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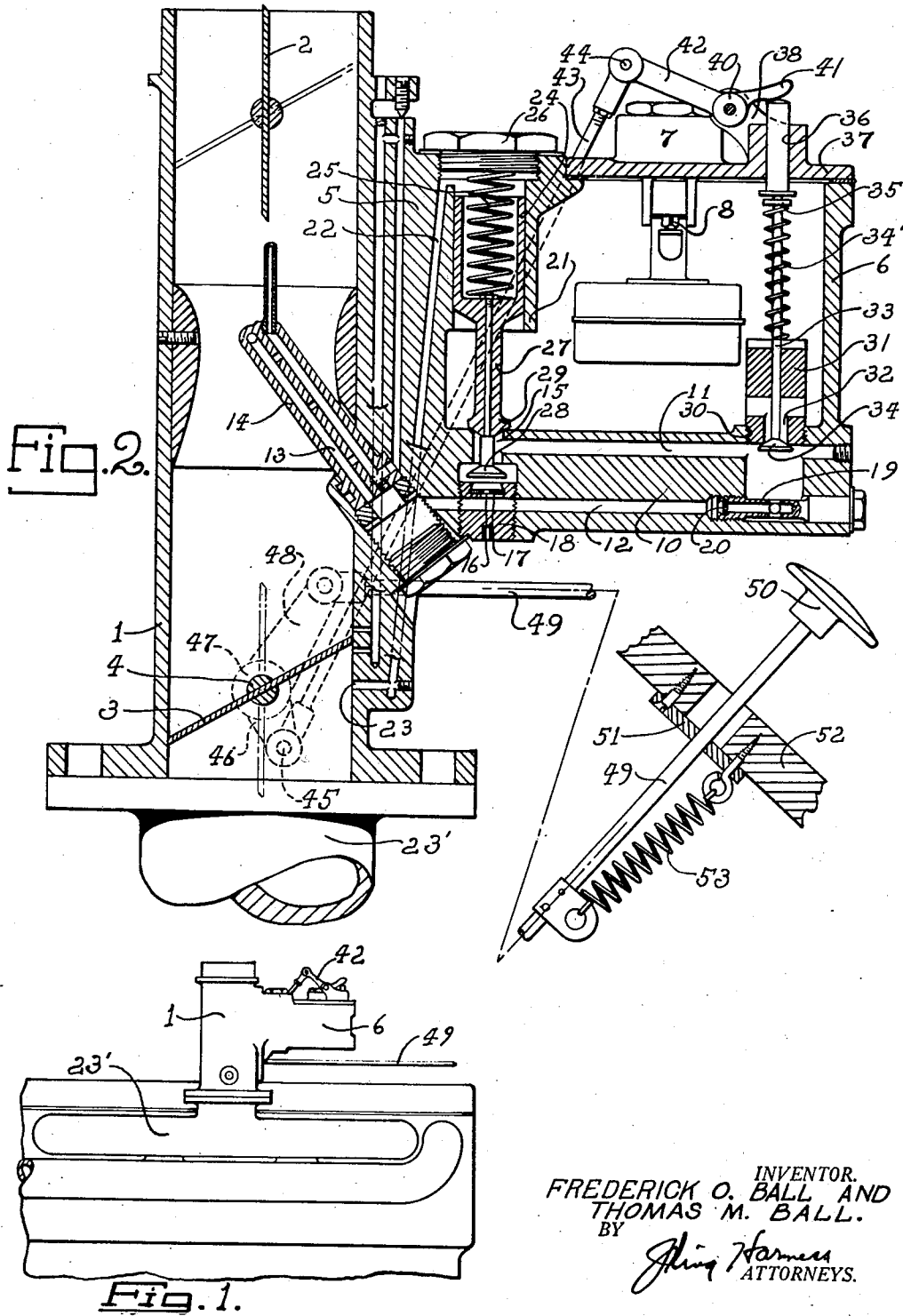
F. O. BALL ET AL

