

July 28, 1936.

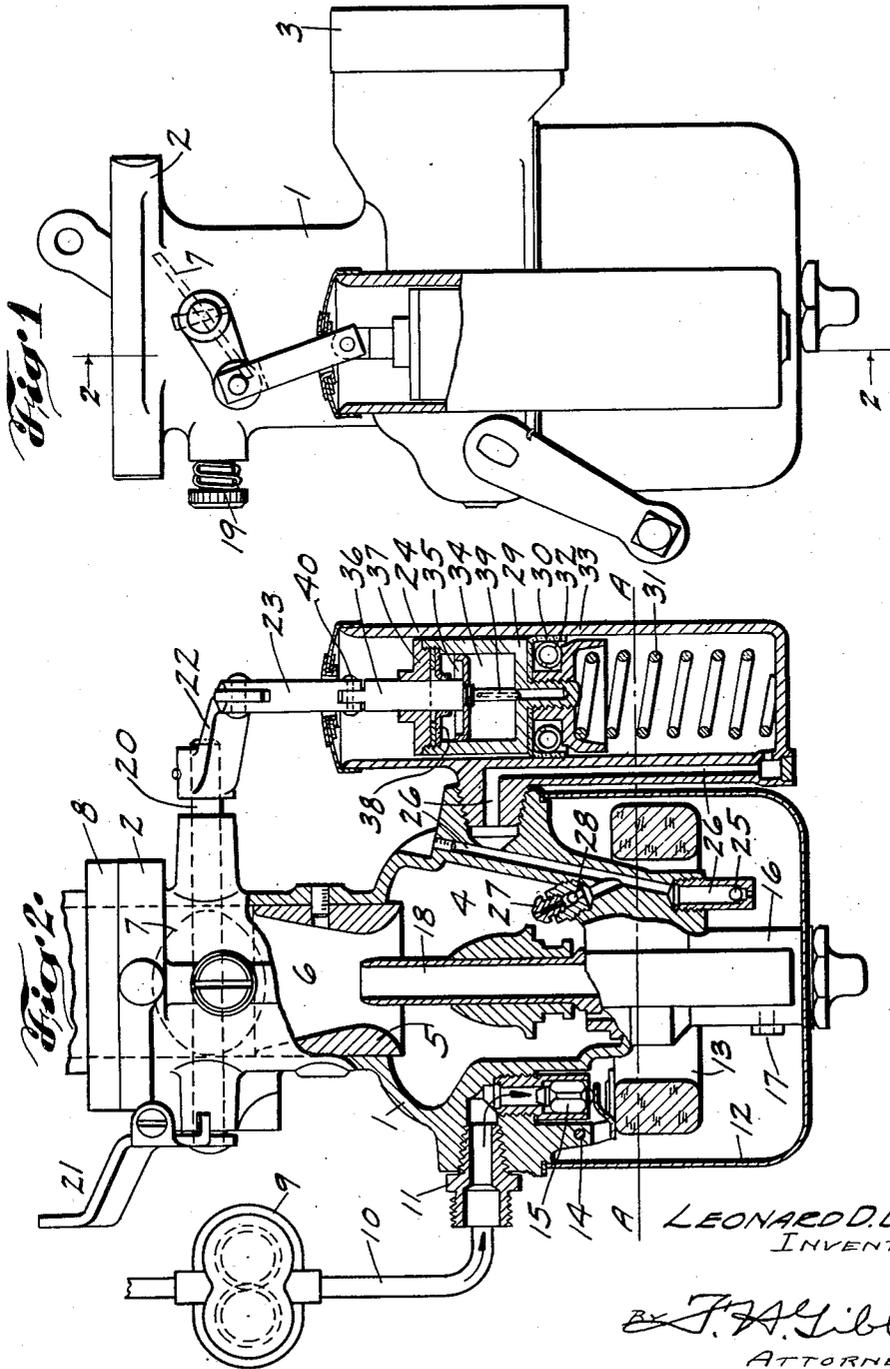
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CARBURETOR

