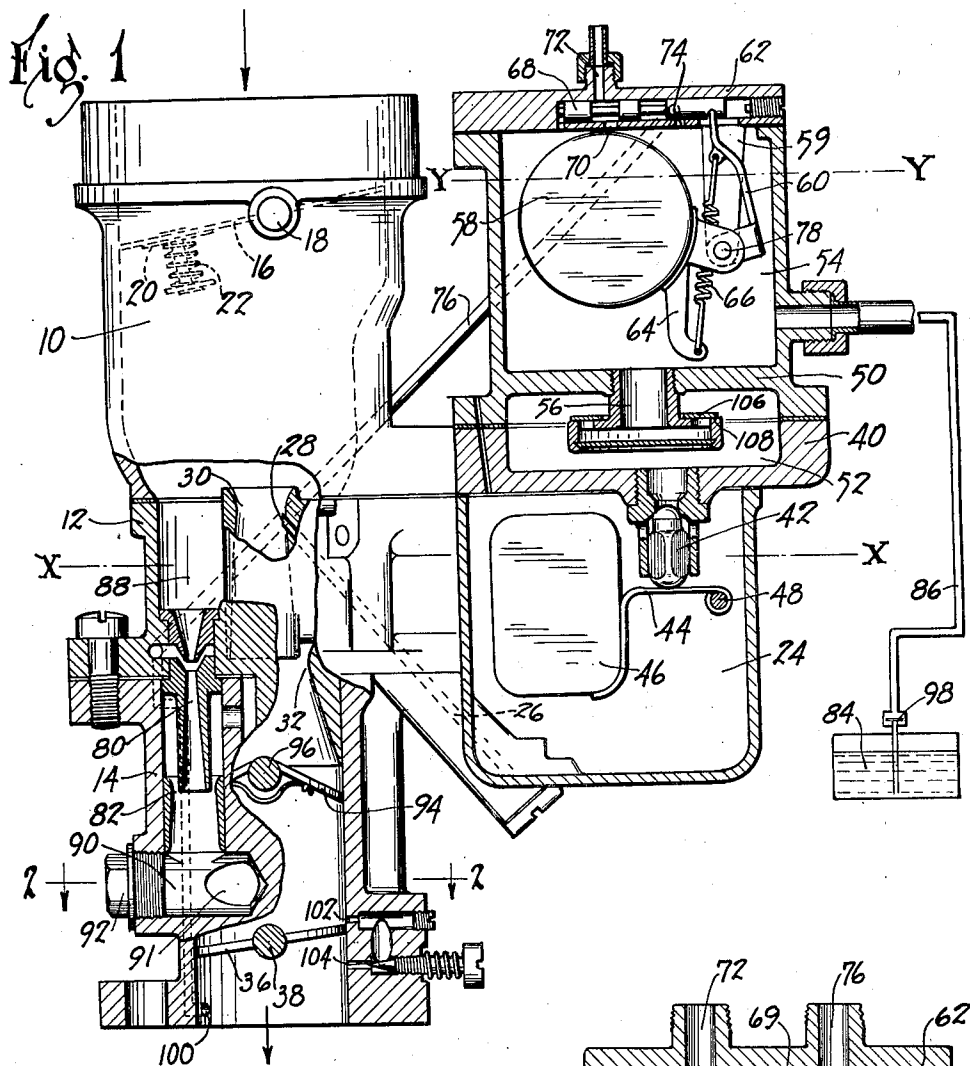
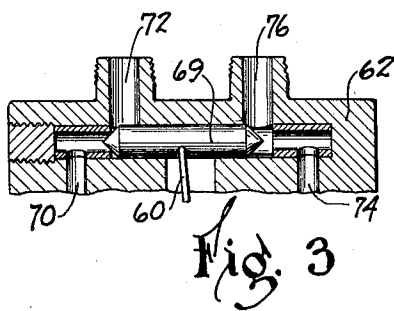
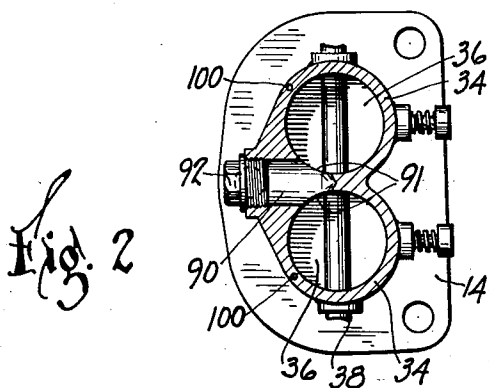


2,051,820

3 Sheets-Sheet 1



INVENTOR.

