June 29, 1965 H. A. CRAFT 3,191,585

CARBURETOR

Filed Dec. 13, 1963 2 Sheets-Sheet 1

FIG. 1.

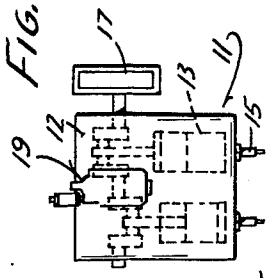


FIG. 4.

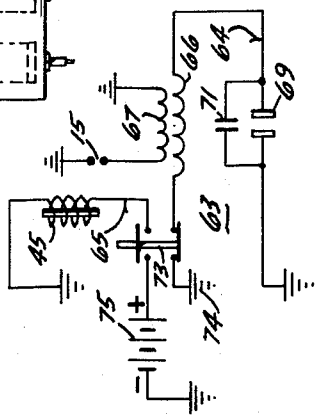


FIG. 3.

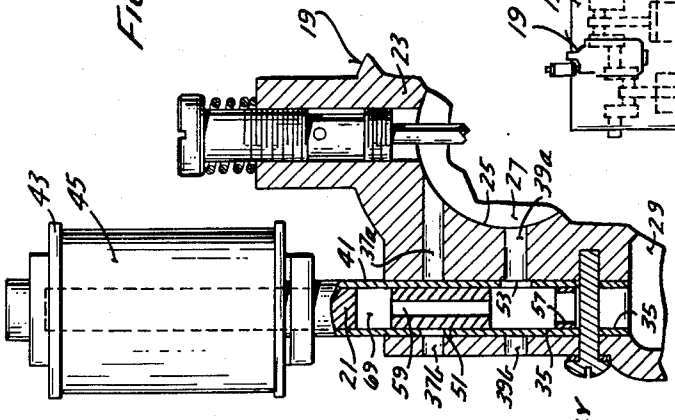
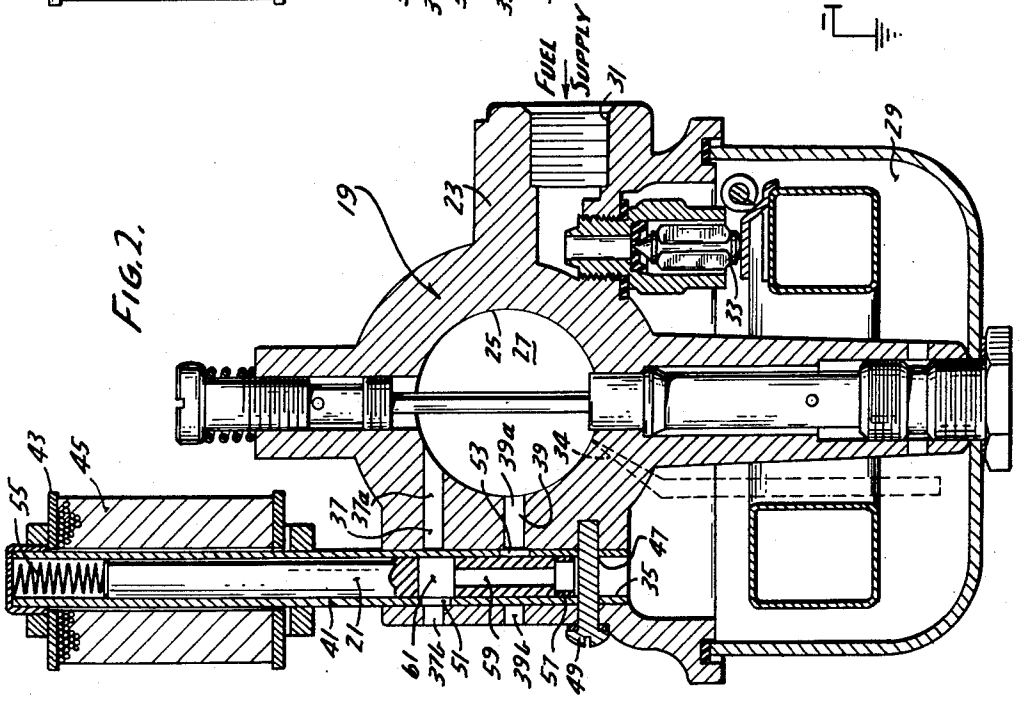


FIG. 2.



