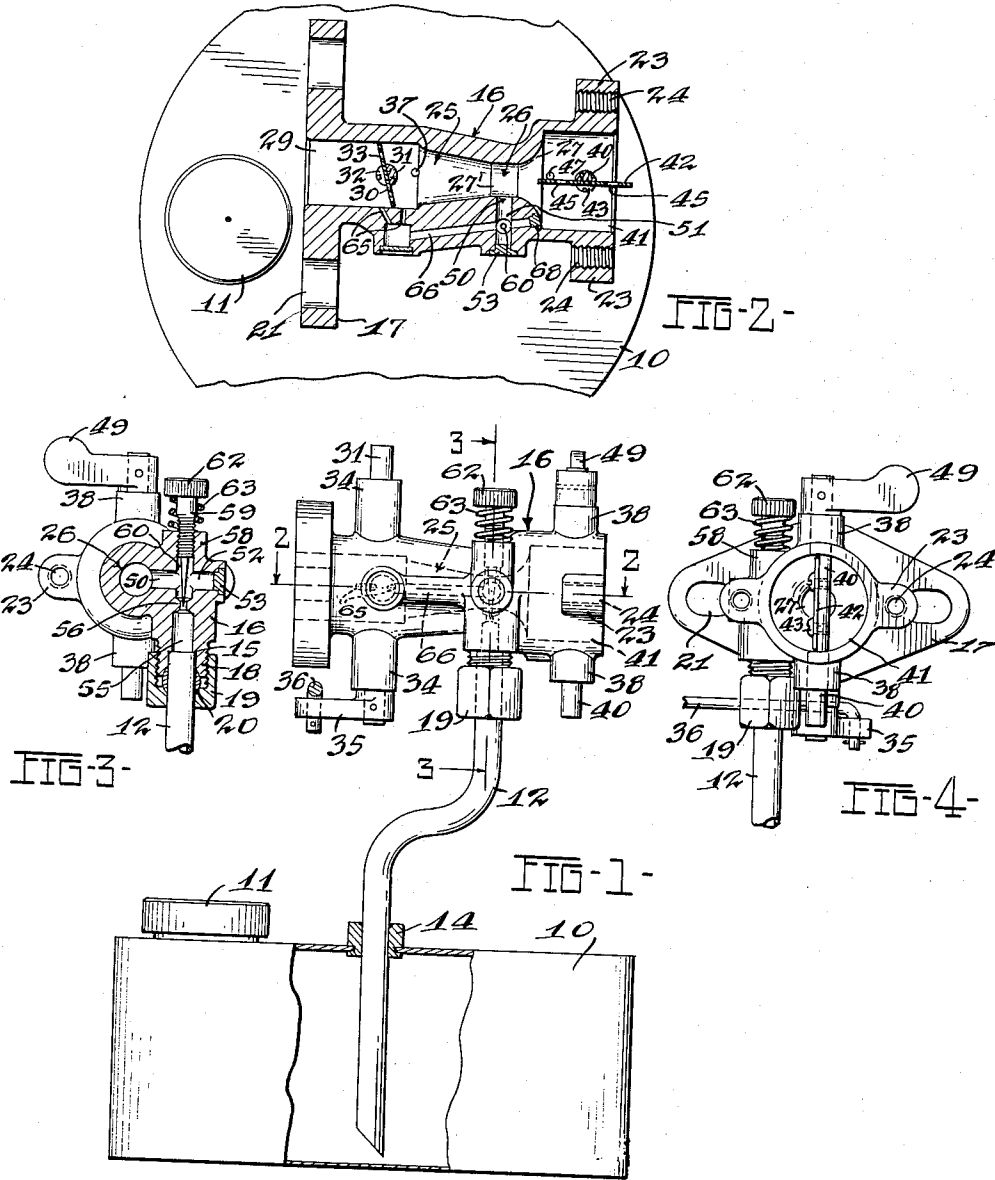


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B. C. PHILLIPS
CHARGE FORMING DEVICE

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CHARGE FORMING DEVICE

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This invention relates to charge forming devices for use with internal combustion engines and more especially to carburetors of the so-called self lift type.

The present invention has particular utility for supplying a fuel and air mixture to comparatively small motors such as those used for power lawn mowers, small generating plants, marine engines and the like where the fuel supply reservoir or fuel tank is disposed but a small distance beneath the carburetor.

The present invention embraces the provision of a carbureting device in which the fuel is delivered or conveyed to the carburetor solely by the subatmospheric pressure created in a mixing passage by the operation of the engine with which the carburetor is used.

An object of the invention is the provision of a carburetor in which float and valve mechanism has been eliminated so that the expense of producing the carburetor is greatly reduced.

