Oct. 11, 1932. G. M. BICKNELL 1,881,996

CARBURETOR

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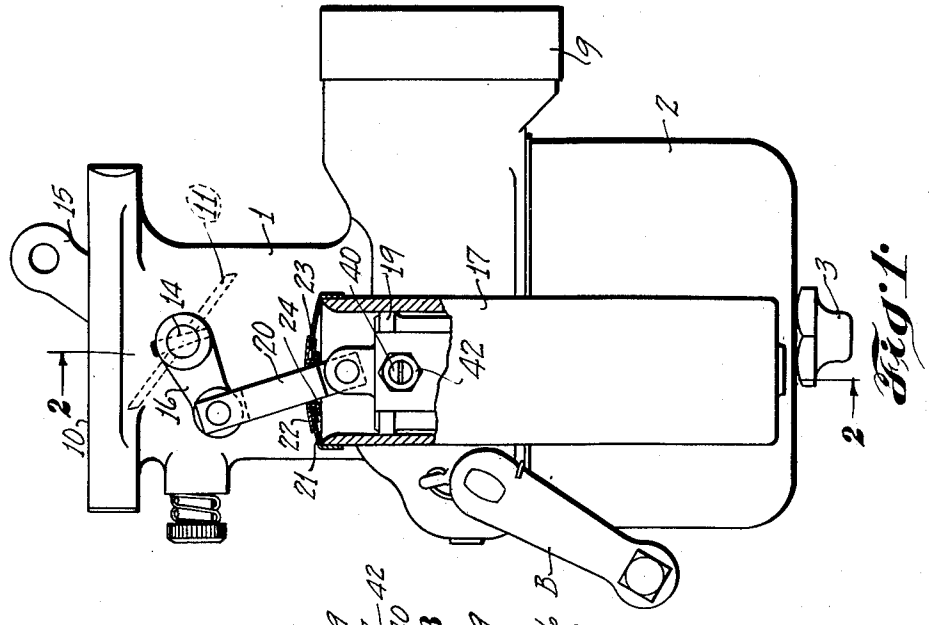


Fig. 1.

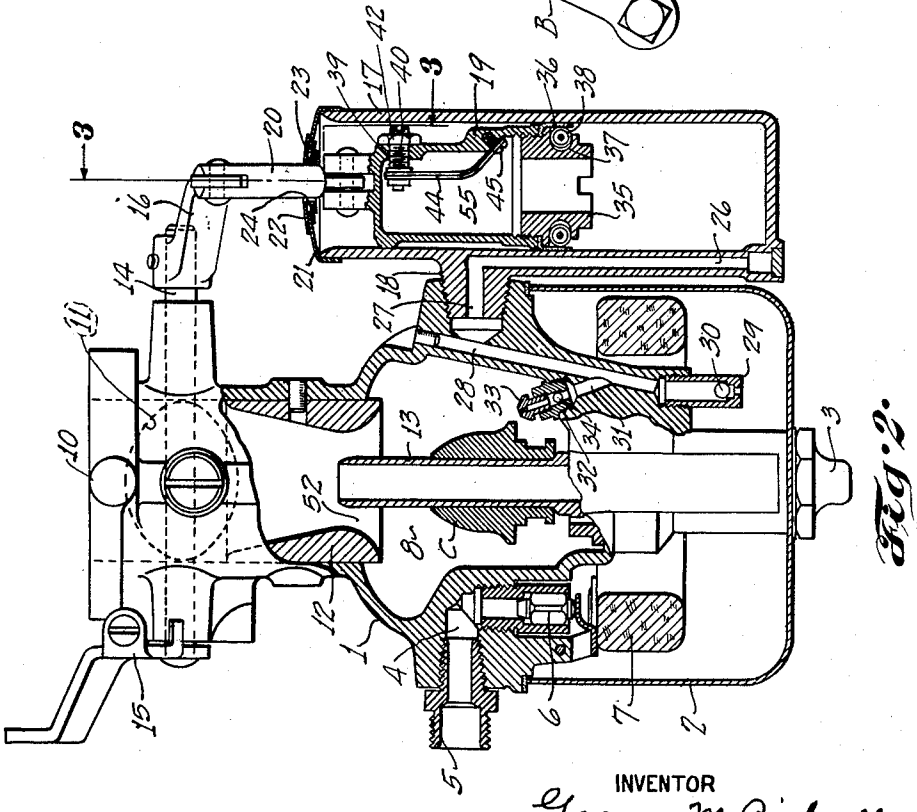


Fig. 2.

