Sept. 25, 1951 R. J. BRUNNER 2,568,987

CARBURETOR

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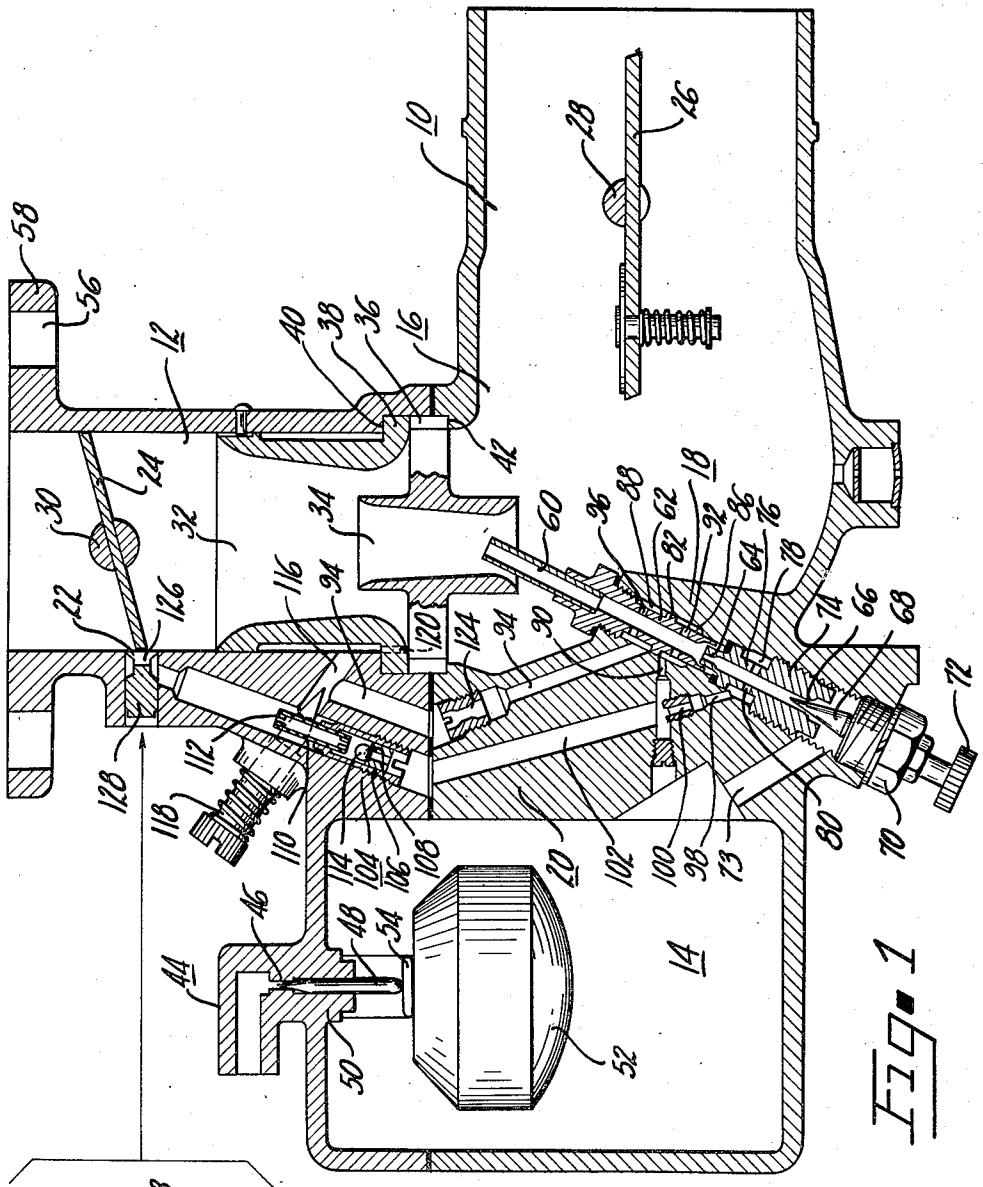


Fig. 1

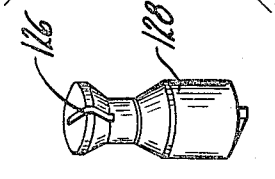


Fig. 2

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CARBURETOR

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The present invention relates to float type carburetors for internal combustion engines and more particularly to a fuel system in the aforesaid carburetors for supplementing the main fuel discharge jet and for supplying fuel to the engine during starting, while idling and at light load operations.

