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J. MIKULASEK

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COMBUSTION ENGINE

Original Filed Sept. 27, 1929 3 Sheets-Sheet 2

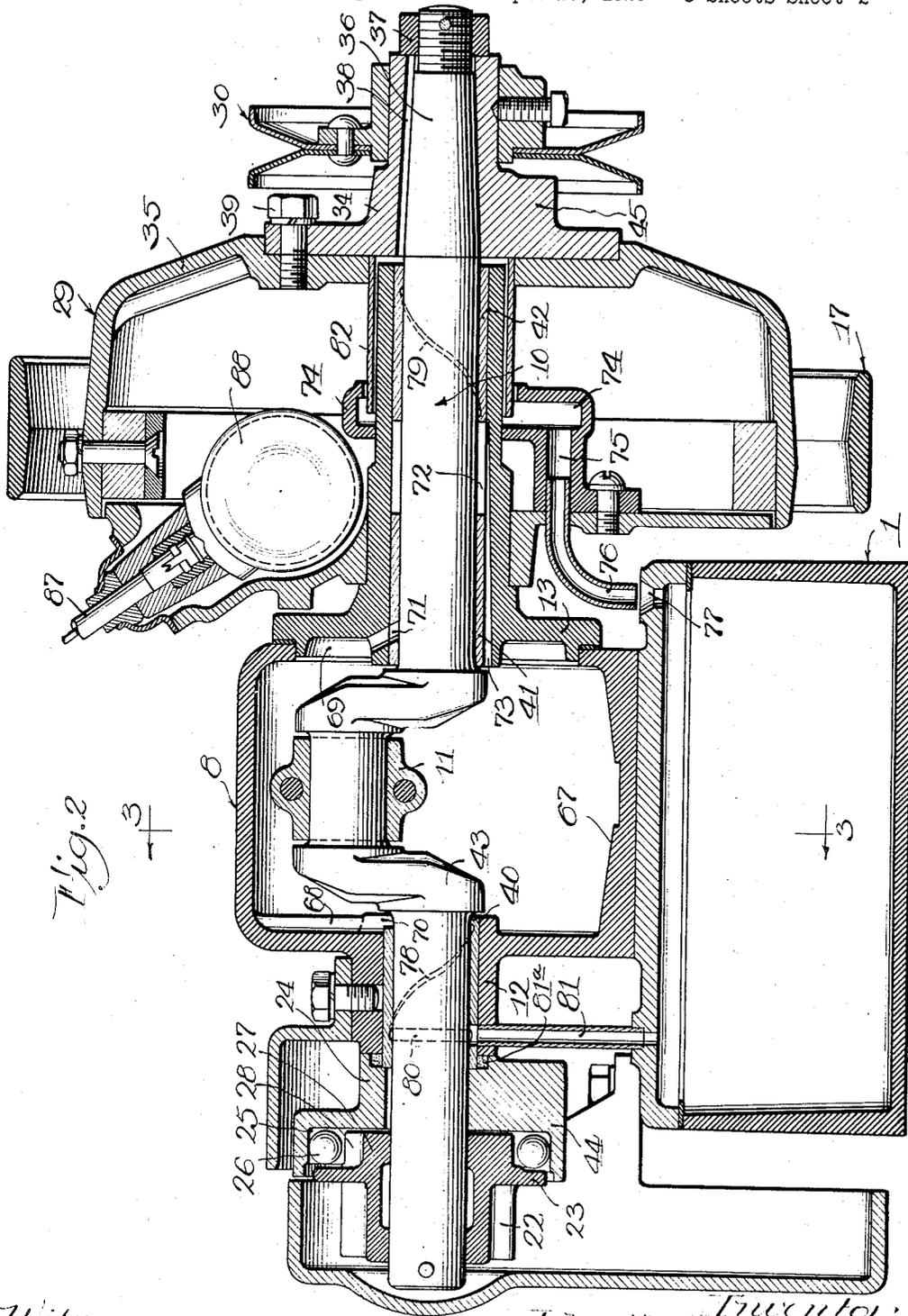


Fig. 2  
3

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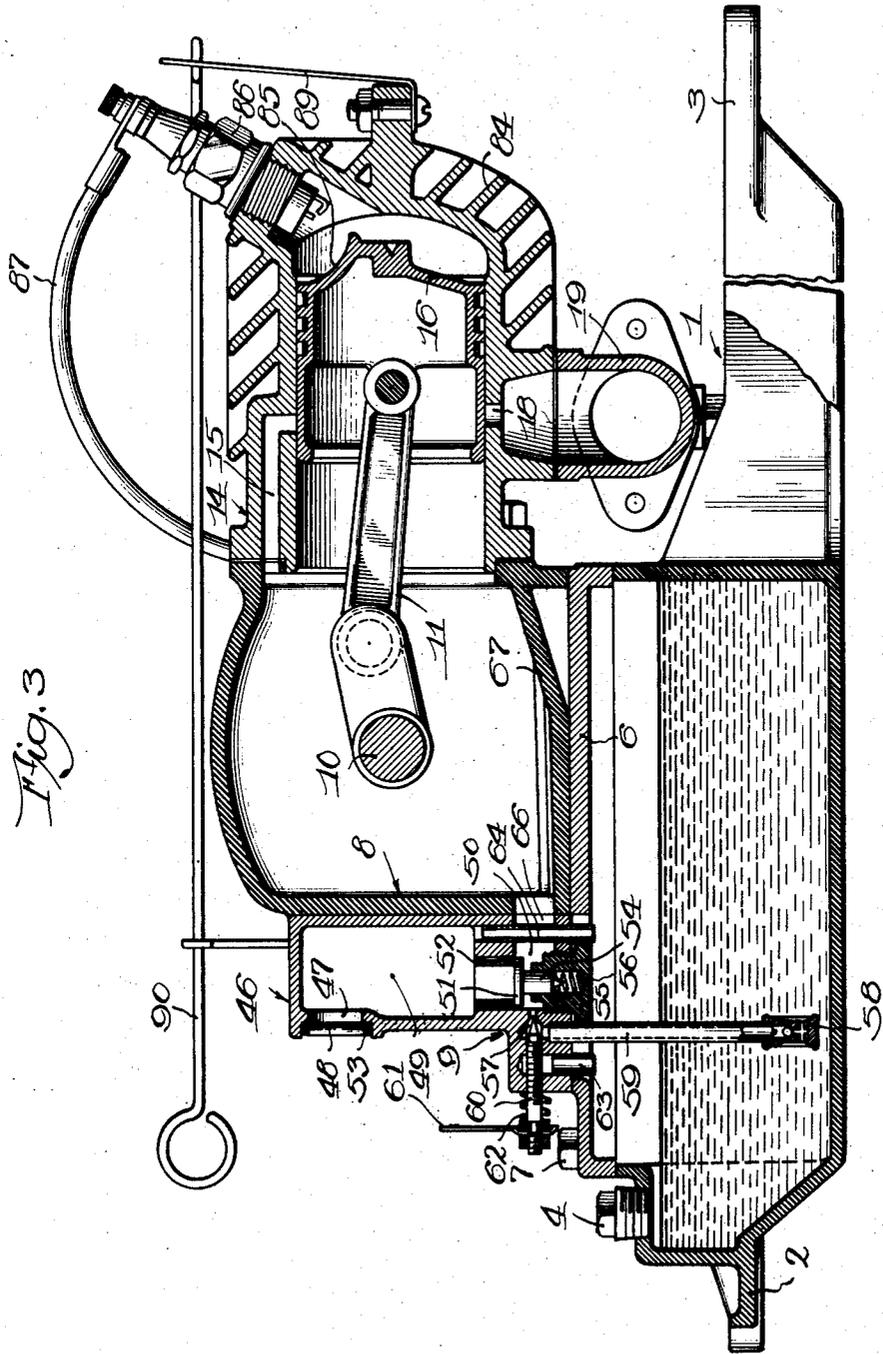


Fig. 3

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# UNITED STATES PATENT OFFICE

2,016,337

## COMBUSTION ENGINE

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Original application September 27, 1929, Serial No. 395,518, now Patent No. 1,973,218, September 11, 1934. Divided and this application July 6, 1931, Serial No. 548,813

10 Claims. (Cl. 123—73)

The present invention relates to novel improvements in internal combustion engines, and more particularly in the carburetor construction and the means and method of lubricating the engine. The present application is a division of my co-pending application Serial No. 395,518, filed September 27, 1929, issued September 11, 1934, as Patent No. 1,973,218.