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CARBURETOR

Filed April 17, 1931

2 Sheets-Sheet 1



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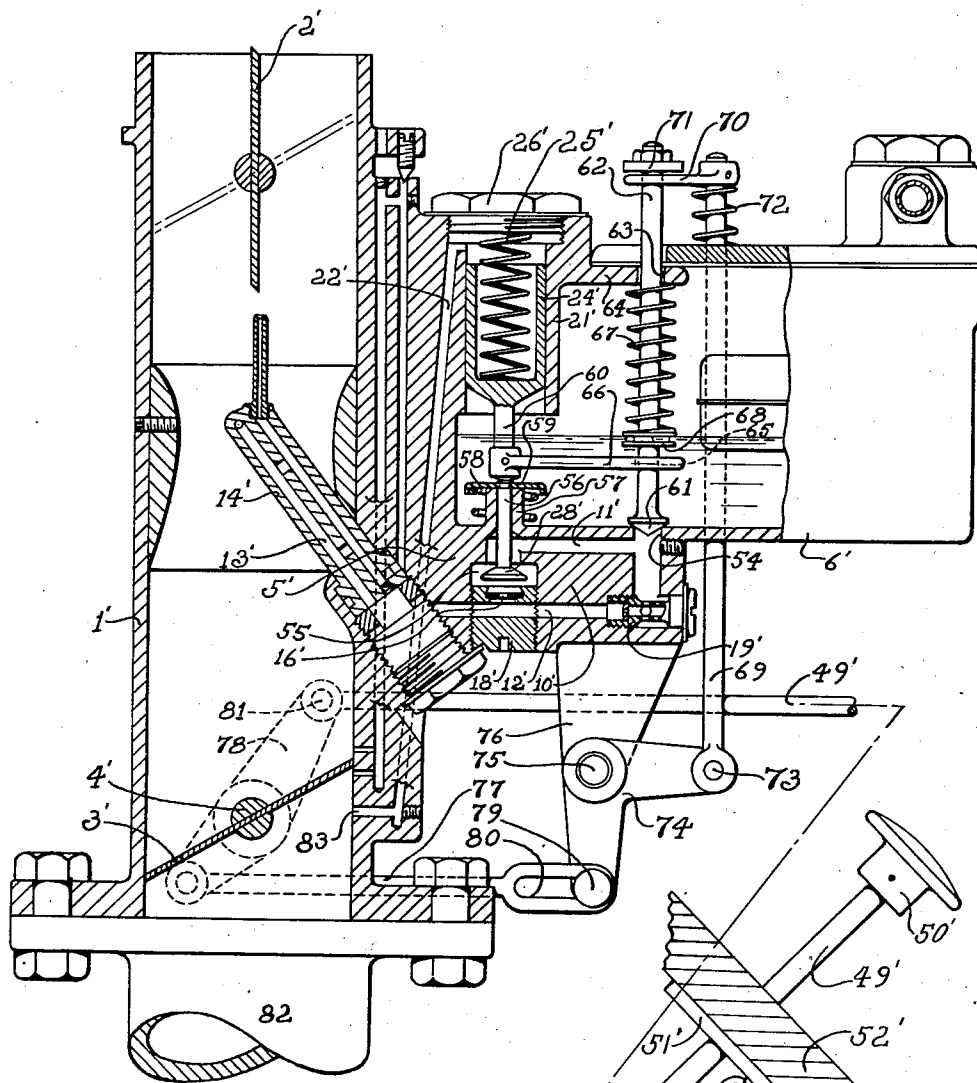


Fig. 3.

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CARBURETOR

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12 Claims. (Cl. 261-41)

This invention relates to an improved carburetor and particularly to improved anti-percolating apparatus.

Carburetors of the type used on vehicle engines generally include a fuel reservoir and they are located in a hood compartment in close proximity to the engine. During operation of the engine the entire carburetor is cooled by a substantial current of air which the fan of the cooling system circulates through the hood compartment and by the air which passes through the mixing chamber of the carburetor. This cooling effect is augmented by the introduction of air into the hood compartment during forward movement of the vehicle.

When operation of the engine is discontinued and the vehicle is at rest, these cooling factors are not present and as a result, the heat given off by the metal of the engine rapidly raises the temperatures of the carburetor and hood compartment above the boiling point of the liquid fuel in the reservoir and communicating fuel passages. This action causes the fuel in the reservoir and communicating fuel passages to be percolated through the nozzle and wasted. More serious effects occur, particularly in down draft carburetion, for the fuel which is percolated through the nozzle immediately after a vehicle is stopped and operation of the engine is discontinued, flows into the carburetor mixing chamber, manifold and engine cylinders, and excessively overloads the engine with a rich charge of fuel. The over loaded or flooded condition of the engine prevents it from being restarted. In extreme cases it is necessary to turn the engine over by towing the vehicle in order to drive out the fuel.