Filed Feb. 20, 1932

2 Sheets-Sheet 1



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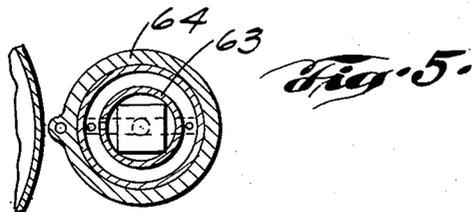
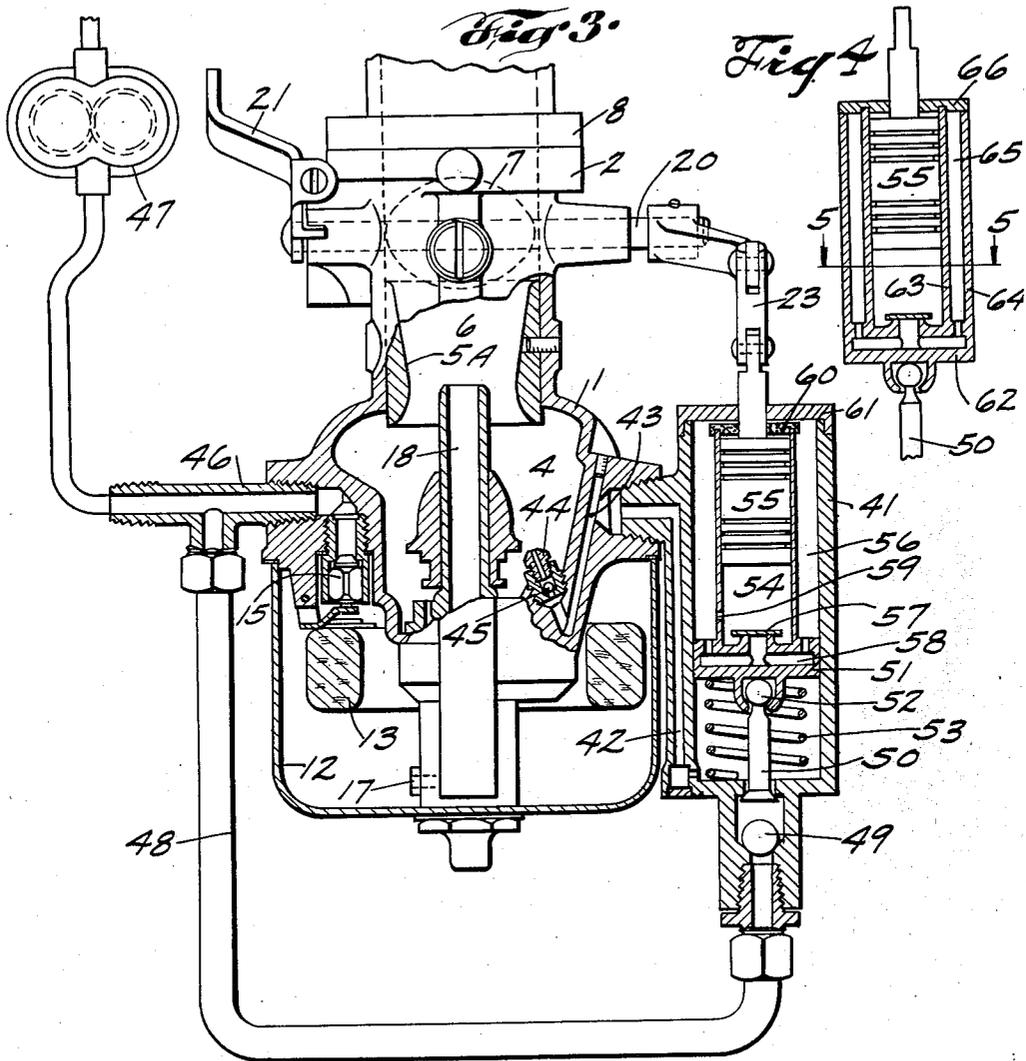
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# UNITED STATES PATENT OFFICE

2,048,727

## CARBURETOR

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Application February 20, 1932, Serial No. 594,337