Another object of the invention is the provision of a carburetor which is capable of exceptionally long life as there are no relatively moving parts such as float controlled needle valves, pivot pins, bearings and the like to wear out.

Another object of the invention resides in the provision of a self lift carburetor in which there is provided a single adjustment operable for both the low and high speed fuel metering or discharge orifices.

Another object of the invention resides in the provision of a carburetor in which the high speed discharge means is in the form of an orifice arranged substantially in the center of the choke band wall of a venturi whereby the Venturi passage configuration is unobstructed and its efficiency therefore greatly improved.

Still a further object of the invention resides in the particular construction and arrangement of main or high speed fuel discharge orifice and low speed or idling fuel discharge means whereby, during the functioning or operation of the low speed fuel discharge means, air from the venturi enters the high speed orifice and is bled into or premixed with fuel so that a mixture of fuel and air is discharged from the idling means.

Still a further object of the invention is the provision of a self lift carburetor having a main fuel discharge orifice opening into the choke band of a venturi and a low speed fuel discharge, the fuel discharge orifices being proportioned in size as to assure efficient operation of the engine at low and high speeds.

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Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

Figure 1 is an elevational view of a form of carburetor of my invention illustrated as connected to a fuel supply reservoir;

Figure 2 is a horizontal longitudinal sectional view taken substantially on the line 2-2 of Figure 1;

Figure 3 is a vertical sectional view taken substantially on the line 3-3 of Figure 1;

Figure 4 is an end view of the air inlet end of the carburetor.

While I have illustrated a form of my invention as particularly adaptable for both two cycle and four cycle internal combustion engines of comparatively low horsepower, it is to be understood that I contemplate the utilization of the principles of my invention for charge forming devices wherever the same may be found to have utility.

Referring to the drawings in detail there is illustrated in Figure 1 a fuel reservoir or tank 10 provided with a filler cap 11, a fuel conveying tube 12 extending through a fitting 14 into the reservoir, the lower end of the tube extending substantially to a point adjacent bottom wall of the reservoir as illustrated. The upper end of the fuel conveying tube extends into a bore 15 formed in the body 16 of the carburetor. The bore 15 is formed in a boss portion 18 of the carburetor body which is threaded externally to receive a threaded coupling 19, the latter cooperating with a sealing collar or ring 20 to establish a fluid tight joint between the tube 12 and the carburetor body.

The carburetor body 16 is elongated in a horizontal direction and is formed at one end with a flange 17 having openings 21 to accommodate bolts for securing the carburetor body direct to an engine block or engine manifold. The other end of the carburetor body is provided with flanges 23 having threaded openings 24 to accommodate bolts for securing a filter or air cleaner to the carburetor body if desired.

The body 16 is formed with a longitudinally extending mixing passage 25 which is inclusive of a venturi 26 the latter having an entrance way 27

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and a choke band 27' the latter being the zone of maximum speed of air or fluid flow through the mixing passage. The mixing passage is also inclusive of a cylindrical portion 29 within which is disposed a throttle valve 30 carried by a transversely extending shaft 31, the valve 30 being in the form of a circular disk secured to a flattened portion of the shaft 31 by means of a screw 32. The valve disk 30 may be provided with a small opening 33 to admit the passage of a small amount of air for idling purposes when the valve disk is in closed position. An abutment pin 31' is provided in the passage 29 for defining the full open position of the throttle valve. The shaft 31 is journaled in suitable bosses 34 formed on the body 16, one projecting portion of the shaft 31 being provided with an arm 35 to which a link 36 may be connected for operating or adjusting the position of the throttle valve 30. The other end portion of the carburetor body is formed with projections or bosses 38 within which is journaled a shaft 40 extending diametrically through the air inlet passage 41 and carries choke or air regulating valve 42 in the form of a circular disk secured to a flat portion of the shaft 40 by means of a screw 43. The disk 42 is provided with a pair of comparatively small openings 45 for admitting some air to the mixing passage even when the valve disk is moved to fully closed position. A stop pin or abutment 47 serves to determine the full open position of the choke valve 42. An arm 49 is secured to a projecting portion of the shaft 40 for manipulating the shaft to open and close the valve 42.