The main objects of the invention are to provide apparatus for positively shutting off the flow of fuel from the fuel reservoir of a carburetor; to provide means of this kind which automatically shuts off the flow of fuel from the fuel reservoir immediately upon discontinuing operation of the engine; to provide apparatus of this character in a conventional carburetor having a suction controlled step up; to provide a valve which is operable by the step up mechanism of a carburetor for controlling one outlet of the fuel reservoir thereof; to provide a valve of this kind which is adapted to be opened by the step up mechanism only when the suction in the mixing chamber of the carburetor exceeds a predetermined degree, as for example, when the throttle is closed and the engine is idling; to provide a valve in another outlet of the fuel

reservoir which is normally closed when the throttle is closed and which is operable by manipulation of the throttle so as to open the latter outlet when the throttle is moved from its closed or idling position; and to provide independent valves of this kind for closing both of the fuel outlets of a fuel reservoir when operation of the engine is discontinued, which are associated with diverse operative elements of the carburetor whereby at least one of the valves is retained in an open position during all the stages of operation of the carburetor and engine.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a side elevation of an engine which is equipped with a carburetor which includes improved anti-percolating apparatus.

Fig. 2 is a vertical section of a carburetor showing the anti-percolating apparatus in detail, and illustrating in offset relation, the accelerator pedal and bar by which the throttle valve of the carburetor is controlled.

Fig. 3 is a vertical section, similar to Fig. 2, but showing a modified form of the anti-percolating apparatus.

In the form shown, the anti-percolating apparatus is illustrated in connection with a carburetor of the down draft type having a fuel reservoir in which are formed two fuel outlets that communicate with fuel passages leading to a discharge nozzle. The fuel outlets of the reservoir are normally closed, by independent valves, when the carburetor is not in operation. One of the valves is carried by a shiftable element of the step up mechanism which varies the fuel metering characteristics of the carburetor in a conventional way and which opens the fuel outlet of the reservoir when a predetermined suction is created in the manifold, as for example, when the throttle valve in the mixing chamber is in a closed, idling position. The other fuel valve of the reservoir is provided with valve actuating mechanism which is operatively connected with the throttle valve by valve actuating mechanism which opens the latter fuel valve when the throttle valve is rotated from its closed position toward an open position. In this manner at least one of the valves is retained in an open position during all stages of carburetion. Anti-percolating apparatus of the above construction may also be successfully employed in up draft carburetors.

In the illustration shown, the carburetor has a tubular portion including a mixing chamber 1 and having a rotatable choke valve 2 at its upper

end and a throttle valve 3 at its lower end which is mounted on a shaft 4 that is journaled in the walls of the mixing chamber. Integrally formed on one side of the mixing chamber is a body portion 5 adjacent which is provided with a fuel reservoir 6. The fuel reservoir 6 has an inlet 7 through which fuel is supplied to its interior under the control of a valve 8 that is controlled by a float 9 so as to predetermine the level of the fuel in the reservoir. The reservoir 6 has a thickened lower wall 10 in which are formed upper and lower passages 11 and 12, respectively which communicate with each other and with a fuel passage 13 of a differential fuel nozzle 14 having its discharge end located in the mixing chamber 1. Formed in the lower wall 10 of the reservoir 6 is a fuel outlet passage 15 which communicates with the upper passage 11 in the thickened wall 10 and with the lower passage 12 thereof through a metering orifice 16 in a disc 17 that is carried by a plug 18 which is threaded in a recess in the thickened wall 10 and located in registration with the outlet opening 15. A metering element 19 having an orifice 20 is located at the junction of the upper and lower passages 11 and 12 for controlling the flow of fuel from the upper passage into the lower passage.