Among the objects of the invention is to provide a carburetor construction in which the fuel is drawn from the fuel tank into the base or lower portion of the engine and through the lubricant in the crank case. This fuel is drawn into the carburetor by the same suction which draws in the air for forming the combustible mixture. By reason of this construction and arrangement, flooding of the crank case is prevented.

A further object is the provision of a construction whereby the amount or supply of air which is sucked into the carburetor is constant, while the amount of fuel may be adjusted for obtaining the proper and most efficient mixture for carburetion and smooth running of the engine.

Another object of the invention is the provision of a carburetor divided into a suction or air compartment located in the upper portion, and a mixing compartment located in the lower portion thereof. An air valve is located intermediate these two compartments. By reason of the location of the suction compartment above the air valve, any fuel escaping through the air valve is trapped therein and is sucked back into the engine during the suction stroke or period.

A further object is the provision of a novel carburetor construction which eliminates the necessity or use of a deflooder. In prior constructions in which a deflooder was employed, the fuel in the fuel tank would become contaminated by the black heavy mixture of lubricant and fuel from the base of the crank case, and by water which accumulates from humid air. By reason of such elimination, there is nothing to contaminate or dilute the fuel in the fuel tank.

Another object of the invention is the provision of a carburetor construction having a novel air filter or strainer removably positioned in a wall of the carburetor housing so that the same may be easily and readily dismantled and cleaned or renewed.

A still further object is the provision of a carburetor provided with novel valve constructions for regulating the flow and amount of fuel

taken from the tank during the suction stroke of the engine.

Another object of the invention is the means and method of lubricating all working and wearing parts of the engine. The method comprehends the addition or admixture of lubricant with the fuel, and delivering this lubricant to the various working parts of the engine. The invention further comprehends the method of delivering the lubricant and fuel, or an admixture thereof, to the crank case of the engine. This method contemplates delivering the lubricant and fuel from the fuel supply tank to the carburetor during the suction stroke, there mixing the requisite amount of fuel and air for forming the combustible mixture, vaporizing the fuel, and depositing the lubricant and its spray on all working parts of the engine, including the bearings, starter, magneto fly wheel, cylinder, piston, etc. This lubricant is deposited either by direct contact with these parts, or by reason of the suction and compression forces existing in the crank case. In order to provide for better access and circulation of the lubricant throughout the various parts, and maintaining the same therein, ribs, deflectors, oil holes and grooves are provided. Additional means or by-passes are provided for leading away the excess lubricant, and returning the same to the crank case and fuel supply tank.

Still another object of the invention is to provide a novel construction of crank shaft, bearings and mounting therefor, and the means and method of lubricating the same. Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly, operation, adjustment and repair; and such further objects, advantages, and capabilities as will later more fully appear and are inherently possessed thereby.

Although the carburetor and lubricating construction is disclosed and described as primarily adapted for two-cycle engines, it is to be understood that the invention is not limited thereto, and comprehends other details, constructions, and arrangements.

The invention further resides in the combination, construction, and arrangements of parts illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other features and constructions, without departing from the spirit of the invention.

In the drawings:

Fig. 1 is a view in side elevation of the internal combustion engine.

Fig. 2 is a transverse vertical cross sectional view taken in a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is a view in vertical cross section taken in a plane represented by the line 3—3 of Fig. 2.

