Dec. 2, 1941. W. C. CONOVER 2,264,365

FUEL AND CARBURETION SYSTEM

Filed Jan. 6, 1941 4 Sheets-Sheet 1

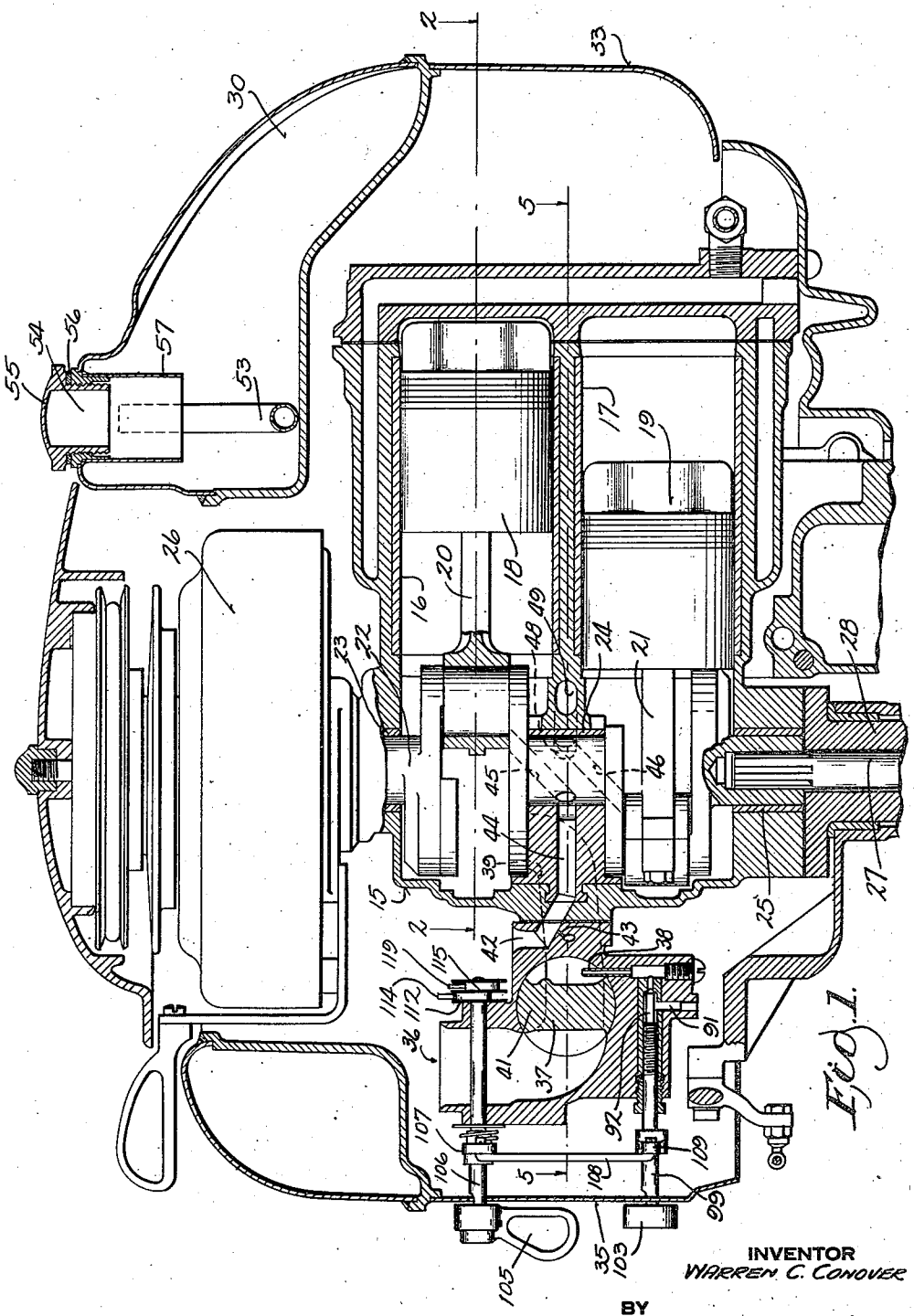


Fig. 1.

