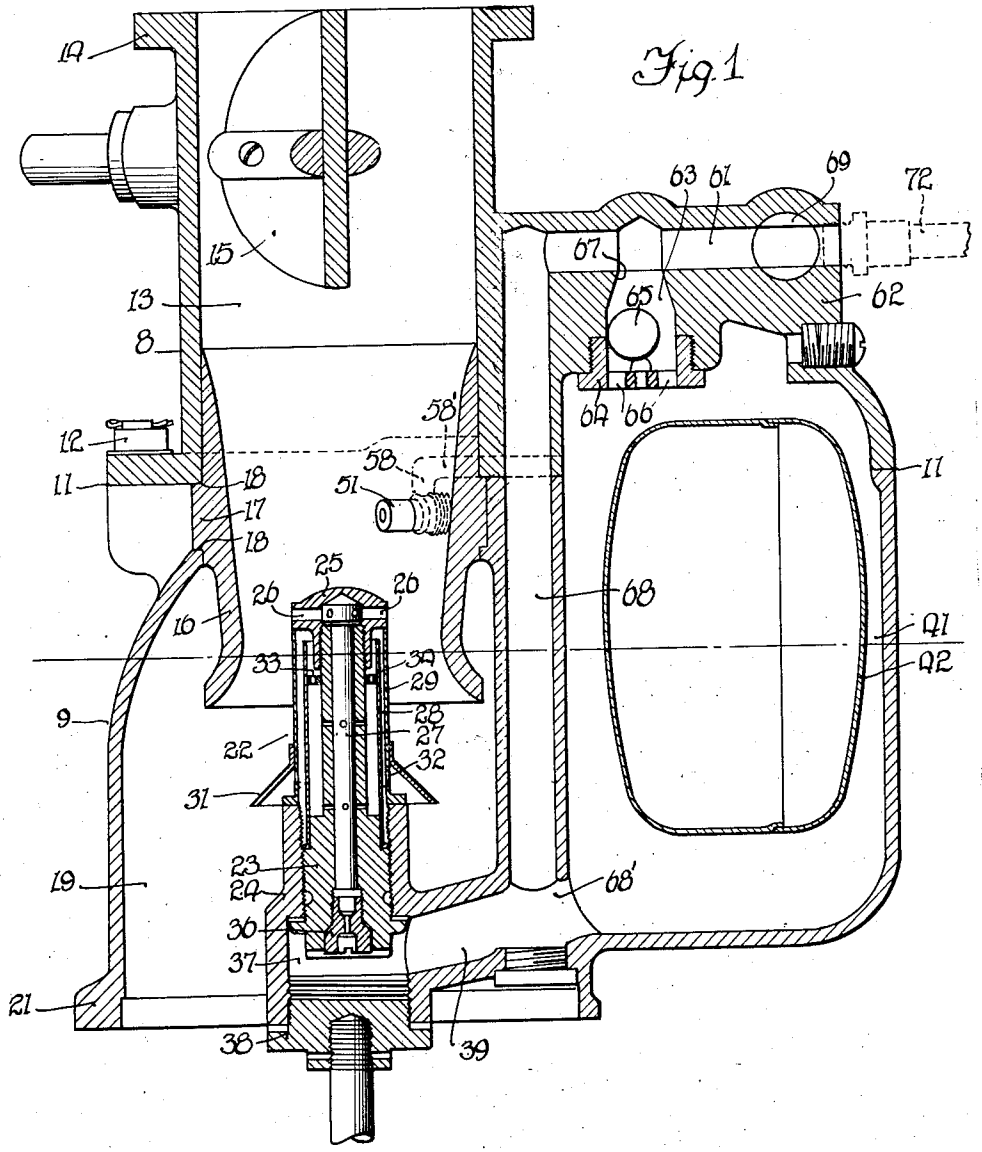
Dec. 29, 1925. 1,567,807

F. C. MOCK

CARBURETOR

Filed Augus 15, 1921 4 Sheets-Sheet 1

Fig. 1



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