The carburetor is equipped with step up mechanism including a cylinder 21 for controlling the flow of fuel from the reservoir to the metering orifice 16. Formed in the body portion 5 is a passage 22 communicating at one end with the interior of the cylinder 21 and at its other end with the interior of the carburetor passage on the discharge side of the throttle at a location 23, between the closed position of the throttle valve 3 and the manifold 23' with which the mixing chamber is connected. A piston 24 is slidably mounted in the cylinder 21 and it is normally urged downwardly by a coil spring 25 which bears between an internal seat on the piston and a plug 26 which is threaded in an opening in the upper extremity of the body portion 5. The piston 24 includes an integral stem 27 on which is mounted a step up valve 28 for opening and closing the lower end of the outlet passage 15 of the reservoir.

Formed on the stem 27 of the cylinder 20 is a fuel valve 29 which normally closes the upper end of the outlet passage 15 when the carburetor is not in operation. The piston 24 is responsive to the suction in the manifold 23' and is adapted to move upwardly against the action of the spring 25 when a predetermined degree of suction is present in the manifold, so as to move the step up valve 28 to a closed position. During this movement of the step up mechanism, the valve 29 is lifted from its seat so as to permit fuel to flow from the interior of the reservoir through the outlet opening 15 and into the passage 11 of the thickened wall 10 of the reservoir from which the fuel is fed to the fuel nozzle 14.

Formed in the thickened wall 10 of the reservoir 6 is an opening 30 in which is threaded a plug 31 having a fuel outlet passage 32 communicating with the fuel passages 11 and 12. A valve stem 33 having a valve 34 on its lower end for closing the outlet passage 32 of the plug is slidably mounted in the latter and normally held in a closed position by a coil spring 34' which bears between the inner extremity of the plug 31 and a collar 35 on the valve stem 33. The upper end portion of the valve stem 33 is larger in diameter than the re-

maining portion thereof and it protrudes through an opening 36 in the cover 37 of the reservoir 6.

Pivotaly mounted on a bracket 38 carried by the cover 37 is a bell crank lever 40 having a cam arm 41 contacting with the upper extremity of the valve stem and an arm 42 which is operatively connected with the control mechanism of the throttle valve 3 by a link 43.

The upper end of the link 43 is pivotally attached at 44 to the arm 42 of the bell crank lever 40 and the lower end of the link is pivotally attached at 45 to an arm 46 of a bell crank lever 47 which is rigidly mounted on the shaft 4 of the throttle valve. The other arm 48 of the bell crank lever 47 is pivotally connected by a rod 49 with an accelerator pedal 50 which is generally located in the passage compartment of a vehicle. The accelerator rod 49 is slidably mounted in an aperture of a plate 51 which is secured to the lower side of a toe riser 52 and which is normally urged rearwardly by a coil spring 53 so as to hold the throttle valve 3 in a closed position.

When operation of the engine is discontinued and the accelerator pedal 50 is released, the throttle valve 3 is rotated under the action of the spring 53 to the closed position shown in Fig. 2. During closing of the throttle valve 3, the bell crank lever 40 is turned in a counterclockwise direction by the link 43, to the position shown in Fig. 2 so as to allow the valve 34 to close under the action of the spring 34'. Since the interior of the manifold is at atmospheric pressure when the engine is not running, the spring 25 holds the piston 24 in its lowermost position so as to retain the valve 29 closed. In this manner, the flow of fuel from the interior of the reservoir into the fuel passages leading to the nozzle 14 is positively prevented immediately after operation of the engine is discontinued. Therefore, only the amount of fuel which remains in the fuel passages and fuel nozzle after the engine is stopped, can be percolated from the carburetor by the heat which accumulates in the hood compartment.

When the engine is started, the throttle valve 3 is necessarily opened by depression of the accelerator pedal 50. As the throttle valve is turned to an open position the bell crank lever 40 is rotated in a clockwise direction by the link 43 and the arm 41 of the bell crank lever moves the valve stem 33 and the valve 34 downwardly against the action of the spring 34' to an open position. Fuel immediately flows through the outlet passage 32 of the fuel reservoir into the fuel passage 12 by which it is conducted to the fuel nozzle. The valve 34 remains open as long as the throttle valve 3 is open and before the throttle valve is closed, sufficient suction is created in the manifold to lift the cylinder 24 against the action of the spring 25. This operation of the step up mechanism changes the metering characteristics of the carburetor in a conventional manner and at the same time opens the valve 29 so as to permit fuel to flow from the interior of the reservoir to the fuel passages and fuel nozzle. In some instances there may be sufficient suction to hold the valve 39 open while the throttle is in an open position and in this case, fuel will flow from the reservoir through both outlets at the same time. At least one of these valves is open during all stages of operation of the carburetor and engine and when operation of the engine is discontinued and the accelerator pedal 50 is released, both valves are closed by their respective springs so as to positively shut off the flow of fuel from the reservoir.