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FIG. 7.

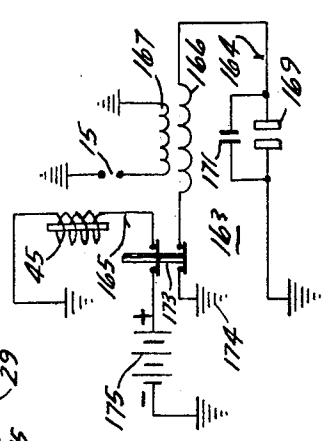


FIG. 6.

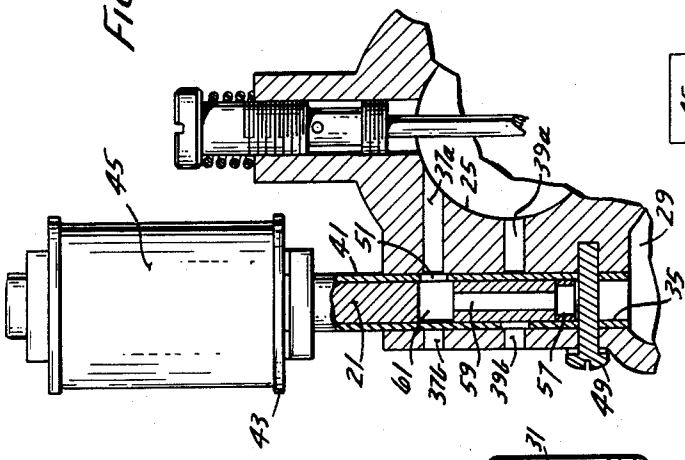
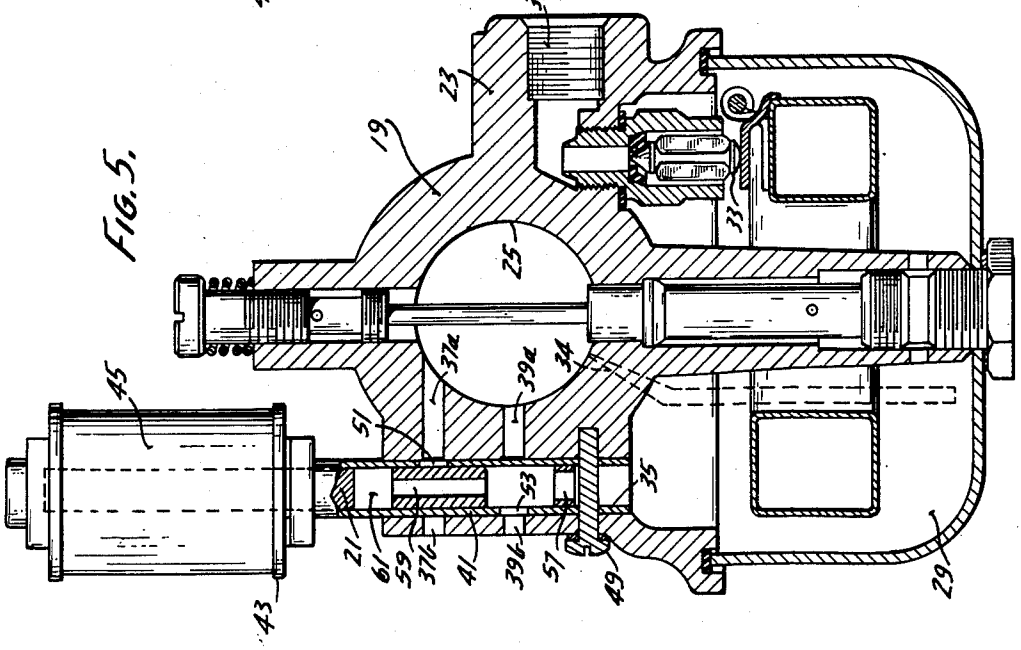


FIG. 5.



