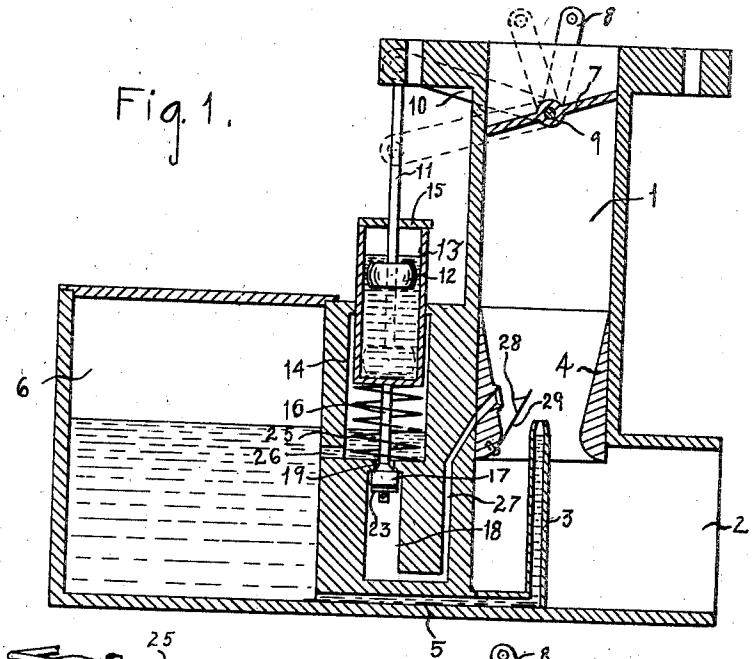
May 16, 1939. H. G. RENNER 2,158,777

CARBURETOR

Original Filed Oct. 17, 1928

Fig. 1.



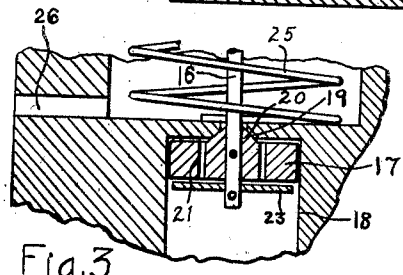


Fig. 3.

Fig. 2.

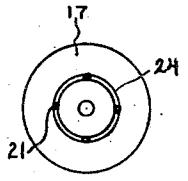


Fig. 4

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CARBURETOR

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Application October 17, 1928, Serial No. 313,152
Renewed April 3, 1933

22 Claims. (Cl. 261—34)

This invention relates to carburetors, and particularly to carburetors which provide for a temporary enriching of the fuel mixture, upon a sudden opening of the throttle, to expedite acceleration of an internal combustion motor.

An object of the invention is to induce an increased flow of fuel to the mixing chamber immediately upon a sudden opening of the throttle, and independently of engine suction, and to maintain a lesser increased flow responsive to engine suction for a brief subsequent period.

Another object is to control, in common with a carburetor throttle, a valve for opening an auxiliary fuel feed passage leading to the mixing chamber, and a pump for inducing a flow through said passage, and to vary the responsiveness of said control according to the speed of application of such control.

A further object is to render such a pump and valve increasingly or decreasingly responsive to its control means, according as the temperature of the carburetor falls or rises, so that a sudden opening of the throttle when the engine is cold will effect a greater temporary augmentation of the fuel feed than will result from exercise of the same control when the engine is warm.

Still another object is to control, in common with a carburetor throttle, the pumping of auxiliary fuel to the mixing chamber and the opening of an auxiliary fuel passage, such control being applied through a dash pot and in opposition to a spring so that a pumping action and opening of said passage immediately result from a sudden throttle opening actuation, while the closing of said passage responsive to said spring is retarded by the dash-pot.

A still further object is to employ in such a dash-pot a liquid, the viscosity of which increases considerably as its temperature drops, so that any flow of said liquid past the dash-pot piston will vary in volume substantially as the liquid varies in temperature, whereby the auxiliary fuel pump will be rendered more responsive to control when the carburetor is cold, and, under that condition, the period of opening of the auxiliary fuel passage will be prolonged.

It is also an object of the invention to provide for automatically cutting off, at a predeterminedly high velocity of flow through a carburetor mixing chamber, an auxiliary fuel feeding connection to said mixing chamber which is effective at lower velocities of flow to increase the normal fuel supply to the mixing chamber when the throttle is suddenly opened.

These and various other objects the invention attains by the construction hereinafter described and illustrated in the accompanying drawing, wherein:

Figure 1 is a view in sectional elevation, showing, somewhat diagrammatically, the improved carburetor, with its throttle closed.

Figure 2 is a similar view showing the throttle open and the auxiliary fuel feed established.

