If the carburetor were cooled slightly so that the dome chamber were filled with

vapor only equal to the displacement of the pump, the first half of the pump stroke would be required to raise the dome pressure to a point where it would open the control valve, and the second half of the pump stroke would deliver fuel, and so on. Because of this delay in action, it is preferable to have the pump operated by manifold vacuum.

With these and other objects in view which may be incident to my improvements, my invention consists in the combination and arrangement of elements hereinafter described and illustrated in the accompanying drawing in which:—

Figure 1 is a vertical section of a carburetor embodying my improved accelerating device,

Figures 2, 3 and 4 are fragmentary sectional views somewhat diagrammatic, illustrating the general principle of vapor control of the pump action,

Figure 5 is a modified form of accelerating device which is controlled by manifold vacuum and in which a diaphragm is substituted for the piston in Figure 1.

Referring first to Figures 2, 3 and 4, the reference numeral 1 denotes a fuel chamber which communicates through a small orifice 2 with a pump cylinder 3 in which reciprocates an air tight piston 4. Near the bottom of cylinder 3 is a relatively large escape port 5 controlled by a spring pressed check valve 6. Figure 2 depicts what happens when fuel is first admitted to cylinder 3 from chamber 1, i. e. air is trapped under piston 4. If now the temperature of the device rises, the air expands and escapes as bubbles through the communicating port 2; also vapor rises from the liquid in cylinder 3 and begins to occupy the space under the piston. This causes a partial displacement of the air with the result that bubbles of both air and vapor escape through port 2. If this process were continued long enough, practically all the air would be expelled and only vapor left in cylinder 3, as indicated in Figure 3.

Figure 4 shows what happens if the device is then cooled to its original temperature; the vapor condenses and liquid fuel is drawn up to fill the space under the piston. If the device is then again warmed up to the temperature of Figure 3, vapor will be generated and fill the space in cylinder 3 above port 2. To obtain the regulation desired, the spring of the outlet valve 6 is made of such a tension that it will not open under the compression generated in the pump cylinder 3 when the dome of pump cylinder is filled with air or vapor. Obviously, it

will have to open when the pump is operated if the dome is full of liquid.

In the embodiment shown in Figure 1, the reference numeral 10 denotes a float chamber filled with fuel to a constant level X—X. The fuel passes downward from chamber 10 through a flat disk check valve 11 to main jet 12 of the carburetor, and is drawn from this jet by the suction of the air through the Venturi tube 13 in the usual manner. Connected with float chamber 10 by a small orifice 14 is a pump cylinder 15 with an additional dome 16 which in turn is connected to the fuel passage by a spring pressed check valve 17. Reciprocating in cylinder 15 is an air-tight hollow piston 18 which is connected through link 19 and lever 20 to a cam 21 on shaft 22 of throttle 23. A spring 24 surrounding link 19 bears against the end of lever 20 and keeps it in contact with cam 21.

When fuel is first admitted to the carburetor, dome 16 and also the space in piston 18 will remain full of air, but after the carburetor has once been heated up to the boiling point of the most volatile fraction of the fuel, these spaces will largely lose their air contents and be filled with vapor, as previously explained. On cooling again domes 16 and 18 will be almost entirely filled with liquid fuel. The force of the spring of valve 17 is so proportioned to the volumes 16 and 18 and the displacement of piston 18 upon its downward stroke, that when the carburetor is hot, operation of the pump will not produce enough pressure in 16 and 18 as to move valve 17 off its seat; with the carburetor cold, and no air in the pump, almost the whole displacement of piston 18 will be discharged through valve 17, (except for leakage through port 14 and past the piston 18). It will be observed that when discharge occurs through valve 17, check valve 11 is raised against its seat, thus preventing flow from the accelerating pump into the float chamber. During the short time the piston 18 is descending when the pump is operated quickly, the back flow of fuel through port 14 is negligible due to the restricted size of the port. Also, due to the continuous opening of port 14, the discharge of the pump is necessarily less when the pump is operated slowly than when it is operated quickly, as is desirable, because slow opening of the throttle does not require as much accelerating discharge as a quick one.

It will be noted that the theoretical device shown in Figures 2, 3 and 4 does not have a gradual operation with a change in temperature, but changes rather abruptly as the temperature of the fuel passes the boiling point of its lightest fractions. To obtain a certain graduation, two chambers, 16 and 18, are provided. As heat is usually received by the carburetor both from the air going through it and by conduction from the engine to which the carburetor is bolted, chamber 16, which is an integral part of the carburetor casting, will usually be warmer than the space in piston 18, which is separate from the body of the carburetor. The dome 16 will therefore empty sooner than space 18, and a graduated control is thereby obtained. A screw threaded needle valve 25, is provided as a means of venting the dome 16 when the engine is cold, thereby

bringing the pump into full action at once waiting for an initial heating up.

Figure 5 shows an arrangement in which a vacuum actuated diaphragm 26 is substituted for the mechanically operated piston 8 of Figure 1. Diaphragm 26 is secured in a supplementary chamber 27 below the float chamber 10 in such a position that its upper surface is subject to fluctuations in vacuum above throttle 23 through passageway 28. The space in chamber 27 corresponds to that in piston 18 in Figure 1, and is filled with fuel through restricted port 14. The construction shown in Figure 5 also differs from the construction of Figure 1 in that the pump is refilled from the passage between the metering orifice and the jet outlet; the orifice, 14, in this case is made very small, so that closing of the throttle 23 gives a very slow refill, which is sufficient to make the main jet 12 discharge about 10% leaner during the time refill takes place.

From the foregoing description, it is clear that I have devised a novel and effective means for automatically controlling the accelerating discharge according to temperature and to volatility of the fuel.

While I have shown and described the preferred form of my invention, I desire it to be understood that I do not intend to be confined to the constructional details shown as these may be modified and changed 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, an accelerating pump comprising a cylinder, a piston in said cylinder, an auxiliary dome chamber communicating with said cylinder, and a pressure actuated outlet valve controlling the flow of fluid from said cylinder and chamber, said chamber being of such size relative to the displacement of said piston that said outlet valve will not open when said chamber is filled with vapor but will open when said chamber is partially filled with liquid fuel.

2. In a carburetor, an accelerating pump comprising a cylinder and piston therein; an auxiliary dome chamber communicating with said cylinder, a pressure actuated outlet valve regulating the flow of fluid from said cylinder and chamber, said valve being controlled by a spring and said chamber being of such size relative to the displacement of said piston that when said chamber is filled with vapor, the internal pressure developed by the displacement of said piston is insufficient to overcome the force of said spring and open said valve.

3. In a carburetor, an accelerating pump comprising a cylinder, an inverted cup shaped piston in said cylinder having an imperforate upper portion for containing vapor, an auxiliary vapor chamber communicating with said cylinder, and a pressure actuated outlet valve controlling the flow of fluid from said cylinder and chamber, said chamber being of such size relative to the displacement of the piston that the outlet valve will not open when the chamber is filled with vapor but will open when the chamber is partially filled with liquid fuel.

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