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3,191,585

CARBURETOR

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The invention relates generally to carburetors and like devices for inducing a fluid flow in response to a pressure condition below the surrounding or atmospheric pressure condition.

The invention can be embodied in any arrangement including a conduit or passage such as the throat of a carburetor, a fluid reservoir such as the fuel bowl of a carburetor, and conduit means communicating between the conduit or passage and the fluid reservoir below the part thereof normally occupied by the fluid. In such an arrangement, when the pressure condition in the conduit or passage is less than the pressure condition in the part of the fluid reservoir unoccupied by fluid, fluid flow is induced from the reservoir through the conduit means to the passage. The invention provides for valve means and associated passage means for automatically establishing communication between the part of the fluid reservoir normally unoccupied by fluid and the atmosphere, and between the part of the reservoir normally unoccupied by fluid and the passage by means other than the before mentioned conduit means. In the first instance, when the reservoir is in communication with the atmosphere, a pressure condition in the passage lower than atmospheric is effective to draw fluid from the reservoir through the conduit means and into the passage. In the other instance, the part of the reservoir normally unoccupied by fluid is closed off from the atmosphere and, instead, is placed in communication with the passage. Consequently, the body of fluid in the reservoir is subject to the same pressure condition acting through the conduit means and acting on the surface of the fluid in the reservoir. Flow through the conduit means to the passage is therefore no longer generated.

In the case of an internal combustion engine which is supplied a combustible measure of fuel and air from an associated carburetor, use of a carburetor incorporating the above disclosed arrangement assures discontinuance of engine operation when the atmosphere above the fuel in the fuel bowl is placed in communication with the throat of the carburetor, thereby cutting off further fuel flow to the engine. This is particularly important in high speed engines which may have a tendency to continue operation even after the ignition is turned off.

The invention also provides for a carburetor having electrically controlled valve means and for an internal combustion engine including both an ignition system and such a carburetor, which carburetor is electrically integrated with the ignition system. Thus, in the disclosed embodiments, the carburetor valve means is solenoid actuated and the solenoid is integrated with the ignition system so that, in response to turning off of the ignition, fuel flow through the carburetor from the fuel bowl to the throat and subsequently to the engine is prevented. The invention further provides for a carburetor which can be assembled to selectively provide for preventing engine operation either when the solenoid is energized or de-energized.

The invention also contemplates connection of the carburetor valve means with remote actuating means to cause discontinuance of engine operation by preventing fuel flow thereto, notwithstanding continued normal operation of the ignition system as for instance, in the event of engine overheating.

Other objects and advantages of the invention will become known by reference to the following drawings and accompanying description in which:

FIGURE 1 is a schematic view of an engine incorporating various of the features of the invention;

FIGURE 2 is a sectional view of the carburetor shown in FIGURE 1, the carburetor being shown in the condition permitting engine operation when the solenoid therein is de-energized;

FIGURE 3 is a fragmentary view of the carburetor shown in FIGURE 2, the carburetor being shown in the condition preventing engine operation in response to energizing of the solenoid;

FIGURE 4 is a diagrammatic view showing an engine ignition circuit usable with the carburetor shown in FIGURES 2 and 3;

FIGURE 5 is a sectional view of the carburetor of FIGURES 3 and 4, shown assembled to permit engine operation when the solenoid is energized and with the solenoid in energized condition;

FIGURE 6 is a fragmentary view of the carburetor shown in FIGURE 5, the carburetor being in the condition preventing engine operation when the solenoid is deenergized; and

FIGURE 7 is a diagrammatic view showing an engine ignition circuit usable with the carburetor shown in FIGURES 5 and 6.

The engine **11** shown in FIGURE 1 can be of any conventional construction, including an engine block **12** with a cylinder **13** having a spark plug **15** mounted therein, together with an ignition system comprising an ignition circuit including a breaker mechanism **17**. Also included in the engine **11** is a carburetor **19** which supplies carbureted air to the cylinder **13** in a conventional manner and which is constructed to include various of the features of the invention.

