May 3, 1960 R. E. PERLEWITZ 2,935,057

PRESSURIZED PROPORTIONAL MIXING DEVICE

Filed June 4, 1958 2 Sheets-Sheet 1

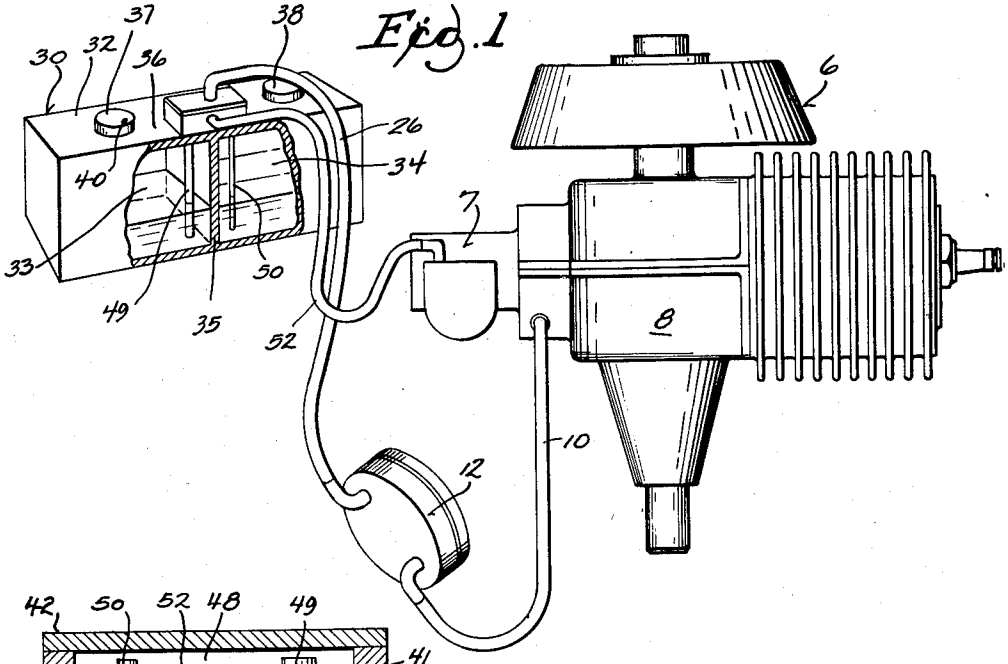



Fig. 1

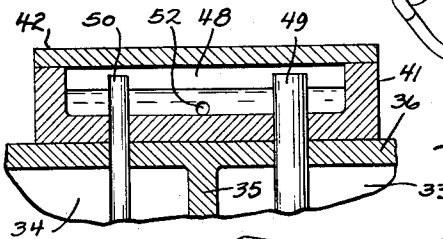



Fig. 4

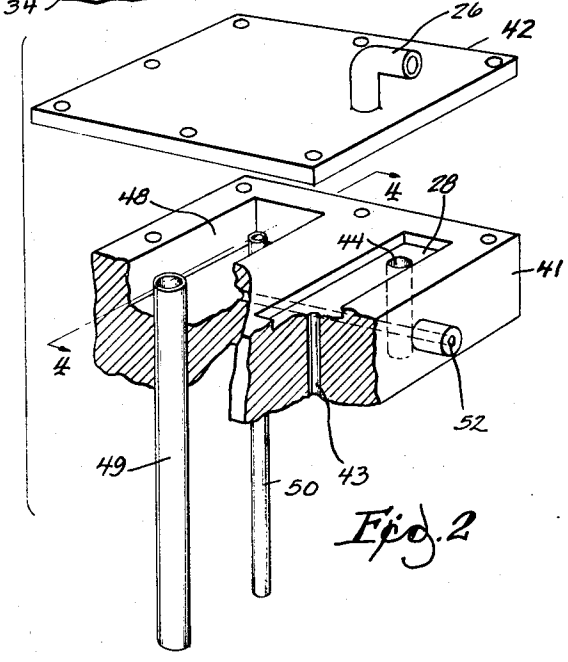



Fig. 2

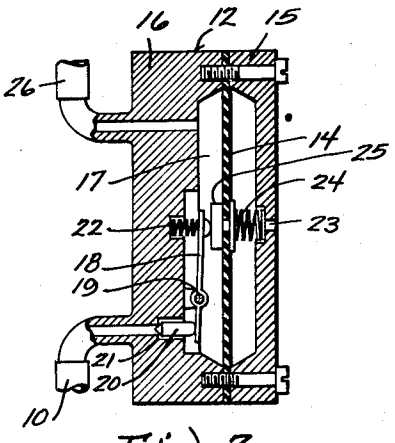



Fig. 3

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May 3, 1960 R. E. PERLEWITZ 2,935,057

