

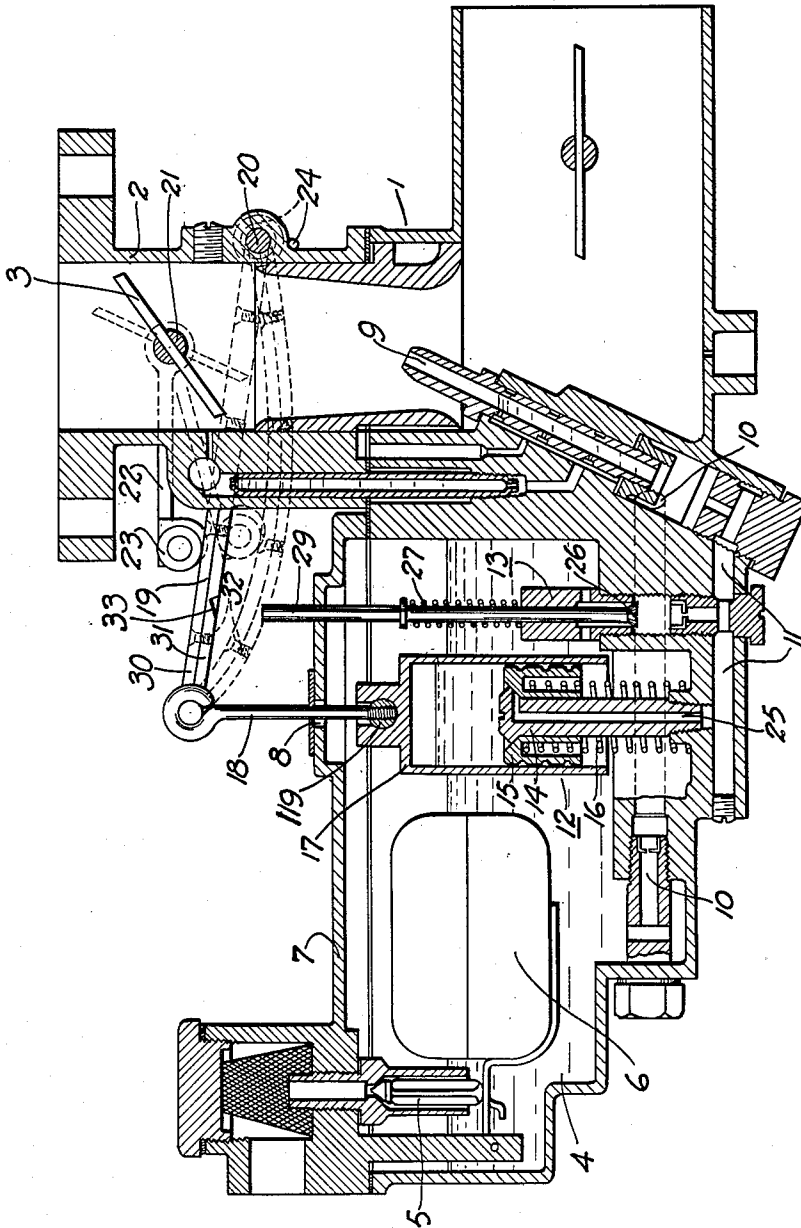
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CARBURETOR

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CARBURETOR

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4 Claims. (Cl. 261—34)

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

Heretofore it has been customary to provide carburetors wherein an increase of pressure is momentarily applied to the float chamber, or to a special chamber containing liquid fuel, to cause a corresponding discharge of the fuel from the nozzle into the mixing chamber for acceleration, or to facilitate starting. Such devices have become generally known as acceleration pumps, and heretofore the operation of these pumps has been the same regardless of the temperature of the carburetor. That is, for a given throw of the throttle, or other operating lever, the same amount of fuel has been discharged into the mixing chamber.

It has long been known that internal combustion engines require a richer mixture for starting and accelerating when cold than when warm and as the temperature of the engine and carburetor rises the additional fuel required for accelerating correspondingly decreases. This is true up to temperature equal to the boiling point of the lightest fraction of the liquid fuel. Above this point, additional fuel injected into the mixing chamber when starting or accelerating not only does not facilitate these operations but actually hinders them. A warm engine often fails to start and never properly accelerates with an over-rich mixture. The problem has, therefore, been to devise an acceleration pump that will enrich the mixture at a maximum when starting and accelerating at low temperatures, then gradually decrease the enriching dose as the temperature increases, and finally, cut out all enrichment when the temperature reaches a certain critical value. Devices which depend upon momentarily increasing the air pressure above the liquid fuel in the float or other special chamber have been found, even when equipped with a temperature responsive relief valve, ineffective for this purpose, chiefly for two reasons. First, the piston or plunger creating the pressure operates with the throttle the same at all times regardless of temperature so that some additional accelerating fuel is always discharged. That is, the acceleration pump does not cut out after a critical temperature is reached. Second, the pressure relief valve is not directly and positively responsive to the temperature of the carburetor as its temperature is considerably modified by the stream of escaping air when the valve is open.