Fig. 2

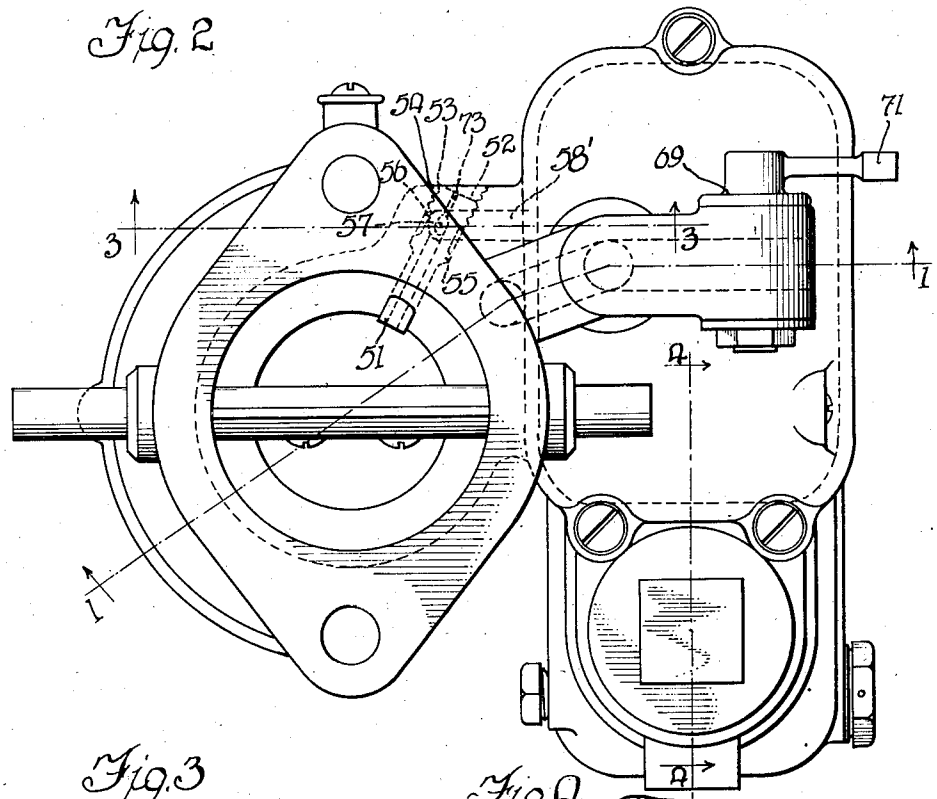


Fig. 3

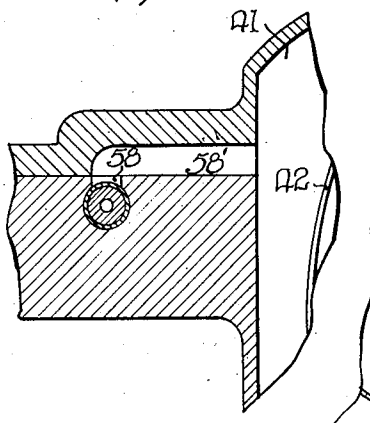
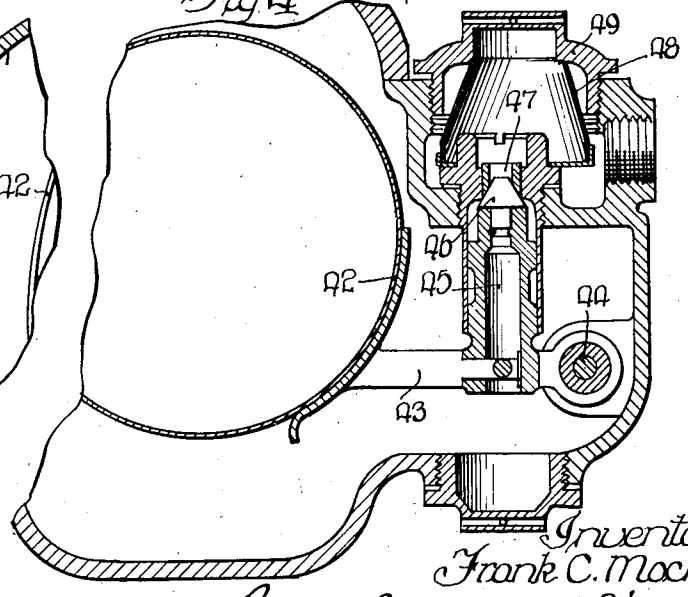