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Filed June 4, 1958 2 Sheets-Sheet 2

Fig. 5

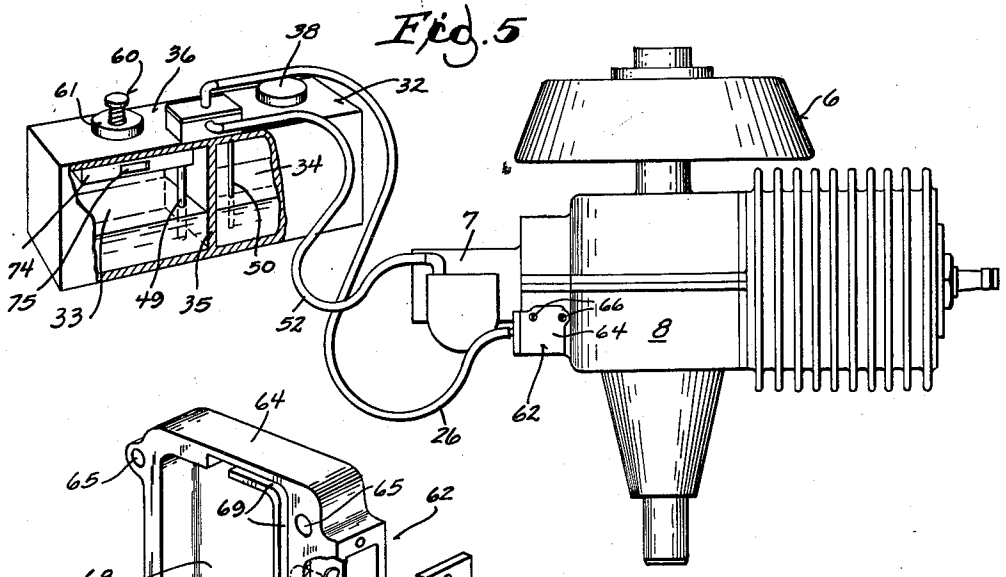



Fig. 6

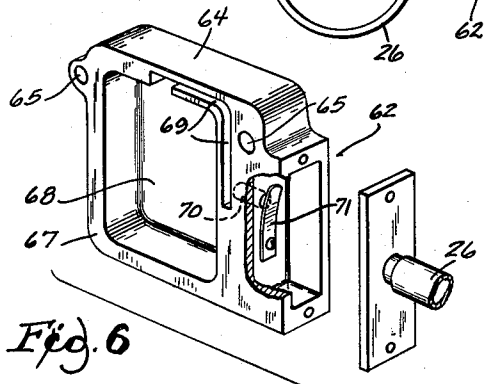
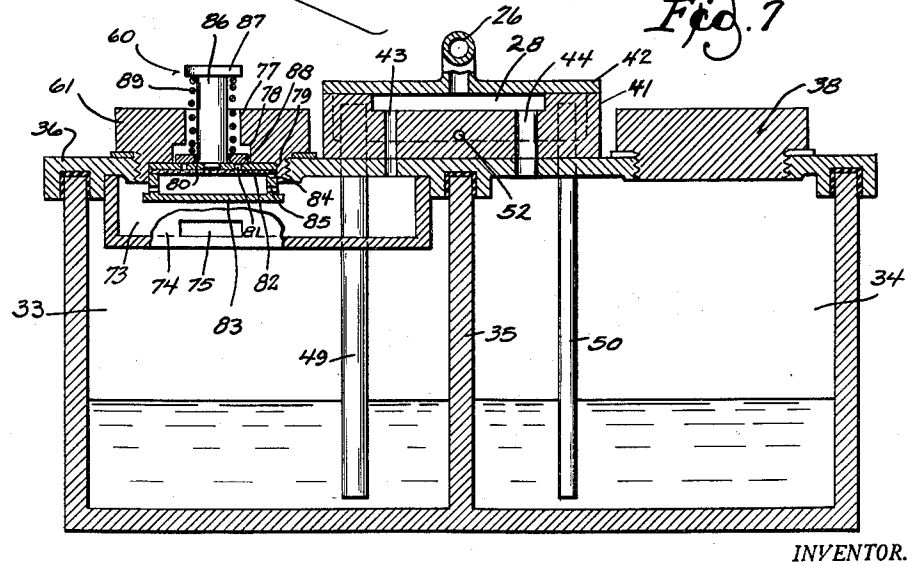



