

Aug. 24, 1943.

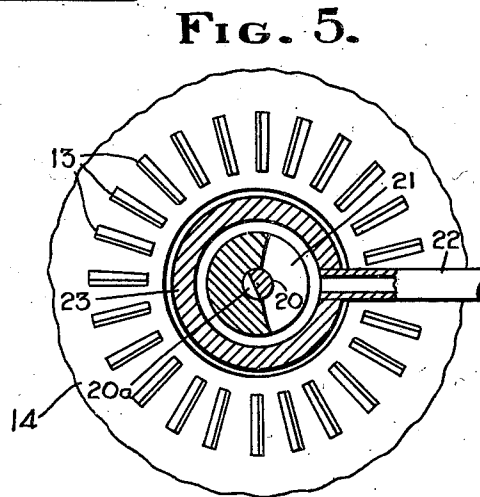
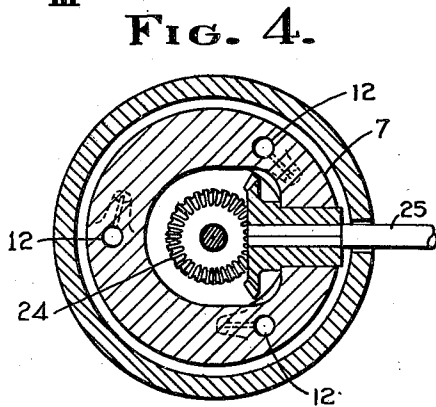
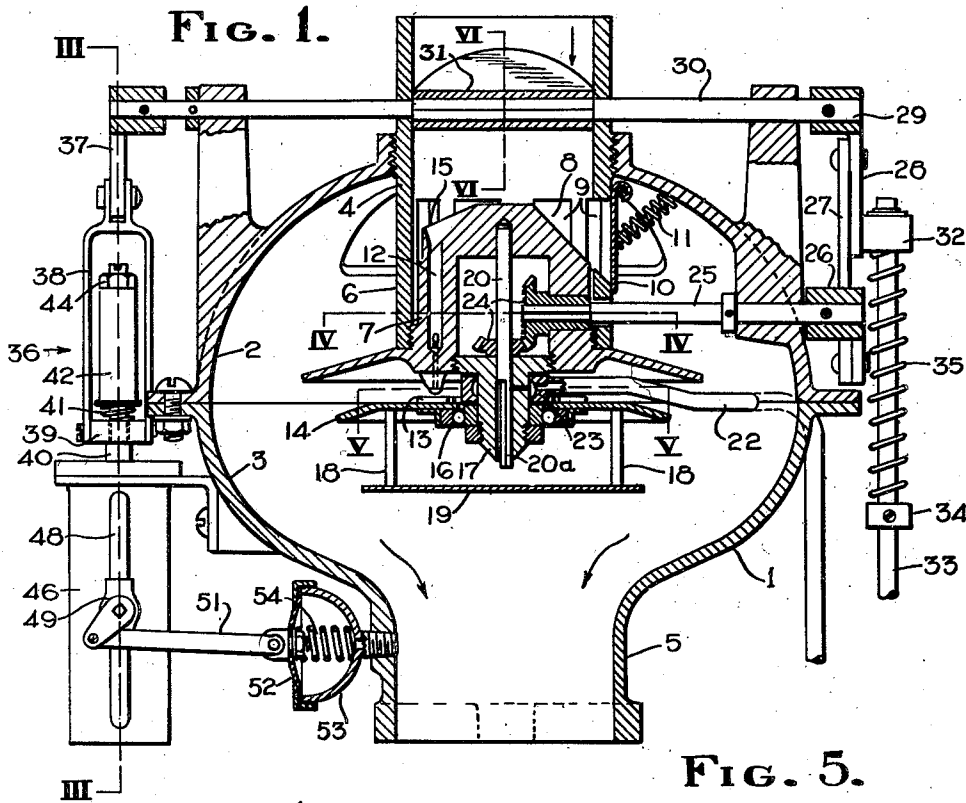
C. R. SNYDER

2,327,675

CARBURETOR

Filed Dec. 10, 1940

2 Sheets-Sheet 1



Inventor
CHARLES R. SNYDER

By *W. J. M. Lowell*

Attorney

Aug. 24, 1943.