8 Claims. (Cl. 261—34)

This invention relates to carburetors for internal combustion engines. In carburetors of this type, some difficulties are encountered in producing a mixture of correct proportions for low speed operation and still providing sufficient capacity for extreme high speed operation. The plain tube carburetor is usually provided with one or more venturis or stream lined restrictions in the air passageway for the purpose of increasing the velocity of the air at one point only without unduly increasing the total resistance to the flow of air through the carburetor. The mixing of fuel with the main body of air is usually done at the throat of these venturis or just posterior thereto. In order to produce sufficient velocity in the air stream at the throat of the venturi to draw fuel from the nozzle in sufficient quantities and to vaporize such fuel under low speed conditions, it is desirable to have a comparatively small venturi, so that the velocity of the air stream at its throat will be high. On the other hand, a small venturi presents such a resistance to the flow of air that it will not pass sufficient air to operate the engine at its maximum power and speed. It is accordingly customary to make a sort of compromise between small and large venturi sizes so as to get fairly good low speed efficiency and fairly good high speed operation, but without obtaining ideal conditions at either end.

Another difficulty encountered in carbureting modern internal combustion engines is due to changing temperatures. With the throttle in closed position, the high vacuum existing in the intake manifold lowers the boiling point of the fuel and vaporizes the greater part of it. When the throttle is opened suddenly, the pressure is increased to something approaching normal atmospheric pressure. This increase of pressure raises the boiling point of the gasoline in the manifold and causes some of it to condense and settle on the walls of the manifold, leaving the air with comparatively little fuel in it to be admitted to the engine.

It is accordingly customary to provide an accelerating well or accelerating pump to supply an additional charge of fuel during the opening movement of the throttle so as to "wet the manifold". Naturally, the amount of fuel which condenses in the manifold is dependent to a great extent on the temperature, and it is impossible to work out a quantity for the pump discharge which will be sufficient to wet the manifold when it is cold without having too much for satisfactory operation when the temperature is high.

It is an object of this invention to produce a carburetor in which the size of the venturis may be made large enough to supply maximum quantities of fuel mixture and to provide means for supplying sufficient fuel to the carburetor under low speed conditions.

It is a further object of this invention to provide a carburetor having means for automatically regulating the amount of fuel supply for wetting the manifold in accordance with the temperature.

Other objects of the invention will appear from the following description and accompanying drawings, referred to which:

Figure 1 shows a side elevation of a carburetor constructed in accordance with this invention, with parts broken away for better illustration of others.

Figure 2 is a view partly in section taken along the line 2—2 of Figure 1.

Figure 3 is a view partly in section showing a modified form of my invention.

Figure 4 is a sectional view showing a modification of the piston and dash pot.

Figure 5 is a supplementary sectional view taken along the line 5—5 of Figure 4.

Referring to the device shown in Figures 1 and 2, the reference numeral 1 indicates the body of the carburetor. This body is provided with a flange 2 for attachment to the intake manifold of an internal combustion engine. An air horn 3 is either open to the atmosphere or connected to an air cleaner or silencer. It will be understood that air enters through the air horn 3 and passes through the comparatively large air chamber 4 from which it enters the venturi 5 and passes on up through the mixing chamber 6, past the throttle 7 and into the intake manifold 8. The fuel is supplied either by gravity or any other suitable source of pressure.

In Figure 2, I have diagrammatically indicated a pump 9 which receives the fuel from any source and delivers it through a pipe 10 to the inlet fitting 11 of the carburetor. The carburetor is provided with a supply bowl 12, and the fuel is maintained at a substantially constant level A—A in the bowl by a float 13 pivoted at 14 to operate the float valve 15. This structure is conventional and will be clearly understood by those skilled in the art.

The carburetor body is provided with an extension 16 having a fuel inlet 17 below the fuel level in the bowl, and the fuel flows up through a nozzle or standpipe 18 which discharges at the throat of the venturi 5. The fuel may be pre-mixed with air to any desired extent by air bleeding or by one or more primary venturis, but it is

eventually discharged either in the form of liquid spray or emulsion at the top of the nozzle 18.