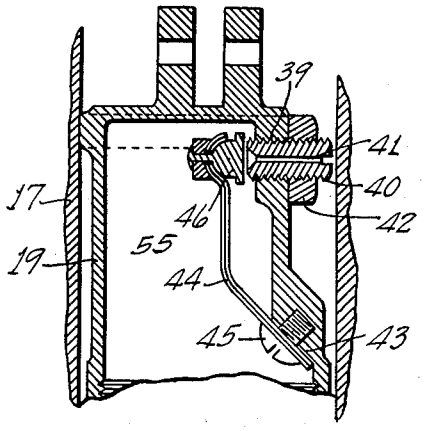
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Fig. 4.



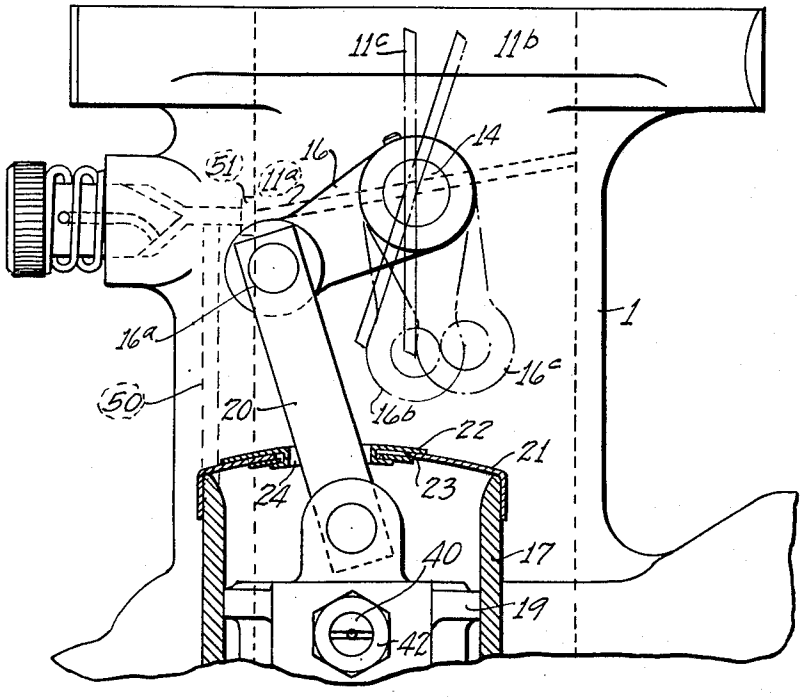


Fig. 3.

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Fig. 5.

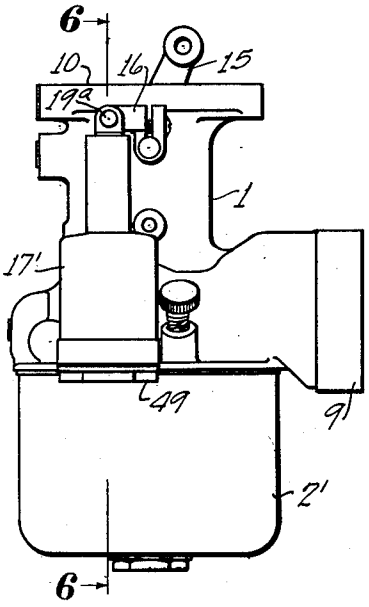
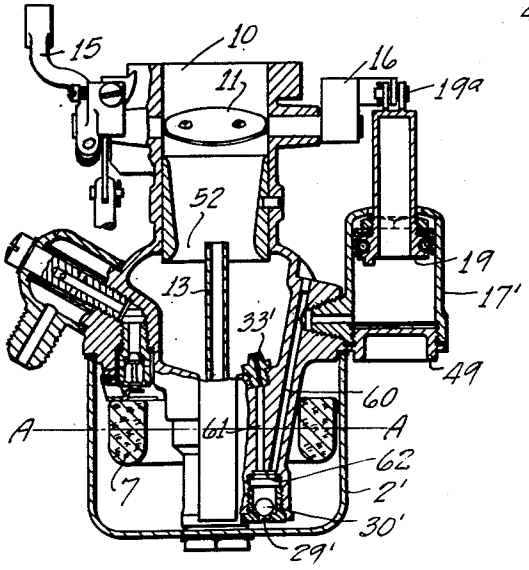