In Fig. 3 of the drawings is illustrated a car-

buretor that is similar to the carburetor shown in Fig. 2, but which is equipped with another form of control apparatus for preventing percolation of fuel from the fuel reservoir when operation of the engine is discontinued. This carburetor has a tubular portion including a mixing chamber 1' having a rotatable choke valve 2' at its upper end and a throttle valve 3' at its lower end which is mounted on a shaft 4' that is journaled in apertures in the walls of the tubular portion. Integrally formed on one side of the mixing chamber is a body portion 5' adjacent which is provided a fuel reservoir 6'. The reservoir 6' has a thickened lower wall portion 10' in which are formed upper and lower passages 11' and 12', respectively, which communicate with each other and with a fuel passage 13' of a differential fuel nozzle 14' having its discharge end located in the mixing chamber 1'.

Formed in the lower wall 10' of the reservoir 6' is a fuel outlet passage 54 which communicates with the upper fuel passage 11' and with the interior of the reservoir 6'. A metering plug 19' having a constricted economy orifice located in the lower passage 12' normally meters the fuel as it flows from the reservoir to the fuel nozzle 14'. The upper fuel passage 11' also communicates with a chamber 55 in the thickened wall portion 10' in which a threaded plug 18' having a metering orifice 16' is disposed. The metering orifice 16' communicates with the lower fuel passage 12' and is adapted to augment the quantity of fuel which enters this passage through the metering plug 19' when a powder mixture is required.

The carburetor is equipped with step up mechanism including a cylinder 21' for controlling the flow of fuel from the reservoir to the metering orifice 16'. This mechanism includes a valve stem 56 which is slidably mounted in a tubular boss 57 integrally formed on the internal side of the lower wall 10' of the reservoir and which carries a valve 28' for controlling the flow of fuel to the metering orifice 16'. The valve 28' is normally held in a closed position by a spring 58 which bears between a flange 59 fixed on the upper end of the valve stem 56 and the internal surface of the lower wall of the reservoir 6'.

The upper end of the valve stem 56 registers with the lower extremity of a piston rod 60 which is integrally formed on the lower end of a piston 24' that is slidably mounted in the cylinder 21'. Formed in the body portion 5' of the carburetor is a passage 22' which communicates at one end with the interior of the cylinder 21' and at its other end with the carburetor passage and with the interior of the manifold 82 on the discharge side of the throttle, as indicated at 83. The piston 24' is normally urged downwardly by a coil spring 25' which bears between an internal seat on the piston and a plug 26' that is threaded in an opening in the upper extremity of the body portion 5'. The spring 25' holds the piston in its lower position when the suction on the discharge side of the throttle valve is insufficient to hold the piston in its uppermost position against the action of the spring. In this manner, the step up valve 28' is held in an open position during low vacuum operating stages of the carburetor and it is held in a closed position during high vacuum operating stages.

The flow of fuel from the reservoir to the fuel passages 11' and 12' is controlled by a valve 61 having a valve stem 62 which is slidably mounted in an aperture 63 formed in a flange 64 which extends outwardly from the cylinder 21', and in an aperture 65 of an arm 66 which is fixed to the piston rod 60. The valve 61 registers with the outlet 54 of the reservoir and it is normally held in a closed position by a spring 67 that bears between the flange 64 and a collar 68 which is fixed on the valve stem 62.

The arm 66 of the piston rod 60 registers with the collar 68 and engages the latter when the piston 24' is held in its upper-most position by the suction existing on the discharge side of the throttle valve 3' during idling operation of the carburetor. In this manner, the piston of the step-up mechanism may be relied upon to hold the fuel valve 61 open against the action of the spring 67 during idling operation of the carburetor.