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FUEL AND CARBURETION SYSTEM

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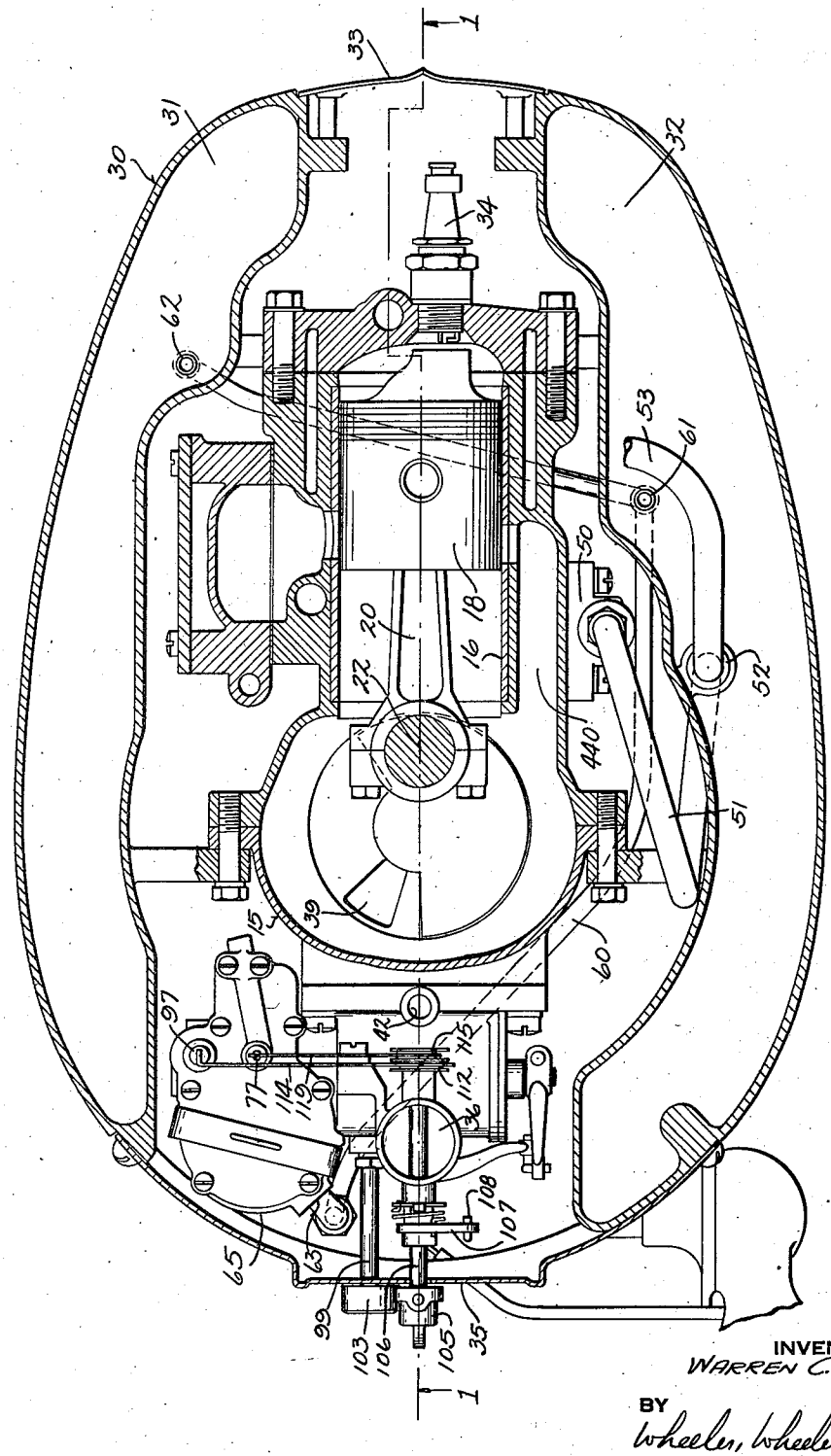


Fig. 2.

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FUEL AND CARBURETION SYSTEM

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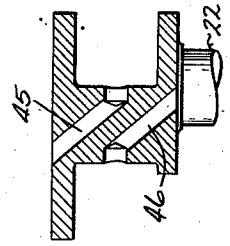


Fig. 6.

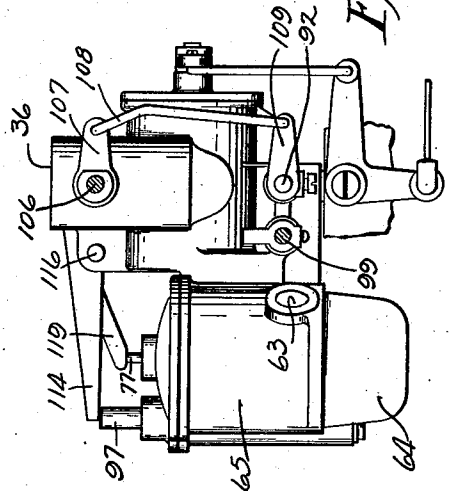


Fig. 4.

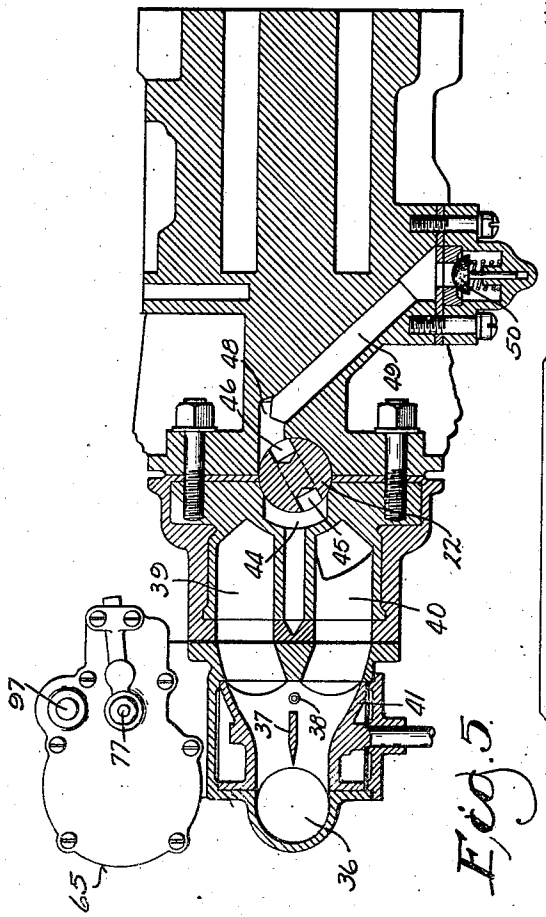


Fig. 5.