C. R. SNYDER

2,327,675

CARBURETOR

Filed Dec. 10, 1940

2 Sheets-Sheet 2

FIG. 3.

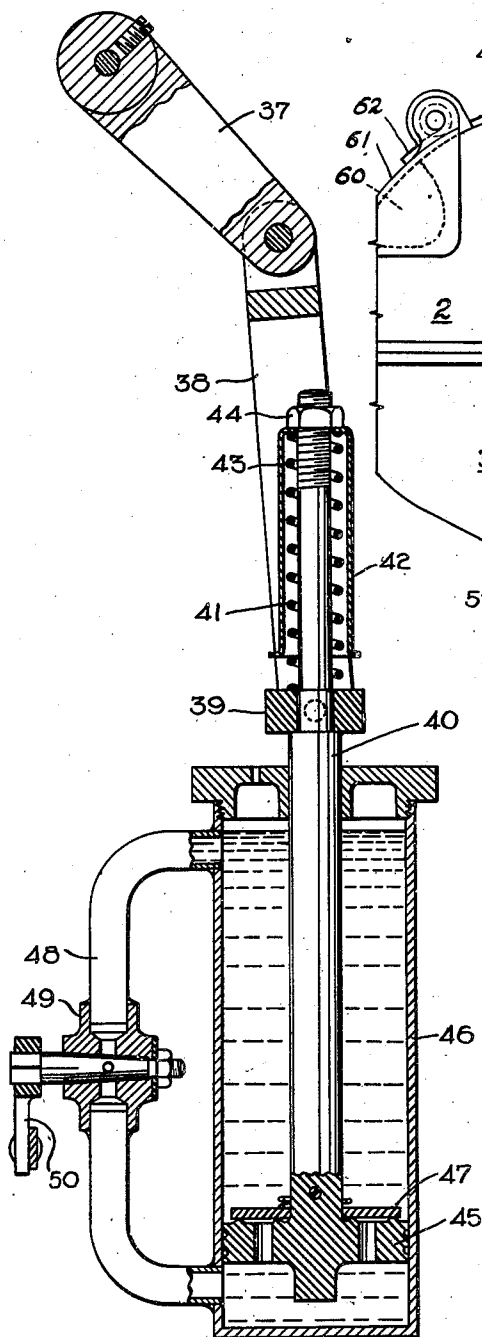


FIG. 2.

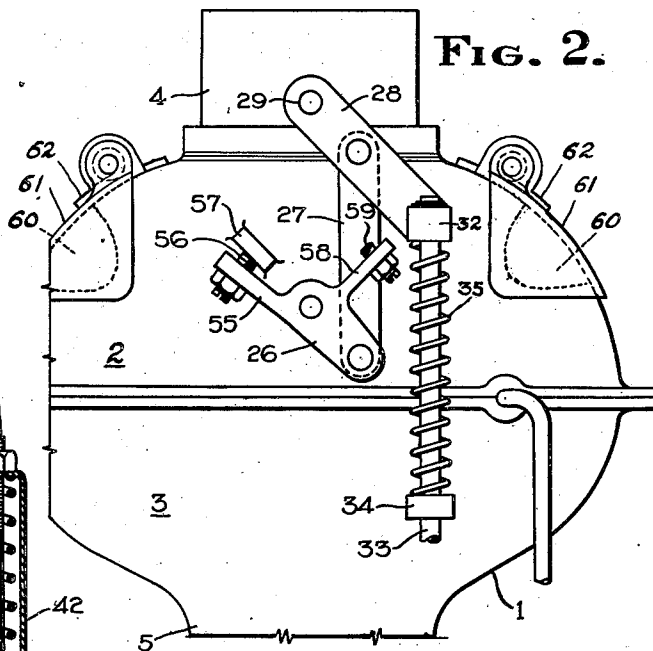
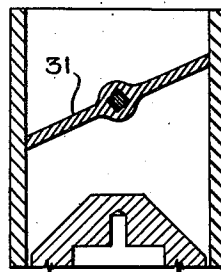


FIG. 6.