It will be understood that the usual "idling tube" may be provided if desired, but the construction of this is well known and has no relation to the present invention. It may be noted, however, that the adjusting screw 19 controls the richness of the idle mixture.

The throttle 7 is carried by a shaft 20 which may be operated by any suitable means, such as the operating arm 21. A crank 22 is attached to the throttle shaft, and a link 23 is pivoted to the outer end of the crank. A pump cylinder 24 is mounted in any suitable manner inside or outside of the bore 12, and an inlet check valve 25 for the pump is arranged to communicate with the fuel in the bowl. A passageway 26 provides communication between the inlet check valve and the lower part of the pump cylinder 24. An outlet nozzle 27 is also provided for discharging fuel from the pump into the air chamber or venturi, and an outlet check valve 28 is provided to prevent the admission of air to the pump through the nozzle 27. The cylinder 24 is provided with the piston 29 having a suitable packing leather 30 and a return spring 31. A small coil spring 32 is provided for holding the packing leather in place, and a retainer 33 forms a seat for the spring 31 and also prevents the displacement of the packing leather and spring 32.

A chamber 34 is formed in the piston. This chamber is substantially filled with oil or some fluid having a marked change in viscosity with changes in temperature. A dash pot piston 35 is slidably mounted in the chamber or cylinder 34, and this dash pot piston is carried by a rod 36 slidably mounted in the cap 37 of the chamber or dash pot 34. A suitable packing washer 38 is mounted in the top of the dash pot to prevent the loss of oil therefrom. The rod 36 is provided with a grooved guide portion 39 serving as a guide for its lower end, a suitable recess or bore being formed in the bottom of the dash pot for that purpose. It will be understood that the connecting rod or link 23 is suitably pivoted to the upper end of the rod 36, as at 40.

The operation of the device shown in Figures 1 and 2 is as follows:

Fuel being supplied to the bowl 12 and suction being applied to the carburetor by the engine, the fuel flows through the nozzle 18 and is mixed with the main body of air in the mixing chamber 6. When the throttle valve is closed, very little fuel will be discharged from the nozzle 18 and perhaps none at all, but it will be understood that the supply under these conditions is taken from the idle tube in a conventional manner. As the throttle valve is opened, the dash pot piston 35 starts to move downwardly through the oil filled dash pot, but due to the resistance of the oil flowing around the dash pot piston 35, the piston 29 will be forced downwardly in the measure in which the oil resists the movement of the dash pot piston. It will be understood that the viscosity of the oil is dependent on the temperature, and accordingly with less temperature, the oil will be stiffer and more viscous and a greater movement of the piston will result. The fuel discharged from the cylinder 24 by the piston 29 will be sprayed into the air chamber of the carburetor in the usual manner, and the spray may be directed into the venturi or any other desired part of the carburetor. It will be understood that when the temperature is extremely high, the oil in the dash pot 34 would be so thin that very

little movement of the piston 29 will result, but when the temperature is low, the oil will become so stiff that a full stroke of the piston 29 will be given at each full opening movement of the throttle.

It may be noted that practically any desired range of operation may be obtained by calibrating the clearance of the piston 35 in the dash pot, and coordinating this with the quality of oil used in the dash pot and in connection with this, it may be stated that the viscosity ranges of various oils are well known, and, if desired, suitable quantities of wax or glycerine or castor oil may be mixed with the mineral oil or other fluid used in the dash pot for procuring the desired viscosity-temperature curve.

With reference to the device shown in Figure 3, the pump cylinder 41 is mounted on the body of the carburetor and is provided with an outlet passageway 42 communicating with a passage 43 in the body of the carburetor which, in turn, has a discharge outlet in the nozzle 44. An outlet check valve 45 to prevent the admission of air at the nozzle may be provided, if desired, but it is not absolutely necessary, because the normal tendency of the fuel is to flow in the other direction. The fuel is admitted to the carburetor through the fitting 46 from any source of supply under pressure, such as the engine driven pump 47. It should be understood, however, that any pressure means may be used, such as a gravity tank, and in certain instances I prefer to use comparatively high pressures, so that the fuel issuing from the nozzle 44 will be broken up into fine particles.

