

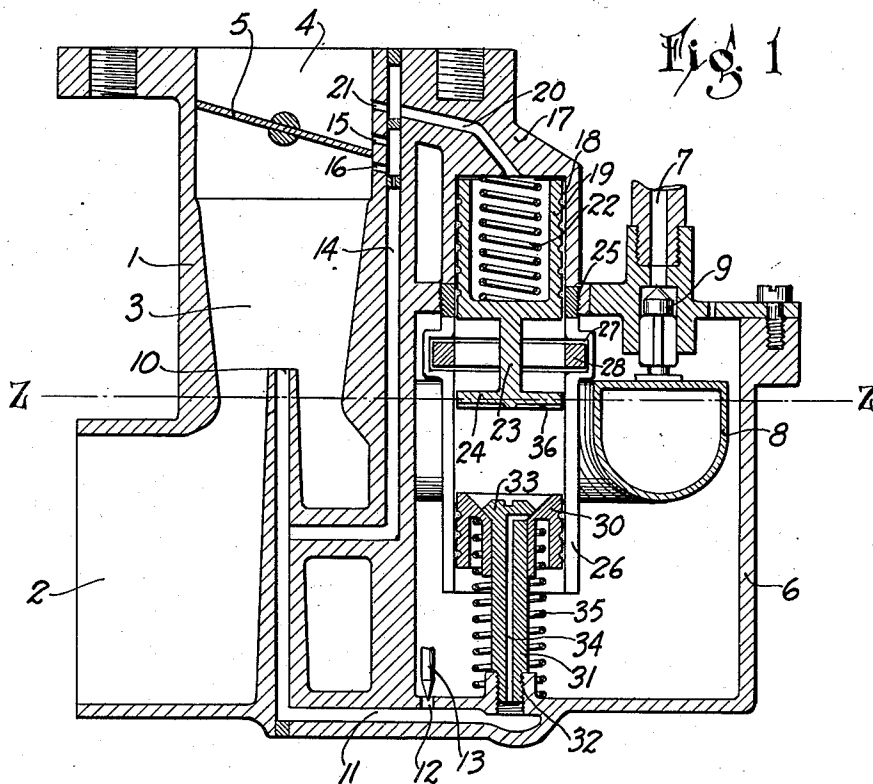
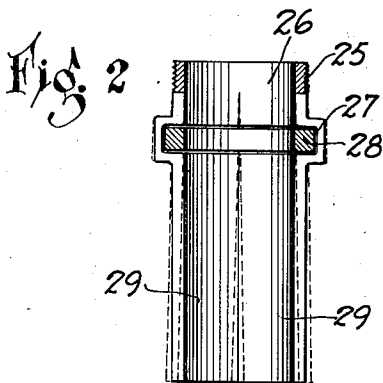
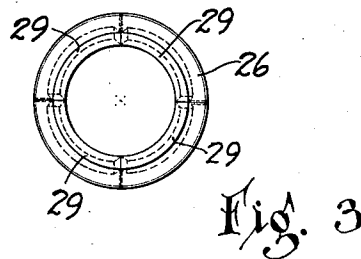
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CARBURETOR

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CARBURETOR

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10 Claims. (Cl. 261—34)

This invention pertains to carburetors for mobile internal combustion engines and more particularly has reference to temperature control of acceleration pumps therefor.

5 It has long been known in the carburetor art that the amount of additional fuel required for accelerating the engine when the throttle is suddenly opened varies with the temperature of the engine and carburetor. Thus, for a cold engine
10 a relatively large accelerating charge of liquid fuel is required, and as the engine warms up a gradually decreasing amount of accelerating fuel is needed until a certain temperature is reached when no accelerating fuel is necessary, and if
15 any is supplied, it not only does not assist acceleration, but actually hinders it.

The problem has heretofore been to control the output of the acceleration pump or device in accordance with these requirements, and several
20 schemes have been proposed for this purpose. These generally have depended upon either regulating the air pressure on the liquid fuel chamber which supplies the accelerating charge, by means of a thermostatically controlled valve, or
25 varying the stroke of the acceleration pump by some thermally responsive element. Both of these schemes are attended with certain disadvantages. The thermostatic air valves do not give a sufficiently close control of the volume of
30 accelerating charge as related to the temperature, because the length and duration of the stroke of the piston creating the air pressure influences the amount of the accelerating charge far more than the thermostatic valve can com-
35 pensate. Also they depend upon the temperature of the air which is often different from that of the liquid fuel. And the method of varying the stroke of the pump does not give a sufficiently responsive device when suction controlled and
40 materially increases the difficulty of operating the throttle when the pump is mechanically connected thereto.