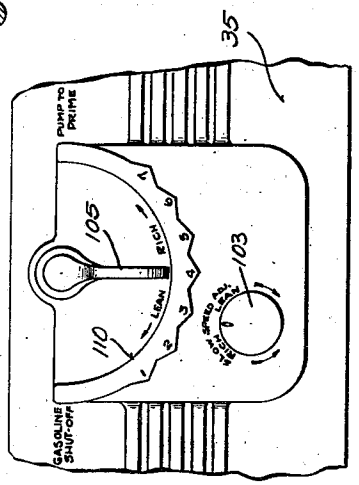


Fig. 3.

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FUEL AND CARBURETION SYSTEM

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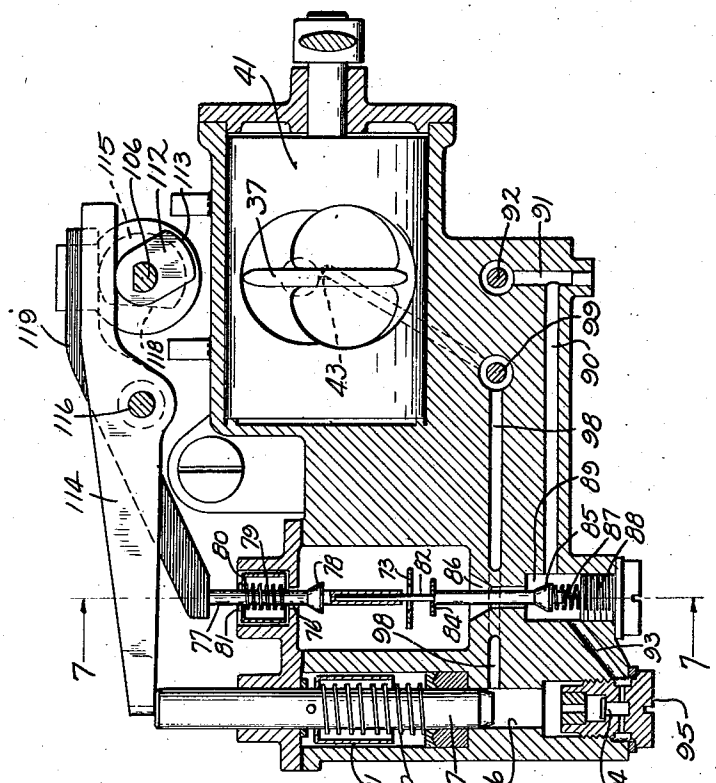


Fig. 8.

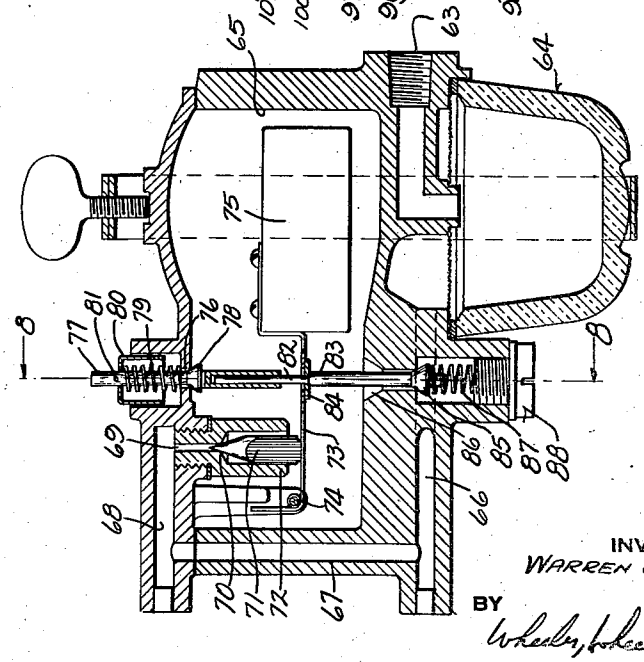


Fig. 7.

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Patented Dec. 2, 1941 2,264,365

UNITED STATES PATENT OFFICE

2,264,365

FUEL AND CARBURETION SYSTEM

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Application January 6, 1941, Serial No. 373,241

24 Claims. (Cl. 123—73)

This invention relates to fuel and carburetion systems for internal combustion engines, and particularly for the engines of outboard motors.

One of the primary objects of the invention is to provide for the automatic maintenance of pressure on a fuel reservoir for delivery of fuel therefrom to the carburetor of an internal combustion engine, the engine itself providing the compression for such fuel delivery. While the fuel reservoir may be at any desired distance from the engine, the preferred construction herein disclosed has for one of its objectives the provision of a novel and compact arrangement in which the fuel tank acts as a partial enclosure for the engine, being associated with an engine shroud and made in the form of a saddle to span the engine cylinders and having an opening through it to receive the engine flywheel, only a portion of the tank, therefore, being below the level of the carburetor so as to require pressure for the delivery of its contents.