Fig. 6.



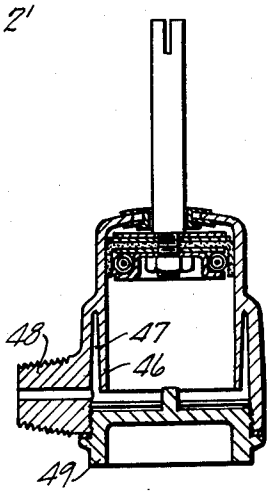


Fig. 7.

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UNITED STATES PATENT OFFICE

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CARBURETOR

Application filed February 21, 1929. Serial No. 341,731.

This invention relates to carburetors, and particularly to carburetors of the type in which a pump is provided for supplying an extra quantity of gasoline during acceleration. Such pumps are usually connected to the throttle to be operated upon an opening movement thereof, and when the throttle is once fully opened to the desired position, the additional supply of gasoline is immediately discontinued, leaving only the normal supply in operation. As considerable time is required after the opening of the throttle for the engine to overcome the inertia of the car and bring it up to the proper speed, it is desirable to continue the extra supply of gasoline for a few seconds after the throttle has been opened.

As carburetors are usually adjusted to operate satisfactorily under all weather conditions, it is customary to adjust them to give a considerably richer mixture than is necessary or desirable after the engine has thoroughly warmed up. The supply of an additional quantity of gasoline to the mixing chamber, such as that delivered by the pump, accordingly becomes less necessary and desirable after the engine has warmed up, and at very high temperatures might cause loading of the engine due to excess fuel.

One of the objects of this invention is to provide an accelerating pump of simple and reliable construction for supplying additional quantities of fuel upon an opening movement of the throttle and for continuing the additional supply for a few seconds after the opening movement of the throttle has ceased.

Another object of this invention is to provide a pump suitable for the first-named purpose of such design and construction that a thermostatic control means may be readily applied thereto for reducing the effectiveness of the pump at high temperatures.

The invention will be better understood upon reference to the accompanying drawings, in which:

Figure 1 is a front elevation of one form of carburetor embodying my invention, with parts broken away for better illustration of others.

Figure 2 is a side elevation of the carburetor shown in Figure 1 with parts shown in cross section on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken along lines 3—3 of Figure 2, looking in the direction of the arrows.

Figure 4 is a detail view showing parts of the pump piston and thermostat control in cross section.

Figure 5 shows an elevation of a modified form of carburetor having my invention applied thereto.

Figure 6 is a somewhat diagrammatic sectional view of the form of carburetor shown in Figure 5.

Figure 7 is a cross sectional view of a modified form of accelerating pump.

The reference numeral 1 indicates a casting forming the body member of the carburetor, a sheet metal bowl 2 is attached to the lower part of the body member by a nut 3. The body member has the usual passageway 4 opening into the bowl to supply gasoline thereto, and a nipple 5 is attached to the ends of the passageway to receive the end of the gasoline supply tube. A valve 6 operated by a float 7 in a conventional manner regulates the supply of gasoline to the carburetor. A mixing chamber 8 is formed in the body member and has a main inlet 9 for air. The usual choke C, operated through connections (not shown) by the lever B, is provided. To this inlet, an air cleaner or other treating device may be attached, in the usual manner. The outlet of the mixing chamber is through the upper end of the casting as indicated at 10, and this outlet is controlled by the usual throttle valve 11. A venturi 12 is mounted in the mixing chamber between the inlet and the outlet. A supply tube 12 of conventional design communicating at its lower end with the fuel in the fuel chamber and having its outlet located adjacent to the throat of the venturi serves as a normal fuel supply means for the carburetor.