BY *Milton E. Chandler*
Q. D. McCrady
ATTORNEY.

Aug. 25, 1936.

M. E. CHANDLER

2,051,820

CARBURETOR

Filed Feb. 23, 1934

3 Sheets-Sheet 2

Fig. 4

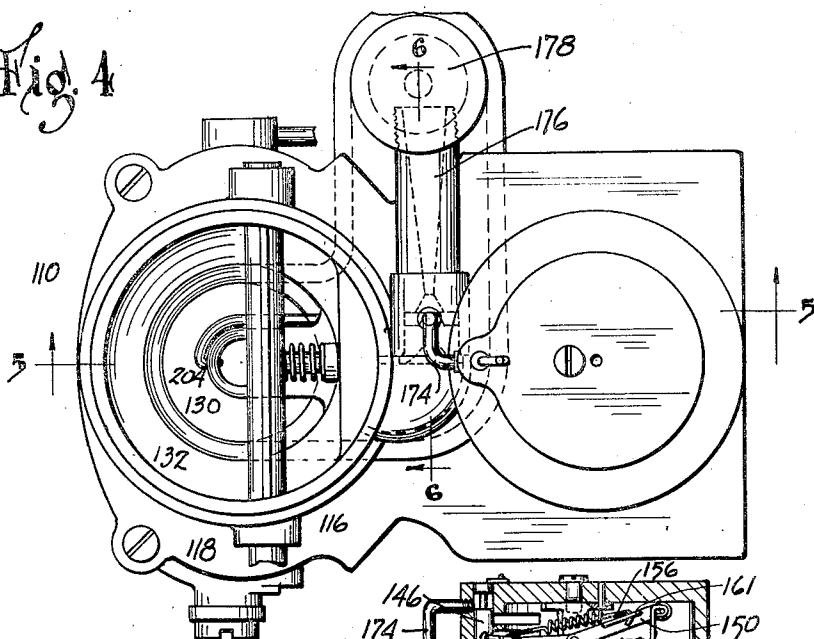
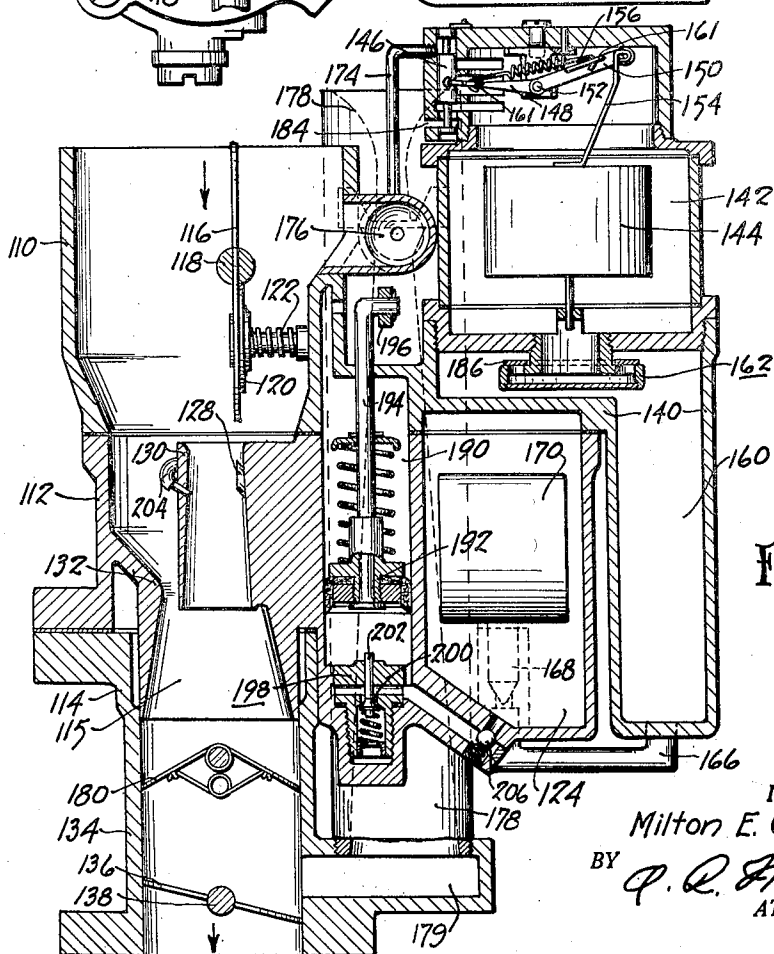