The carburetor **19**, as shown best in FIGURES 2 and 3, includes a plunger or member **21** which is displaceable between two positions respectively preventing and permitting engine operation. Normally, the plunger **21** is biased toward one position and can be moved or displaced to the other position either manually or, as in the preferred construction, by electrical operating means in the form of a solenoid. One of the advantages of the disclosed construction is that the carburetor can be arranged either to prevent or to permit engine operation when in its biased position in accordance with the manner in which the carburetor components are assembled.

The carburetor **19** comprises a housing **23** including a duct which includes a throat or portion **25** subject to pressure conditions below atmospheric and which includes the usual throttle valve **27**. Supported by the housing **23** is a fuel reservoir or bowl **29** which communicates with a source of fuel through a threaded socket **31** and includes the usual float valve **33**. Except for connection with conduit means in the form of one or more orifices or jets **34** which are shown schematically in broken lines in FIGURE 2 and which communicate with the throat **25** for supplying fuel thereto in accordance with the vacuum condition existing therein, and except as otherwise explained hereinafter, the reservoir **29** is closed. The provision of the orifices or jets **34** is well known, as shown for instance in the Evinrude Patent No. 2,744,736.

One of the features of the invention resides in the provision of valve means operable to establish communication between the reservoir **29** at a point above the normal fuel level therein and either of the atmosphere and the throat **25**, such communication between the throat **25** and the reservoir **29** being by means other than the jets or orifices normally affording fuel flow from the reservoir **29** to the throat **25**.

When the reservoir **29** is in communication with the

atmosphere, engine operation takes place in the normal manner. However, when the reservoir 29 is in communication with the throat 25, the pressure condition existing in the throat 25 also acts on the surface of the fuel in the reservoir 29, thereby preventing further fuel flow through the jets to the throat 25. Engine operation is therefore rendered impossible. This is of particular importance with respect to engines including ignition systems having a tendency to continue to sustain ignition even though the usual ignition switch is in its "off" position.

The means for selectively establishing communication between the reservoir 29 and either of the throat 25 and the atmosphere includes provision in the housing of a passage or bore 35 communicating at one end with the reservoir 29 at a point above the normal surface of the fuel in the bowl. Communicating with the bore 35 are a pair of transverse passages 37 and 39 which are spaced axially of the bore 35 and extend from the exterior of the housing 23 and communicate with the throat 25.

Extending in the bore 35 is a selective blocking means in the form of a hollow guide or sleeve 41 which, at its upper end, supports the yoke 43 of a conventional solenoid 45. At its lower end, the sleeve 41 includes a transverse aperture 47 adapted to receive a screw 49 utilized to fixedly assembly the guide 41 and connected solenoid 45 to the housing 23. The sleeve 41 also includes a pair of diametrically opposed ports 51 and 53 which are spaced axially of the bore from one another by an amount corresponding to the spacing between the passages 37 and 39 and which are located in relation to the length of the sleeve 41 in position for communication with the passages 37 and 39 when the sleeve 41 is properly assembled in the bore 35.

Slideably mounted in the sleeve 41 is the elongated member 21 which comprises the armature of the solenoid 45 and which is biased away from the solenoid 45 by a spring 55, such movement being limited by a stop 57 secured within the sleeve 41. Extending in and from the lower end of the armature or member 21 is an axial bore 59 terminating in a cross bore 61 located for communication with the port 51 when the armature 21 is located with its lower end engaged with the stop 57.

In the arrangement shown in FIGURE 2, the carburetor solenoid 45 is electrically connected in the ignition circuit 63 shown diagrammatically in FIGURE 4. The carburetor 19, as shown in FIGURE 2, is arranged to allow engine operation when the solenoid 45 is deenergized and to prevent fuel supply to the engine when the solenoid 45 is energized.

More specifically, in the arrangement shown in FIGURE 2, the sleeve 41 is assembled so that the port 53 communicates with the portion 39*a* of the passage 39 extending between the bore 35 and the throat 25 and so that the port 51 comunicates with the portion 37*b* of the passage 37 extending between the bore 35 and the exterior of the housing. Thus, when the solenoid 45 is de-energized, the armature 21 is positioned by the spring 55 against the stop 57 to establish communication between the surface of the fuel in the reservoir 29 and the atmosphere through the passage portion 37*b*, the port 57, the cross bore 61, the axial bore 59 in the armature 21, and the open interior of the sleeve 41. At the same time, the passage portions 37*a* and 39*b* are blocked by the sleeve 41, while the passage portion 39*a* which communicates with the port 53 is blocked by the outer wall of the armature 21. As both passage portions 37*a* and 39*a* communicating with the throat 25 are blocked, normal engine operation is therefore permitted.