A throttle valve 11 is mounted on shaft 14 which is connected with operating lever 15. The usual means for operating this lever is provided. At the end of the shaft 14 opposite the lever 15 is mounted a lever 16. A pump

cylinder 17 is supported on the side of the carburetor by a nipple 18 screwed into the casting 1. The cylinder is fitted with a piston 19, and this piston is operated from the lever 16 through a connecting rod 20.

A suitable cap 21 is fitted to the top of the cylinder, and a sheet metal cover 22 is slidably mounted on a port 23 in the cap. The cover 22 is provided with an opening 24 to receive the connecting rod 20, thus forming the dust cap for the cylinder 17.

The lever 16 and the throttle valve 11 are mounted on the shaft 14 at such an angle that the most rapid travel of the pump piston occurs during the early stages of the opening movement of the throttle. This is clearly illustrated in Figure 3 in which the reference numeral 16A indicates the position of the lever 16 when the throttle is in the position indicated at 11A, or substantially closed. The reference numerals 16B and 11B represent the corresponding positions of the throttle and lever when the throttle is about three-quarters open, and 16C and 11C indicate their positions when the throttle is wide open. It will be noted upon inspection of Figure 3 that all of the downward movement of the piston has occurred between the closed position of the throttle and the three-quarter open position, and that between the three-quarter open position and the full open position, the movement of the piston is slightly upward.

This arrangement is made to secure the desired rich mixture when the throttle is partly open and to prevent an over-rich mixture when the throttle is fully open. By the arrangement of the levers in this position, I am enabled to enrich the mixture at the particular point that the carburetor ordinarily supplies too weak a mixture, and thus obtain much more satisfactory operation.

The fuel pump is provided with a passageway 26 forming both inlet and outlet. This passageway communicates with a passageway 27 in the nipple 18 and a bore 28 in the body of the carburetor. Screwed into the lower end of the bore 28 below the level of the fuel in the bowl is a body member 29 carrying a check valve 30. This forms the inlet check valve of the pump. A second bore 31 at an angle to the bore 28 has threaded therein a cage 32 carrying a jet 33 and a ball check 34 forming the outlet check valve of the pump. The jet 33 discharges into the mixing chamber 8 and is located to direct the stream of fuel into the mixing chamber and into the path of the flow of gas therethrough.

The piston of the pump is formed with an air bell, as shown. Threaded to the lower portion of the air bell is an annular retaining member 35 which retains the pump washer 36 in position. The annular member 35 is formed with a groove 37 to receive a spring 38 which resiliently holds the washer 36 in engagement with the cylinder wall. The upper portion of the air bell is threaded as at 39 to receive a member 40 which is provided with a small bore 41. A lock nut 42 holds the member in position, as shown in Figure 4.

The inside of the air bell has a boss 43 carrying a bimetallic thermostat 44 secured by a suitable screw 45. A valve member 46 is carried by the upper end of the thermostat and serves to form a closure for the ends of the bore 41 when the temperature is low. The metals in the thermostat are so arranged that the closure 46 will be held against the ends of the member 40 to close the bore 41 when the temperature is low, and will be drawn away from the end of the member 40 when the temperature is high, to permit air to pass freely through the opening 41. The closure member 46 may be provided with a yieldable seating member of suitable material, if desired, such as a cork or oiled silk facing.

The form of device shown in Figure 6 is similar to that shown in Figures 1 and 2, except that the thermostatic control device is omitted and the pump is provided with only a single ball check. Other slight differences are that the lever 16 is connected directly to the piston at 19A instead of through a link as shown in Figures 1 and 2. The dust cap is omitted and the piston oscillates in the cylinder as it reciprocates.

The pump shown in Figure 7 is similar to that shown in Figures 5 and 6, except that instead of the piston being provided with an air bell, the pump cylinder is formed with a skirt 46 surrounded by an annular passageway 47, as shown. The attaching nipple 48 is at the lower portion of the cylinder, and the lower end of the cylinder is closed by a plug 49. The annular chamber 47 forms the equivalent of the air bell and receives the fuel during a rapid downward movement of the piston.