The fuel valve 61 may be conveniently held in an open position during all other stages of operation of the carburetor by suitable mechanism which is actuated during opening of the throttle 3' from its idling position. The valve actuating mechanism, shown in Fig. 3, includes a substantially vertical rod 69 having an arm 70 at its upper end which is provided with an aperture for receiving the valve stem 62. This arm is normally urged against a washer 71 on the upper end of the valve stem by a spring 72 which bears between the cover of the fuel reservoir and the arm 70 with sufficient force to overcome the effect of the spring 67 and normally retain the valve 61 in an open position when the throttle valve 3' is open beyond its idling position. The lower end of the rod 69 is pivotally attached at 73 to one arm of a bell crank lever 74 which is pivoted at 75 on a bracket 76 that extends downwardly from the thickened wall portion 10' of the reservoir. The other arm of the bell crank lever 74 is connected by a link 77 with one arm of a bell crank lever 78 which is fixed on the shaft 4' of the throttle valve. The link 77 is slidably connected with the lower arm of the bell crank lever 74 by a pin 79 which extends through a slot 80 in the end portion of the link.

The throttle valve 3' is provided with conventional control apparatus which includes an accelerator rod 49' having a pedal 50' located in the passage compartment of a vehicle. The rod 49' is slidably mounted in a bracket 51' which is secured to a toe riser 52' of the vehicle and the accelerator rod is normally held in a leftwardly extended position, as viewed in Fig. 3, by a spring 53'. The forward end of the accelerator rod 49' is pivotally attached at 81 to the lever 78. In operation, when the carburetor is conditioned for idling operations, the throttle valve 3' is closed and sufficient suction is present on the discharge side of the throttle to hold the piston 24' in its upper position, thereby holding the fuel valve 61 open by means of the arm 66. When the throttle valve is turned in a counterclockwise direction from the idling position, shown in Fig. 3, the link 77 is moved to the left and the bell crank 74 is permitted to turn in a counterclockwise direction under the action of the spring 72 which shifts the rod 69 upwardly so as to hold the fuel valve 61 in an open position during all stages of operation of the carburetor other than the idling stage. In this manner, the fuel valve 61 is held in an open position during all stages of operation of the carburetor, but when operation of the carburetor and the engine with which it is associated is discontinued, the operator normally releases the accelerator pedal and allows the

spring 53' to return the throttle valve 3 to its closed position. During this return movement of the throttle control apparatus, the arm 70 is lower so as to permit the valve 61 to be closed by the spring 67. It is obvious that when operation of the engine is discontinued, insufficient suction exists in the carburetor to hold the piston 24' in its upper position and therefore, the arm 66 is held out of contact with the collar 68 so that the valve 61 is free to close under the action of the spring 67.

Although but several specific embodiments of this invention have herein been shown and described, it will be understood that various changes in the size, shape and arrangement of parts may be made without departing from the spirit of my invention and it is not our intention to limit its scope other than by the terms of the appended claims.

What we claim is:

1. In a carburetor including a fuel reservoir having a pair of fuel outlets, valves for normally closing said outlets when operation of said carburetor is discontinued, valve actuating mechanism operable by the suction in said carburetor during idling operation thereof for holding one of said valves in an open position, and valve actuating mechanism operable during all other stages of operation of said carburetor for holding the other valve in an open position.

2. In a carburetor including a throttle valve and a fuel reservoir having a pair of fuel outlets, fuel valves for normally closing said fuel outlets when operation of said carburetor is discontinued, valve actuating mechanism operable by the suction in said carburetor when said throttle valve is closed during idling operation thereof for holding one of said fuel valves in an open position, and valve actuating mechanism connected with said throttle valve for opening the other fuel valve in timed relation to the opening of said throttle valve.

3. In a carburetor including a fuel mixture passage, a throttle valve and a source of fuel having a pair of fuel outlets communicating with said fuel mixture passage, fuel valves for normally closing said outlets when operation of said carburetor is discontinued, valve actuating mechanism operable by the suction in said carburetor for holding one of said fuel valves open when a predetermined degree of suction exists in said carburetor, and valve actuating mechanism for holding the other valve open when said throttle valve is open.

4. In a carburetor including a throttle valve and a fuel reservoir having a pair of fuel outlets, step up mechanism for regulating the fuel metering characteristics of said carburetor including a valve for positively closing one of said fuel outlets when operation of said carburetor is discontinued, said step up mechanism being adapted to open said fuel valve when said throttle is closed during operation of said carburetor, a valve for positively closing the other outlet of said reservoir when operation of said carburetor is discontinued, and valve actuating apparatus connected with said throttle for opening the latter fuel valve when said throttle is opened.