Energizing of the solenoid 45 raises the armature 21, as shown in FIGURE 3, to a position with its lower end located between the passages 37 and 39. Such movement of the armature 21 closes communication between the passage portion 37*b* and the reservoir 29 while establishing communication between the reservoir 29 and the

carburetor throat 25 through the hollow interior of the sleeve 41, the port 53, and the passage portion 39*a*. The surface of the fuel in the reservoir is therefore subject to the pressure condition existing in the carburetor throat 25, thereby precluding further fuel flow through the orifices or jets. In addition, communication between the reservoir 29 and the atmosphere through the passage portion 37*b* and port 51 is blocked by the outer wall of the armature 21.

The circuit 63 shown in FIGURE 4 includes both a magneto ignition circuit 64 and a solenoid actuating circuit 65. The magneto ignition circuit 64 includes a coil having primary and secondary windings 66 and 67, respectively. As is usual, the secondary winding 67 is grounded at one end and, at its other end, is connected to the spark plug 15. At one end, the primary winding 66 is connected in parallel to a breaker 69 and a condenser 71. At its other end, the primary winding 66 is connectable through one pole of a double pole switch 73 to a ground 74.

Also extending through the double pole switch 73 is the sub-circuit 65 including the winding in the solenoid 45 and a battery 75. The switch 73 couples the solenoid 45 and the ignition system so that when the magneto ignition circuit 64 is closed to permit normal engine operation, the circuit 65 to the solenoid 45 is open. However, when the switch 73 is actuated to interrupt or open the magneto circuit 64, the circuit 65 to the solenoid 45 is closed. The circuit 63 shown in FIGURE 4 can also be used in a battery ignition system by connecting the ignition circuit 64 to the battery 75.

In the arrangement shown in FIGURES 5 and 6, the sleeve 41 is located in the bore 35 so that the port 51 communicates with the passage portion 37*a* and so that the port 53 communicates with the passage portion 39*a*. Both of the passage portions 37*b* and 39*a* are blocked by the sleeve 41. With this arrangement, normal engine operation is permitted when the solenoid 45 is energized by affording communication between the reservoir 29 and the atmosphere through the passage portion 39*b*, the port 53, and the interior of the sleeve 41. When the solenoid 45 is de-energized, the armature 21 engages the stop 57, blocking the port 53 and establishing communication between the port 51 and the cross bore 61. As a result, communication between the reservoir and the atmosphere is blocked and, instead, the reservoir 29 communicates with the carburetor throat 25 through the passage portion 37*a*, the port 51, the cross bore 61, the axial bore 59 in the armature 21, and the interior of the sleeve 41, thereby preventing further fuel flow.

The carburetor 19, as shown in FIGURES 5 and 6, can be used in connection with the ignition circuit 163 shown in FIGURE 7. This circuit includes both a magneto subcircuit 164 and a solenoid operated sub-circuit 165. The magneto circuit 164 includes a coil having primary and secondary windings 166 and 167, respectively. The secondary winding 167 is grounded at one end and connected to the spark plug 15 at its other end. The primary winding 166 is grounded at one end and, at its other end, is connectable through one pole of a double pole switch 173 to a ground 174. Wired in parallel with the primary winding 166 is a breaker 169 and condenser 171. In the circuit 163 shown in FIGURE 7, the desired sparking will be provided when the switch 173 is closed. However, when the switch 173 is opened, the primary winding 166 will be disconnected from the ground 174, thereby preventing sparking operation in response to operation of the breaker 169.