A conduit 48 leads from the fitting 46 to the lower end of the pump cylinder and, if desired, a check valve 49 may be located in the conduit. Instead of connecting the conduit 48 to the fitting 46, I may connect it to the float chamber 12 below the fuel level, so that the additional fuel will be supplied by suction and manual pressure instead of by pressure of pump 47. A valve 50 is attached to the piston 51 by means of the bowl and gasket joint 52, and a suitable return spring 53 is provided to normally hold the piston 51 in its uppermost position. A dash pot 54 fitted with the piston 55 is formed in the upper part of the piston 51. The walls of the dash pot are smaller than the cylinder 41, thereby forming an annulus 56 surrounding the dash pot. A check valve 57 controls the by-pass 58 leading from the annulus to the dash pot, and a calibrated passage 59 is provided to permit restricted flow of fluid from the dash pot into the annulus. A suitable cap 60 is provided for the top of the dash pot, and a cover 61 for the top of the cylinder.

It will be understood that the piston 51 may serve merely as a guide, in which case it would be made of considerably smaller diameter than the cylinder 41, say from ten to fifteen thousandths of an inch, or it may be made a substantial fit so that the displacement of the piston will, in itself, discharge fuel through the nozzle 44.

It will also be understood that the piston 51 may be completely sealed against leakage of gasoline, so that the upper chamber or dash pot may be filled with a heavy oil. This sealing might be accomplished in any one of several ways: For instance, the piston may be constructed as shown in Figures 4 and 5 in which the piston 62 carries an inner shell 63 corresponding to the shell 54, as shown in Figure 3. An outer shell 64 is also formed on the piston so that the annular space 65 is completely enclosed.

The top of the inner and outer shells is sealed by a cover 66, and, if desired, packing may be applied to the stem of the piston 55. If desired, a packing leather might be applied to the piston 62 to further resist the mixing of the fuel with the fluid in the dash pot. It will also be readily understood that connections or conduits may be provided to permit fluid to be conveniently supplied to the dash pot. These are not shown, as their provision would be obvious to any mechanic.

The operation of the device is as follows:

Starting with the parts in the position shown in Figure 3, the throttle being in closed position, substantially no fuel is drawn from the nozzle 18 and none from the nozzle 44, but when the throttle is opened, the piston 55 moving in the dash pot 54 carries with it the piston 51 and thereby opens the valve 50. This permits an additional supply of fuel to flow through the valves 49 and 50, the pistons 42 and 43, and the nozzle 44 into the mixing chamber. When the throttle is held in wide open position, the piston 55 contacts with the valve 57 in such a manner as to hold the piston 51 down against the spring 53, thereby holding the valve 50 continuously in open position. In this manner, a continuous constant charge of fuel is provided in addition to the fuel that may be drawn from the nozzle 18. At low speeds of the engine, for instance, up to 400 R. P. M. with the throttle in wide open position, this is substantially the only fuel supply to the carburetor, but the size of the nozzle 44 may be so calibrated with respect to the pump pressure as to give a proper fuel mixture ratio at these speeds, and the shape of the curve may be further improved by employing a pump (47) which is capable of giving a pressure which varies in accordance with the speed.

By the provision of the constant low speed supply, the necessity for restricting the throat of the venturi 5A is obviated, for the main nozzle does not have to supply fuel at low speeds and wide open throttle. It will be understood that the part throttle operation is taken care of by the idle tube, which may be of conventional construction.

It will be understood that by the use of the check valve 49, priming of the carburetor may be accomplished the same as with any ordinary accelerating pump. That is to say, the operator, by opening the throttle valve, can discharge a stream of fuel through the nozzle 44 prior to starting the engine.