Referring more particularly to the disclosure in the drawings, the engine construction is shown as provided with a base or casting forming a fuel supply tank 1, and provided with frame extensions 2 and 3 for mounting the same upon operating mechanism to be driven thereby. The fuel tank 1 is provided with an opening adapted to be closed by a threaded plug 4.

As clearly disclosed in Figs. 1 and 3, this plug is provided adjacent the upper surface of the fuel supply tank to permit filling of the tank, and at the same time the position of the plug is such that the tank cannot be filled beyond the stage of overflowing. A drain cock 5 is provided in the base of the fuel supply tank for draining the same. The removable cover plate 6 is adapted to close the upper end or top surface of the supply tank and is attached thereto by means of bolts or the like 7. This top plate 6 is adapted to receive a crank case 8 and is provided with an opening for the reception of a carburetor 9 and the fittings thereof.

The crank case 8 provides a housing for the crank shaft 10 and its connecting rod 11 and furnishes a direct support or bearing 12 for one end of the crank shaft, and provides connections for a main double bearing 13, cylinder 14, and carburetor 9. One end of the cylinder 14 is in complete communication with the crank case, and the other end of the cylinder receives its communication with the crank case by means of an intake port 15, whenever the piston 16 is retracted sufficiently to unseat the port 15, which is for an instant during each revolution of the fly wheel 17. An exhaust port 18 is provided in the lower part of the cylinder and communicates with an exhaust 19 for disposing and carrying away the burnt exhaust gases.

In order to conveniently and efficiently start and accelerate the engine, the structure is provided with a foot starter 20 acting directly on the crank shaft 10 for turning the same. Said foot starter is pivoted at 21 and at its inner end is provided with a gear segment adapted to mesh with a pinion gear 22 mounted upon a cam pinion 23 loosely mounted on the crank shaft 10. Mounted adjacent the cam pinion 22 is a cup shaped ratchet wheel 24 provided with relatively deep pockets 25 for the reception of balls 26. The cam surface 27 of the pinion 23 is also provided with pockets 28, and this cam portion and pockets project within the cup of the ratchet 24. Both the pockets 25 in the ratchet wheel 24 and the pockets 28 in the gear 23 are shaped wedgewise and will interlock with the balls that fall between them, thus transmitting power from the cam pinion 23 to the ratchet wheel 24 in the direction required for starting of the engine, this ratchet wheel being mounted upon the crank shaft. While the engine is running, the balls 26 are kept within the pocket 25 by reason of the centrifugal force of the rotating shaft. If the cam pinion 23 is rotated in the opposite direction as when endeavoring to start the engine, the balls will be shifted from their interlocking position into the relatively deep cavities or pockets 25 so that the two coupling members remain free from engagement. Thus the two coupling members remain free not only during the time the engine is run-

ning, but also during such periods in the starting when the member 20 is being elevated. This construction is more clearly set forth in the co-pending application Serial No. 395,518.

The crank shaft 10 is of the central type, the side to which the foot starter is mounted, is somewhat shorter in length than the opposite side. Or, this opposite or longer side, this crank shaft transmits a working torque load of the engine and carries a fly wheel magneto 29 and a drive pulley 30 mounted upon a coupling disc 34 which in turn is mounted on a cup-shaped housing 35 of the fly wheel. This coupling disc is connected to the end of the crank shaft 10 by being forced over the tapered portion 36 of the shaft and held in place by a nut 37. A key 38 holds the disc or torque plate 34 in proper angular relation with the crank shaft for the purpose of timing the magneto. Bolts 39 retain the disk or torque plate 34 upon the cup-shaped housing 35 of the fly wheel.

The crank shaft is mounted within three separate bearings, one of which numbered 40 is on the short side of the crank shaft and the other two numbered 41 and 42 are on the long side of the crank shaft. The bearings adjacent the crank 43 take the main shaft load delivered to the crank shaft through connecting or piston rod 11. The outer bearing 42 carries principally the load exerted by the pull of the belt or the pulley, and by the energy of the fly wheel. In order to provide smooth running of the engine, the crank shaft is balanced by means of a lug or lugs 44 on the ratchet wheel 24, and by a lug or lugs 45 on the coupling disk 34, these lugs acting as counterweights and are so positioned as to be in proper relation with the bend of the crank shaft.