The switch 173 also controls the solenoid operating circuit 165 which includes the solenoid 45 and a battery 175. The switch 173 is arranged so that when the primary winding 166 is connected to the ground 174, the circuit 165 is closed, thereby energizing the solenoid 45 and permitting engine operation. However, when the switch 173 is operated to open the ignition circuit 164, the circuit 165

to the solenoid 45 is also opened, thereby de-energizing the solenoid 45 to prevent further engine operation. The circuit 163 shown in FIGURE 7 can be modified to permit battery operation of the ignition circuit 164 by passing both the solenoid operating circuit 165 and the ignition circuit 164 through a single switch which, when closed, connects both the primary winding 166 and the solenoid 45 in series with the battery 175.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. The combination of a duct having a portion subject to a pressure condition below atmospheric, a closed fluid reservoir, conduit means communicating with said fluid reservoir below the part thereof normally occupied by the fluid and with said duct portion so as to be subject to the pressure condition in said duct portion, first passage means communicating with said fluid reservoir above the part thereof normally occupied by the fluid, second passage means communicating with said duct portion so as to be subject to said same pressure condition to which said conduit means is subject, vent means communicating with the atmosphere, and valve means communicating with said first and said second passage means and with said vent means for alternatively and selectively establishing communication between said first passage means and said vent means and between said first passage means and said second passage means, whereby, when said first passage means communicates with said vent means, flow of fluid is afforded from said fluid reservoir through said conduit means to said duct in response to a pressure condition in said duct portion below atmospheric, and when said first passage means communicates with said second passage means, flow of fluid from said reservoir through said conduit means to said duct terminates.

2. A carburetor including a housing comprising means defining a throat, a closed fuel reservoir adapted to be connected to a source of fuel, means connected with said reservoir for maintaining a generally predetermined fuel level in said reservoir, fuel conduit means communicating with said reservoir below said fuel level and terminating in said throat for delivering fuel to said throat in response to the presence of a condition of lesser pressure in said throat than on the surface of the fuel in said reservoir, a first passage communicating with said reservoir above said fuel level, a second passage communicating with said throat, a third passage communicating with the atmosphere, and valve means communicating with said first, second, and third passages for alternatively and selectively establishing communication between said first passage and one of said second and third passages.

3. A carburetor in accordance with claim 2 wherein said valve means includes a member movable relative to said first, second, and third passages, and means for displacing said member between a first position wherein communication is blocked between said first passage and said second passage and communication is estabilshed between said first passage and said third passage for gas flow between the atmosphere and said reservoir, and a second position wherein communication between said first passage and said third passage is blocked and communication is established between said first passage and said second passage for gas flow between said throat and said reservoir.

4. A carburetor in accordance with claim 3 wherein said means for displacing said member comprises an electrical solenoid.

5. A carburetor in accordance with claim 4 including means biasing said member toward said first position, and wherein said electrical solenoid is energizable to displace said member to said second position.

6. A carburetor in accordance with claim 4 including means biasing said member toward said second position, and wherein said electrical solenoid is energizable to displace said member to said first position.

7. A carburetor including a housing comprising means defining a throat, a closed fuel reservoir adapted to be connected to a source of fuel, means connected with said reservoir for maintaining a generally predetermined fuel level in said reservoir, fuel conduit means communicating with said reservoir below said fuel level and terminating in said throat for delivering fuel to said throat in response to the presence of a condition of lesser pressure in said throat than on the surface of the fuel in said reservoir, a first passage communicating with said reservoir above said fuel level, a second passage communicating with said throat and including a bore communicating with said first passage, a third passage communicating with the atmosphere and including an opening communicating with said first passage, and valve means communicating with said first, second, and third passages for alternatively and selectively establishing communication between said first passage and one of said second and third passages, said valve means including a member movable in said first passage, said member having an outer surface, a cavity extending in the direction of movement, said cavity being open at the end of said member adjacent to said reservoir and being closed at the other end, and a port in the outer surface of said member communicating with said cavity, and means for displacing said member between a first position wherein communication between said first passage and said bore is blocked by said outer surface and said port communicates with said opening for gas flow between the atmosphere and said reservoir, and a second position wherein said opening is blocked by said outer surface and said first passage is in communication with said bore.