It will be noted that the pump 17′, shown in Figures 5 and 6, has no outlet check valve, it being directly connected through the bores 60 and 61 to the jet 33′. The inlet of the pump at 29′ being considerably below the fuel level A—A in the bowl 2′, the fuel will normally displace the ball 30′ before the level of fuel in conduit has fallen as low as the level of the point 62 at which the bores 60 and 61 communicate. While some air may be sucked into the pump upon a rapid upward movement of the piston 19′, this quantity will be negligible on account of the small size of the jet orifice 33′. By this arrangement, the necessity for using an additional ball check is obviated.

The operation of the device is as follows:

The nipple 5 being connected to a suitable course of supply, the float 7 permits the valve to remain open until the fuel has reached a

predetermined level in the bowl 2. Upon starting the engine, air is drawn into the inlet 9 through the mixing chamber 8 and the outlet 10, the rate of its passage therethrough being controlled by the throttle 11.

Assuming that the throttle is in its closed position, as indicated at 11A, the fuel will be drawn up through the idling tube 50 and discharged through an outlet 51 at the end of the throttle in the usual manner. When the throttle is open, the suction at the outlet 51 is reduced, while that in the throat 52 of the venturi is increased. The tubes 50 and 13 being separately connected in conventional manner to a point in the fuel chamber below the fuel level, the flow of fuel through the outlet 51 will cease and the fuel level in the tube 13 will be drawn up to the mouth of the tube, from whence it will be carried away by the stream of air passing through the throat of the venturi.

As the throttle is opened, the piston 19 will be moved downwardly in the cylinder 17, fuel will rise through the opening in the annular member 35 and into the air bell 55. Assuming that the temperature is comparatively low, the closure 46 will be seated against the end of the member 40, preventing the escape of air from the bell and causing it to be compressed therein by the fuel. It will be understood that the jet 33 is a very small orifice, the resistance of which sets up a back pressure against the operation of the pump. The fuel, of course, is also discharging from the jet and supplements the fuel supply in the mixing chamber as long as the piston is being forced downwardly by the opening movement of the throttle. After the downward movement has ceased, the air compressed in the bell 55 will continue to discharge fuel through the jet 33 into the mixing chamber, this being desirable for the reason that the acceleration of the car is subsequent to the opening of the throttle, generally lagging behind it for an interval of several seconds.

A supply of rich mixture during this period causes the car to accelerate more rapidly and is highly desirable when the engine is cool, but when the engine is hot, the fuel vaporizes freely and a sufficient quantity is supplied without the operation of the pump. Under these conditions, the thermostat 44 moves to the left, as shown in Figure 4, and moves the closure 46 out of contact with the end of the member 40, permitting communication of the air bell 55 with the atmosphere. When the pump is operated, the comparatively free movement of air through the bore 41 permits the piston to move downwardly without displacement of fuel from the pump cylinder, and the pump is practically rendered inoperative.

When the engine is running nearly full speed with the throttle nearly open, the normal supply of gasoline is sufficient for purposes of acceleration, and it is not desired to augment the supply during the movement of the throttle from the three-quarters open to full open position, even when the engine is cold. With the levers connected as shown, the downward movement of the piston from the position 11B to 16C of the operating lever is negligible, while the movement during the early stages of the opening movement is quite rapid.

It will be seen from the above description that the supplementary supply device is entirely separate and distinct from the normal fuel supply means, the main supply jet and the idling supply jet operating the same in a carburetor to which this device is applied as they would in its absence. It will also be noted that the jet 33 being of comparatively small dimensions will spray the fuel into the mixing chamber upon operation of the pump rather than supplying it in drops and comparatively large unbroken masses as might occur if the pump were connected to discharge through one of the main jets of the carburetor. It will be understood that the invention is susceptible of many modifications, and, accordingly, I do not wish to be limited in my protection, except as set forth in the accompanying claims.