Fig. 5

INVENTOR.
Milton E. Chandler
BY *P. R. McCreedy*
ATTORNEY.

Aug. 25, 1936.

M. E. CHANDLER

2,051,820

CARBURETOR

Filed Feb. 23, 1934

3 Sheets-Sheet 3

Fig. 6

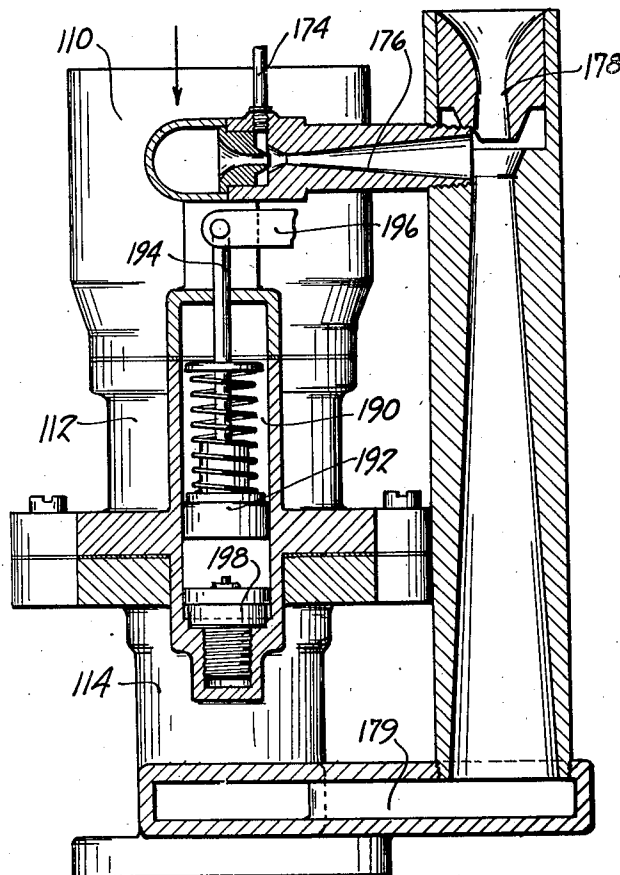
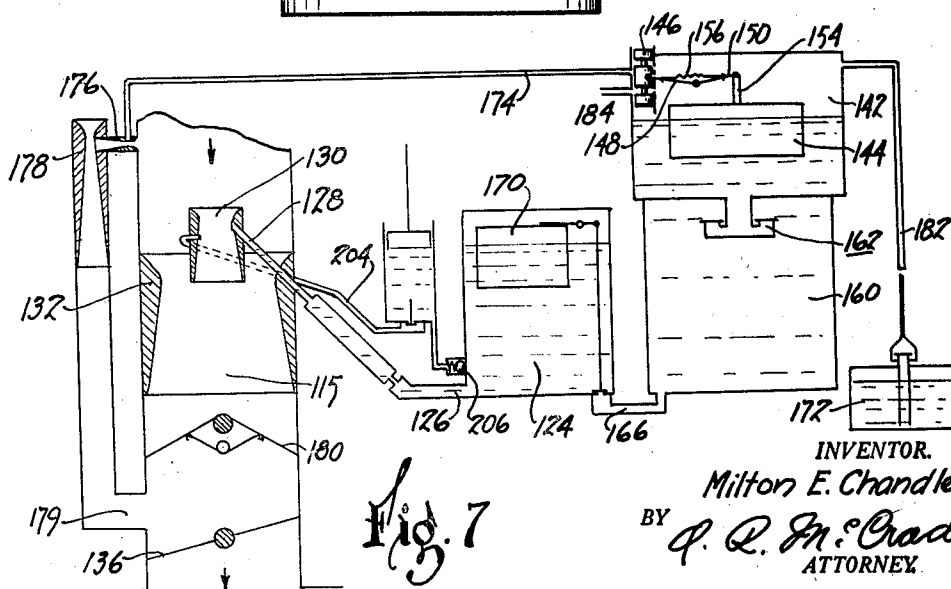