8. A carburetor including means defining a throat, a closed fuel reservoir adapted to be connected to a source of fuel, means connected with said reservoir for maintaining a generally predetermined fuel level in said reservoir, fuel conduit means communicating with said reservoir below said fuel level and terminating in said throat for delivering fuel to said throat in response to the presence of a condition of lesser pressure in said throat than on the surface of the fuel in said reservoir, a first passage communicating with said fuel reservoir above said fuel level, second and third passages communicating with said first passage and with the exterior of said housing, fourth and fifth passages communicating with said first passage and with said throat, means for selectively blocking one of said second and third passages and one of said fourth and fifth passages, and valve means communicating with the other of said second and third passages and with the other of said fourth and fifth passages for alternatively and selectively establishing communication between said reservoir and one of said throat and the exterior of said housing.

9. A carburetor including means defining a throat, a closed fuel reservoir connected to a source of fuel, means connected with said reservoir for maintaining a generally predetermined fuel level in said reservoir, fuel conduit means communicating with said reservoir below said fuel level and terminating in said throat for delivering fuel to said throat in response to the presence of a condition of lesser pressure in said throat than on the surface of the fuel in said reservoir, a first passage communicating with said reservoir above said fuel level, a second passage communicating with said first passage and including a first portion communicating with the atmosphere, and a second portion communicating with said throat, a third passage communicating with said first passage and including a first portion communicating with the atmosphere and a second portion communicating with said throat, means for blocking said first portion of a selected one of said second and third passages and said second portion of the other of said second and third passages, and valve means communicating with said first portion of said other of said second and third passages and with said second portion of said one of said second and third passages for alternatively and selectively establishing communication between said reservoir and one of said throat and the atmosphere.

10. A carburetor in accordance with claim 9 wherein

said blocking means comprises a sleeve received in said first passage and having a first port in registry with said first portion of said other of said second and third passages, and a second port in registry with said second portion of said one of said second and third passages.

11. A carburetor in accordance with claim 10 wherein said valve means includes a member movable reciprocably in said first passage, said member having an outer surface, a cavity extending in the direction of reciprocal movement, said cavity being open at the end of said member adjacent to said reservoir and being closed at the other end, and a port in the outer surface of said member communicating with said cavity, and means for displacing said member between a first position wherein communication between said first passage and said second port is blocked by said outer surface and said reservoir communicates with the atmosphere, and a second position wherein communication between said first passage and said first port is blocked by said outer surface and said reservoir is in communication with said throat.

12. The combination of an engine having an ignition system and a carburetor having a throat, a closed fuel bowl connected to a source of fuel, means for maintaining a generally predetermined fuel level in said bowl, fuel conduit means communicating with said fuel bowl below said fuel level and with said throat, a first passage communicating with said fuel bowl above said fuel level, a second passage communicating with said throat, a third passage communicating with the atmosphere, valve means communicating with said first, second, and third passages for alternatively and selectively establishing communication between said first passage and said second passage and between said first passage and said third passage, said valve means including electrical operating means, and means electrically coupling said electrical operating means and said ignition system for operating said valve means in accordance with the operation of said engine.

13. A combination in accordance with claim 12 wherein said valve means further includes a member movable by said electrical operating means relative to said first, second, and third passages, and between a first position affording engine operation wherein communication is blocked between said first passage and said second passage and communication is established between said first passage and said third passage for gas flow between the atmosphere and said fuel bowl, and a second position precluding engine operation wherein communication between said first passage and said third passage is blocked and communication is established between said first passage and said second passage for gas flow between said fuel bowl and said throat.

14. A combination in accordance with claim 13 wherein said electrical operating means comprises an electrical solenoid.

15. A combination in accordance with claim 14 including means biasing said member toward said position affording engine operation and wherein said means electrically coupling said electrical operating means and said ignition system energizes said solenoid to displace said member to said position precluding engine operation in response to interruption of said ignition system.

16. A combination in accordance with claim 14 including means biasing said member toward said position precluding engine operation and wherein said means electrically coupling said electrical operating means and said ignition system energizes said solenoid to displace said member to said position affording engine operation in response to conditioning of said ignition system for engine operation.

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