It is a primary object of the present invention to provide, in a float type carburetor for an internal combustion engine, a highly dependable fuel supply system which is readily responsive to variations in engine operating conditions.

Another object of the invention is to provide in the aforesaid carburetors an idle and low speed fuel metering system in conjunction with the main fuel metering system, wherein rapid changeover from one feeding system to the other is attained when the throttle valve is opened or closed during the operation of the engine.

Further objects and advantages of the present invention will be apparent to those skilled in the art from the following description when taken in conjunction with the accompanying drawings wherein one embodiment of the present invention is shown. The interconnecting idling and main discharge systems comprising the present invention are not limited to the embodiment shown in the aforementioned drawings nor to the particular design of float type carburetor included therein for the purpose of illustrating the present invention, but are understood to be adaptable in the present or modified form to many float type carburetors for internal combustion engines. As used throughout the specification and in the appended claims the term "idling" system refers to the system in a carburetor for supplying fuel to the engine during starting, slow or fast idling or at light load operations when the throttle valve is in closed or nearly closed position and the main discharge jet is inoperative.

The present invention is predicated on the discovery that engine performance and fuel metering control can be improved to an appreciable degree during idling and light load operation by interconnecting the idling system and the main fuel supply system of a carburetor at points anterior and posterior to a main or secondary metering jet in said supply system, and by including in said idling system a valvular means for preventing backflow of air or fuel therein when said system is inoperative. In the present interconnected systems, fuel is supplied through said idling system to the main discharge jet posterior to the main metering jet during part and wide open throttle and to the idling system

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by the main discharge jet from points on either side of a metering jet during idling and light load operations.

In Figure 1 of the drawings, a vertical cross section of a carburetor for an internal combustion engine is shown in which certain parts of the carburetor have been rearranged to more clearly illustrate the present invention.

In Figure 2, an enlarged perspective view of a fuel discharge member of the idling system is shown.

The embodiment of the invention illustrated in the accompanying drawings is shown in combination with a conventional updraft carburetor generally comprising an air horn 10, a throttle body 12, a float chamber 14 and a main body 16 having therein a main fuel discharge system generally shown at 18 and a portion of the idling system generally shown at 20. The throttle body 12 includes the remainder of the idling system 20 which in the assembled carburetor communicates with the main fuel discharge system 18 and with the carburetor induction passage at a port 22 adjacent a throttle valve 24. The induction passage which extends through the air horn 10, main body 16 and throttle body 12 is controlled at the air inlet end by a choke valve 26 mounted on shaft 28 and at the mixture outlet end by throttle valve 24 mounted on shaft 30 which is actuated by any suitable means through a throttle valve lever and linkage (not shown) mounted on an end of said shaft. A large Venturi tube 32 and a small or secondary Venturi tube 34 in alignment with said large tube are mounted in said throttle body adjacent the main body and are held in place by projections 36 and 38 thereof being clamped in recesses 40 and 42 formed in adjacent ends of throttle body 12 and main body 16.

A fuel inlet is shown generally at 44 and includes fuel inlet orifice 46, and valve 48 slidably received in sleeve 50 and adapted to be actuated by float 52 through float lever 54 in accordance with the quantity of fuel in chamber 14.

The assembled carburetor is secured to an engine intake manifold by machine screws (not shown) inserted in holes 56 of external flange 58 on the mixture outlet end of throttle body 12.

The main fuel discharge jet 18 extends from the bottom of the carburetor adjacent float chamber 14 to the throat of the secondary venturi 34 and includes a main discharge tube 60, a perforated sleeve 62, a fixed fuel metering orifice 64 and a variable fuel metering orifice 66 regulated by a needle valve 68, said valve being