Inventor
CHARLES R. SNYDER

By *H. J. McDowell*

Attorney

UNITED STATES PATENT OFFICE

2,327,675

CARBURETOR

Charles R. Snyder, Miami Beach, Fla.

Application December 10, 1940, Serial No. 369,417

7 Claims. (Cl. 261-50)

This invention relates generally to carburetors and is particularly directed to a carburetor of the type to which fuel is fed directly under fuel pump pressure and means are provided for mechanically reducing the fuel to minute particles to assist in more rapid vaporization thereof.

One of the objects of the present invention resides in the provision of a carburetor of the type mentioned having a throttle valve associated therewith, this member being positioned in the air inlet to control the flow of air into the mixing chamber and having its operating mechanism directly connected with a valve employed to control the flow of fuel to the carburetor in order that when the throttle valve is opened, the fuel control valve will also be opened, the relative movement of the members being directly proportioned.

Another object resides in the formation of a carburetor having directly connected throttle and fuel valves and means for automatically controlling the degree of movement of these valves, the latter means being governed by a condition of operation of the engine with which the carburetor is associated.

A further object rests in the construction of a carburetor into which fuel is fed under fuel pump pressure and a valve is provided to control the introduction of the fuel, this valve being so connected with the throttle valve operating mechanism that the operation of the latter will result in similar operation of the former, the operating mechanism also being connected with means by which the extent of movement toward valve opening positions will be controlled by the vacuum produced in the manifold of the engine; the movement limiting means is to be so constructed and connected with the valve actuating mechanism that under the normal operating conditions of the engine, it will be ineffective but under certain unusual conditions, it will become effective and operate to control the throttle and valve actuating mechanism until conditions of normal operation have been restored at which time the limiting means will again be made ineffective.

To illustrate the function of the controlling mechanism, assume that the vehicle bearing it is traveling along a level roadway with the throttle slightly open and the fuel valve permitting the proper flow of fuel for normal driving conditions. The car now reaches a sharp incline and the operator depresses the accelerator pedal to increase the power by opening the throttle. As the fuel valve is directly connected with the throttle, it will also open to a greater extent and introduce more fuel. If the grade is excessive or of unusual length, the engine will slow down and the operator will naturally depress the accelerator to a greater extent. This

movement would, if uncontrolled, result in opening the throttle and fuel valves but as the engine is turning over slowly, too much gas in relation to the amount of air might be introduced and thereby stall the engine.

To prevent this undesirable action, the valve movement limiting means is rendered operative by the decrease in suction in the manifold and the throttle and fuel valves will be restrained from opening further until the speed of the engine has increased sufficiently to use an increased amount of fuel.

Another feature of this invention resides in so constructing the limit means above mentioned that when it is rendered effective, the rate of fuel flow to the carburetor may be slightly increased to enrich the combustible mixture and develop more power, the increase of fuel, however, being limited to the amount which the engine has capacity to use without losing power or stalling from an over-rich mixture. It is also desired to provide means for determining the quantity of the increased fuel introduced after the limiting means has been made effective, to prevent the production of such over-rich mixture.

Other objects will be apparent from the following description and the accompanying drawings in which a carburetor formed in accordance with the invention has been illustrated in detail.

In the drawings:

Fig. 1 is a vertical longitudinal sectional view taken through the carburetor;

Fig. 2 is a side elevational view showing the throttle valve operating mechanism and the connection between this mechanism and the fuel valve operating lever;

Fig. 3 is a detail vertical longitudinal sectional view taken through the means for limiting the throttle and fuel valve adjusting mechanism, this section being taken on the plane indicated by the line III-III of Fig. 1;

Fig. 4 is a detail horizontal sectional view taken on the plane indicated by the line IV-IV of Fig. 1 and shows the motion transmitting mechanism employed in the actuation of the fuel valve;

Fig. 5 is a similar view taken on the plane indicated by the line V-V of Fig. 1;

Fig. 6 is a detail vertical sectional view taken on the plane indicated by the line VI-VI of Fig. 1.