An object of this invention is to provide an

acceleration pump that is fully responsive to the temperature of the carburetor and which is automatically cut out of action when the temperature rises above a predetermined critical degree.

Another object of this invention is to provide a temperature controlled acceleration pump which discharges a maximum measured dose of enriching fuel when the temperature is below a certain predetermined degree and which gradually diminishes this measured dose in proportion as the temperature rises until a certain critical temperature is reached whereupon the accelerating dose is automatically cut out entirely.

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 a carburetor embodying my improvements is shown in central longitudinal section.

1 indicates the carburetor body upon which is mounted a mixture outlet stack 2 controlled by an ordinary throttle valve 3 of any suitable type. Formed integral with the body 1, is a float chamber 4 in which liquid fuel is normally maintained at a substantially constant level by means of an inlet valve 5 and float 6. The top of the float chamber 4 is closed by a cover 7 having a hole 8 for a purpose as will hereinafter appear.

A main jet nozzle 9 is provided in the body 1 and communicates with the float chamber 4 through a passageway 10. Also in communication with the nozzle 9 through a passageway 11 are an acceleration pump 12 and an economizer 13. The pump 12 comprises a hollow stud 14 which is fixed to the floor of the float chamber 4 and upon which is slidably mounted a piston 15 normally held in contact with the conical head of the stud 14 by a helical spring 16 as clearly shown in the drawing. Slidably mounted upon piston 15 is a hollow cylinder 17 to the upper end of which is attached a stem 18 by means of a ball and socket joint 119. The stem 18 passes through the hole 8 in cover 7 and is rotatably connected to one end of a lever 19 which is pivoted at 20 to the stack 2 of the carburetor. Fixedly attached to the shaft 21 of the throttle 3 is an arm 22 which carries at its free end a roller 23 adapted to bear upon and engage the lever 19 when in contact therewith.

It is obvious from the arrangement just described that when the throttle 3 is opened arm 22 swings down and roller 23 engages lever 19 rotating it downwardly and depressing the cylinder 17 through the medium of link 18. Lever 19

is provided at its pivoted end with a coil spring 24 which constantly tends to rotate the lever upward so that when throttle 3 is closed and arm 22 raised, lever 19 follows in contact with it and raises cylinder 17. The angular movement of the throttle 3 from closed to full open position is regulated by suitable adjustable stops (not shown) in the well known manner. Arm 22 being fixed to the throttle shaft 21 is likewise similarly regulated in its angular movement.

Cylinder 17 fits somewhat loosely on piston 15 so that when it is raised and creates a vacuum within, liquid fuel is drawn past piston 15 and fills the interior of cylinder 17 more or less completely, depending on the prevailing temperature of the fuel. If this temperature is at, or above, the boiling point of the lightest fraction of the fuel, vapor collects in the upper part of cylinder 17 and partly displaces liquid fuel. The amount of vapor thus collected is approximately in proportion to the temperature above the critical value indicated.

When the cylinder 17 is near the upper part of its stroke, as shown in the drawing, piston 15 is on its seat against the conical head of stud 14 and cuts off communication between the interior of cylinder 17 and a passageway 25 through stud 14 communicating with passageway 11. When cylinder 17 is quickly depressed by a sudden opening of throttle 3, a pressure is created on the liquid in the cylinder, which pressure thrusts down piston 15 against the face of spring 16 and opens communication between the interior of cylinder 17 and nozzle 9 whereupon liquid fuel is discharged through nozzle 9 in direct proportion to the travel of cylinder 17. When cylinder 17 ceases its downward movement, spring 16 returns piston 15 to its seat and cuts off further flow of fuel.

It is clear from the above description that the quantity of fuel discharged by the pump 12 is directly in proportion to the travel of cylinder 17.