I claim:

1. In a carburetor, means forming a mixing conduit, a throttle valve for controlling the flow of fuel mixture through said conduit, a pump connected with said throttle for discharging fuel into said mixing conduit when said throttle is opened, said pump having a piston, a dash pot connection between said piston and said throttle, and a viscous fluid in said dash pot, the viscosity of said fluid varying with variations in temperature, whereby the stroke of said piston will be automatically varied according to the temperature, a second pump for supplying fuel to said first named pump, and a valve operated in conjunction with the throttle to permit flow of fuel from said last named pump thru the first named pump to the mixing conduit when the throttle is in a predetermined position.

2. In a carburetor, means forming a mixing conduit, a main venturi in said conduit, a fuel bowl, a nozzle receiving fuel from said fuel

bowl and discharging near the throat of said main venturi, a throttle valve for controlling the flow of mixture from said carburetor, a fuel pump operated by said throttle valve to discharge supplementary fuel to said mixing conduit upon opening movements of the valve, said pump having a piston, a dash pot forming a connection between said piston and said throttle, said dash pot being filled with a fluid having a marked change in viscosity under changes in temperature, a second pump for supplying fuel to said first named pump, valve means normally preventing the flow of fuel from the last named pump to the first named pump, and means for holding said valve in open position when the throttle is in open position.

3. An accelerating pump for carburetors comprising a piston, a dash pot in said piston, a cover for said dash pot, a piston for said dash pot having a piston rod extending through said cover, and a packing device for said piston rod held in place by said cover.

4. In a carburetor, means forming a mixing conduit, means forming a constant level supply chamber, means for supplying fuel under pressure to said carburetor, a main nozzle operated by suction to convey fuel from said constant level supply chamber to said mixing conduit, a throttle for controlling the discharge of mixture from said carburetor, a pump operated by said throttle for discharging additional fuel into said carburetor when said throttle is opened, and a valve operated by said throttle for admitting fuel direct from said source of pressure into said mixing conduit.

5. In a carburetor, means forming a mixing conduit, means forming a constant level supply chamber, a nozzle operated by suction to withdraw fuel from said constant level supply chamber and discharge it into said mixing conduit, means for supplying fuel to said carburetor under pressure, a float controlled valve for maintaining the fuel at a constant level in said chamber, a by-pass for supplying fuel to said mixing conduit direct from said source of pressure without passing through said constant level chamber, a manually operable throttle valve, a valve controlling said by-pass, and connections holding said by-pass valve in open position whenever said throttle is moved beyond a predetermined point in its opening movement.

6. In a carburetor, means forming a mixing conduit, means forming a constant level supply chamber, a nozzle operated by suction to withdraw fuel from said constant level supply chamber and discharge it into said mixing conduit, means for supplying fuel to said carburetor under pressure, a float controlled valve for maintaining the fuel at a constant level in said chamber, a by-pass for supplying fuel to said mixing conduit direct from said source of pressure without passing through said constant level chamber, a throttle for controlling the flow of mixture from said carburetor, and a valve operated by said throttle for controlling the flow of fuel through said by-pass, said valve being opened temporarily and then closed upon partial opening movements of the throttle, and being held open when and as long as said throttle is in fully open position.

7. In a carburetor, means forming a mixing conduit, a throttle for controlling the flow of fuel through said conduit, a source of suction for drawing mixture through said carburetor in-

cluding an intake manifold, a source of pressure for supplying fuel to said carburetor, suction operated means for supplying fuel to said mixing conduit, a supplemental fuel supply means for admitting fuel to said carburetor directly from said source of pressure, said supplemental fuel supply means being temporarily operated by partial opening movements of the throttle and being continuously operated when said throttle is held in fully open position.

8. In a carburetor, means forming a mixing conduit, a throttle for controlling the flow of fuel through said conduit, a source of suction for

drawing mixture through said carburetor including an intake manifold, a source of pressure for supplying fuel to said carburetor, suction operated means for supplying fuel to said mixing conduit, a supplemental fuel supply means for admitting fuel to said carburetor directly from said source of pressure, said supplemental fuel supply means being at least temporarily operated by any opening movement of the throttle, and said supplemental supply means being maintained in operation at least as long as said throttle is held in fully open position.

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