Referring more particularly to the drawings, the numeral 1 designates the casing of the carburetor. In the form of the invention shown, this casing includes upper and lower sections 2 and 3, each of substantially bowl-shaped formation and having meeting flanges at their larger ends, the flanges being bolted or otherwise secured to hold the sections in casing forming order. These casings, when so assembled, pro-

vide a mixing chamber of substantially spherical form. The section 2 has an inlet tube 4 supported therein and the section 3 has an outlet conduit 5 depending therefrom.

The tube 4 is threaded into the section 2 and extends into the mixing chamber as at 6, the lower or inner end of the tube being threaded to receive a plug 7. This member has its upper end tapered as at 8 to guide air entering the chamber through the tube 4 toward openings 9 formed in the side walls of the tube. Normally, these openings are closed by pivoted gates 10 and so held by springs 11. The resistance of the springs is of such an extent that the shutters will be maintained in a closed position until the volume of air passing into the mixing chambers exceeds that capable of passing through a plurality of passages 12 extending through the plug 7. The outlet ends of the passages 12 terminate in restricted nozzles which discharge in the direction of impeller blades 13 formed on a plate 14 constituting part of the fuel vaporizing mechanism.

By reason of the restrictions caused by the nozzles, the air entering the tube 4 will build up pressure sufficient to compress the springs 11 and permit the shutters 10 to open to admit air to the mixing chamber. The inclined surfaces at the inner end of the plug are provided with scoop-like baffles 15 to insure a proper flow of air into the passages 12. As the air flows through the passages and the nozzles, it will impinge the impeller blades and cause the plate 14 to revolve about the longitudinal axis of the mixing chamber. This rotation of the plate is made possible through the provision of an antifriction bearing 16 to which the plate 14 is secured. The stationary race of the bearing is secured to a valve body 17 threaded into the open lower end of the plug 7.

The plate 14 is provided with depending pins 18, the lower ends of which receive and support a vaporizing disk 19. This disk is disposed in a horizontal plane and rotates with the plate 14 when air is drawn into the mixing chamber through the nozzles. The center of the disk 19 is in registration with the discharge end of the gas inlet passage which extends axially through the member 17. A valve stem 20 is rotatably positioned in this passage and has one side flattened as at 20^a to register with a reduced slot 21 extending laterally through the side of the member 17 to provide for the flow of fuel to the passage.

When the stem 20 is positioned as illustrated in Figs. 1 and 5, fuel cannot flow through the slot 21. As the valve is rotated, however, the flat side will be presented to the slot and fuel will be permitted to flow into the passage from which it will be discharged onto the disk 19. Due to the rotation of the disk, this fuel will be discharged laterally in the mixing chamber by centrifugal force, will vaporize and be mixed with the air passing through the chamber. By controlling the rotation of the valve stem, the quantity of fuel permitted to pass through the slot 21 may also be controlled.

The fuel is conducted to the slot 21 through a tube 22, the inner end of which is connected with a ring 23 between the bearing 16 and a shoulder on the body 17. The ring 23 has an annular recess formed therein to receive the fuel introduced through the tube 22. The outer end of this tube communicates directly with the fuel pump so that fuel will be delivered to the carburetor

under positive pressure. Gaskets may be placed between the upper and lower surfaces of the ring and the adjoining mechanism to prevent the escape of fuel at these points.

The plug 7 has an internal chamber formed for the reception of a set of beveled gears 24, one of which is fixed to a valve stem 20 and the other is journaled in the wall of the plug 7. The latter gear receives the splined end of a shaft 25, the outer portion of which is journaled in a bearing provided in the casing section 2. The extreme outer end of the shaft has a lever 26 secured thereto, the movement of the lever serving to rotate the shaft which movement will be imparted by the gears to the valve stem. To move the lever 26, it is connected by a link 27 with a second lever 28 secured, as at 29, to a shaft 30, the intermediate portion of which extends through the inlet tube 4. This shaft is flattened at its central portion to receive the conventional throttle or butterfly valve 31 disposed in the inlet tube and employed to control flow of air into the mixing chamber. The free end of the lever 28 has a perforated block 32 pivotally secured thereto for the slidable reception of one end of a pusher rod 33. This member has an adjustable stop 34 secured thereto and a compression spring 35 surrounds the rod between the stop and the block 32. By this construction, the rod 33 may be moved upward to impart movement to the lever 28 in the operation of opening the throttle.