Economizer 13 comprises a valve 26 which is normally held closed by spring 27, but which is adapted to open when the stem 29 of the valve 26 is depressed by contact with lever 19. It is noted that this contact only occurs when the lever 19 is near the bottom of its travel and that only a very small further movement is necessary to completely open valve 26. Valve 26 thus controls a supplementary flow of fuel from chamber 4 to nozzle 9 which occurs only at or near full open throttle.

In order to control the action of the acceleration pump 12 in accordance with the temperature of the carburetor, I have made the lever 19 of special construction so that it is responsive to temperature changes.

This is accomplished by constructing the lever in a plurality of leaves of different metals with different coefficients of expansion. For the purposes of illustration, I have shown the lever 19 as composed of two leaves 30 and 31 secured together by a series of countersunk screws 32 so that the leaves act as a single member mechanically. The upper leaf 30 is made of a metal of very low coefficient of expansion, such as invar metal, and the lower leaf of a metal of very high coefficient of expansion, such as aluminum. By this arrangement, the bar is very sensitive to changes in temperature and if the invar bar be made perfectly straight at 0° C., then at temperatures below 0° C. the lower leaf will contract more rapidly than the upper leaf causing the lever 19 to

bend upwardly in the middle. This will cause the roller 23 on arm 22 to contact with lever 19 sooner in its downward travel as the throttle is opened and thus increase the stroke of acceleration pump causing it to deliver an increased acceleration charge to the mixing chamber. Conversely, at temperatures above 0° C. the lower leaf 31 will expand more rapidly than the upper leaf 32 causing the lever to bend downwardly in the middle. This will cause the roller 23 on arm 22 to contact with the lever 19 later in its downward travel as the throttle is opened and thus decrease the stroke of the pump 12 and the amount of acceleration charge correspondingly.

Practically, the lever is so constructed and calibrated that it just contacts with the roller 23 on arm 22 in its highest position (closed throttle) at the lowest operating temperature to which the carburetor is subjected, and with the top of the stem 29 of the economizer at highest operating temperature (see dotted lines on drawing). When lever 19 is in contact with stem 29, (as shown by dotted lines in the drawing), roller 23 does not contact with lever 19 until arm 22 is practically at the end of its downward travel (wide open throttle). It will be noted from the drawing, that it requires only a very slight further movement downward from this point to open the economizer valve 26. This slight movement is imparted to stem 29 by bringing the arm 22 to its lowermost point of travel, when opening the throttle completely. Because of the concave action of lever 19, this movement is so slight that it has no appreciable effect upon acceleration pump 12 other than to slightly compress the vapor collected in the top of cylinder 17 but not enough to unseat piston 15. Thus, when lever 19 reaches its maximum concavity, at highest operating temperature, it functions to completely cut out the action of the acceleration pump. Also, at temperatures below the maximum it operates as a variable cam to modify the action of the acceleration pump so as to proportion the amount of accelerating charge to the operating temperature. To insure a positive contact between lever 19 and stem 29, there is provided a notch 33 in the lower face of the lever into which the stem 29 engages.

From the above disclosure, it is clear that I have provided a simple and effective means of controlling the amount of accelerating charge in accordance with the operating temperature of the carburetor and since lever 19 is pivoted to stack 2 of the carburetor it quickly receives the heat transmitted by conduction from the engine to the carburetor. This is a factor of considerable importance in warm weather operation. Furthermore, my heat sensitive element is not subject to local cooling by escaping air currents as in the case of devices which depend upon a thermally controlled air relief valve.

It is also evident that my invention is not necessarily limited to use in connection with a piston acceleration pump, inasmuch as similar results may be obtained, for example, where the piston is replaced by a diaphragm or other equivalent device; neither is it necessary, although preferable, that my invention operate in connection with the throttle, since other operating levers or means may be used.

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 these may be changed in form and arrangement by those skilled in the art without depart-

ing from the spirit of my invention or exceeding the scope of the appended claims.

I claim:

1. In a carburetor having a throttle, an acceleration pump, a bimetallic actuating member for the pump, and means associated with the throttle for contacting with the bimetallic member when the throttle is opened.
2. In a carburetor having a throttle, an acceleration pump, an actuating member associated therewith and adapted to change its shape in response to temperature changes, and throttle-actuated means contacting the actuating member to operate the pump.

3. In a carburetor having a throttle, an acceleration pump, a temperature-responsive actuating lever having a fixed pivot and connected to the pump, and means associated with the throttle contacting the lever intermediate the pivot and the point of connection to the pump to operate the pump upon opening the throttle.

4. A carburetor as defined in claim 3, having an economizer also actuated by the actuating lever.

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