Another major object of the invention is to provide a single control for the fuel system of an internal combustion engine. In the past, internal combustion engines in general and particularly those of outboard motors, have required a number of different controls including a throttle valve, a needle valve, a cut-off valve, and an air vent valve. Since outboard motors are portable and are apt to be stored, carried or held in any position, complete closure of the entire fuel system is necessary to prevent loss of fuel from the tank when the engine is inverted or laid down, danger from fire due to such loss of fuel, and untidiness due to the lubricating oil present in such fuel for use in two cycle engines.

The present invention seeks to provide a single control handle by which all of the several valves in the fuel system including not only the air relief valve but all inlets and vents from the carburetor and the tank, are all subject to unitary manipulation so that only a single lever may be turned to place the mechanism in one of several running positions or, in stopping the engine, to completely protect it against loss of fuel.

A further object is generally to simplify and improve the construction, arrangement and operation for one or more of the purposes mentioned, and still other objects will be apparent from the specification.

In the drawings:

Fig. 1 is a vertical fore and aft section through the power head of an outboard motor taken on line 1—1 of Fig. 2.

Fig. 2 is a plan section taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary detail of the operating panel in front elevation.

Fig. 4 is a view in elevation similar to Fig. 3 showing the carburetor behind the panel as it appears with the panel removed.

Fig. 5 is a plan section taken on line 5—5 of Fig. 1.

Fig. 6 is a fragmentary detail partially in section and partially in side elevation showing the rotary valve as built in to the crank shaft.

Fig. 7 is an enlarged detail view in cross section through the carburetor taken on line 7—7 of Fig. 8.

Fig. 8 is a transverse section through the carburetor taken on line 8—8 of Fig. 7.

Like parts are identified by the same reference characters throughout the several views.

The invention will be described with particular reference to outboard motor structure, but it will be understood that the disclosure in this regard is merely representative of extreme conditions requiring full control of the fuel system in a highly portable engine. For other purposes the full advantages of the invention as herein disclosed may not necessarily be utilized.

The general engine structure will be apparent to those skilled in the art and need not be described in particular detail here. There is a crank case 15, cylinders 16 and 17, pistons 18 and 19, connecting rods 21, and a crank shaft 22 having an upper bearing 23, a central bearing 24, and a lower bearing 25. At its upper end the crank shaft 22 carries the flywheel magneto 26, while at its lower end it drives the vertical shaft 27 whereby power is communicated to the conventional propeller (not shown).

The entire engine is carried on the shaft housing 28 and its flanged end engages the crank case 15 adjacent the lower crank shaft bearing 25.

The engine is enclosed in part by the saddle-shaped fuel tank 30, which has depending portions 31 and 32 as shown in Fig. 2 at each side of the engine and has an annular top portion surrounding the flywheel as indicated in Fig. 1. Complementing the fuel tank as an engine enclosure is shroud means including the cover 33 for the spark plugs 34 at the rear of the cylinders and a control panel 35 spanning the carburetor hereinafter to be described.

The engine is preferably of a type having dual carburetion as disclosed in C. L. Johnson Patent No. 2,185,506. Air for high speed operation is admitted to the carburetor through the intake

passage 36 and, divided by partition 37 in accordance with the disclosure of Conover application filed Aug. 1, 1940, Serial No. 349,078, it passes alternately at opposite sides of the jet 38 into the branch manifolds 39 and 40. These lead to ports in the crank case near the central crank shaft bearing controlled by the crank shaft cheeks, which act as rotary valves as disclosed in the aforesaid application and patent and not necessarily to be described in detail here. The partition 37 is located within a rotary throttle valve 41 (Figs. 2 and 5).

Air admitted to the crank cases for low speed operation enters through the inlet passage 42 and, passing the jet orifice 43, is led through the low speed manifold 44 to a port in the center crank shaft bearing 24. The central portion of the crank shaft, rotatable in said bearing, has obliquely bored passages 45 and 46 which respectively lead upwardly and downwardly from the level of the manifold 44 for alternately affording communication between the manifold and the respective crank cases in which gases are alternately compressed by reciprocation of the pistons 18 and 19.

Opposite to the port in which low speed manifold 44 terminates in the bearing, is another port at 48 with which the respective bores 45 and 46 communicate when their ends are at high pressure. It will be understood that such bores communicate with the low speed manifold 44 when the crank cases into which they open are at low pressure.

Fig. 1 shows the bore 46 affording communication between the lower crank case and the port 48 at the time when the piston 19 is at the end of its expansion stroke, whereby the gases in the lower crank case are maintained temporarily at maximum compression. The pressure developed in the crank case is used to transfer such gases in the usual manner through transfer passage 440, subject to control by the piston skirt, to the combustion chambers. It is also used in accordance with the present invention to maintain pressure in the fuel tank, such pressure being communicated to the fuel tank through the ducts 45 and 46 in the crank shaft, the port 48 in the bearing 24, the passage 49 leading through the crank case to the side of the cylinder block (Fig. 5) and thence, subject to the control of check valve 50, through pipe 51 into the fuel tank portion 32 at 52 and thence upwardly and across the fuel tank at 53 (Fig. 1 and Fig. 2) to the hollow interior 54 of the filler cap 55 through which fuel is introduced into the fuel tank 30. The filler cap seats against a gasket 56 whereby pressure communicated to the tank is retained therein. The hollow 54 in the interior of the cap provides a bell into which the fuel cannot rise, as does the sleeve-like extension 57 downwardly into the top of the tank. The fuel introduced into the tank cannot rise therein above the lower end of the sleeve 57, thereby assuring expansion space in the top of the tank.