threaded into bushings 70 and adapted to be adjusted in respect to orifice 66 by the turning of handle 72 on the end of said valve. Fuel is delivered to the main discharge jet 18 from float chamber 14 through conduit 73. Variable orifice 66 and fixed metering orifice 64, which may be referred to respectively as primary and secondary metering orifices or jets, are formed in a removable bushing 74 so that the size of said orifices may readily be changed to any desired size, the substitution of said bushing being accomplished by first removing bushing 70 and valve 68 and then bushing 74. Bushing 74 is provided with a circumferential reduced portion 76 which forms an annular well 78 when said bushing is seated in place in discharge jet 18. This well is connected to the main discharge conduit in jet 18 by a plurality of ports 80 which are located in bushing 74 at a point intermediate the variable orifice 66 and the fixed metering orifice 64 and which are adapted to supply fuel to a by-pass around metering orifice 64 when discharge jet 18 is in operation and to the idling system 20 when said discharge jet is inoperative. The foregoing function will be more fully described hereinafter. Perforated sleeve 62 is provided with an annular land 82 which forms two circumferential compartments or wells 86 and 88, said well 86 being connected with the idling system 20 through duct 90 and with the main conduit in jet 18 through ports 92, and said well 88 being connected with an air bleed 94 and with the main conduit through ports 96.

The idling system 20 communicates with the induction passage adjacent throttle valve 24 through port 22 and with the main discharge jet 18 through duct 90 on the posterior side of secondary metering orifice 64 and through duct 98 on the anterior side of said metering orifice. Duct 98 having restriction 100 therein and duct 90, together with the lower section of the main idling conduit 102 of the idling system comprise a fuel by-pass around fixed metering orifice 64, which conducts fuel from well 78 to well 86 and ports 92 when the discharge jet is in operation. When the idling system is in operation and the main discharge jet is inoperative, ducts 90 and 98 deliver fuel from wells 86 and 78 respectively to the idling system. In the upper portion of conduit 102 of the idling system, a check valve 104 is provided which prevents any substantial backflow of air or fuel in the idling system when the main discharge jet is in operation, and consequently rapid changeover from the main discharge system to the idling system is facilitated because a reversal of air and fuel flow does not have to be accomplished before the idling system begins to operate. The check valve 104 is of the ball type consisting of a sleeve 106 inserted in the main idling conduit 102, a valve seat 108, a metering tube 110 having restriction 112 therein and a ball 114 adapted to move freely between valve seat 108 and the lower end of tube 110, the end of said tube being serrated to prevent ball 114 from closing tube 110 when the idling system is functioning. An air bleed duct 116 which provides air to the idling system for emulsifying the fuel as it leaves tube 110, connects the induction passage behind large Venturi tube 32 with conduit 102 adjacent the end of tube 110 and is controlled by needle valve 118 which may be adjusted to provide the right amount of air for properly emulsifying the fuel before it is discharged into the induction passage at port 22. The air for duct 116 is admitted into an annular cavity behind the large venturi through one or more ports 120. Air bleed 94 having a restriction 124 therein connects duct 116 with well 88 in the main discharge jet 18 to provide a supply of air for emulsifying the fuel in jet 18 before the fuel is discharged into the induction passage.

The idling system discharges a fuel-air mixture through a vertical slot 126 of plug or member 128, clearly shown in the enlarged view thereof, said slot and plug being so arranged adjacent throttle valve 24 that when said valve is closed, a portion of slot 126 is above the valve and a portion thereof below the valve. With this relationship, air is bled into said slot when the throttle valve is closed to provide additional air for combustion of the fuel. When the throttle valve has been opened to a point where the entire slot is above said valve, only the original emulsion formed in conduit 102 passes through said slot.

In the operation of the hereindescribed carburetor, with the engine running and the throttle valve closed, fuel is delivered from the float chamber 14 through the idling system 20 to port 22, passing through conduit 73, variable orifice 66, a portion of the fuel then passing through ports 80 into well 78, duct 98, conduit 102, check valve 104 to port 22 from which the fuel is discharged into the induction passage on the engine side of the throttle valve. The other portion of the fuel supplied to the idling system follows the same general course through the main discharge jet and idling system with the exception that said portion passes through secondary metering orifice 64, ports 92, well 86 and duct 90 into conduit 102 of the idling system. This dual fuel supply arrangement provides an adequate supply of fuel for idling immediately upon shifting from the main discharge jet to the idling system. As the fuel flows through the upper portion of the idling system to the induction passage, air is bled through conduit 116 into conduit 102 adjacent tube 110 forming an emulsion with the fuel which passes through slot 126 into the induction passage.