The carburetor 9 comprises a housing 46 provided with an upper air intake 47 having a filter screen 48 therein. The carburetor proper is divided into two compartments, an upper compartment or air chamber 49 and a lower compartment or mixing chamber 50. The air entering the air chamber through the filter 48 is admitted into the mixing chamber 50 through a check valve 51 seating against an interchangeable bushing 52. This bushing as well as the filter screen or gauze 48 is made readily removable and interchangeable, the member 48 being held in position by a retaining ring 53. The check valve 51 is provided with a reduced portion 54 seating within a threaded nut or cap 55, the latter being provided with a spring 56 for normally seating the valve 51 against the bushing.

The check valve 51 is adapted to be opened and closed by the suction and compression created by the piston 16 through the communicating crank case 8. The inrushing air through this valve during the suction period is met by a spray of fuel sucked into the mixing chamber at the same time through an adjustable jet 57. The fuel passing through this jet is drawn from the fuel tank below through a strainer and check valve 58, through the feed tube 59 and thence through the jet 57, and this flow is by the same suction of the engine as that which draws the air through the valve 51 into the mixing chamber. The purpose of the check valve 58 is to hold the fuel at a constant level since the column of fuel in the feed tubing is subjected to alternating reciprocating suction and compression. The amount of fuel allowed to enter the engine is regulated by a needle valve 60 adapted to be adjusted by means of a handle 61. In order to prevent the needle valve from slipping or changing its position due

to the vibration of the engine or other causes, the same is provided with a spring 62 seated between the carburetor housing and the handle 61.

5 The novel construction of carburetor does not depend upon any prevaporized fuel being formed ahead of the intake valve. It further eliminates the use of any injector. Since the alternate suction and compression of the engine causes the check valve 58 to be opened and closed, there is 10 little possibility of this valve sticking. As the fuel in the tubing 59 and likewise in the jet 57 is subjected to periodic momentary compression, it frequently happens that some of the fuel is 15 forced by the threads of the needle valve 60 by this pressure. In order to return this fuel to the fuel tank, a tube 63 is provided whereby this fuel may drain back into the fuel supply tank. A second tube 64 provides a vent for the fuel tank. 20 This tube leads into the air chamber 49 of the carburetor, and any escaping vapor from the supply of fuel is thus caught by the carburetor and sucked into the engine.

In order to properly position the carburetor on the engine, the same is provided with flanges 65 25 at its base, and is also provided with laterally extending flanges adapted to seat the same on the side and base of the engine, these flanges forming a cover over the assembly wall or top of the crank case and the fuel tank. 30

By the present arrangement, the mixing chamber is situated under the air valve in such manner that the bottom of the chamber is slightly below the bottom of the crank case, and communicates therewith by means of a port or passage 66, which also is slightly below the bottom 35 of the crank case so that the inrushing air will charge on the settling fuel in the crank case and revaporize it for useful work in the engine. 40 Also to permit drainage of the settling fuel in the path of the inrushing air through the port 66, the base 67 of the crank case is tapered or slants toward the port 66.

By reason of this construction, the danger of flooding the engine is eliminated. For this reason, the present engine is not provided with any deflooder at the base of the crank case, and thus there is no means to clog and flood the engine, as 45 has been the case where deflooders have been provided. 50

Furthermore, the present construction does away with any contamination of the fuel. There is no possibility of the humid air securing access to the fuel tank to cause accumulation of water 55 in the gasoline. With the present construction of carburetor and its arrangement, the fuel in the tank is not effected. There is but one adjustment from the carburetor, the air remaining constant while the amount of fuel may be adjusted to obtain a proper mixture. This adjustment is accomplished by means of the arm or handle 61 operating on the needle valve 60. 60 When this handle is moved in a clockwise direction, the needle valve is closed, while when the same is moved in a counter-clockwise direction, the needle valve is opened to provide an inlet of desired size. 65