The point at which the rotary valve cuts off communication between the crank cases and the pressure line will determine the pressure communicated to the tank if less than maximum crank case pressure be desired. The rotary valve might be omitted if only one crank case were used for supplying pressure or if separate check valves were used for the several crank cases and maximum pressure were desired from each.

The space in the top of the tank is always saturated with fuel vapors in any event, as is any other fuel reservoir, and consequently it is immaterial that the pressure communicated thereto is derived from the engine crank case in which fuel vapors are present.

Since the valve ducts 45 and 46 in the crank shaft alternately communicate with port 48 and thence with the fuel tank only at times of maximum pressure in the respective crank cases, it will be apparent that the fuel tank will constantly be maintained at a pressure equal to maximum crank case pressures. It will be apparent that the tank might be located at any desired distance from the carburetor, it being only necessary to extend to the tank the fuel line and the pressure pipe 51 which leads from the engine block thereto.

Incidentally, the check valve 50 may be located at any desired point in the pressure line. It is conveniently placed in a suitable fitting at the side of the cylinder block whence the passage 49 issues. The spring which seats the check valve 50 will preferably be a rather light spring.

Since the tank as shown includes separate portions 31 and 32 which have no communication except across the top of the tank, it is necessary, in order to completely use the gasoline from these portions, that the gasoline line 60 to the carburetor should communicate not only with portion 32 at 61, but should also be extended to communicate with portion 31 at 62. From both of the portions, therefore, the gasoline line 60 extends to a carburetor fuel inlet at 63 (Fig. 7) whence the fuel passes into a transparent settling chamber 64 which may conveniently, though not necessarily, be located below the float chamber 65.

From the top of the settling chamber 64 the fuel flows through passages 66, 67, 68 and 69 to the valve seat 70 which is controlled by the float valve 71. The valve is guided in the sleeve 72 and has flat sides to pass the fuel which is permitted by the valve to enter through the seat 70. The float arm 73 is hinged to bracket 74 and carries a conventional float 75 in float chamber 65, the valve 71 being supported on the arm 73 so that the raising of the float closes the valve against the seat 70.

The fuel leaves the float chamber under atmospheric pressure. Consequently it is necessary to provide for venting the float chamber and for the delivery of fuel therefrom. The vent port is shown at 76 (Figs. 7 and 8) surrounding the valve rod 77 upon which valve 78 is carried to seat against the carburetor wall about the port 76 for the closing of the vent. A compression spring 79 biases the rod 77 and valve 78 in a seating direction. An inverted cup-shaped spring seat 80 is anchored by a pin 81 to rod 77 to receive the thrust of spring 79 while at the same time constituting a baffle for the vent.

The lower end of the valve rod 77 is socketed to receive the upper end of a pin 82 which extends through the float arm 73 and is shouldered at 83 to carry a washer 84 engageable with the float arm 73 from beneath. It will be noted in Fig. 7 that there is a certain amount of lost motion between the end of pin 82 and the end of the socket in valve rod 77.

At its lower end the pin 82 carries a valve 85 disposed in the fuel outlet passage 86 for the control of flow therethrough. A compression spring 87 biases the valve 85 toward its seat, the spring being supported removably on screw plug 88.

From the chamber 89 into which the valve 85 opens, there are two fuel passages. Fuel pas-

sages 90 and 91 lead past the high speed needle valve 92 (Fig. 1 and Fig. 8) to the high speed jet 38.

Passage 93 leads past the check valve 94 built into plug 95 into the pump cylinder 96 in which the priming plunger 97 is operable. Below the normally elevated priming plunger 97 is a passage 98 leading past the low speed needle valve 99 (Figs. 1, 4 and 8) to the low speed jet 43 (Fig. 1).

The plunger pump 97 used for priming is biased to remain in the normally open position, being supported by compression spring 100 engaged in the cup-shaped seat 101 as best shown in Fig. 8. When operated, it forces a small amount of fuel through the passage 98 to the low speed jet. The check valve 94 prevents the return of such fuel through chamber 89 to the float chamber.

The low speed needle valve 99 is provided at the front of control panel 35 with a knob 103 which, once fixed as to adjustment, will seldom require resetting. The entire general control of the fuel system is effected by manipulation of a lever 105 mounted in front of control panel on control shaft 106 (Figs. 1, 2 and 3). The control shaft 106 is a rock shaft having a rocker arm 107 connected by link 108 with arm 109 on the high speed needle valve 92 (Figs. 1 and 2). Oscillation of the hand lever 105 through the range indicated by the scale at 110 on the control panel 35 (Fig. 3) will afford entirely adequate control of the needle valve to and from its seat for the purposes of regulating the richness of the mixture supplied through jet 38. Through the link 108 the needle valve 92 is turned in the same direction of rotation as the control shaft 106, the arrangement preferably being such that counterclockwise rotation of the control lever 105 opens the needle valve while clockwise rotation of the control shaft 106 on the needle valve closes the needle valve.