Fig. 7

INVENTOR.
Milton E. Chandler
BY
Q. R. M. Crady.
ATTORNEY.

UNITED STATES PATENT OFFICE

2,051,820

CARBURETOR

Milton E. Chandler, South Bend, Ind., assignor
to Bendix Aviation Corporation, South Bend,
Ind., a corporation of Delaware

Application February 23, 1934, Serial No. 712,492

10 Claims. (Cl. 261-72)

This invention relates to carburetors and more particularly to carburetors of the fuel lift type, which draw fuel from a supply tank positioned at a lower level than the fuel nozzle of the carburetor.

An object of this invention is to provide an improved carbureting device which will lift fuel from the supply tank to a chamber positioned above the fuel nozzle of the carburetor, and supply the carburetor with fuel at constant pressure.

A further object is to provide an improved carbureting unit of simplified construction which will eliminate the fuel pump or vacuum tank ordinarily used therewith.

A still further object is to provide an improved fuel lift carburetor of simplified construction, which may be economically manufactured and will be economical and positive in operation.

Other objects and advantages of the invention will be apparent from the following detailed description, and from the illustrative embodiments of the invention in the accompanying drawings, which are submitted merely for purposes of illustration, and are not intended to define the scope of the invention, reference being had for that purpose to the appended claims.

In the drawings wherein similar reference characters refer to similar parts throughout the several views:

Figure 1 is a vertical section illustrating a preferred embodiment of the invention;

Figure 2 is a sectional view taken on line 2-2 of Figure 1;

Figure 3 is an enlarged sectional view showing a modified form of valve;

Figure 4 is a plan view illustrating a modified form of the invention;

Figure 5 is a vertical section taken on line 5-5 of Figure 4;

Figure 6 is a vertical section taken on line 6-6 of Figure 4; and

Figure 7 is a diagrammatic view showing the fuel passages disclosed in Figures 4, 5, and 6.

Referring more particularly to Figures 1 and 2, there is shown a carbureting unit having an upper or airhorn section 10, a middle or body section 12 and a throttle body section 14. The upper and middle body sections are preferably to be formed of zinc or similar material suitable for die-casting, while the throttle body section is preferably a sand casting. The induction passage formed by airhorn 10 divides at section 12 into two parallel barrels 34 each of

which supplies fuel to a plurality of engine cylinders.

The flow of air through airhorn 10 is controlled by a choke valve 16 mounted on a shaft 18 and provided with a spring pressed poppet valve 20 to permit a small amount of air to pass through airhorn 10 when the suction is great enough to compress spring 22.

Fuel is supplied to the carburetor from float chamber 24, through a pair of fuel ducts 26 10 each of which terminates in a fuel discharge nozzle 28 positioned to discharge at the most restricted portion of a primary venturi 30 which in turn discharges at the most restricted portion of a secondary venturi 32. The venturis 30 15 and 32 are carried in middle body section 12 and are preferably formed integral therewith. The lower end of secondary venturi 32 is a slip fit in the upper portion of barrel 34 formed in the throttle body section 14. The flow of mixture 20 through each of the carbureting passages thus formed by the three described sections is controlled by a throttle valve 36 mounted on a shaft 38 journaled in the walls of the throttle body section 14.