Fig. 7




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# PRESSURIZED PROPORTIONAL MIXING DEVICE

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12 Claims. (Cl. 123—73)

This invention relates generally to devices for mixing fuel and lubricant, such as gasoline and oil, in predetermined proportions and then supplying the mixture to an internal combustion engine. More particularly, the invention relates to such a device which uses crankcase pressure of the engine to feed the fuel and lubricant.

It is generally an object of the present invention to provide an improved pressurized proportional mixing device of the above type. More specifically, the invention contemplates an automatic mixing device of this character in which the sizes of the conduits for the fluids to be mixed are in a ratio determined by the ratio of the fluids desired in the mixture. Furthermore, the invention provides a device of the above type which has means for preventing excessive pressure from flooding the carburetor, this excessive pressure being the result of exhaust port plugging or throttle position.

Another more specific object of the present invention is to provide a pressurized proportional mixing device of the above type which provides a faster build-up of pressure in the oil supply chamber than in the gasoline supply chamber, when the engine is first started. This arrangement insures that lubrication is immediately supplied upon starting the engine.

Still another and important object of the present invention is to provide a pressurized proportional fuel and lubricant mixing device for an internal combustion engine in which the pumping of either the fuel or lubricant will cease if the supply of the other is exhausted. As a result, the engine will stop and cannot be run tight and thereby damaged.

Another object of the invention is to provide a pressurized proportional fuel and lubricant mixing device for an internal combustion engine which insures uniformity of the mixture and which requires less oil than conventional systems. By requiring less oil for complete lubrication, there is less tendency of the engine to smoke, less spark plug fouling and the parts of the engine remain cleaner.

A further object of this invention is to provide an improved combination relief valve and fill cap assembly for a pressurized liquid storage tank.

The mixing device provided by this invention permits the fuel and lubricant supply to be located below the level of the carburetor which results in a system that is flexible as to installation.

These and other object and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings, in which;

Figure 1 is a perspective view of a two-stroke internal combustion engine utilizing the present invention;

Figure 2 is an exploded fragmentary view of the pressure inlet chamber and the mixing device shown in Figure 1 but on an enlarged scale, some of the parts being in section or broken away for clarity;

Figure 3 is a sectional view of the pressure regulator shown in Figure 1 but on an enlarged scale, certain parts



being in section, broken away or removed for clarity in the drawings;

Figure 4 is a vertical sectional view through the mixing chamber and taken generally on line 4—4 of Figure 2, but on an enlarged scale;

Figure 5 is a view similar to Figure 1 but showing a modified form of the invention;

Figure 6 is an enlarged and exploded, perspective schematic view of the check valve assembly shown in Figure 5; and

Figure 7 is a vertical sectional view of the supply and mixing device as shown in Figure 5, but on an enlarged scale.

Referring in greater detail to Figures 1 to 4 of the drawings, a two-stroke cycle internal combustion engine **6** has been shown more or less schematically and includes a carburetor **7** through which a mixture of fuel and lubricant, such as gasoline and oil, respectively, is passed into the combustion chamber thereof in the well-known manner. The engine also includes a crankcase **8** which is pressurized during operation by reciprocation of the pistons (not shown) as is conventional practice.

A pressure conduit **10** extends from the crankcase chamber and into a pressure regulator **12**. The pressure regulator has a flexible diaphragm **14** held between complementary housings **15** and **16** and defining a chamber **17** with the latter. An arm **18** is pivotally mounted on pin **19** within the housing **16** and carries a valve stem **20** which is urged to its closed position against valve seat **21** by the action of spring **22**. The other side of the diaphragm is open to the atmosphere via port **23** and a spring **24** acts on the diaphragm to urge the block **25** associated therewith against the arm **18** and the influence of spring **22**.