For convenience the control shaft 106 may extend through the air intake passage 36 as shown in Fig. 1. Behind the carburetor the shaft carries two cams 112 and 115 (Figs. 1 and 8). The cam 112 is of uniform radius except for the high point 113. Resting thereon is a cam follower lever 114 pivoted at 116 and having its remote free end bearing in the top of the priming plunger 97. Thus when the rock shaft 106, which controls the needle valve, is rotated counterclockwise to its extreme right hand position as viewed in Fig. 3, the lobe 113 of cam 112 will rock the lever 114 to operate the primer, the needle valve being then set to give the richest possible mixture within its range of movement. Cam 115 has a flat face at 118 (Fig. 8). Resting on its periphery, which is otherwise of constant radius, is lever 119, likewise pivoted on the pintle 116 and having its free end engaged with the top of the valve rod 77. When the control lever 105 is moved clockwise to its extreme left hand position as viewed in Fig. 3, the needle valve 92 will be closed to make the mixture lean and at the end of the range of movement permitted the control shaft, the flat portion 118 of cam 115 will register with the lever 119, thus permitting such lever to oscillate clockwise as viewed in Fig. 8, thereby allowing the valve rod 77 to raise and the valve pin 82 to raise, whereby valves 78 and 85 are both seated under pressure of the springs 79 and 87 respectively.

Due to the use of the pressure system as heretofore described, the gasoline tank 30 requires no vent to the atmosphere but operates at super atmospheric pressure communicated thereto from the crank case by the rotary valve. Thus, the only vent required to insure the proper flow of gasoline to the carburetor is in the float chamber thereof and this is controlled by valve 78 which is shown seated in Fig. 7 but open in Fig. 8. When the control lever 105 is turned clockwise over the panel dial 110 to the shutoff position at the left, as viewed in Fig. 3, thereby closing the needle valve 92, the flattened portion 118 of cam 115 moves into position to allow lever 119 to rotate clockwise about the pivot 116 (Fig. 8) under the urge of springs 79 and 87 with the resulting closure of the relief valve 78 and the valve 85 which controls all fuel deliveries from the carburetor to the engine intake manifold. Furthermore, the resulting upward movement of washer 85 which is carried on stem 82 pivots the float arm 73 to close the float valve 71. In this position of arm 119, it is no longer possible for any fuel to pass from the tank into the float chamber, nor is it possible for any fuel to leave the float chamber either through the discharge port at 86 or through the vent control valve 78, regardless of the angle at which the motor might be positioned. Therefore, the entire fuel system, including all necessary valves, becomes sealed through the manipulation of the single lever 105 which serves to control the needle valve 92 and the priming plunger 97 during normal engine operation.

Conversely, movement of the control lever 105 toward the starting position in which the mixture is rich and the primer is operated, effects the opening of all valves to place the system in condition for operation, the air vent valve 78 being first to open; the float valve and discharge valve being relieved of closing pressure with consequent opening thereof as soon as the lost motion between the valve rod 76 and the valve pin 82 is taken up, as shown in Fig. 8.

I claim:

1. The combination with an engine having a chamber in which pressure is developed in the course of engine operation, of means for admitting air to said chamber, means for carbureting air so admitted, a fuel tank provided with a fuel delivering connection to said engine and a pressure connection from the engine chamber to the tank, said tank having at least a portion carrying fuel at a lower level than the engine whereby fuel deliveries depend upon pressure communicated to the tank from said chamber, and a delivery conduit from said fuel tank portion to said air carburetion means for the delivery thereto of fuel forced by pressure from said tank at the pressure communicated to the tank from said chamber.

2. The structure specified in claim 1 wherein said delivery conduit includes a float chamber provided with a float valve for controlling delivery from said fuel tank portion to said air carburetion means.

3. The structure defined in claim 1 in which the delivery conduit includes a float chamber provided with a vent and arranged for gravity delivery to said air carburetion means and having a float and a valve connected to be operated by said float and operatively associated with the portion of said conduit leading to said float chamber for controlling deliveries from said fuel tank portion to said float chamber and thence to said air carburetion means.

4. The combination with an engine having a

chamber alternately subject to pressure and relief of pressure in the course of engine operation, said engine providing an air inlet and an outlet from said chamber, a valve operable in accordance with the operation of the engine for closing said outlet when said chamber is at reduced pressures and opening said outlet when said chamber is at high pressure, a fuel tank provided with a fuel delivery connection to said engine, said tank having at least a portion below said engine, a pressure line from said chamber outlet to said tank whereby said chamber communicates with said tank subject to the control of said valve at relatively high pressure, whereby the pressure of said chamber is communicated to said tank for the delivery of fuel therefrom to said engine, and means in communication with said tank for the carburetion of air entering said engine chamber through said inlet.

5. The combination with an engine having a combustion chamber and a chamber in which combustible mixture is compressed for delivery to the combustion chamber, said last mentioned compression chamber being provided with an air inlet and an outlet and a valve controlling said outlet, of means for periodically opening said valve in accordance with engine operation at periods when mixture is being compressed in said compression chamber, a carburetor provided with an air passage communicating with said chamber air inlet and provided with a float chamber and a float valve adapted to control the admission of fuel under pressure to said float chamber, a fuel tank provided with a fuel supply line leading to said carburetor float chamber, and a pressure line leading from said compression chamber outlet to said fuel tank.