A flange 40 formed integral with the airhorn section 10 provides a cover for float chamber 24 and accommodates a needle valve 42 which when actuated by lever 44, fixed to float 46 and pivoted at 48, controls the flow of fuel into said float 30 chamber and maintains a constant level therein. The upper portion of flange 40 has a recess which cooperates with a corresponding recess in the lower portion of a superposed tank section 50 to form a fuel reservoir 52 which receives fuel 35 from chamber 54 through an outlet member 56 which terminates in a cup-shaped member 108 and is controlled by a gravity-actuated disk valve 106.

Chamber 54 accommodates a float 58 which is 40 pivotally mounted on a pin 78 positioned in the lower ends of two downwardly extending studs 59. An arm 64 fixed to float 58 connects by means of a spring 66 with a lever 60 mounted on pin 78. A float actuated slide valve 68 operates to selectively subject chamber 54 to atmospheric pressure or a partial vacuum derived from two auxiliary venturis, as described below. Lever 60 connects with slide valve 68 in such a manner as to move the valve from one of its extreme positions 50 to the other when the spring 66 is moved past the dead center, formed by pin 78, by movement of float 58. As float 58 rises, arm 64 rotates in the clockwise direction moving spring 66 past pin 78 and causing lever 60 to exert a lateral pull on 55

slide valve 68 which will move the valve to the left, thereby opening passage 70 to allow air to enter chamber 54 from duct 72 which communicates with the usual air cleaner (not shown) attached to airhorn 10. The pressure existing in the upper portion of chamber 54 will immediately rise to atmospheric, and fuel will flow out of said chamber through outlet member 56. As the fuel level in chamber 54 drops, float 58 will rotate in a counterclockwise direction around pin 78, thereby carrying arm 64 to the right. As spring 66 passes the dead center at 78, it will cause lever 60 to exert an increasing lateral pull on slide valve 68 in the opposite direction as the fuel level drops, and will finally overcome the resistance of said valve and move it to the right, closing air inlet passage 70 and opening port 74 and duct 76 leading to auxiliary venturis 80 and 82, which will exert suction in chamber 54 and draw fuel from supply tank 84 to chamber 54 through duct 86 while at the same time holding valve 106 to its seat to prevent flow of fuel from chamber 54 to reservoir 52. A check valve 98 is positioned in fuel duct 86 to prevent fuel from flowing from chamber 54 back to the tank 84.

The auxiliary venturis 80 and 82 are positioned in series in the walls of the main carbureting passage 88. The primary venturi 80 is carried in the middle body section 12 and discharges at the most restricted portion of the secondary venturi 82 carried in the throttle body section 14 which communicates with both barrels 34 through a passage 90, the outer end of which is closed by a plug 92. Annular passage 90 communicates with barrels 34 through outlet ports 91 anterior to throttle valve 36. A two-leaf spring-pressed valve 94 is mounted on a shaft 96 in each barrel 34 for the purpose of insuring a predetermined minimum suction at ports 91, so that sufficient air will be forced to flow through the auxiliary venturis, even at wide open throttle, to lift fuel from storage tank 84 to chamber 54.

Auxiliary passages 100 lead from an annular chamber at the throat of venturi 80 and discharge into the barrels 34 posterior to throttle valves 36 to provide suction to create a partial vacuum in chamber 54 when the engine is idling with throttles 36 fully closed. Fuel for idling purposes is supplied through the conventional idling passages 102 and 104.

Figure 3 illustrates a type of valve which may be used instead of cylindrical slide valve 68 described above. It comprises a double-ended needle valve 69 slidable endwise to subject chamber 54 to suction or atmospheric pressure depending upon the position of float 58.