Conduit **26** places regulator chamber **17** in communication with the pressure intake passage **28** of the pressurized mixing device **30**.

The mixing device **30** is shown for illustration purposes as being a container **32** which is separated from the engine **6**. However, the device **30** may be connected directly to the engine and made an integral part thereof.

The container **32** is divided into two pressurizable compartments or chambers **33**, **34** by the dividing wall **35**, for storing a supply of fuel and lubricant, respectively. The container has a cover **36** which in turn has removable caps **37**, **38** for filling the chambers **33**, **34**, respectively, with a fuel such as gasoline and a lubricant such as oil. A vent **40** is provided in the fuel cap **37** for purposes that will later appear.

The cover **36** includes an enlarged portion **41** which may be considered as an integral part thereof and this portion in turn has a removable top **42**.

Pressure from the engine crankcase is introduced from passage **28** into the fuel chamber **33** via the pressure port **43**. Pressure is introduced into the lubricant chamber **34** from passage **28** through the port **44**. The diameter of the port **43** is considerably less than that of port **44**. By restricting the fuel pressure port more than the lubricant pressure port, pressure is built up faster in the lubricant supply chamber **34** than in the fuel supply chamber, when the engine is first started. This arrangement insures that fuel does not enter the engine before the lubricant and causing the engine to run without lubrication when starting.

The sizes of ports **43** and **44** may vary depending for one thing, on the viscosity of the lubricant. Practice has indicated good results with a fuel pressure port about 2½ times smaller than the lubricant port, when using an oil lubricant of SAE #30 viscosity, for example, an orifice of about ⅛ inch diameter for the lubricant tank pressure line and about 3/64 inch diameter for the fuel tank pressure line.

A mixing chamber 48 is placed in communication with the fuel chamber 33 by means of tube 49, and with the lubricant chamber 34 by means of the smaller tube 50. These tubes extend downwardly into their respective chambers and terminate adjacent the bottom thereof. As shown best in Figure 4, the upper ends of tubes 49 and 50 extend upwardly to a point adjacent the top of chamber 48 and above the level of the mixture therein. By having these tubes extend into the air pocket above the level of the mixture, one fluid is prevented from entering the supply chamber for the other fluid. Furthermore, if the supply of one fluid is exhausted before the other, pumping of the remaining fluid will cease, as will appear later.

The ratio of the cross sectional areas of tubes 49 and 50 is determined by the ratio of fuel and lubricant desired thereby providing proper fuel-lubricant ratio at all times regardless of the rate of mixture feed to the engine. For example, with the device as shown, for a fuel to lubricant ratio of 16 to 1, a tube cross-sectional area ratio of 83 to 1 has been found satisfactory.

Pressure in chambers 33 and 34 forces fuel and lubricant up their respective tubes 49 and 50 and into the mixing chamber where they are thoroughly mixed and discharged via conduit 52 to the carburetor 7.

Conduit 52 preferably has a small internal diameter than either of the tubes 49 and 50. As a result, if dirt should enter the supply chambers, it would be more likely to plug this mixture supply line 52, rather than either of the fuel or lubricant tubes 49 and 50. Therefore, the engine would stop rather than having continued pumping of only one fluid or the other.

The pressure regulator 12 serves to hold the pressure in the chambers 33 and 34 substantially constant and prevents excessive pressure from flooding the carburetor. This excessive pressure may be caused, for example, by the throttle setting of the engine or exhaust port plugging.

The vent hole 40 is provided in the gasoline cap in order to prevent oil from collecting in the pressure line 26 and thereby causing pressure variations. Stated otherwise, the vent 40 results in continuous flow through the pressure line 26 into the gasoline chamber and keeps the pressure line 26 free of liquid. It also results in slightly less pressure in the gasoline chamber than in the oil chamber, which has the effect of offsetting the difference in density between the oil and gasoline.

The modification of the invention as shown in Figures 5 to 7 functions in a manner similar to the Figure 1 device but provides different pressure control means. In this modification, the pressure regulator 12 as shown in Figure 1 has been eliminated and a relief valve device 60 (Figure 7) provided in the gas cap 61. In addition, a check valve assembly 62 has been mounted on the crankcase and pressure is furnished therethrough to the conduit 26 which communicates with the mixing chamber as mentioned.

Elements which are similar or common to both the Figure 1 and Figure 5 devices have similar reference numerals.