6. The combination with an engine having a crank shaft, crank case, carburetor, cylinder, piston and connecting rod, said crank case being subject to pressure variation in the course of piston movement in said cylinder, of a fuel tank provided with a fuel supply line leading to said carburetor, a pressure line from said crank case to said fuel tank, and valve means in said pressure line for maintaining in said fuel tank the pressures of compression in said crank case.

7. The combination with an engine having a crank shaft, crank case, cylinder, piston and connecting rod, said crank case being subject to pressure variation in the course of piston movement in said cylinder, of a carburetor for said engine including an air passage, a fuel jet, a float chamber communicating with said jet for gravity delivery of fuel thereto and a float valve adapted to control delivery of fuel under pressure to said float chamber, a fuel tank provided with a fuel supply line leading to said carburetor float chamber subject to the control of said float valve, a pressure line from said crank case to said fuel tank, and valve means in said pressure line for maintaining in said fuel tank the pressures of compression in said crank case, said valve means comprising a valve rotatable with the crank shaft.

8. A two-cycle engine having crank case compression including a crank case provided with bearing means having inlet and outlet ports, a crank shaft provided with openings registerable alternately with the respective ports, a piston in operative connection with the crank shaft, a cylinder in operative connection with the crank case and in which the piston is movable to subject the crank case alternately to high and low pressure, the crank shaft opening being adapted to register with the bearing inlet port at low crank case pressure and to register with the bearing outlet port at high crank case pressure, means providing a manifold passage leading to the inlet port of said crank case, means for carbureting air traversing said passage and including a fuel line, a supply tank with which said line communicates, and a pressure line from the bearing outlet port of said crank case to said tank and controlled by said valve to maintain said tank under pressure for fuel deliveries to said carbureting means.

9. The combination with a two-cycle internal combustion engine arranged for crank case compression of combustible mixture and including a crank case, a cylinder, a crank shaft, a connecting rod and a piston reciprocable in the cylinder, of a fuel tank, means providing a valve controlled air inlet to said crank case, means for carbureting air traversing said inlet toward said crank case whereby to supply combustible mixture to said crank case for the operation of said engine, a fuel line from said fuel tank to said carbureting means, at least a portion of said tank being lower than said carbureting means whereby to preclude gravity flow from said tank to said carbureting means, and a valve controlled pressure connection from said crank case to said tank, said tank being provided with a sealed filter cap removable to permit the introduction of fuel but normally hermetically closed whereby to maintain in said tank pressure communicated thereto from said crank case for the delivery of fuel to said carbureting means from said tank.

10. The combination with a two-cycle internal combustion engine having dual carburetion and crank case compression and including a carburetor with a main inlet passage and a low speed inlet passage, a throttle controlling the main inlet passage, the low speed inlet passage being normally open, means for carbureting air traversing the respective passages, a crank case provided with valve controlled means for admitting combustible mixture from the respective passages and having a valve controlled outlet passage, a cylinder connected with the crank case, a piston reciprocable in the cylinder, a crank shaft rotatable in the crank case and in operative connection with the piston, and a fuel tank having at least a portion lower than said carburetor and provided with a pipe from the lowest portion of said tank through said carburetor, and a pressure line from said valve controlled outlet passage affording pressure communication from said crank case to said tank for delivery of fuel to said carburetor.

11. The combination with an internal combustion engine having an upright crank shaft provided with at least two cranks and a central bearing portion with oblique ducts opening toward the respective cranks, of a crank case housing providing separate crank cases for the respective cranks and having crank shaft bearings including a bearing for said central crank shaft portion, said last mentioned bearing having an inlet port and an outlet port with which said ducts alternately register in the course of crank shaft rotation, cylinders connected with said housing and communicating with the respective crank cases, pistons reciprocable in the cylinders and in operative connection with the cranks of said crank shaft whereby said crank cases are alternately subject to compression and relief of compression, fuel supplying means for said en-

gine including a manifold leading to the inlet port of said central crank case bearing, and jet means for the carburetion of air traversing said manifold, a fuel tank having at least a portion below said jet means, a fuel pipe from said tank portion toward said jet means, and a pressure pipe from the outlet port of said center bearing to said fuel tank whereby fuel therein is subjected to pressure developed alternately in the respective crank cases in the course of engine operation for delivery of such fuel through the fuel pipe to said jet means.

12. In a device of the character described, the combination with a two-cycle internal combustion engine having a mixture compression chamber and a carburetor in controlled communication therewith, of a fuel tank having at least a portion below said carburetor and provided with a pipe leading from said portion to said carburetor, filler means for said fuel tank comprising an air trap at the top of said tank and a valve controlled duct from said pressure chamber into said air trap for maintaining in said tank the pressures developed in said compression chamber.

13. The combination with an internal combustion engine having crank case compression and provided with a crank case with vertical crank shaft and at least one horizontal cylinder, of a fuel tank straddling said cylinder, a carburetor at a higher level than the bottom of said fuel tank and provided with means placing it in controlled communication with said crank case, a fuel line from said fuel tank to said carburetor and a valve controlled pressure duct from said crank case to said fuel tank.

14 The combination with an internal combustion engine having a compression chamber and an hermetically sealed fuel tank, of a valve controlled pressure line from said pressure chamber to said tank, a carburetor having a fuel line from said tank and provided with a float chamber and a float controlled valve regulating fuel deliveries from said tank to said float chamber, said float chamber having a vent and a valve controlling said vent, a carburetor jet in controlled communication with said float chamber, a valve controlling such communication, and means for concurrently actuating the several valves.