Fig. 4



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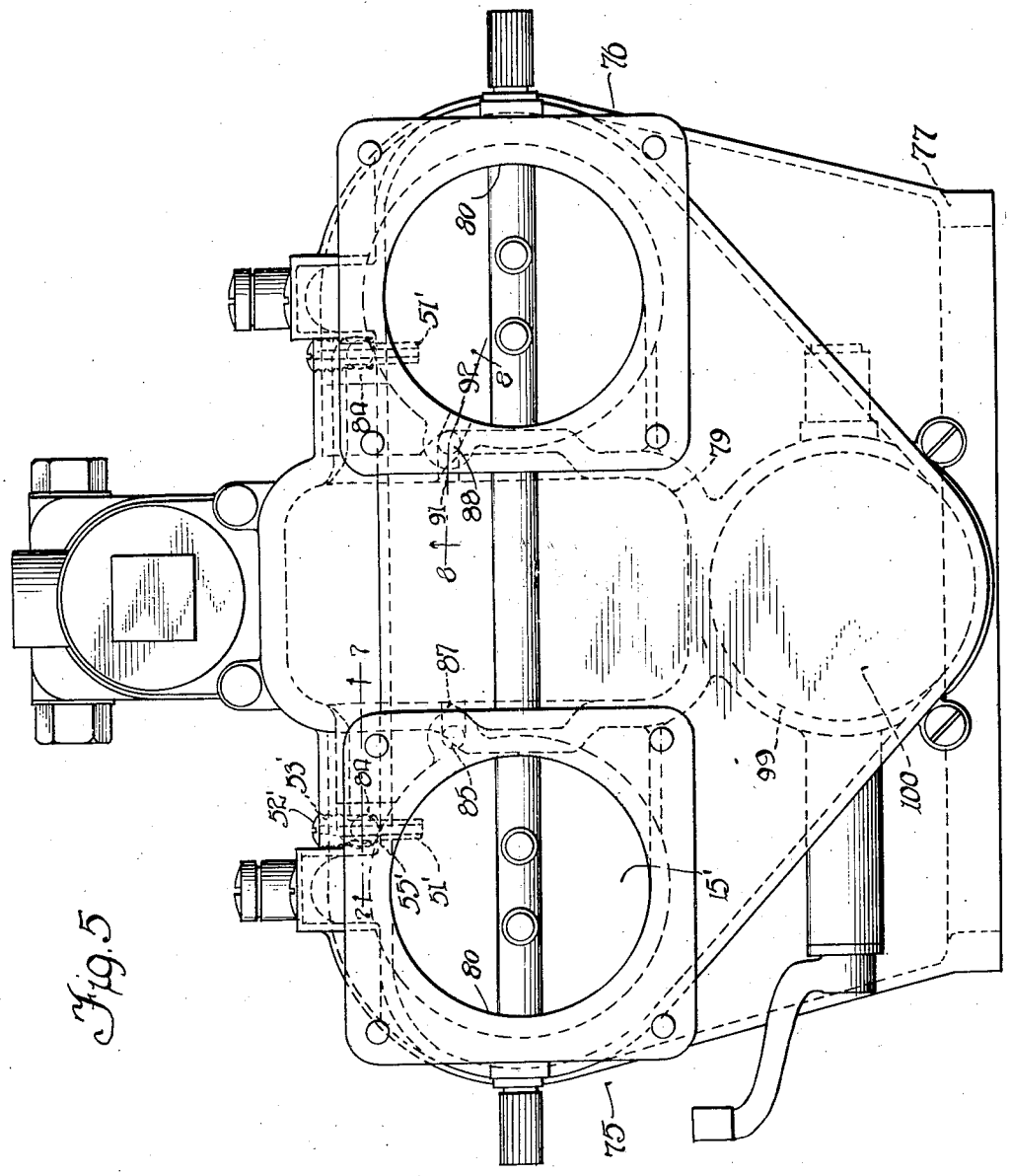