If, for any reason, resistance to opening movement is imparted to the throttle, the rod 33 may continue to move upwardly and compress the spring 35. Movement of the throttle toward an open position may be resisted by the mechanism designated generally by the numeral 36 in Fig. 1 of the drawings. This mechanism is connected with the shaft 30 at the opposite side of the carburetor from the lever 28. The mechanism also includes a lever 37, one end of which is secured to the shaft 30 while the opposite end is pivotally connected with one end of a yoke-shaped link 38. The lower or free end of the link supports a collar 39 slidably positioned on the reduced extension of a piston rod 40.

When movement is imparted to the lever 37, the link 38 will move the collar upwardly against the lower end of a compression spring 41 disposed between the collar and the inner upper end of a thimble 42 carried by the upper portion of the rod 40. This portion of the rod is threaded as at 43 to receive an adjusting nut 44 through the movement of which the clearance between the lower end of the thimble and the collar may be varied. When the collar moves upwardly, the spring will transmit this movement to the nut and, in turn, to the rod 40. This motion will cause a piston 45 provided at the lower end of the rod 40 to travel upwardly in an oil cylinder 46. This cylinder is rigidly secured to the carburetor casing.

As disclosed in Fig. 3, the piston has a plurality of ports extending therethrough which are normally closed by a spring-pressed valve 47. When the piston moves upwardly, resistance will be offered thereto by the oil or other fluid contained within the cylinder and the vacuum produced between the bottom of the piston and the cylinder. To permit the upward movement, a by-pass line 48 is connected with the ends of the cylinder so that as the piston moves longitudinally thereof, the oil will flow through the by-pass to eliminate the pressure applied to the top of the piston and the vacuum applied to the

under side. When the piston moves in a downward direction, the valve 47 will be free to open and oil may flow through the ports in the piston without obstruction.

To control the movement of the piston in the cylinder, the by-pass line has a valve 49 positioned therein, this valve being of the plug type as disclosed in Fig. 3, although other types of valves may be employed with equal facility. When the valve is closed, the piston will be restrained against upward movement. Since the piston is connected with the link 38 through the spring and collar, resistance to movement of the lever 37 will also be offered. This resistance will be transmitted through the shaft 30 to the levers 28 and 26 so that the throttle and fuel control valves will be stopped in their movement toward open positions. Normally, the valve 49 will be in an open position when the engine with which the carburetor is connected is operating under usual conditions. If the accelerator pedal should be suddenly depressed or an unusual load applied to the engine, the valve 49 will be closed to resist movement of the piston. At this time, the throttle and fuel valves will be stopped so that an excessive amount of fuel will not be introduced. After the engine has increased in speed or the load has been relieved, the valve will open and the throttle and fuel valves permitted to resume normal operation.

The valve 49 is actuated by a lever 50 and a link 51 which transmits movement from a vacuum operated diaphragm 52 to the lever 50. The diaphragm is carried by a housing 53 disposed in open communication with the interior of the carburetor casing. A coil spring 54 is positioned in the housing between the inner portion and the diaphragm. This spring serves to move the diaphragm outwardly when the vacuum in the casing is reduced. When the spring moves the diaphragm, the valve plug will be rotated to close the by-pass line and the piston will be checked in its upward movement. If pressure is applied to the accelerator at this time, the shaft 30 may rotate and swing the arm 37 upwardly until the collar 39 engages the lower end of the thimble 42. Upward movement will then be precluded until the diaphragm is drawn inwardly by vacuum to restore the valve 49 to its open position. The movement of the arm 37 between the stoppage of the piston and the engagement of the collar 39 with the thimble permits the fuel control valve to move an additional amount whereby the quantity of fuel introduced will be increased after the engine has slowed down because of an increased load.