An object of this invention is to overcome the above difficulties by providing a form of thermostatic control of the output of the accelerating
45 pump which does not necessitate or depend upon air pressure for varying the stroke of the pump, but which shunts a portion of the accelerating charge back to the liquid fuel (float) chamber depending upon the temperature.

50 Another object of my invention is to provide a temperature control for an acceleration pump which depends primarily upon the temperature of the liquid fuel and not upon the temperature
55 of the air or body of the carburetor.

Still another object of my invention is to provide a temperature control of an acceleration pump which is fully automatic in action and requires no operating adjustments.

A still further object is to provide a simple
5 self-contained device for this purpose which does not discharge liquid fuel or vapor outside the carburetor where it may constitute a fire hazard.

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

Figure 1 shows in central longitudinal section
15 a carburetor embodying my improved acceleration pump.

Figure 2 is a central longitudinal section of the cylinder or body of my improved pump.

Figure 3 is a bottom plan view of the same.
20 Referring specifically to Figure 1, the reference numeral 1 denotes the body of the carburetor which consists of the usual air intake

2, mixing chamber 3, and mixture outlet 4, controlled by a throttle valve 5. Cast integrally
25 with the body 1 is a liquid fuel float chamber 6, which is supplied with liquid fuel by a pipe 7, leading to a main supply tank (not shown). Within the chamber 6 is a float 8 which acts on
30 valve 9 to maintain the level of the liquid fuel in said chamber at the normal static level indicated by the line Z—Z.

Positioned within mixing chamber 3 is a main fuel nozzle 10 which communicates through a
35 passageway 11 and port 12 with float chamber 6. Port 12 is controlled by a needle valve 13 which serves to regulate the main jet discharge and thus controls the normal operating mixture.

The slow speed or idle feed is delivered through a passageway 14 which runs from nozzle
40 10 to a plurality of ports 15 and 16 which beside the throttle 5 when in closed position, in a well known manner.

Integral with the body 1 is an extension
45 having a cylindrical bore 18 in which reciprocates a piston 19 as clearly shown in Figure 1. The cylinder 18 communicates with the mixture outlet 4 and (when the throttle is open) mixing chamber 3, by means of a passageway
50 20 and port 21, so that fluctuations in vacuum in the mixture outlet and mixing chamber are transmitted to the cylinder 18 and actuate the piston 19 in opposition to a spring 22 which is positioned within the piston 19 as shown in
55 Figure 1.

Piston 19 carries on its lower end a stem 23, and head 24 for a purpose as will hereinafter appear.

Securely attached, as by screw threads 25, to the lower end of cylinder 18 is a cylindrical sleeve 26 which depends from the top of float chamber 6 and is partially immersed in liquid fuel at all times. At a short distance below its upper end, sleeve 26 is provided with an annular groove 27 for the reception of an expansion ring 28 (see Figures 1 and 2). At a point just below the threads 25, sleeve 26 is split into a plurality of segments 29, of which four are shown in Figures 2 and 3, and the sleeve is so designed that at a certain predetermined temperature, segments 29 abut each other closely so that there is substantially no liquid leakage therebetween. For this purpose sleeve 26 is made of an elastic metal having a relatively low coefficient of expansion, such, (for example) as invar steel, and the segments 29 are given such an initial stress as will make them tend to cling tightly at all times.

The ring 28 is made in two semi-circular parts of a metal of relatively high coefficient of expansion, such (for example) as aluminum, so that when this ring is assembled in groove 27, its inner surface is flush with the bore of sleeve 26 while its outer surface abuts and bears against the inner surface of groove 27 as clearly shown in Figure 2. With this arrangement, it is clear that as the temperature of the liquid fuel in float chamber 6 raises the temperature of the sleeve 26 and ring 28, the ring having a relatively high coefficient of expansion as compared to the sleeve, will undergo a correspondingly greater enlargement than the sleeve, thus forcing apart the segments 29 as shown in dotted lines in Figures 2 and 3.