Figure 3 is an enlargement of a portion of Figure 1.

Figure 4 is a bottom view of a pump plunger employed in the invention.

In these views, the reference character 1 designates the mixing chamber and 2 the air inlet of a carburetor, and 3 a fuel nozzle discharging axially into a Venturi tube 4, forming the lower portion of said mixing chamber and admitting air thereto from the passage 2. A main fuel-feed passage 5 leads to said nozzle from a reservoir 6, in which a substantially constant level may be maintained in any desired manner.

A throttle 7, which may be of the usual pivotal construction controls the outlet of the mixing chamber, and is actuable by an arm 8 upon the throttle shaft 9. Said shaft further carries an arm 10, to which is pivoted a depending stem 11, carrying at its lower end a dash-pot piston 12. The latter works in a dash-pot cylinder 13, slidable in and upwardly projecting from a cylindrical chamber 14 in the carburetor body. At its upper end, the cylinder 13 is closed by a head 15, centrally apertured to give free passage to the stem 11, and resting freely upon said cylinder to allow the slight lateral movement of said stem which is incidental to swinging of the arm 10. Preferably the peripheral face of the piston 12 is substantially spherical, and has a slight clearance from the cylinder, whereby any binding of said piston due to swinging of the stem 11 is avoided and a restricted flow of the liquid contents of the cylinder past the piston is facilitated. To the lower end of the cylinder 13 is attached a downwardly projecting stem 16, which terminally carries a pump plunger 17, loosely fitting in a cylinder 18 coaxial with and of less diameter than the chamber 14 and opening into the latter through a port 19. Just above said plunger and preferably integral therewith is a conical valve member 20 for engagement with a valve seat formed by the correspondingly coned upper end of the chamber 18. The plunger 17 is formed preferably with a number of passages 21 connecting its top and bottom faces and the stem 16 projects sufficiently below said plunger to loosely mount a disk 23 and adapt it to undergo a slight

up and down travel to control said passages. Preferably the bottom face of the plunger 17 is formed with an annular groove 24 intersecting said passages to facilitate the radial discharge therefrom of liquid fuel.

A spring 25 coiled in the chamber 14 below the cylinder 13 maintains the normal raised position of the latter, shown in Figure 1, and also normally seats the valve member 20 to close the port 19, as appears in said figure.

Into the lower end of the chamber 14 a fuel delivery passage 26 opens from the reservoir 6 and another fuel delivery passage 27 auxiliary to the passage 5, extends from the lower end of the pumping chamber 18, and has an outlet into the Venturi portion of the mixing chamber, at a point preferably above the normal liquid fuel level.

Preferably said outlet is under automatic control of a valve member 28, mounted upon the upper end of a light leaf spring 29 secured at its lower end to the Venturi member 4 and inclined normally slightly toward the Venturi axis as it extends upwardly so as to uncover the outlet of the passage 27.

In the operation of the described carburetor, the displacement of the cylinder 13 relative to any actuation of the throttle is proportionate to the velocity of such actuation. Thus, if the throttle is gradually opened, the downward actuation of the piston 12 to its position shown in dash lines in Figure 1, will be correspondingly gradual, so that the accompanying upflow of the dash-pot liquid around said piston will tend to minimize downward actuation of the cylinder. Thus the auxiliary fuel feed means is little, if at all, responsive to a slow opening of the throttle, which is desirable since the throttle movement, alone, effects an adequate acceleration of mixture delivery, under such conditions.

When, however, the throttle is rapidly opened, the resulting downward pressure of the piston 12 is communicated through the liquid medium beneath said piston to the cylinder 13, without adequate lapse of time for escape of said medium past said piston, so that the cylinder is forced down, compressing the spring 25, as appears in Figure 2. The plunger 17 being carried down with said cylinder displaces fuel from the chamber 18 beneath said plunger, forcing the fuel so displaced through the passage 27 and into the mixing chamber. Thus there occurs a sudden enriching of the mixture concurrently with and responsive to a quick opening of the throttle. It will be evident that during the described actuations of the pump plunger, the passages 21 thereof will be closed, owing to seating of the disk 23 upon said plunger by pressure of the fuel undergoing displacement.

Upon completion of a quick opening movement of the throttle, there occurs a gradual return travel of the cylinder 13 to its raised position, due to expansion of the spring 25, such travel being retarded by necessity of displacement of the liquid beneath the piston through the restricted passage surrounding said piston. Thus, for a predetermined short interval of time, the port 19 will remain open, following a quick opening of the throttle so that the auxiliary passage 27 will supplement the passage 5 in delivering fuel to the mixing chamber responsive to engine suction. Since the normal raised position of the cylinder 13 is established by seating of the valve member 20, it will be evident that the auxiliary flow of fuel through the port 19 and passage 27 will terminate as said cylinder completes its upward travel.