Fig. 5

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CARBURETOR

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Fig. 6

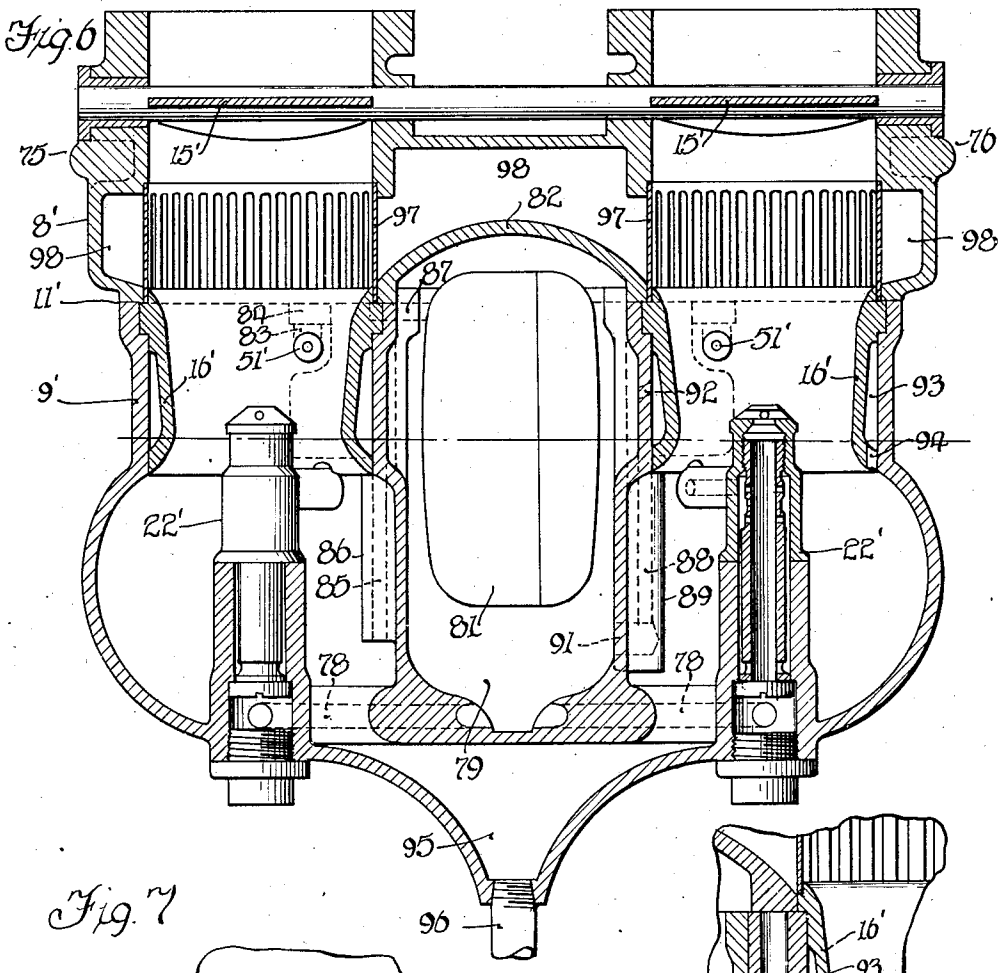


Fig. 7

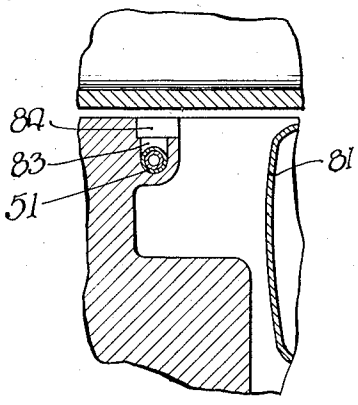
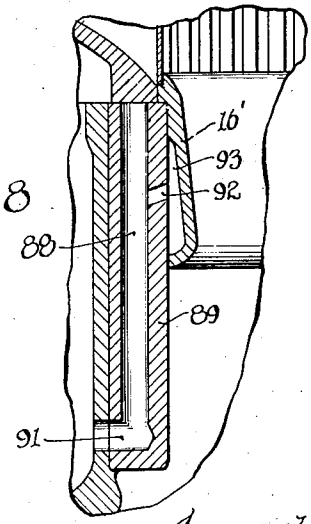


Fig. 8



Inventor
Frank C. Mock

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Atty's

Patented Dec. 29, 1925.

1,567,807

UNITED STATES PATENT OFFICE.

FRANK C. MOCK, OF CHICAGO, ILLINOIS, ASSIGNOR TO STROMBERG MOTOR DEVICES COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CARBURETOR.

Application filed August 15, 1921. Serial No. 492,263.

To all whom it may concern:

Be it known that I, FRANK C. MOCK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Carburetors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

The present invention relates to carburetors, and has particular reference to carburetors for airplane motors.

It is essential to the success of an airplane carburetor that it be capable of delivering fuel to the engine in the proper manner when the plane is at a relatively sharp inclination either in the fore and aft direction or laterally. For certain maneuvers it is furthermore desirable to maintain the motor running under full power with an uninterrupted feed of fuel thereto when the plane is flying through a loop or when the plane is flying in an inverted position. It is the fundamental object of the present invention to fulfill these requirements by providing a construction of carburetor which will feed fuel to the motor without interruption when the plane is at a sharp angle or is in an inverted position.

It is a more specific object of the invention to provide a construction of carburetor wherein the float chamber is made operative to feed fuel to the carbureting chamber from either the top or bottom of said float chamber, whereby the float chamber is made capable of feeding fuel in either its upright or inverted position.

A further object is to provide means for admitting atmosphere to the top or bottom of the float chamber, depending upon the position of the carburetor; or for admitting a predetermined air pressure regulated in accordance with the barometric pressure.