By adjusting the nut 44, the increased amount of fuel may be varied to prevent the introduction of too much fuel which might stall the engine. Through the admission of this additional amount of fuel, the speed of the engine will be increased and when the load is decreased to such an extent that the engine will operate normally, vacuum will be restored and the valve returned to an open position. If the accelerator pedal is still depressed when the valve opens, the energy stored in the spring 35 will cause the lever 28 to move upwardly whereby the throttle and fuel valves will be opened. After the lever 28 has ceased to move, the spring 41 will continue to move the piston until the compression of the spring has been relieved. At this time, the collar 39 will be in engagement with a shoulder on the piston rod and when the pressure on the throttle is released, the piston will be positively

moved downwardly. The return of the lever 28 to a normal position will also cause the return of the lever 26. This movement will be transmitted by the shaft 25 and the gears 24 to the fuel valve to move it to a closed position.

The lever 26 has an extension 55 for the adjustable reception of a stop screw 56. This screw will engage an abutment 57 to prevent movement of the lever 26 to a position wherein valve 20 will be completely closed. This provides sufficient fuel flow to permit the motor to operate at idling speed. The degree of opening may be varied through the adjustment of stop screw 56. A second projection 58 is formed on the lever 26 to limit the degree of opening movement of the fuel valve. This projection has an adjustable stop screw 59.

Through the provision of the carburetor above described, the throttle valve is located in advance of the fuel vaporizing mechanism and is directly connected to the fuel control valve in order than when the throttle is opened, the fuel control valve will also be opened to increase the flow of fuel. By introducing the fuel to the carburetor under pressure, a quantity in proportion to the needs of the motor may be provided regardless of the speed of operation. Through the limiting device, this quantity of fuel may be controlled by a condition of operation of the engine so that in the event a load is applied to the engine to reduce its speed, the amount of fuel introduced will not be sufficient to cause the engine to stall.

When the throttle valve is positioned between the fuel vaporizing means and the engine as in conventional constructions, there is a tendency for the fuel to condense through engagement with the throttle valve. In addition, there is grave danger of ice forming on the throttle due to the lowered temperature resulting from rapid vaporization of the fuel. By positioning the throttle valve in advance of the fuel vaporizing means which is made possible by the construction set forth herein, the outlet leading from the carburetor mixing chamber is unobstructed and may be decreased in length to such an extent that the vaporizing means will be located immediately adjacent to or in the intake manifold. When the outlet passage is thus decreased in length, the casing of the carburetor may be heated to positively prevent any ice formation and provide for a more rapid vaporization of fuel.

To provide for relief for pressure within the mixing chamber in the event the engine equipped with the carburetor should backfire, the top section 2 has one or more openings 60 formed therein. These openings are closed by pivoted covers 61 mounted on the outer sides of the section 2. Springs 62 engage the surfaces of the section 2 and the covers 61 to resiliently hold the latter in normally closed positions. If the engine should backfire, the increased pressure within the carburetor would have no deleterious effect because the covers 61 would move open to vent the casing.

From the foregoing, it will be seen that a carburetor has been provided whereby the gas to air ratio of the fuel mixture introduced to the engine will be varied according to the demands for power made upon the engine.

What is claimed is:

1. In a carburetor of the type having a mixing chamber provided with inlet and outlet passages, fuel vaporizing means in said mixing chamber and means for conducting fuel under pressure to said vaporizing means, a throttle valve disposed

in the inlet passage, resilient manually operable means for opening said throttle valve, valve means in said fuel conducting means for controlling the flow of fuel to said vaporizing means, motion transmitting means connecting said throttle and fuel valves, means connected with one of said valves for interrupting the movement of said valve toward an open position, and means connected with said movement interrupting means and operative upon a decrease in the suction created by the engine equipped with the carburetor to render said movement interrupting means operative.

2. In a carburetor of the type having a mixing chamber provided with inlet and outlet passages, fuel vaporizing means in said mixing chamber and means for conducting fuel under pressure to said vaporizing means, a throttle valve disposed in the inlet passage, resilient manually operable means for opening said valve, valve means in said fuel conducting means for controlling the flow of fuel to said vaporizing means, motion transmitting means connecting said throttle and fuel valves, means connected with one of said valves for interrupting the movement of said valve toward an open position, a lost motion connection between said movement interrupting means and one of said valves and means connected with said movement interrupting means and operative upon a decrease in the suction created by the engine equipped with the carburetor to render said movement interrupting means effective, said lost motion connection providing for a slight additional movement of the valve connected therewith after said movement interrupting means becomes operative.