I claim:

1. In a carburetor, a fuel chamber, a mixture conduit, means for normally supplying fuel from said fuel chamber to said mixture conduit, a valve for controlling the passage of mixture through said conduit, a fuel pump for supplying additional quantities of fuel to said fuel conduit, said pump comprising a chamber in which fuel is segregated from the fuel in said first named chamber, a connection between said pump and said valve for operating the pump to discharge fuel upon a movement of said valve, an air chamber associated with said pump to receive a portion of said segregated fuel during said movement and to discharge said portion after said movement has terminated, said pump being constructed and arranged to be substantially inoperative at high temperatures.

2. In a carburetor, a throttle valve, a main fuel chamber, a fuel pump, a fuel chamber in said pump, means for operating said valve, means operable by opening said valve to discharge said pump, means operated by closing said valve to draw fuel from said main chamber into said pump chamber, means comprising an air chamber adapted to receive and discharge fuel under pressure for continuing the discharge of said pump after the termination of such opening movement, and thermostatic means for reducing the quantities of fuel discharged by said pump as the temperature increases.

3. In a carburetor, a throttle valve, an accelerating pump having a cylinder, a compression chamber, said chamber containing

air and being adapted to receive and discharge fuel under pressure, means for placing fuel in said chamber under pressure upon an opening movement of said throttle valve, thermostatic means gradually operable as the temperature increases for relieving said pressure, and pressure means rendering said thermostatic means less effective in proportion to the speed of operation of said valve.

4. In a carburetor, a throttle valve, an accelerating pump having a cylinder, a piston, a fuel compression chamber in said cylinder, an air chamber in communication with said compression chamber, means for forcing fuel into said air chamber upon an opening movement of said valve, an opening in communication with one of said chambers, a closure for said opening, and thermostatic means for operating said closure.

5. In a carburetor, a mixing chamber, an accelerating pump having an outlet, a piston for said pump, a jet in communication with said outlet and adapted to discharge fuel into said mixing chamber, an opening in said piston through which the pressure may be relieved independently of the jet, a closure for said opening and thermostatic means for operating said closure.

6. In a carburetor, a throttle valve, a mixing chamber, means normally supplying fuel to said chamber, an accelerating pump connected to intermittently supply additional fuel to said chamber, means connected to said valve for operating said pump upon an opening movement thereof, a piston for said pump having an air-bell, an opening in said bell, and thermostatic means for controlling said opening.

7. In a carburetor, a throttle valve, a mixing chamber, means normally supplying fuel to said chamber, an accelerating pump, connected to intermittently supply additional fuel to said chamber, means connected to said valve for operating said pump upon an opening movement thereof, a piston for said pump having an air-bell, an opening in said bell, a closure for said opening, and thermostatic means for operating said closure.

8. In a carburetor, a throttle valve, a mixing chamber, a fuel chamber, means for conveying fuel from said fuel chamber to said mixing chamber, means operable by a movement of said throttle valve to supply additional fuel to said mixing chamber comprising an accelerating pump, an air bell in communication with said pump, an opening in said air bell for communication with the atmosphere, and thermostatic means for controlling said opening.

9. In a carburetor, a pump, said pump comprising an expansible chamber having a movable wall, an orifice in said wall, and thermostatic means for controlling said orifice, said control means comprising a valve mounted at the inner side of said orifice and being adapted to be moved to closed position either by a decrease in temperature or by a sudden increase in pressure.

10. In a carburetor, an accelerating pump, a piston for said pump having walls forming a chamber in which air is contained and is adapted to be compressed, an orifice in one of said walls, and thermostatic means controlling said orifice.

11. In a carburetor, a mixing chamber, a throttle valve controlling the outlet of said chamber, means forming a constant level fuel chamber, a fuel nozzle for supplying fuel to said mixing chamber at a point anterior to said throttle valve, an idling tube for supplying fuel to said mixing chamber at a point adjacent said throttle valve, a fuel pump connected to said throttle, said pump having a fuel discharge outlet discharging into said mixing chamber at a point anterior to said throttle, said pump comprising a cylinder and piston of circular cross section fitted to said cylinder, and an air bell in said piston, said air bell being adapted to receive fuel during the discharge stroke of said piston and to discharge said fuel after the termination of said discharge stroke.