The lubrication of the engine, and all working parts thereof, is accomplished by mixing the lubricating fluid or oil with the fuel in the fuel tank, this lubricant being carried through the carburetor into the engine with the fuel, and there deposited on all wearing surfaces of the engine. Normally this lubricant is in the form 70 of vapor when it passes into the crank case and

parts of the engine. The reciprocating suction and compression action of the engine draws the lubricant from the crank case and forces the same through all the bearings, wrist pins, cylinders, and all working parts of the engine. To 5 facilitate better circulation of the lubricant in the bearings and working surfaces, the crank case 8 is provided with deflecting ribs 68 and 69 radially disposed, the same deflecting the lubricant in sufficient quantities into the oil holes 70 10 and 71, respectively, leading to the bearings 40 and 41. The annular space 72 between the bearings 41 and 42 is provided with a drain return port 73 to prevent excessive lubricant entering the bearing or bushing 42 and leaking out through 15 the end of it into the oil ring 74 provided with a drain port 75 leading to an outlet 76. The lubricant escaping through the oil catch ring 74 may be returned through a port 77 to the supply tank, or may be dispensed with in any other 20 manner. The bearings 40 and 42 are each provided with a loop oil groove 78 and 79 respectively, which aids in the distribution of the lubricant through the bearing and the return of the same to the crank case. Adjacent the loop oil 25 groove 78, the bearing 40 is provided with an oil ring or groove 80 where excess lubricant gathers and is led off through tubing 1 to the fuel tank or otherwise dispensed with.

In order to avoid the forcing of any of the lubricant through the bearings 40 and therebeyond, by the compression force in the crank case, the bearing 43 is provided with a felt washer 81 30 placed in an interlocking groove between the end of the bearing and the ratchet wheel 24. 35

The bearing 42 is provided with a lubricant deflecting device whereby the escaping lubricant from the end of the bearing is led through a space between the main bearing member 13 and a sleeve 82, this sleeve being pressed into the hub flange 40 of the magneto flywheel 29, and revolving therewith.

The magneto fly wheel 29 is provided with blades or vanes 83 to cool the engine, these blades or vanes blowing air against the cylinder walls. In 45 order to proper dissipate the heat, the cylinder 14 is provided with heat radiating ribs 84.

The engine disclosed being of the two cycle construction, the intake and outlet ports are opened by the sliding piston 16 at the end of 50 each rearward stroke thereof, the exhaust port being opened a trifle earlier than the intake port. This prior opening of the exhaust port causes the burnt gases to escape from the cylinder and permits a new charge of fuel mixture 55 to enter the cylinder. The piston in its rearward stroke will compress the fuel mixture in the crank case sufficiently to cause the vaporized fuel to rush through the intake port into the explosion chamber. In order to prevent this fresh charge 60 from blowing out of the cylinder through the almost simultaneously opened exhaust port located on the opposite side of the intake port, a deflector 85 is provided on the piston directly in front of or adjacent the intake port. By mean 65 of this construction the charge is deflected, and before it has time to again rush toward the exhaust port, both the exhaust port and the intake port are closed and the new charge is compressed, ready to be ignited at the end of the compression 70 stroke.

The spark plug 86 is connected by high tension cable 87 to the high tension coil 88 in the magneto fly wheel. The construction and operation of the magneto is clearly set forth in my co-75

pending application Serial No. 395,518 of which the present case is a division.

The speed of rotation of the engine is governed by the frequency of the spark which in turn is governed by the governor in the fly wheel magneto. The engine may be stopped either by shutting off the supply of fuel passing to the carburetor, or by pulling the switch 88 by means of the handle 90 against the spark plug so as to ground the charge.

From the above description and the disclosure in the drawings, it will be readily seen that I have provided a novel construction of carburetor and means and method of lubricating an internal combustion engine. Although the disclosure is that of a two cycle engine, it is to be understood that the construction is suitably adapted for use in other types of engines and constructions.