Moreover, the difference in coefficients of expansion between the sleeve 26 and ring 28 can be made to give a predetermined amount of spread, or opening, between the segments 29 for each degree rise in temperature. In other words, the amount of opening between the segments 29 is calibrated with the temperature. When the temperature of the liquid fuel in chamber 6 falls, the sleeve 26 and ring 28 cool to the same degree, and as the ring 28 contracts faster and more than sleeve 26, the segments 29 are free to assume their normal abutting position which the initial stress in the metal of the sleeve 26 compels them to take, when the ring 28 has contracted enough to permit it.

It will be noted that by locating the ring 28 near the top of sleeve 26, the effect on the sleeve of the ring expansion is multiplied several fold, depending upon the ratio of the distance from the top of the segments 29 to the center line of the ring as compared to the total length of the segments 29. Thus, if the distance from the top of the segments to the center of the ring is one-tenth the length of the segments, the expansion of the lower end of the segments will be ten fold that of the ring. When the segments 29 abut each other, which is their position at the lowest operating temperature of the carburetor, the sleeve 26 defines a cylinder in which the head 24 of piston 19 travels with a free running fit which is made as liquid-tight as possible without binding.

Positioned with sleeve 26 near its lower end is a piston 30 which reciprocates within the sleeve 26 and normally closes the lower end thereof. Piston 30 slides upon a stud 31 which is fixed to

the bottom of the float chamber 6 as with screw threads 32. Stud 31 has an enlarged conical head 33 and a central longitudinal passageway 34 that communicates with passageway 11. Head 33 forms a seat for the piston 30 which is normally held in contact therewith by a spring 35 so as to close the end of passageway 34 and cut off communication between the interior of sleeve 26 and passageway 11.

The clearance between the piston 30 and sleeve 26, when segments 29 are abutting, is such that when head 24 descends slowly, as when the throttle is slowly opened, the liquid fuel escapes between the walls of the sleeve 26 and the piston 30 back into the float chamber 6 without unseating piston 30 and opening passageway 34. Thus no accelerating charge is delivered to the mixing chamber 3 through nozzle 10. If, however, head 24 quickly descends, as when the throttle 5 is quickly opened, the clearance between sleeve 26 and piston 30 is too small to permit the escape of liquid fuel from sleeve 26 without unseating piston 30 and discharging liquid fuel through passageways 34 and 11, and nozzle 10 into mixing chamber 3. If now the segments 29 spread with a rise in temperature it is clear that a portion of the liquid fuel charge in sleeve 26 escapes back into float chamber 6 even when the throttle 5 is quickly opened and the head 24 quickly descends, thus subtracting from the total accelerating charge delivered by the pump. Moreover, it is equally clear that as the segments further spread with a further rise in temperature, a further corresponding reduction is made in the amount of the accelerating charge delivered by any stroke of the pump. Thus the output of the pump is gradually reduced proportionately with rise in temperature from a maximum at the coldest operating temperature of the carburetor to a minimum, or nothing, at the highest operating temperature of the carburetor, and perfect temperature compensation or control results.

From the arrangement described above and shown in Figure 1, it is apparent that when head 24 quickly descends and segments are not too wide open, piston 30 will be unseated and forced down by the pressure on the liquid fuel in sleeve 26, but as the liquid fuel escapes through passageway 34 and between piston 30 and sleeve 26, spring 35 will gradually force piston 30 upward and return it to its seat thus clearing the sleeve 26 of liquid fuel provided head 24 has not risen in the meantime. This return stroke of piston 30 serves to prolong the discharge of liquid fuel from the accelerating pump.

In this connection, however, it will be noted that piston 30 extends somewhat above the top of stud 31 so that if head 24 descends to its lowermost position it will mechanically contact with piston 30 and hold it slightly off its seat thus keeping open the passageway 34. This serves an important function, namely that of an economizer. For it will be observed that the only conditions under which piston 19 would descend to the bottom of its stroke and remain there for any appreciable length of time is when the throttle is wide open and the engine is turning over slowly under a heavy load. Then the vacuum in mixing chamber 3 and outlet 4 is so weak that spring 22 keeps piston 19 at the bottom of its stroke until either the engine gains speed or the opening of the throttle is restricted. In order that liquid fuel may flow from float chamber 6 to the mixing chamber 3 when head 24

24 is holding piston 30 off its seat, head 24 is provided with a plurality of radial grooves 36 which provide a channel from the space between piston 30 and sleeve 26 and the end of passage-way 34.