3. In a carburetor of the type having a mixing chamber provided with inlet and outlet passages, fuel vaporizing means in said mixing chamber and means for conducting fuel under pressure to said vaporizing means, a throttle valve disposed in the inlet passage, resilient manually operable means for opening said valve, valve means in said fuel conducting means for controlling the flow of fuel to said vaporizing means, means for simultaneously moving said valves toward open positions, means rendered operative upon the decrease of suction produced by the engine equipped with the carburetor to fix the extent of movement of said valves toward open positions, and means between said last-mentioned means and one of said valves to delay the effect of said means on said valve.

4. In a carburetor of the type having a mixing chamber provided with inlet and outlet passages, fuel vaporizing means in said mixing chamber and means for conducting fuel under pressure to said vaporizing means, a throttle valve disposed in the inlet passage, valve means in said fuel conducting means for controlling the flow of fuel to said vaporizing means, means for simultaneously moving said valves toward open positions and means regulated by the suction of the engine for controlling certain operations of said valves, said means having a cylinder for the reception of a quantity of fluid, a piston movable in said cylinder for displacing the fluid, means for connecting said piston and said valves, the former being movable substantially in unison with the latter, means establishing communication between the ends of said cylinder on opposite sides of said piston, and means operative upon a decrease in suction produced by the en-

gine equipped with the carburetor to interrupt communication between opposite ends of said cylinder to prevent movement of said piston and valves.

5. In a carburetor of the type having a mixing chamber provided with inlet and outlet passages, fuel vaporizing means in said mixing chamber and means for conducting fuel under pressure to said vaporizing means, a throttle valve disposed in the inlet passage, valve means in said fuel conducting means for controlling the flow of fuel to said vaporizing means, means for simultaneously moving said valves toward open positions and means regulated by the suction of the engine for controlling certain operations of said valves, said means having a cylinder for the reception of a quantity of fluid, a piston movable in said cylinder for displacing the fluid, a lost motion yieldable coupling connecting said piston and said valves, the former normally being movable in unison with the latter, means establishing communication between the ends of said cylinder on opposite sides of said piston, and means operative upon a decrease in suction produced by the engine equipped with the carburetor to interrupt communication between opposite ends of said cylinder to prevent movement of said piston and valves, said lost motion connection permitting the valves to move a limited distance after the movement of the piston is interrupted.

6. In a carburetor, a casing formed with an air passageway, the inlet of said passageway communicating with the atmosphere and the outlet with the cylinders of an associated engine, fuel vaporizing means disposed within said passageway, a throttle valve arranged in said passageway adjacent to the air inlet end thereof, resilient manually operable means for opening said throttle valve, means for conducting fuel under pressure to said vaporizing means, valve means associated with said fuel conducting means for controlling the flow of fuel to said vaporizing means, motion-transmitting means directly connecting said throttle valve and fuel control valve means, and means controlled by conditions of operation of the engine being served by the carburetor for automatically limiting the extent of movement of said throttle valve and fuel control valve means toward open fluid-flow admitting positions.

7. In a carburetor, a casing formed with an air passageway, the inlet of said passageway communicating with the atmosphere and the outlet with the cylinders of an associated engine, fuel vaporizing means disposed within said passageway, a throttle valve arranged in said passageway adjacent to the air inlet end thereof, resilient manually operable means for opening said throttle valve, means for conducting fuel under pressure to said vaporizing means, valve means associated with said fuel conducting means for controlling the flow of fuel to said vaporizing means, motion-transmitting means directly connecting said throttle valve and fuel control valve means, means connected with said throttle and fuel control valve means for automatically limiting the extent of movement thereof toward open fluid-flow admitting positions, said limiting means having a variable stop, and means actuated by vacuum produced in the engine served by the carburetor for varying the operative position of said stop.

CHARLES R. SNYDER.