The high speed fuel discharge means is in the form of an orifice 50 which opens adjacent to or into the choke band 27 of the venturi 26. The orifice 50 or high speed metering jet is in communication with a fuel chamber or duct 52 formed in the body of the carburetor by means of a passage 51. The chamber 52 and passage 51 including the orifice 50 are drilled from the exterior of the carburetor body and the outer end of the chamber or passage 52 closed by means of a friction plug 53. The bore 15 in the boss 18 is in communication with the chamber 52 by means of a passage 55 and a comparatively smaller passage 56, the latter adapted to accommodate a fuel regulating valve. The carburetor body 16 is formed with a boss 58 which is threaded to receive a member 59 carrying a needle valve 60 which cooperates with the restricted passage 56 in order to regulate the rate of flow of fuel from the reservoir 10 through the tube 12 into the chamber 52. The member 59 is formed with a knurled finger piece 62 for rotating the member 59 for the purpose of regulating the position of the needle valve 60. An expansive coil spring 63 surrounds the member 59 and is disposed between the boss 58 and the finger piece 62. The spring sets up a coefficient of friction operative on the member 59 so that the latter will be frictionally held in adjusted position.

A passage 65 is drilled into the wall of the mixing passage as shown in Figure 2 the outlet serving as a low speed or idling orifice. A channel 66 is drilled in a horizontal direction from the air inlet end of the carburetor body, the channel 66 intersecting the chamber 52. The idling means which may include one or more passages 65 (two being illustrated in the drawing), are in communication with the channel 66. The end of the channel 66 at the air inlet of the carburetor is closed by means of a plug 68. It is pointed out that the orifice 50 forming the main fuel dis-

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charge into the choke band of the venturi may, if desired, be of a lesser diameter than the chamber or passage 52. In installations of carburetors embodying the invention with both two and four cycle engines, I have found that in order to secure satisfactory operation, the metering restrictions 65 for the idling or low speed fuel discharge orifice are made of a lesser size or diameter than the high speed fuel orifice 50. Another reason for the reduction in size of the metering restrictions 65 as compared with the size of the high speed orifice 50 is that less fuel is required to provide an idling mixture when the engine is operating at low speed.

The operation of the carburetor of my invention is as follows: In starting the engine with which the carburetor may be used, the choke valve 42 is first closed by means of the arm 49, some air being admitted to the mixing passage through the openings 45 even though the choke valve 42 is in full closed position. When the air or choke valve 42 is in closed position, a maximum suction or subatmospheric pressure set up by reason of piston movement of the engine is obtained which is of sufficient amplitude to elevate fuel through the tube 12 into the chamber 52 and hence through the discharge orifices 50 and 65. The engine is provided with a fuel supply for low speeds from the passage or passages 65 and as the fuel is conveyed through the channel 66 and idling means, some air is passing through the venturi 26 by reason of the engine suction. Some air moving through the venturi passes into the passage 50 and into the channel 66 so as to provide an air bleed into the fuel in channel 66. In this manner, a mixture of fuel and some air is discharged into the portion 29 of the mixing passage through the low speed fuel discharge means 65. This mixture of fuel and small amount of air passing through the idling orifices 65 is further mixed with air admitted to the mixing passage through the opening 45 in the valve disk 42. Due to the fact that the throttle valve disk 30 is in partially closed position whenever the engine is operating at low speed so that maximum suction is effective on the idle orifices 65, some air is moved into the fuel discharge passage 50 into the fuel channel 66. When the throttle opening is increased and the engine speed increases, the suction effective in the venturi 26 is increased to the point where fuel is discharged through the high speed orifice 50 into the choke band 27 of the venturi. The fuel discharged into the venturi is mixed with the high velocity air stream passing through the venturi into the engine. As the high speed fuel discharge orifice 50 comes into operation, the discharge of fuel from the idling means 65 is gradually reduced and as the engine gains speed, and under certain operating conditions the discharge of fuel through the idling means 65 may cease.

It is to be noted that in the carburetor of my invention the control of fuel to both the high speed fuel discharge orifice 50 and the low speed or idling means 65 is controlled or regulated by means of a single needle valve 60 formed on the member 59 which is adjusted by manipulating the finger piece 62 on member 59 for varying the rate of flow of fuel to the carburetor chamber 52. It is to be understood that with this form of carburetor, it is possible to lift fuel a vertical distance of about six inches. A carburetor of this type is limited in its use to installations where the fuel does not have to be elevated a vertical distance of more than about six inches.