The operation of the device thus far described is as follows. It is apparent from the foregoing description that irrespective of the position of throttle valves 36 sufficient suction will at all times be present in the throat of primary venturi 80 to lift fuel from supply tank 84 to upper chamber 54. When the fuel level in chamber 54 is at its highest point, represented by the line Y—Y in Figure 1, slide valve 68 will be in the position shown in Figure 1, in which position it permits air to enter through duct 72 and passage 70 to maintain the pressure in chamber 54 at atmospheric. The resulting head of fuel unseats valve 106, permitting the fuel in chamber 54 to be discharged into reservoir 52 and thence into float chamber 24 at a rate controlled by needle valve 42. As the fuel level in chamber 54 lowers, float 58 moves spring 66 past the dead center position represented by pin 78, whereupon lever 60

will move valve 68 to the right, thereby closing atmospheric duct 72 and opening port 74 to permit the suction developed at venturi 80 to be transmitted to the chamber 54. The suction draws valve 106 tightly to its seat, and draws fuel from the supply tank 84 to chamber 54, thus gradually raising the fuel level therein. Float 58 is moved upwardly by the rising fuel level, and when it approaches the position shown in Figure 1, the spring 66 will be moved to the left past dead center 78, and will thus overcome the resistance of valve 68 and move it to the left, thereby closing port 74 and duct 76 leading to the auxiliary venturis and opening duct 72 to restore the pressure in chamber 54 to atmospheric. The weight of the fuel will thereupon force valve 106 from its seat and the fuel will flow to reservoir 52, as before described, and the cycle will then be repeated.

Figures 4, 5, 6, and 7 illustrate a carburetor similar in many respects to the preferred embodiment disclosed in Figures 1 and 2, but comprising only one barrel. It includes an upper or airhorn section 110, a middle body section 112 and a throttle body section 114.

The flow of air through airhorn 110 is controlled by a choke valve 116 mounted on a shaft 118 and provided with a spring-pressed poppet valve 120 to permit a small amount of air to pass through airhorn 110 when the suction therein is sufficient to compress spring 122.

Fuel is supplied to the carburetor from float chamber 124, through fuel duct 126 which terminates in a fuel discharge nozzle 128 positioned to discharge at the most restricted section of a primary venturi 130 which in turn discharges at the most restricted section of a secondary venturi 132, the lower end of which is carried in the upper portion of barrel 134 formed in throttle body section 114.

The flow of combustible mixture through carbureting passage 115 thus formed by the three described sections is controlled by a throttle valve 136, mounted on a shaft 138 journaled in the walls of throttle body section 114.

A flange 140 formed integral with airhorn section 110 provides a cover for float chamber 124 and provides an intermediate fuel compartment 160. An upper chamber 142 positioned above and secured to flange 140 accommodates a float 144 which actuates a slide valve mechanism comprising a cylindrical valve member 146 and two levers 148 and 150 mounted on pin 152. The free end of lever 148 is attached to cylindrical valve 146 while the free end of lever 150 is attached to link 154 fixed to float 144. A tension spring 156 fixed to ears 161 formed on levers 148 and 150 tends to move said levers away from a position of alinement with each other.

Flange 140 has a downwardly extending portion forming an intermediate fuel compartment 160. The upper and intermediate fuel compartments are connected by means of a gravity actuated check valve 162 in such manner that fuel may flow by gravity from upper chamber 142 to intermediate chamber 160 from which point fuel is admitted to float chamber 124 by means of fuel duct 166 and the rate of flow is regulated by a needle valve 168 actuated by float 170 in the conventional manner.

Suction to lift fuel from supply tank 172 to upper chamber 142 is derived from two venturis 176 and 178 set at right angles to each other. Suction duct 174 leading from upper chamber 142 communicates with the most restricted section of primary venturi 176, which discharges at

the most restricted section of secondary venturi 178, which in turn discharges into a hollow flange 179 communicating with the main carbureting passage 115 anterior to throttle valve 136 and posterior to spring pressed valve 180.