Referring in greater detail to Figures 5 and 6, the check valve assembly 62 comprises a cast body 64 having apertures 65 which receive cap bolts 66 that are threaded into the engine and hold the mounting face 67 of the assembly in sealing engagement with the engine. The chamber 68 of the assembly communicates with the engine crankcase and crankcase pressure is introduced through the L-shaped passageway 69 into bore 70. A check valve 71 is provided in the body and across the bore 70 and is shown for illustrative purposes as being of the reed valve type. Conduit 26 is in communication with the valve which acts as a one-way check for the crankcase pressure. The particular L-shaped passageway and bore as shown minimizes the amount of oil and gasoline passing out of the crankcase with the air.

Pressure from the crankcase is conducted via conduit 26 to the pressure inlet chamber 28 (Figure 2) which conducts it to the oil and gas tanks, respectively, through tubes 44 and 43, previously described.



As shown in Figure 7, an auxiliary gas chamber 73 is provided above the main gas chamber 33 and is defined by the baffle-like housing 74 secured to the cover 36. The housing has a port 75 connecting chambers 73 and 33 and pressure enters via tube 43 into chamber 73, through port 75, into chamber 33 and thereby forces fuel out the tube 49, previously described, and into the mixing chamber 48.

The housing 74 and the separate chamber 73, into which the pressure is introduced before entering the main gas chamber 33, prevents fuel from blowing out the relief valve assembly 60 in the gas cap 61.

Crankcase pressure forces lubricant from chamber 34 into the mixing chamber 48 in the same manner as in the device of Figure 1.

The construction of the relief valve assembly 60 is such as to prevent fuel from escaping therethrough and thereby creating a fire hazard and the outside of the gas cap remains dry. This valve functions to relieve pressure over a predetermined amount from the gas chamber and also from the oil chamber 34 which is in communication with the gas chamber via the pressure inlet chamber 28.

Furthermore, this valve performs the function of the vent 40 in the Figure 1 device, namely, preventing oil from collecting in the pressure line 26. This is accomplished by the fact that the relief valve 60 is set to open at a pressure less than that of the crankcase. As a result, a continuous flow of air through pressure line 26 keeps the latter free of liquid.

A gas cap 61 is threadably engaged in the cover 36 and contains a bore 77 and counterbores 78 and 79. A disc 80 is located in bore 79 and has a series of apertures 81 extending therethrough. A piece of filtering material 82, such as chamois, is located on the underside of the disc 80, and the disc and filter are held captive in the bore 79 by the cup-like member 83 having an axial flange 84 press-fitted into the bore 79. A series of apertures 85 extend through flange 84 and it will be noted that apertures 81 and 84 are positioned at right angles to one another.

A stem 86 is secured at its lower end in the disc 80 and extends upwardly through the bores 77 and 78, and terminates in an enlarged cap 87. A disc 88 is loosely mounted around the stem and is resiliently urged against the disc 80 to seal the apertures 81. The means for yieldingly holding the disc 88 in sealing position takes the form of a spring 89 which bears against the disc and the stem cap 87.

The chamois located between the angularly disposed apertures 81 and 84 prevents the fuel from escaping through the relief valve and have proven to be particularly effective in keeping the escaping air dry and free of fuel vapor.

With the present invention, fuel and liquid are automatically mixed in predetermined proportions. When the engine is started, the immediate flow of lubricant into the combustion chamber of the engine is assured because of the more rapid build-up of pressure in the lubricant chamber than in the fuel chamber.

In addition, and importantly, if the engine runs out of fuel, the engine will stop pumping lubricant because of the pressure being balanced in the mixing chamber and the lubricant chamber. If the engine runs out of lubricant, it will also stop pumping fuel because of the equalized pressures in the mixing chamber and the fuel chamber. Under these circumstances also the engine will stop and it cannot be run tight from the lack of lubricant.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers adapted to be pressurized by pressure from said crankcase, a mixing chamber, fluid conducting means for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, and conduit means placing said mixing chamber in communication with said carburetor.

2. In combination with a two-stroke internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers adapted to be pressurized by pressure from said crankcase, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, the cross sectional areas of said tubes being of different size and in proportion to the proportion of fuel and lubricant feed desired, and conduit means placing said mixing chamber in communication with said carburetor.

3. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure passageway for each of said chambers and in communication with said crankcase whereby said chambers are adapted to be pressurized by pressure from said crankcase, said pressure passageway for said lubricant chamber being of larger cross section than said fuel chamber passageway whereby pressure build-up is more rapid in said lubricant chamber, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, and conduit means placing said mixing chamber in communication with said carburetor.

4. In combination with a two-stroke internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure passageway for each of said chambers and in communication with said crankcase whereby said chambers are adapted to be pressurized by pressure from said crankcase, said pressure passageway for said lubricant chamber being of larger cross section than said fuel chamber passageway whereby pressure build-up is more rapid in said lubricant chamber, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, the cross sectional areas of said tubes being of different size and in proportion to the proportion of fuel and lubricant feed desired, and conduit means placing said mixing chamber in communication with said carburetor.

5. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure conduit placing said crankcase in communication with said chambers whereby the latter are adapted to be pressurized by pressure from said crankcase, said fuel supply chamber being vented to atmosphere to insure continual pressure discharge through said conduit, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, and conduit means placing said mixing chamber in communication with said carburetor.

6. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure conduit placing said crankcase in communication with said chambers whereby the latter are adapted to be pressurized by pressure from said crankcase, said fuel supply chamber being vented to atmosphere to insure continual pressure discharge through said conduit, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, conduit means placing said mixing chamber in communication with said carburetor, and a pressure regulator in said pressure conduit for maintaining substantially constant pressure in said fuel and lubricant chambers and preventing flooding of said carburetor.

7. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure passageway for said fuel chamber and a smaller pressure passageway for said lubricant chamber, a pressure conduit connecting said passageway to said crankcase whereby pressure in said lubricant chamber builds up faster than in said fuel chamber, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, the cross sectional area of said lubricant chamber tube being less than that of said fuel chamber tube whereby more fuel than lubricant is delivered to said mixing chamber, means placing said mixing chamber in communication with said carburetor, and a pressure regulator in said pressure conduit for minimizing pressure fluctuations in said chambers and thereby preventing flooding of said carburetor.

8. A fuel and lubricant mixing device for an internal combustion engine having a pressurized crankcase, said device comprising, separate fuel and lubricant supply chambers adapted to be pressurized by pressure from said crankcase, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, and conduit means adapted to place said mixing chamber in communication with said engine.

9. A fuel and lubricant mixing device for an internal combustion engine having a pressurized crankcase, said device comprising, separate fuel and lubricant supply chambers adapted to be pressurized by pressure from said crankcase, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, the cross sectional size of said tubes being proportional to one another in proportion to the feed of fuel and lubricant desired, and conduit means adapted to place said mixing chamber in communication with said engine.

10. A fuel and lubricant mixing device for an internal combustion engine having a pressurized crankcase, said device comprising, separate fuel and lubricant supply chambers, a pressure passageway for each of said chambers and adapted to be in communication with said crankcase whereby said chambers are adapted to be pressurized by pressure from said crankcase, said lubricant chamber passageway being of larger capacity than said fuel chamber passageway, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chamber, and conduit means adapted to place said mixing chamber in communication with said engine.

11. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure conduit placing said crankcase in communication

with said chambers whereby the latter are adapted to be pressurized by pressure from said crankcase, said fuel supply chamber having a pressure relief valve for relieving pressure above a predetermined amount from said fuel and lubricant supply chambers, said valve being set to open at a pressure below that in said crankcase to thereby insure continual passage of air from the crankcase to said device, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chambers, and conduit means placing said mixing chamber in communication with said carburetor.

12. In combination with an internal combustion engine having a pressurized crankcase and also having a carburetor through which a fuel and lubricant mixture is passed to said engine, a fuel and lubricant mixing device comprising, separate fuel and lubricant supply chambers, a pressure conduit placing said crankcase in communication with said chambers whereby the latter are adapted to be pressurized by pressure from said crankcase, a one-way check valve in said pressure conduit, said fuel supply chamber having a pressure relief valve for relieving pressure above a predetermined amount from said fuel and lubricant supply chambers, said valve being set to open at a pressure below that in said crankcase to thereby insure continual passage of air from the crankcase to said device, a mixing chamber, a tube for each of said fuel and lubricant chambers for placing them in communication with said mixing chambers, and conduit means placing said mixing chamber in communication with said carburetor.



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