Having thus disclosed the invention, I claim:

1. A carburetor for an internal combustion engine, comprising a housing adapted to be mounted on the fuel supply tank, said housing being provided with an air chamber in its upper portion and a mixing chamber in its lower portion, a fuel inlet to said carburetor and provided with a check valve, and a valve located in the base of said air chamber for admitting air direct to said mixing chamber, said check and air valve being automatically actuated by the suction and compression forces in the engine.

2. A carburetor for an internal combustion engine, comprising a housing adapted to be mounted on the fuel supply tank, said housing being provided with an air chamber in its upper portion and a mixing chamber in its lower portion, a valve connecting said chambers, and a vent leading from said fuel tank to said air chamber whereby any fuel escaping through the valve and vapor escaping from the tank is caught by the carburetor and sucked into the engine.

3. A carburetor for an internal combustion engine, provided with an air chamber and a mixing chamber, an inlet to said air chamber, a valve intermediate said air and mixing chambers, a fuel supply tank, an inlet from said supply tank to said mixing chamber, a valve in said inlet, said air and fuel valves being automatically actuated by the suction and compression forces in the engine, and manually operated means for regulating the quantity of fuel delivered to said mixing chamber.

4. A carburetor for an internal combustion engine, comprising an air chamber in the upper portion and a mixing chamber in the lower portion of the carburetor, a valve intermediate said chambers, the base of said carburetor being substantially flush with the base of the engine whereby the inrushing air passing through said valve charges upon the settling fuel in the engine and re-vaporizes the same for useful work.

5. A carburetor for an internal combustion engine provided with an air chamber and a mixing chamber communicating with an opening in the base of the engine, a valve connecting said chambers, the base of said carburetor and the base of the engine adjacent the opening being at sub-

stantially the same level whereby the inrushing air through the valve charges upon any fuel collecting in the engine and revaporizes this fuel for useful work.

6. In an internal combustion engine provided with a fuel tank in its base, a carburetor therefor comprising a housing positioned on said fuel tank, said carburetor being provided with an air chamber and a mixing chamber, a fuel opening leading into said mixing chamber, a needle valve in said opening, means operable from the exterior of said carburetor for adjusting said needle valve, a tubing leading from said fuel tank to said opening, a check valve in said tubing, and a check valve intermediate said chambers for admitting air to said mixing chamber, said fuel and air being simultaneously sucked into the mixing chamber by the suction of the engine.

7. In an internal combustion engine provided with a fuel tank in its base, a carburetor therefor comprising a housing positioned on said fuel tank, said carburetor being provided with an air chamber and a mixing chamber, a fuel opening leading into said mixing chamber, a needle valve in said opening, a tubing leading from said fuel tank to said opening, a ball check valve in said tubing, and a check valve intermediate said chambers for admitting air to said mixing chamber, said check valves being automatically opened and closed by the suction and compression created by said engine.

8. In an internal combustion engine provided with a fuel tank in its base, a carburetor therefor comprising a housing positioned on said fuel tank, said carburetor being provided with an air chamber and a mixing chamber, and a vent leading from said fuel tank to said air chamber for trapping escaping vapor from the fuel supply and leading said vapor into the carburetor mixing chamber with the incoming air.

9. A carburetor for an internal combustion engine comprising a housing adapted to be attached to the engine casting and positioned above a fuel reservoir, said housing being divided into an air chamber and a mixing chamber, a fuel inlet in the base of said housing, a valve for adjusting the amount of fuel delivered to said carburetor and a check valve leading from said air chamber for admitting air to said mixing chamber, said valves being automatically opened and closed by the suction and compression created by said engine.

10. A carburetor for an internal combustion engine comprising a housing provided with an air chamber in its upper portion and a mixing chamber in its lower portion, a filter screen adjacent the top of said housing for admitting air into said air chamber, a check valve leading from said air chamber to said mixing chamber, and automatically opened and closed by the suction and compression created by said engine, a fuel inlet in the base of said housing and adjacent said mixing chamber, and an adjustable valve in said inlet for regulating the amount of fuel entering said mixing chamber.

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