Thus the invention attains the desirable result of an abrupt and considerable enrichment of the mixture when the throttle is suddenly opened, and a lesser enrichment of the mixture for a short subsequent period, so that the increased power demand indicated by such throttle opening is immediately and adequately met.

It is a matter of common knowledge that a cold engine is less easily accelerated than a warm one, and also that the difficulty of accelerating tends to increase, roughly, in an inverse ratio to the temperature of the engine. The present invention takes this into consideration by employing in the dash-pot 12, 13 a liquid, of which cylinder oil is an example, that undergoes a marked increase in viscosity as its temperature is lowered. Thus the pumping of auxiliary fuel and the subsequent suction flow of such fuel, controlled through said dash-pot, are rendered more or less intensive according as the engine is cold or warm, when the control is exercised.

When an engine is operating at high speed or under considerable power, it is sometimes necessary or desirable to close (or substantially close) the throttle only for a sufficient time to somewhat check the engine speed. Under such conditions, when the throttle is reopened, at a rapid rate, it is neither necessary nor desirable to deliver auxiliary fuel to the mixing chamber, since the engine will be creating a high enough vacuum effect to induce an adequately increased fuel flow through the normal supply passage 5 of the carburetor, under such conditions. By providing the described valve member 28 mounted on the spring 29, the response of the auxiliary fuel supply means to a rapid throttle opening is negatived when there is a considerable velocity of flow through the mixing chamber since such flow will deflect the spring 29 to the dash line position shown in Figure 2, closing the outlet of the auxiliary fuel feed passage 27. As soon as the mixture flow is decreased in velocity to a predetermined extent, the spring 29 again carries the valve member 28 clear of said opening.

While it will be apparent that the illustrated embodiment of my invention herein disclosed is well calculated to fulfil the objects and advantages primarily stated, it is to be understood that the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

What I claim is:

1. The combination with a throttle-controlled carburetor comprising a mixing chamber, of a fuel-pump having a discharge connection to said mixing chamber, means for supplying fuel to said pump and an actuating connection from said throttle to said pump, said actuating connection being variably responsive to actuation of the throttle according to the carburetor temperature.

2. The combination with a throttle-controlled carburetor comprising a mixing chamber, of an accelerating device, comprising a fuel pump having a discharge connection to said mixing chamber, a dash-pot establishing an actuating connection to said pump from said throttle, employing a liquid characterized by a marked increase of its viscosity responsive to lowering of its temperature.

3. The combination with a throttle-controlled carburetor comprising a mixing chamber, and means establishing a normal fuel supply to said chamber, of means for increasing such supply,

and an actuating connection to the last named means from the throttle, varying in its effective response to control in an inverse proportion to the temperature, under which the control is exercised.

4. The combination with a throttle-controlled carburetor comprising a mixing chamber, and means establishing a normal fuel supply to said chamber, of means for increasing such supply, and mechanism for controlling the last named means in common with the throttle, including a dash-pot containing a liquid of a viscosity highly responsive to temperature variations, whereby the effectiveness of a control through said mechanism increases or diminishes, according as the temperature of said liquid falls or rises.

5. The combination with a throttle-controlled carburetor comprising a mixing chamber and means establishing a normal fuel supply to said chamber, of means for increasing such normal supply, and mechanism controlling the last named means in common with the throttle, including a movable container for a liquid of a viscosity highly responsive to temperature variations, an element movable within said container and acting upon said container through said liquid and more or less effective to displace said container responsive to a control, according to the viscosity of said liquid.

6. The combination with a throttle-controlled carburetor comprising a mixing chamber, and means establishing a normal fuel supply to said chamber, of means for increasing such normal supply, and mechanism controlling the last named means, comprising a liquid container, an element movable in said container, means for actuating said element in common with the throttle, said container varying in its response to said element according to the viscosity of said liquid, and a spring establishing a normal position of said container.

7. The combination with a throttle-controlled carburetor comprising a mixing chamber, and means establishing a normal fuel supply to said mixing chamber, of a normally closed valve, effective when opened, to increase the fuel supply to said mixing chamber, a movable liquid container carrying said valve, a piston operable in said container, and means for actuating said piston in common with the throttle.

8. The combination with a throttle-controlled carburetor comprising a mixing chamber and means establishing a normal fuel supply to said mixing chamber, of means for increasing such supply, mechanism controlling the last named means in common with the throttle, and means automatically responsive to a pre-determined rise of velocity in the flow through said mixing chamber to cut off delivery of such increased fuel to said chamber.

9. The combination with a throttle-controlled carburetor comprising a mixing chamber and means establishing a normal fuel supply to said chamber, of a passage opening to said chamber for delivering an abnormal fuel supply, an element movable to control the fuel delivery through said passage, mechanism controlling said element in common with the throttle, and a closure for said passage automatically movable to its seat, responsive to a pre-determined increase in the velocity of flow through the mixing chamber.