In the accompanying drawings wherein I have illustrated a preferred embodiment of my invention:

Figure 1 is a vertical sectional view of one form of the present airplane carburetor, this figure being taken approximately on the plane of the line 1—1 of Figure 2;

Figure 2 is a plan view of this same form;

Figure 3 is a detail sectional view taken on the plane of the line 3—3 of Figure 2;

Figure 4 is a detail sectional view taken on the plane of the line 4—4 of Figure 2;

Figure 5 is a plan view of another form of my invention embodied in a duplex carburetor;

Figure 6 is a vertical sectional view of the same.

Figure 7 is a fragmentary sectional view taken on the plane of the line 7—7 of Figure 5; and

Figure 8 is a similar view taken on the plane of the line 8—8 of Figure 5.

The carburetor illustrated in Figures 1 and 2 is built up of upper and lower casing sections 8 and 9 which join along the line 11, being suitably fastened together by cap screws 12 engaging in gears on the casing sections. The upper casing section 8 defines the usual carbureting chamber 13 having a vertical mixture outlet adapted to be coupled by the flange 14 to the intake manifold. The conventional throttle valve 15 extends through this carbureting chamber for controlling the flow of mixture therefrom. A Venturi tube 16 is supported in the lower end of the carbureting chamber 13 by an external flange 17 on the Venturi tube which is adapted to be engaged between opposing shoulders 18 on the upper and lower casing sections. The lower casing section 9 defines a circular air intake 19, which may be suitably flanged at its lower end as indicated at 21 for connection with a supercharger attachment.

Projecting into the lower end of the Venturi tube 16 is a fuel nozzle 22 which is adapted to supply the main volume of fuel to the carbureting chamber when the carburetor is in an upright or approximately upright position. This fuel nozzle is constructed of a hollow stem 23 which screws into a hollow boss 24 supported in the center of the air intake 19. A nozzle head 25 having a plurality of radial fuel ports 26, screws over the upper end of the stem 23, the ports 26 communicating with the bore 27 of the stem. The stem 23 is surrounded by inner and outer spaced sleeves 28 and 29 which are arranged to bleed air into the bore 27 of the stem and thereby proportion and assist in the atomization of the fuel. The outer sleeve 29 is provided with a de-

flector or petticoat 31 which is adapted to deflect a part of the inrushing air up through ports 32 into the annular space between the sleeves 28 and 29. From the top of the inner sleeve 28 the air flows downwardly through ports 33 in a spacing flange 34, and thence enters the bore 27 of the stem through a series of ports 35. The fuel flow to the nozzle is controlled by an interchangeable plug restriction 36 in the lower end of the stem, this plug restriction opening into a chamber 37 in the lower part of the hollow boss 24. A removable plug 38 affords access to this chamber 37. Fuel is supplied to the chamber 37 through a diagonal fuel passageway 39 which opens into the bottom of the float chamber 41.

The shape, proportions and location of the float chamber are of particular significance in an airplane carburetor owing to the wide range of angular deviation of the carburetor and the necessity of maintaining an effective flow of fuel to the carbureting chamber despite these inclinations of the carburetor. The float chamber 41 is of generally symmetrical outline, being of relatively narrow transverse dimension and having its flat side thereof abutted in close proximity to the carbureting chamber and to the center line of the fuel nozzle 22. The float 42 is constructed of sheet metal in the form of a narrow, drum shaped cylinder having its axis horizontal. The cylindrical form of the float results in the float presenting a constant area of displacement of a uniform contour to the various inclinations of the fuel level. Similarly, the generally cylindrical outline of the float chamber retains the fuel level at substantially the same general height therein in practically all fore and aft inclinations of the carburetor. As shown in Figure 4, the float 42 has pivotal connection through an arm 43 with a fixed pivot 44 supported on one of the end walls of the float chamber. Connected to the arm 43 and intermediate the pivot 44 and float 42 is a valve stem 45 carrying a valve 46 which is adapted to control the entry of fuel through the valve port 47. The entering fuel is required to pass through a straining screen 48 which is supported below the removable bonnet 49. I shall not describe this valve mechanism and strainer in detail, as the essential features thereof form part of the disclosure of the co-pending application of Frank C. Mock, Charles J. Gustafson and Milton E. Chandler, Serial No. 244,231, filed July 10, 1918, in which application this particular float valve mechanism is specifically described. This float valve is so adjusted that when the carburetor is in an upright position, the fuel level in the float chamber 41 will stand at about the dash and dot level indicated. It will be noted that owing to the formation of the float chamber 41 and its immediate proximity to the carbureting chamber 13, the inclination of the carburetor in the plane transverse to the float chamber will result in only a slight variation of level of the fuel in the nozzle 42. In the other plane the center of buoyancy of the float 42 is arranged in close proximity to the axis of the carbureting chamber so that lateral inclination of the carburetor likewise produces only a small variation of fuel level at the nozzle 22.