It will be noted that when segments 29 are spread apart, liquid fuel enters the sleeve 26 above head 24 and surges in and out of sleeve 26 as head 24 falls and rises. This serves to steady the movements of piston 19 and prevents chattering with small sudden fluctuations of vacuum in mixture outlet 4. It also insures that the sleeve 26 will always be at the temperature of the liquid fuel.

While I have shown and described the preferred embodiment 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, an acceleration pump comprising a cylinder having a relatively low thermal coefficient of expansion, an element having a relatively high thermal coefficient of expansion associated with said cylinder so that, as the temperature rises, the cylinder is expanded in increasing ratio from one end to the other by said element.

2. In a carburetor, an acceleration pump comprising a cylinder composed of a material of relatively low thermal expansion, an annular member of relatively high thermal expansion positioned within said cylinder so that, as the temperature rises, the cylinder is enlarged in increasing ratio from one end to the other by said member.

3. In a carburetor, an acceleration pump comprising a cylinder divided for a portion of its length into a plurality of segments and means within said cylinder for spreading said segments apart in linear proportion to an increase in temperature.

4. In a carburetor having a chamber containing liquid fuel, an acceleration pump comprising a cylinder supplied with fuel from said chamber and divided for a portion of its length into a plurality of segments, and means within said cylinder responsive to the temperature of the liquid fuel for spreading apart said segments in direct proportion to a rise in temperature of the liquid fuel, whereby a portion of said liquid fuel escapes back into said chamber.

5. In a carburetor having a liquid fuel chamber, an acceleration pump comprising a cylinder supplied with fuel from said chamber, a plurality of pistons in said cylinder adapted to

apply pressure to the liquid fuel therein, one of said pistons controlling an outlet port through which the accelerating charge of liquid is delivered from said cylinder, said last mentioned piston holding said outlet port closed until the pressure on the liquid fuel in said cylinder reaches a predetermined amount.

6. In a carburetor having a mixing chamber and a liquid fuel chamber, an acceleration pump comprising a cylinder supplied with liquid fuel from said chamber, a plurality of pistons in said cylinder, one of said pistons being responsive to the vacuum in said mixing chamber, the other of said pistons controlling an outlet port from said cylinder to said mixing chamber, said first mentioned piston being adapted under low vacuum in said mixing chamber to hold down said second mentioned piston and maintain said port open so that additional fuel is continuously fed from said liquid fuel chamber to said mixing chamber as long as low vacuum obtains in said mixing chamber.

7. In a carburetor having a float chamber, a reciprocating acceleration pump in said chamber comprising a cylinder, a piston in said cylinder and temperature-responsive means for admitting liquid fuel from said chamber to said cylinder whereby the amount of accelerating charge delivered by said pump is inversely proportional to the temperature of the liquid fuel under certain operating conditions.

8. In a carburetor having a float chamber, a reciprocating acceleration pump in said chamber comprising a cylinder, a piston in said cylinder and temperature-responsive means for admitting liquid fuel from said chamber to said cylinder, and for returning said liquid fuel to said chamber, whereby the amount of accelerating charge delivered by said pump is inversely proportional to the temperature of the liquid fuel.

9. In a carburetor having a chamber containing liquid fuel, a reciprocating acceleration pump in said chamber comprising a cylinder, a piston in said cylinder and temperature-responsive means for supplying liquid fuel from said chamber to said cylinder so that minor fluctuations in the reciprocations of said piston are damped and steadied.

10. In a carburetor having a float chamber, an acceleration pump comprising a cylinder, a piston in said cylinder, and a unitary, temperature-responsive means for admitting liquid fuel from said chamber to said cylinder above and below said piston, whereby minor fluctuations in the movements of said piston are damped and the amount of accelerating charge delivered by said pump is inversely proportional to the temperature of the liquid fuel.

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