Sufficient suction is therefore always present in primary venturi 176 to draw a proper quantity of air through the auxiliary venturis to produce adequate suction to lift fuel from supply tank 172 to upper chamber 142, from which point fuel is directed through the remaining chambers of the carburetor by force of gravity.

The operation of this device is as follows. When the engine is running, suction is applied to duct 174 and transmitted to chamber 142 by the valve mechanism described above. The differential pressure will draw fuel from supply tank 172 through duct 182 to chamber 142 and as the fuel level therein rises, float 144 will be lifted. Link 154 fixed to float 144 will thereupon lift lever 150, extending spring 156. When lever 150 rises above the dead center position spring 156 will force lever 148 upward, thereby moving slide valve 146 upward, closing suction duct 174, opening vent 184, and subjecting chamber 142 to atmospheric pressure. The weight of the entrained fuel will immediately force valve member 186 from its seat and the fuel will flow by force of gravity into chamber 160. When the fuel level in chamber 142 drops to a point such that levers 148 and 150 move downward past dead center position, spring 156 will force lever 148 downward, thereby moving slide valve 146 downward, opening suction duct 174 and closing vent 184 so that suction will again be exerted in chamber 142 which will hold valve member 186 on its seat and draw fuel from tank 172 through duct 182 to said chamber.

The flow of fuel from compartment 160 is regulated by float actuated needle valve 168 so that substantially constant fuel level will be maintained in float chamber 124 at all times.

An acceleration pump similar to that disclosed in the copending application of Hunt et al., Serial No. 701,740, filed December 11, 1933, is incorporated with this carburetor and comprises chiefly, an acceleration pump cylinder 190 formed integral with the middle body section 112, a piston 192 slidable therein and a piston actuating mechanism consisting of a piston rod 194 and an arm 196 pivotally connected therewith and actuated upon movement of the throttle valve 136 by means of a connecting linkage not shown. An economizer valve 198 is positioned in the lower portion of cylinder 190 and comprises a spring-pressed valve member 200 having a stem 202 projecting above the surface of said valve and designed to be engaged by the end of piston 192 to hold said valve open and permit a steady discharge of fuel through duct 204 when the engine is operating at substantially full throttle position. A check valve 206 positioned between the economizer valve 198 and float chamber 124 operates to prevent fuel from flowing back into the float chamber when the acceleration pump is actuated.

I claim:

1. A carbureting device having a main carbureting passage with a throttle valve and an auxiliary spring pressed-valve mounted therein, a plurality of chambers at different levels, floats in the upper and lower chambers, a float actuated valve in the upper chamber, fuel inlet means into said upper chamber, a check valve to permit the

flow of fuel in only one direction in said inlet means, a gravity seating valve between said upper chamber and a middle chamber, a float actuated valve between said middle chamber and lower chamber, suction means comprising a primary and secondary venturi mounted in series in said main carbureting passage, said secondary venturi communicating with said main carbureting passage between said auxiliary valve and said throttle valve, and suction transmitting means between said upper chamber and the throat of said primary venturi controlled by said float actuated valve.

2. A carbureting device having a main carbureting passage with choke and throttle valves and an auxiliary spring-pressed valve mounted therein, a plurality of chambers at different levels, floats in the upper and lower chambers, a float actuated valve in the upper chamber, fuel inlet means into said upper chamber, a check valve to permit the flow of fuel in one direction only in said inlet means, a middle chamber, a pressure responsive valve between said upper chamber and said middle chamber, a float actuated valve between said middle and lower chambers, suction means comprising a primary and secondary venturi mounted at right angles to each other, said primary venturi communicating with said main carbureting passage posterior to said choke valve, discharge means from said secondary venturi to said main carbureting passage communicating therewith at a point between said auxiliary spring pressed valve and said throttle valve, and suction transmitting means between said upper chamber and the throat of said primary venturi.