As the throttle valve is opened, a point is reached where the effect of the suction created by air flow through the venturis on the main discharge jet is greater than engine suction on the fuel in the idling system; consequently, said fuel starts to flow downwardly through said system toward the discharge jet, thus tending to empty the fuel from the idling system. This backflow, however, is arrested by ball check valve 104 so that conduit 102 below restriction 112 remains full of fuel and ready for immediate discharge into the induction passage when the throttle valve is again closed. The fuel delivered by the main discharge jet is drawn from float chamber 14 by the air flow through the venturis, said fuel passing through conduit 73, variable orifice 66, fixed metering orifice 64 and tube 60 from which it is discharged into the throat of the secondary venturi. A portion of the fuel discharged by the main jet 18 passes through ports 80, well 78, ducts 98 and 90, well 86 and ports 92, thus bypassing fixed metering orifice 64. The fuel in this by-pass is constantly in motion while the engine is running and is readily available for either the idling system or the main discharge jet. In the main discharge jet 18, the fuel is emulsified by air bled thereinto from a supply system consisting of duct 116, conduit 94 and well 88, the air being discharged from said well through a plurality of ports 96 in sleeve 62. The

air admitted through ports **96** forms a fuel-air emulsion in discharge jet **18** which is readily drawn from said jet by the suction in secondary venturi **34**. When the throttle valve is returned to closed or nearly closed position, engine suction again draws fuel from conduit **102**, and inasmuch as the fuel is already flowing into the idling system and has been maintained at a high level in conduit **102** by check valve **104** while the discharge jet was in operation, an immediate response to said engine suction is obtained.

While in the drawings only the idling and main fuel discharge systems are shown, it is understood that the other fuel systems normally present in conventional carburetors for internal combustion engines, such as the economizing and accelerating systems, are preferably included in the carburetor in which the present invention is used. It is further understood that various modifications may be made in said system without departing from the scope of the invention as defined in the appended claims, even though only one specific embodiment of the present fuel supply system has been described herein and shown in the accompanying drawings.

I claim:

1. In an engine carburetor having an induction passage with a throttle valve therein, a fuel supply system comprising a main discharge jet adapted to supply fuel to said induction passage anterior to said throttle valve, a variable metering orifice in said discharge jet, a fixed metering orifice in said jet posterior to said variable orifice, a conduit communicating at one end with said discharge jet between said orifices and posterior to said fixed orifice and at the other end with the induction passage on the engine side of said throttle valve, a check valve in the conduit adapted to prevent backflow of air and fuel in said conduit, and a duct for supplying air to said conduit posterior to said check valve.

2. In a float type carburetor having an induction passage with a throttle valve therein, a fuel supply system comprising a main discharge jet adapted to supply fuel from a float chamber to said induction passage anterior to said throttle valve, a variable metering orifice in said discharge jet, a fixed metering orifice in said jet posterior to said variable orifice, a passageway communicating at one end with said induction passage and having two branches at the other end, one of said branches communicating with said discharge jet between said orifices and the other of said branches communicating with said jet posterior to said fixed metering orifice, a check valve

in the conduit adapted to prevent backflow of air and fuel in said conduit, and a duct communicating with said induction passage for supplying air to said conduit posterior to said check valve.

3. An updraft carburetor comprising an induction passage, a throttle in said passage, a fuel bowl, a discharge jet connecting said bowl with said induction passage below said throttle, an adjustable metering restriction in said jet, a fixed restriction in said jet posterior to said adjustable restriction, a conduit communicating at one end with said discharge jet between said restrictions and posterior to said fixed restriction and at the other end with the induction passage on the engine side of the throttle, a check valve in said conduit near the upper end thereof, and a duct for supplying air to said conduit above said check valve.

4. An updraft carburetor comprising an induction passage, a throttle in said passage, a fuel bowl, a main discharge jet connecting said bowl with said induction passage on the air intake side of said throttle, a first restriction in said jet, a second restriction in said jet posterior to said first restriction, a passageway communicating at one end with said induction passage adjacent the throttle and having two branches at the other end, one of said branches communicating with said discharge jet between said restrictions and the other of said branches communicating with said jet posterior to said second restriction, a check valve in said passageway near the upper end thereof, and a duct communicating with said induction passage for supplying air to said passageway posterior to said check valve.

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