Opening into the carbureting chamber 13 through the wall of the Venturi tube 16 is a second fuel nozzle 51 which is adapted to feed fuel to the carbureting chamber when the carburetor is inverted or approximately so. As shown in Figure 2, this secondary nozzle has a threaded shank 52 which screws into a bore 53 in a boss or enlargement 54 formed on the lower casing section 9. A collar 55 on the nozzle bears against an internal shoulder in the end of the bore 53, and the intervening channel 56 between the collar and the threaded portion of the nozzle has communication with the bore thereof through radial ports 57. Communicating with the annular channel 56 in the nozzle is a vertical fuel passageway 58 which intersects a horizontal fuel passageway 58′ opening into the float chamber 41. Both these passageways 58—58′ occur at the juncture plane 11 of the two casing sections, and are simply and easily constructed by forming registering recesses in the opposing faces of the casing sections. The secondary nozzle 51 is so positioned and the interior of the float chamber 41 is so designed that when the carburetor is inverted the fuel level (in the upper part of the float chamber) will stand higher than the level of the secondary nozzle 51. The extent of submergence or head of the fuel above the nozzle 51 may be proportioned according to the requirement of the carburetor; if it is desired that the carburetor feed fuel to the carbureting chamber for a relatively long interval of inverted position of the carburetor, the head of fuel above the nozzle 51 can be made relatively high. It may be found desirable however, that the fuel level in the inverted position shall not be so high that it will raise the float and open the fuel valve, this valve being preferably retained closed or substantially closed at this time by the weight of the float.

Air is admitted to the float chamber 41 through a passageway 61 formed in an enlarged portion 62 on the top of the float chamber. This air passageway communicates with the upper part of the float chamber through a valve chamber 63 which intersects the bore 61. The lower end of this valve pocket is provided with a flanged bushing 64 which threads into the lower end

of the valve pocket for supporting the ball check valve 65. The center of the bushing 64 has a series of apertures 66 from which the ball valve 65 is held out of engagement to maintain open communication between the valve chamber 63 and the float chamber 41. The upper end of the valve chamber 63 is tapered to form a valve seat 67 against which the ball 65 is adapted to seat when the carburetor is inverted. Air is supplied to the bottom of the float chamber when the carburetor is inverted through a vertical bore 68 which intersects the horizontal bore 61 and which opens into the bottom of the float chamber through the fuel port 68′ and into the bottom of the nozzle through the passageway 39. For obtaining the proper proportioning of the mixture at the different altitudes, there has risen the practice of controlling the pressure in the float chamber so as to compensate for variations in barometric pressure. This action may be obtained in the present embodiment by the use of a manually or automatically controlled valve for controlling the admission of air to the float chamber or for controlling the communication of suction from the carbureting chamber to the float chamber, this float chamber control being fully disclosed in the copending application of Frank C. Mock, Charles J. Gustafson and Milton E. Chandler, Serial No. 371,199, filed April 5, 1920. In the present instance I have shown such a float chamber control through the interposition of a plug valve 69 in the air passageway 61, which is adapted to be manually operated by the pilot through a control lever 71.

When the carburetor is upright, air enters the top of the float chamber through the air passageway 61 and valve chamber 63, and at this time the operation of the carburetor is typical of that of a conventional design. During this period of operation, the secondary nozzle 51 may be functioning to create a reduced pressure in the upper part of the float chamber through cooperation with the valve 69. During fore and aft inclinations of the carburetor, the fuel level is maintained fairly constant in the float chamber and at the fuel nozzle 22, as before described. Owing to the narrow float chamber 41 and its close grouping to the carburetor barrel, the lateral inclination of the carburetor does not produce much change in level at the nozzle. When the air-craft swings into a loop or assumes an inverted position, the volume of fuel swings into the top part of the float chamber and the check valve 65 engages on the seat 67. The point of entrance of the fuel passageways 39 and 58′ into the float chamber are so positioned relative to each other and to the float chamber, that as the craft swings into its inverted position, the secondary nozzle 51 will come under the fuel level before the fuel level recedes from the primary nozzle 22, so that there is no period of time when the carbureting chamber 13 is not receiving fuel. With the carburetor thus inverted, the air supply into the float chamber is through the passageways 61 and 68 into the bottom of the float chamber, or what is normally the bottom. By virtue of the symmetrical form of the float chamber and the diametrically opposite locations of the air ports 66 and 68′ one air port will always remain clear of the fuel level for supplying air to the float chamber when the craft is swinging from an upright to an inverted position or vice versa. When the craft is inverted primary nozzle 22 is dry, and similarly to the secondary nozzle 51 this primary nozzle may be used for creating a sub-atmosphere in the float chamber under the control of the valve 69. To rid the vertical passageway 68 of any fuel which may become trapped therein in swinging from an upright to an inverted position, there may be provided a drain pipe 72 leading away from the end of the air passageway 61 to a point outside of the fuselage or to a point where it is safe to discharge such trapped fuel. The head of fuel above the level of the secondary nozzle 51 in the inverted position of the carburetor does not detrimentally affect the action of the nozzle for the reason that the flow of air past the nozzle is generally capable of receiving and volatilizing all of the fuel discharged therefrom. This nozzle may have a suitable air bleed port 73 opening into the rear thereof, and the nozzle may be otherwise proportioned to insure that an excessive fuel flow therefrom will not result from the head of fuel effective upon the nozzle in the fully inverted position.