15. The combination with an internal combustion engine having a compression chamber and an hermetically sealed fuel tank, of a valve controlled pressure line from said pressure chamber to said tank, a carburetor having a fuel line from said tank and provided with a float chamber, and a float controlled valve regulating fuel deliveries from said tank to said float chamber, said float chamber having a vent and a valve controlling said vent, a carburetor jet in controlled communication with said float chamber, a valve controlling such communication, and means for concurrently actuating the several valves, together with a needle valve also controlling fuel delivery to said jet from said float chamber, said means being connected for the concurrent operation of said needle valve in addition to the valves first mentioned above.

16. The combination with an internal combustion engine having a compression chamber and an hermetically sealed fuel tank, of a valve controlled pressure line from said pressure chamber to said tank, a carburetor having a fuel line from said tank and provided with a float chamber, and a float controlled valve regulating fuel deliveries from said tank to said float chamber, said float chamber having a vent and a valve controlling said vent, a carburetor jet in controlled communication with said float chamber, a valve controlling such communication, and means for concurrently actuating the several valves, together with a needle valve also controlling fuel delivery to said jet from said float chamber, said means being connected for the concurrent operation of said needle valve in addition to the valves first mentioned above, said means comprising a control handle means for transmitting motion from said handle to said needle valve, a cam connected with said shaft, and a cam follower including operative connections to the vent valve, the float valve and the fuel outlet valve.

17. A carburetor comprising the combination with a float chamber having inlet, outlet and vent ports, of valves for controlling the several ports and a single control means operatively provided with mechanical connections to the several valves for effectuating the simultaneous closing of the several valves.

18. In a carburetor, the combination with a float chamber having an inlet port, a float operated valve normally controlling delivery through said port, said float chamber also having a vent port and a delivery port, valve means for the vent port and the delivery port, a single control lever for the actuation of said valve means, and means for holding said float operated valve to its seat in the closing of the vent valve and the delivery port valve whereby all ports opening to and from said float chamber are concurrently opened and closed.

19. A carburetor for a portable engine subject to inversion and comprising the combination with a float chamber and a float therein, said float chamber being provided with inlet, vent and outlet ports whereof the vent and outlet ports are aligned, a float actuated valve controlling said inlet port, separate valves controlling the vent and outlet ports, aligned connections for the actuation of said vent and outlet port valves, said connections including means for holding the float actuated valve to its seat when the vent and outlet port valves are closed, and a single lever operatively connected for the actuation of said means, together with priming plunger having a cylinder communicating with the float chamber through said outlet port, at least one fuel jet communicating with the float chamber through said oulet port, a needle valve controlling the communication of said jet and said float chamber and variable as to its opening, said lever being connected for the opening and closing of said needle valve and the actuation of said priming plunger.

20. The combination with an engine having a crank shaft, crank case, cylinder, piston, and connecting rod, said crank case being subject to pressure variation in the course of piston movement in said cylinder, of a fuel tank provided with a fuel supply line leading to said engine, a pressure line from said crank case to said fuel tank, and a check valve in said pressure line adapted to open by pressures from the crank case of substantially greater magnitude than pressures within the fuel tank and to close when the fuel tank pressure is equal to or greater than the pressure within the crank case.

21. A device as set forth in claim 20, wherein said check valve comprises a plug valve in the pressure line from the crank case to the fuel tank, and a spring adapted to bias said valve against a complementary valve seat when the

crank case pressure and the fuel tank pressure are substantially equal, said valve adapted to open when the crank case pressure exceeds the fuel tank pressure, whereby to permit equalization of pressure therebetween, and to close when the fuel tank pressure is substantially greater than the crank case pressure to prevent pressure equalization therebetween.

22. The combination with an engine having separate chambers alternately subject to pressure and relief of pressure in the course of engine operation and provided with outlets from said chambers, of a rotary valve operable in accordance with the operation of the engine for selectively closing each of said outlets when the chamber connected therewith is at reduced pressures and opening each of said outlets when its connected chamber is at high pressure, a fuel tank provided with a fuel delivery connection to said engine, said tank having at least a portion below said engine, a pressure line from said chamber outlets to said tank, and a check valve in said line, whereby pressure transfer between the crank case and the tank is subject to the control of both said rotary valve and said check valve, whereby certain pressures built up in the chambers are communicated to said tank for the delivery of fuel from the tank to the engine.

23. A carburetor comprising the combination with a float chamber having inlet, outlet and vent ports, of valves for controlling the several ports, a float connected to actuate the valve for the inlet port, the valve for the outlet port being subject to manual actuation for mixture regulation, and a single control means operatively connected with the several valves for simultaneously urging said valves to their respective seats irrespective of their initial adjustment or their respective actuating means, said single control means being adjustable to a position such as to release the several valves for independent movement.

24. A carburetor comprising the combination with a float chamber having a plurality of ports for inlet, outlet and vent purposes, said ports constituting the sole means of exterior communication with said float chamber, of valves operatively positioned to control all of the several ports, and a single control means provided with mechanical connections to the several valves for the actuation thereof in a closing direction whereby said single control means is adapted entirely to close all means of exterior communication with said float chamber.

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