It will be obvious from the foregoing description that the carburetor of my invention is of simple construction in that automatic valves, float mechanism and other wearing parts have been eliminated and that there are no moving parts to get out of order. Furthermore, the fixed discharge orifices for the fuel provide for a stable operating condition of the carburetor throughout the entire range. It is to be understood that the relative sizes of the fuel discharge orifices 50 and 65 may be varied depending upon the conditions of operations and the type or size of engine with which the carburetor may be used.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than is herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

What I claim is:

1. A charge forming device of the floatless type for internal combustion engines comprising in combination, a body; a horizontally disposed mixing passage in said body including a restricted zone; a chamber formed in said body at one side of the mixing passage to receive the fuel from a fuel supply; a horizontally positioned fuel discharge orifice in the wall of the restricted zone; said orifice being in communication with said fuel receiving chamber for delivering fuel into the restricted zone of the mixing passage; a second fuel discharge orifice in communication with said mixing passage; means including a horizontally disposed channel connecting said mentioned second fuel discharge orifice with said fuel receiving chamber; said fuel discharge orifices being arranged in the same horizontal plane, said channel including a fuel metering restriction, and manually operated single means for regulating the admission of fuel to said fuel receiving chamber.
2. A charge forming device of the floatless type for internal combustion engines comprising in combination, a body; a horizontally disposed mixing passage in said body including a venturi; a chamber formed in said body at one side of the mixing passage to receive the fuel from a fuel supply; a horizontally disposed main fuel discharge orifice formed in the wall of the most restricted zone of said venturi and presenting no obstruction in said zone; said main fuel discharge orifice being in communication with said chamber for delivering fuel into said venturi; a supplemental fuel discharge orifice in a wall of said mixing passage; means including a channel connecting said supplemental fuel discharge orifice with said fuel receiving chamber; the axes of said main and supplemental fuel discharge orifices, said channel and said venturi lying in the same horizontal plane, and manually operated single means for regulating the admission of fuel to said fuel receiving chamber.
3. A charge forming device of the floatless type for internal combustion engines comprising in combination, a body; a horizontally disposed mixing passage formed in said body including a restricted zone; a fuel chamber formed in said body at one side of the mixing passage; said chamber adapted to be supplied with fuel from a fuel supply; a horizontally disposed fuel discharge orifice in the wall of the restricted zone of the mixing passage in communication with the fuel chamber and presenting no obstruction in said zone; a supplemental fuel discharge ori-

fice in a wall of said mixing passage; a channel connecting said fuel chamber with said supplemental fuel discharge orifice; the axes of said main and supplemental fuel discharge orifices, said channel and mixing passage lying in the same horizontal plane; a metering restriction associated with said supplemental orifice; said metering restriction being of lesser size than the fuel discharge orifice in the restricted zone of the mixing passage; and means including a manually operated needle valve extending through said fuel chamber for regulating the admission of fuel to the fuel chamber in said body.

4. A carburetor of the self lift floatless type including in combination, a body; a horizontally disposed mixing passage formed in said body including a venturi; an air valve movably supported at the air inlet end of said venturi; a throttle valve movably mounted adjacent the outlet end of the venturi; a fuel chamber formed in said carburetor body at one side of the mixing passage; said fuel chamber adapted to be connected to a source of fuel supply; a high speed fuel discharge orifice horizontally disposed at the central portion of the zone of maximum restriction of said venturi; said orifice being in direct communication with said fuel chamber; a horizontally disposed low speed fuel discharge orifice formed in the body; said low speed orifice being disposed in a wall of the mixing passage adjacent the throttle valve; a horizontally disposed channel connecting the low speed fuel discharge orifice with the fuel chamber in said body; said channel including a restriction arranged to determine the fuel discharged through said low speed orifice; the axes of the venturi, low and high speed fuel discharge orifices and said channel lying in the same horizontal plane; a vertically disposed needle valve associated with said fuel chamber; said needle valve being adjustably mounted in said body and manually operable for regulating the amount of fuel entering the fuel chamber in the body.

5. A carburetor of the self lift floatless type including, in combination, a body; a horizontally disposed mixing passage formed in said body including a venturi having a choke band of appreciable width; an air valve movably supported at the air inlet end of said venturi; a throttle valve movably mounted adjacent the outlet end of the mixing passage; a fuel chamber formed in said carburetor body at one side of the mixing passage; said fuel chamber adapted to be connected to a source of fuel supply; a high speed fuel discharge orifice horizontally disposed at the central portion of the choke band of said venturi and presenting no obstruction in the choke band; said orifice being in communication with said fuel chamber; a low speed fuel discharge orifice disposed in a wall of the passage adjacent the throttle valve; a channel connecting the low speed fuel discharge orifice with the fuel chamber in said body; said channel including a restriction arranged to limit the rate of fuel discharged through said low speed orifice; the axes of the venturi, low and high speed fuel discharge orifices and said channel lying in the same horizontal plane; a needle valve associated with said fuel chamber; said needle valve being adjustably mounted in said body for regulating the amount of fuel entering the fuel chamber from the fuel supply; manual means associated with said needle valve for adjusting same, and means including a spring for setting up a frictional com-

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ponent adjacent said needle valve to retain the
latter in adjusted position.

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