5. In a carburetor including a fuel mixture passage, a throttle and a source of fuel having two outlets communicating with said fuel mixture passage, a pair of fuel valves for normally closing said outlets when operation of said carburetor is discontinued, and a pair of valve actuating mechanisms, one responsive to suction in said

carburetor and the other responsive to manipulation of said throttle for retaining at least one of said fuel valves open during all operating stages of said carburetor.

6. In an internal combustion engine, a carburetor in close proximity to said engine including a fuel mixture passage and a fuel reservoir having a pair of fuel outlets communicating with said passage, a pair of valves for closing said outlets when operation of said engine is discontinued so as to prevent percolating of fuel from said reservoir, control apparatus for said carburetor including resilient means for yieldably holding said apparatus in a predetermined position, means for opening one of said valves when said control apparatus is in said predetermined position during operation of said engine, and, means operable by said control apparatus for opening the other valve when said control apparatus is moved from said predetermined position.

7. In an internal combustion engine, a carburetor in close proximity to said engine including a fuel reservoir having a pair of fuel outlets, a pair of valves for closing said outlets when operation of said engine is discontinued so as to prevent percolating of fuel from said reservoir, a throttle valve in said carburetor, control apparatus for said throttle valve including a resilient member for yieldably holding said throttle in an idling position, mechanism operable by said control apparatus for opening one of said fuel valves when said throttle is opened beyond an idling position, and means responsive to the suction in said carburetor during idling of said engine for opening the other fuel valve during idling of said engine.

8. In an internal combustion engine, a carburetor in close proximity to said engine including a fuel mixture passage and a fuel reservoir having a pair of fuel outlets communicating with said passage, a pair of valves for closing said outlets when operation of said engine is discontinued so as to prevent percolating of fuel from said reservoir, a throttle valve in said carburetor for controlling the operation of said engine adapted to influence the suction in said carburetor, means responsive to a predetermined degree of suction in said carburetor for opening one of said fuel valves, and mechanism operable in timed relation with said throttle valve for opening the other fuel valve when said throttle is in a predetermined position.

9. In a carburetor including a throttle valve and a communicating fuel reservoir and fuel nozzle, means for controlling said throttle valve, control apparatus for completely preventing the flow of fuel from said reservoir to said nozzle when operation of said carburetor is discontinued, and actuating mechanism for said control apparatus including means responsive to the suction in said carburetor only when said throttle valve is closed for establishing communication between said reservoir and nozzle only when said throttle is in an idling position and means operable by said throttle valve control means for establishing communication between said reservoir and said nozzle only when said throttle is opened beyond its idling position.

10. In an internal combustion engine, a carburetor in close proximity to said engine including a fuel reservoir having a fuel inlet, a fuel valve for closing said fuel outlet when operation of said engine is discontinued so as to prevent percolating of fuel from said reservoir, a throttle

valve in said carburetor, control apparatus for said throttle valve including a resilient member for yieldably holding said throttle in an idling position, mechanism operable by said control apparatus for holding said fuel valve in an open position when said throttle is opened beyond its idling position, and means responsive to the suction in said carburetor during idling of said engine for holding said fuel valve in an open position during idling of said engine.

11. In a carburetor, a fuel reservoir, a fuel nozzle communicating therewith, a throttle valve, means for operating the latter, control apparatus for completely preventing the flow of fuel from said reservoir when operation of said carburetor is discontinued, and actuating mechanism for said control apparatus including means responsive to the suction in said carburetor only when said throttle is closed beyond a predetermined position for establishing communication between said reservoir and nozzle only under such conditions and means responsive to movement of said

throttle valve operating means only during opening of said throttle beyond said predetermined position for establishing communication between said reservoir and nozzle only when said throttle is opened beyond said predetermined position.

12. In a carburetor including a mixing chamber and having a fuel passage leading thereto, a fuel reservoir having a pair of fuel outlets communicating with said fuel passage, a valve in each outlet, means for yieldably normally urging said valves and holding the latter in closed position, valve opening apparatus associated with one of said valves and constructed and arranged to automatically open and hold the same against closing during idling operation of said carburetor only, and valve opening apparatus associated with the other valve and constructed and arranged to automatically open and hold the latter valve against closing when the carburetor is conditioned for operations other than idling.

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