3. In a fuel lift carburetor having a main carbureting passage with a throttle valve and an auxiliary valve mounted therein, a plurality of chambers at different levels, fuel inlet means provided with a check valve to permit fuel to flow only into the upper chamber, controlling means for regulating the flow of fuel from said upper chamber to the lower chambers, floats in the upper and lower chambers, float controlled means for maintaining constant fuel level in the lowest chamber, suction means comprising two auxiliary venturis communicating with the main carbureting passage and discharging into said main carbureting passage between said auxiliary valve and said throttle valve, suction transmitting means connecting said auxiliary venturis and said upper chamber, a vent in said upper chamber, a float actuated slide valve in said upper chamber, and means to actuate said valve producing successively a partial vacuum and atmospheric pressure in said upper chamber.

4. In a fuel lift carburetor, an induction passage, a fuel jet and throttle valve therein, a pressure responsive valve in said passage between the fuel jet and throttle valve, a venturi connected in parallel with the passage and having its inlet communicating with the passage anterior to the pressure responsive valve and its outlet communicating with the passage between the pressure responsive valve and the throttle, and suction operated fuel lifting means communicating with said venturi, comprising a fuel reservoir supplying fuel to said fuel jet and subjected above the fuel level therein to the suction developed at said venturi.

5. A carburetor comprising a carbureting passage, a fuel jet therein, a throttle valve posterior to the fuel jet and controlling the carbureting

passage, a suction-responsive valve in the carbureting passage between the fuel jet and the throttle valve, a fuel reservoir, and means for supplying fuel to said reservoir comprising a venturi connected thereto and communicating with the carbureting passage between the suction-responsive valve and the throttle valve.

6. A carburetor comprising a carbureting passage having an air inlet of constant effective cross-section at normal operating temperatures, a fuel inlet to said carbureting passage, a fuel supply system leading to said fuel inlet, a throttle valve posterior to the fuel inlet and controlling the carbureting passage, a pressure-responsive valve in the carbureting passage posterior to the fuel inlet and anterior to the throttle valve, and means for actuating said fuel supply system comprising a suction-multiplying member connected to a part of said system and communicating with the carbureting passage posterior to the pressure-responsive valve and anterior to the throttle valve.

7. A carburetor comprising a carbureting passage having an air inlet, a choke valve controlling said air inlet and designed to be fully opened at normal operating temperatures, a fuel inlet to said carbureting passage, suction operated fuel lifting means supplying fuel to said fuel inlet, a throttle valve posterior to said fuel inlet and controlling the carbureting passage, variable flow-restricting means in the carbureting passage between the fuel inlet and the throttle valve, and means for energizing said fuel lifting means comprising a suction-multiplying member communicating with the carbureting passage posterior to the flow-restricting means and anterior to the throttle valve.

8. In a fuel supply system for an internal combustion engine, a carburetor having an induction

passage, a venturi in said passage, a fuel nozzle discharging within said venturi, a throttle valve and a suction responsive valve positioned in series in said induction passage posterior to said nozzle, a fuel reservoir, and means for supplying fuel to said reservoir comprising a venturi connected thereto and communicating with the induction passage between said valves.

9. In a fuel supply system for an internal combustion engine, a carburetor having an induction passage, a venturi in said passage, a fuel nozzle discharging within said venturi, a throttle valve and a suction responsive valve positioned in series in said induction passage posterior to said fuel nozzle, and means for supplying fuel to said nozzle comprising a fuel reservoir and a venturi connected thereto and having its inlet communicating with the induction passage anterior to said valves and its outlet communicating with the induction passage between said valves.

10. In a fuel supply system for an internal combustion engine, a carburetor having an induction passage, a venturi in said induction passage, a fuel nozzle discharging within said venturi, a suction responsive valve and a throttle valve positioned in series in said induction passage posterior to said nozzle, a choke valve adjacent the inlet of said induction passage and designed to leave the inlet unobstructed at normal operating temperatures, and means for supplying fuel to said nozzle comprising a fuel reservoir and a suction-multiplying venturi having its inlet communicating with the induction passage anterior to both said valves, its outlet communicating with the induction passage between said valves, and its throat communicating with said fuel reservoir to transmit suction thereto.

MILTON E. CHANDLER.