10. In a carburetor comprising a mixing chamber and a throttle, means establishing a normal fuel delivery to said mixing chamber, a passage opening to the mixing chamber for delivering an abnormal fuel supply, and a closure for the last named passage mounted within the mixing chamber upon a wall thereof, and automatically movable to close said passage responsive to a predetermined increase in the velocity of flow through the mixing chamber.

11. In a carburetor, means forming a mixing conduit, a throttle valve controlling said mixing conduit, normal fuel supply means for said mixing conduit, auxiliary fuel supply means for said mixing conduit, means for operating said auxiliary fuel supply means in response to opening movements of said throttle, and a pressure operated device for cutting off said auxiliary fuel supply means.

12. In a carburetor, means forming a mixing conduit, an accelerating pump for supplying fuel to said mixing conduit and a pressure operated device for cutting off the flow of fuel from said accelerating pump.

13. In a carburetor, means forming a mixing conduit, a source of fuel supply, a main fuel supply device for supplying fuel from said source to said mixing conduit, an auxiliary fuel supply device for supplying fuel to said mixing conduit, said auxiliary fuel supply device comprising conduit means leading from said source to said mixing conduit, an expansible chamber in communication with said conduit means, said expansible chamber having a movable wall, valve means operated by said movable wall for controlling the flow thru said conduit means, a second valve for controlling said conduit means and fluid pressure operated means for controlling said second valve.

14. In a carburetor having a throttle, an acceleration pump, means for actuating said pump by said throttle, said means being responsive to changes in temperature of the carburetor whereby the action of said pump is substantially varied in accordance with said temperature changes.

15. In a carburetor having a throttle, an acceleration pump having a reciprocating part, means for actuating said pump by said throttle, said means being responsive to changes in temperature of the carburetor whereby the length of stroke of the reciprocating part is substantially varied in accordance with said temperature changes.

16. In a carburetor having a throttle, an acceleration pump, and connecting means between the throttle and the pump whereby opening the throttle actuates the pump, said connecting means being temperature-responsive to substantially decrease the ratio between pump actuation and throttle opening as the temperature rises.

17. In a carburetor having a throttle, an acceleration pump having a reciprocating part, and an operative connection between the throttle and the reciprocating part for actuating the reciprocating part, said connection being substantially variable operatively due to changes in temperature.

18. In a carburetor, a mixing conduit having a venturi therein, a throttle for controlling the flow of mixture through said mixing conduit, a chamber containing lubricating oil, a member connected to said throttle and adapted to set up a pressure in said lubricating oil, means including a passageway for supplying fuel to said venturi, a valve for controlling said passageway and means responsive to the pressure of the lubricating oil set up in said chamber for operating said valve.

19. In a carburetor, means forming a mixing conduit, a venturi therein, a throttle valve for controlling the flow of mixture through said mixing conduit, a fuel supply chamber, conduit means leading from said fuel supply chamber to said venturi, means for regulating the flow of fuel through said conduit, a connection between said throttle and said regulating means, said connection including a chamber containing lubricating oil and a member operated by movements of the throttle to set up a pressure in said lubricating oil, said chamber being arranged to by-pass oil around said piston when said pressure is set up, whereby the operation of said device will be varied by temperature as the viscosity of said lubricating oil is varied by temperature.

20. In a carburetor, means forming a mixing conduit, a venturi in said mixing conduit, a throttle in said mixing conduit, means forming a fuel supply chamber, means forming a passage from said supply chamber to said venturi, a valve in said passage, a connection between said throttle and said valve, said connection embodying means to substantially vary its operating effect in accordance with variations of temperature.

21. In a carburetor, means forming a mixing conduit, a throttle valve for controlling the flow of fuel mixture through said conduit, a pump connected with said throttle for discharging fuel into said mixing conduit when said throttle is opened, said pump having a piston, a dash pot connection between said piston and said throttle, and a viscous fluid in said dash pot, the viscosity of said fluid varying with variations in temperature, whereby the stroke of said piston will be automatically varied according to the temperature.

22. In a carburetor, means forming a mixing conduit, a main venturi in said conduit, a fuel bowl, a nozzle receiving fuel from said fuel bowl and discharging near the throat of said main venturi, a throttle valve for controlling the flow of mixture from said carburetor, a fuel pump operated by said throttle valve to discharge supplementary fuel to said mixing conduit upon opening movement of the valve, said pump having a piston, a dash pot forming a connection between said piston and said throttle, said dash pot being filled with a fluid having a marked change in viscosity under changes in temperature.

HAROLD G. RENNER.