The present carburetor may be provided with an idling jet and other similar carburetor features, but I shall make no specific reference to these as they have no direct bearing upon the present invention.

In the duplex construction illustrated in Figures 5 and 6, the carburetor is built up of upper and lower casing sections, 8′ and 9′ joining along the line 11′. The casing is constructed to form two carburetor barrels 75 and 76 having a common air intake 77 and separate mixture outlets 80. Each carburetor barrel has an individual throttle valve 15′ and an individual Venturi tube 16′ into which discharges a primary fuel nozzle 22′. These two primary fuel nozzles draw fuel through passageways 78 from a common float chamber 79. This float chamber is formed in the median plane between the carburetor barrels 75 and 76 and has a narrow drum shaped float 81 similar to the one previously described. The float valve mechanism is substantially similar to that previously shown and need not be described

again. The top of the float chamber 79 is covered by an arched plate 82 constituting part of the upper casing section 8'. For feeding fuel to the carbureting chamber when inverted there is provided in each carburetor barrel a secondary nozzle 51' which opens into the carbureting chamber through the upper part of the Venturi wall.

As shown in Figure 5, these secondary nozzles are similar to the previous nozzle 51 consisting of a threaded portion 52' and a forward collar 55' which bears against the end of the bore 53'. The intermediate channel portion of the nozzle communicates through a vertical passageway 83 with a horizontal channel 84 which is formed in the top of the lower casing section and which opens into the upper part of the float chamber 79. As in the previous embodiment, the secondary nozzles 51' are so positioned and the upper part of the float chamber 79 is so designed that when the carburetor is inverted, the secondary nozzles will be submerged by a certain amount of fuel to maintain an effective fuel feed to the carburetor barrels for a considerable period.

When the carburetor is upright, the air supply to the upper part of the float chamber is through a vertical passageway 85 which is formed in an enlargement 86 extending along the inner wall of the left hand carburetor barrel 75. The lower end of the passageway 85 opens into the air intake area at a point sufficiently far down so that when the carburetor is inverted, fuel cannot leak out through the passageway 85 into this intake area. The upper end of the passageway 85 communicates with the upper end of the float chamber through a channel 87 formed in the upper surface of the lower casing section 9'.

For supplying air to the bottom of the float chamber when the carburetor is inverted, there is provided a similar passageway 88 formed in an enlargement 89 cast on the inner wall of the right hand barrel 76. The lower end of the passageway 88 opens into a horizontal passageway 91 which enters the lower part of the float chamber, the upper end of the passageway 88 communicating at a point above the normal fuel level with a drill hole 92 which opens into the annular space 93 in back of the right hand Venturi tube 16'. This annular space connects with the air intake area through a hole 94 in the lower periphery of the Venturi tube. When the carburetor is inverted the effective pressure in this air intake area is communicated through the hole 94, space 93 and passageways 92, 88 and 91 into the bottom part of the float chamber above the fuel level therein. It will be noted that both air passageways 85 and 88 receive air from this air intake area, thus insuring a point of common air pressure for supplying air to the float chamber in either its upright or inverted positions. Any fuel which these air passageways discharge in clearing themselves is precipitated in a central pocket 95 in the bottom of the lower casing section, from which a drain pipe 96 extends to drain the discharged fuel to any suitable point outside of the fuselage. By the present disposal of the two air ports 87 and 91 on opposite sides of the float chamber in the positions illustrated, one air port will invariably be clear of the fuel for supplying air to the float chamber irrespective of the angle of the carburetor or the swing of the craft.