12. In a carburetor, means forming a mixing chamber, means forming a liquid fuel chamber, means for maintaining liquid fuel at a substantially constant level in said fuel chamber, a nozzle connected with said fuel chamber and adapted to discharge fuel into said mixing chamber, a fuel pump connected to receive fuel from said fuel chamber, said fuel pump having an outlet connection terminating in a highly restricted orifice discharging into said mixing chamber, said pump including a piston, an air chamber for receiving fuel under pressure during the discharge stroke of said pump and subsequently discharging said fuel through said orifice after termination of said discharge stroke, means for sealing said pump and said air chamber to permit the building up of pressure therein, a throttle valve controlling the outlet of said mixing chamber, and means connected with said throttle for operating said pump.

13. In a carburetor, means forming a mixing chamber, a throttle valve for controlling the outlet of said mixing chamber, means forming a fuel chamber, means for maintaining a constant level of fuel in said chamber, a nozzle connected to said fuel chamber and discharging into said mixing chamber, an idle conduit connected to said fuel chamber and discharging into said mixing chamber adjacent the throttle, said nozzle and said idle conduit being calibrated to supply sufficient fuel for the requirements of said carburetor during constant speed operation, and a pump operated by said throttle for discharging additional quantities of fuel to said mixing chamber during acceleration; said

pump comprising a cylinder, a circular piston closely fitting the walls of said cylinder, means for admitting fuel from said constant level chamber to said cylinder, a discharge conduit leading from said cylinder to said mixing chamber, and an air bell adapted to receive fuel under pressure during the discharge stroke of said pump and to discharge said fuel under pressure subsequent to the discharge stroke of said pump.

14. In a carburetor, means forming a mixing chamber, a throttle at the outlet of said mixing chamber, means forming a fuel chamber, means normally supplying fuel from said fuel chamber to said mixing chamber, a pump for increasing the normal supply of fuel to said mixing chamber, said pump comprising a cylinder, a piston in said cylinder, said piston fitting said cylinder tightly enough to develop substantial pressure therein, an air chamber in said piston, said air chamber being in communication with said cylinder and adapted to receive fuel during the compression stroke thereof, said cylinder having a fuel inlet and a restricted fuel outlet and connections for operating said pump in response to a movement of said throttle.

15. In a carburetor, a mixing chamber, a fuel bowl, means normally supplying fuel from said bowl to said chamber, a valve controlling the passage of mixture through said chamber, means for operating said valve, a pump, said pump comprising a cylinder and a tight fitting piston therein, said pump being connected to be operated by a movement of said valve, a passageway in communication with the outlet of said pump, a highly restricted orifice in the outlet of said passageway, and an air chamber in said piston connected to receive fuel during the operation of said pump and to discharge it through said jet after said pump has ceased to operate.

16. In a carburetor, means forming a mixing conduit having an air inlet and a mixture outlet, a throttle valve controlling said mixture outlet, means forming a constant level fuel supply chamber, an accelerating pump, said pump including a cylinder, passages for admitting fuel to said cylinder from said constant level chamber and for discharging fuel from said cylinder to said mixing conduit, said fuel admitting passages having an inlet check valve and said fuel discharge means having a highly restricted passageway, a piston in said cylinder, connections for operating said piston in response to a movement of said throttle, said piston being constructed and arranged to draw fuel into said cylinder during closing movements of said throttle and tending to discharge said fuel in response to opening movements of said throttle, resilient means yieldable in response to increased pressure in the cylinder to permit the opening of said throttle at a more rapid rate than fuel can be discharged from said cylinder, said resilient means operating when said throttle is opened and held open to maintain the fuel in said cylinder under pressure until a predetermined quantity has been discharged thru said restricted passageway, and an expansible packing for said piston to prevent the leakage of fuel during the period in which it is held under pressure.

17. A device of the character described in claim 16 and in which said packing comprises an annular cup leather and an annular coil spring for holding said cup leather in expanded position.

In testimony whereof, I affix my signature.

GEORGE M. BICKNELL.