Provision is made for introducing a supplementary supply of air into the mixture at points above the Venturi tubes 16' through the slotted screens 97. Supplementary air is supplied to these distributing screens from a supplementary air chamber 98 which receives air from the main air intake 77 through a vertical intake opening 99 controlled by a throttle valve 100. It will be obvious that various changes may be made in the general embodiment hereinbefore described without departing from the essence of the invention.

I claim:

1. In a carburetor, the combination of a carbureting chamber, a float chamber, means for discharging fuel from said float chamber into said carbureting chamber when said carburetor is inverted, and means for venting air into said float chamber when the latter is upright or inverted.

2. In a carburetor, the combination of a carbureting chamber, a float chamber, means for conducting fuel from said float chamber to said carbureting chamber, said means opening into said float chamber at a plurality of points for drawing fuel therefrom at widely different angular positions of said carburetor, and means for venting atmosphere into said float chamber above the fuel level when said float chamber is either upright or inverted.

3. In an airplane carburetor, the combination of a carbureting chamber, a fuel supply chamber, a first fuel port fed therefrom and discharging fuel into said carbureting chamber when said carburetor is upright, and a second fuel port adapted to receive fuel from said supply chamber and discharge into said carbureting chamber when said carburetor is inverted, one of said fuel ports serving to transmit suction from said carbureting chamber back to said float chamber when the other port is supplying fuel.

4. In an airplane carburetor, the combination of a carbureting chamber, a fuel supply chamber, fuel aspirating means opening into said carbureting chamber, a first fuel passageway extending from said aspirating means and opening into said sup-

ply chamber below the normal fuel level therein when the carburetor is upright, and a second fuel passageway extending from said fuel aspirating means and opening into said supply chamber above the normal fuel level therein, said second fuel passage being adapted to receive fuel when the carburetor is inverted, and being operable to transmit suction to said supply chamber when the carburetor is upright.

5. In an airplane carburetor, susceptible to being inverted in operation, the combination of a carburetor chamber, a fuel supply chamber, means for feeding fuel from said fuel supply chamber to said carbureting chamber, and means for maintaining a continuous supply of air to either the top or bottom of said fuel supply chamber when the carburetor is upright or inverted.

6. In an airplane carburetor, the combination of a carbureting chamber, fuel injecting means discharging into said carbureting chamber, a fuel supply chamber supplying said fuel injecting means, air ports opening into the top and bottom of said fuel supply chamber for admitting outside air thereto when the carburetor is upright or inverted, and means for preventing a leakage of fuel through one of said air ports.

7. In an airplane carburetor, the combination of a carbureting chamber, fuel aspirating means in said carbureting chamber, a fuel supply chamber feeding said aspirating means, means for feeding fuel to said aspirating means from adjacent the top and bottom of said supply chamber, whereby a fuel feed is maintained in either the upright or inverted position of said carburetor, and means for admitting air to either the top or bottom of said supply chamber in accordance with the position of said carburetor.

8. In an airplane carburetor, the combination of a carbureting chamber, a fuel port supplying fuel thereto, a fuel feed chamber feeding said fuel port, a first air passageway communicating with the bottom of said supply chamber and extending to a level higher than the normal fuel level therein, and a second air passageway communicating with the top of said supply chamber and extending to a point beyond the highest fuel level in said supply chamber when said carburetor is inverted.

9. In a carburetor, the combination of a carburetor barrel, a relatively narrow float chamber having generally straight substantially parallel sides, said float chamber being disposed with one of its relatively long substantially straight sides in immediate proximity to said carburetor barrel, whereby there is a minimum variation of level at the fuel nozzle in said carburetor barrel with the various inclinations of said carburetor, and a relatively narrow cylindrical float in said chamber controlling the level of fuel therein.

10. In an airplane carburetor, the combination of a carbureting chamber, a throttle valve controlling the outlet from said chamber, a fuel supply chamber, a fuel port leading from one end of said supply chamber to said carbureting chamber, a second fuel port leading from the other end of said supply chamber to said carbureting chamber, said ports having separate inlets into said carbureting chamber, one of said ports being effective to supply fuel from said fuel chamber when the other port is ineffective, means permitting air inlet to said fuel chamber above the fuel therein during upright or inverted position of said carburetor, the ineffective fuel port acting to create sub-atmosphere in said fuel chamber above the fuel to cooperate with the air inlet to control the operation of the carburetor.

In witness whereof, I hereunto subscribe my name this 30th day of July, 1921.

FRANK C. MOCK.