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LIQUID FEEDING APPARATUS

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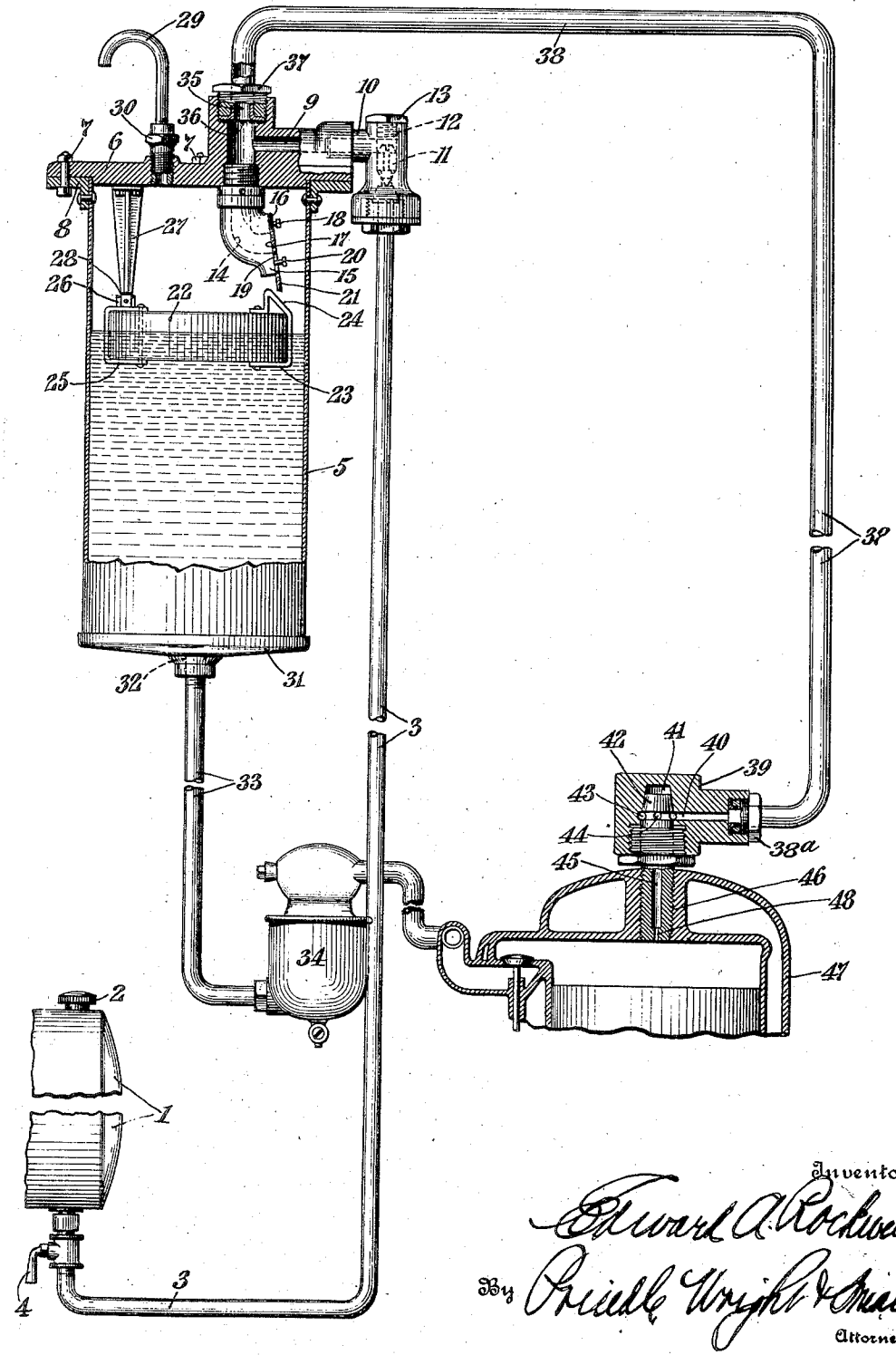

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LIQUID-FEEDING APPARATUS.

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My invention relates particularly to an apparatus designed for feeding liquids of various kinds, but it has especial reference to apparatus designed for feeding liquid fuel to automobile engines.

The object of my invention is to provide an apparatus by means of which liquids of various kinds may be fed, but which is especially adapted for feeding fuels to internal combustion engines.

Another object of my invention is to provide an apparatus by means of which internal combustion engines are supplied with fuel through the agency of the pumping action of the engines themselves.

A further object of my invention is to provide a fuel feeding system in which the pressure within the engine cylinder is utilized to force the fuel from a tank, which may be located at a high or at a low level, to a carburetor which may be located below the same, so as to avoid by this means the necessity of, e. g., relying upon the action of a float to control the feeding of the fuel.

Still another object of my invention is to construct a fuel supply system which is extremely simple in that it need comprise only a single tank located above the level of the carburetor, and in which the moving parts of the apparatus are all carried upon the cover of said tank.

Again, a further object is to provide a construction of this character in which tight joints are not necessary between the tank and its attached parts, so that in this way I avoid the difficulties caused by the unavoidable loosening of joints through the vibration of the engine and attached parts, as well as due to the changes in pressure within the apparatus.

Furthermore, another object of my invention is to provide a construction which is extremely easy to install, inasmuch as the apparatus may be connected directly to the engine cylinder at the pet-cock opening without the necessity of drilling a hole in the manifold or some other part of the apparatus supplying the fuel to the engine.

Again, another object is to provide a construction which may be manufactured at very low cost, in view of the fact that the single tank may be made of a smaller size than previous constructions involving the use of a plurality of tanks.

Further objects of my invention will appear from the detailed description thereof contained hereinafter.

While my invention is capable of embodiment in many different forms, for the purpose of illustration I have shown only one form of my invention in the accompanying drawings, in which;

The figure is an elevation partly in section of an apparatus made in accordance with my invention.

In the drawing, I have shown a main fuel tank 1, which is adapted to be supplied with any desired liquid fuel suitable for use in internal combustion engines by means of a removable screw-threaded cover or plug 2.

This tank 1 may be located at a lower level than the internal combustion engine to be supplied with fuel therefrom, and may for this purpose be located at some lower rear portion of an automobile equipped with my fuel supply system.

From the tank 1 a pipe 3, shown as containing a hand valve 4, leads to an auxiliary tank 5, which may be located at a level higher than said tank 1 and at a level higher than the engine carburetter to be supplied with the fuel. As shown the auxiliary tank 5 carries a cover plate 6, with which it is united by means of screws 7, passing through the same and through a casting 8 riveted to the upper edge of the tank 5. Said cover plate 6 may have cast therein a horizontal passageway 9, constituting an elevated chamber in which there may be screw-threaded a valve casing 10, which may be screw-threaded to the pipe 3 and may carry a check valve 11, adapted to be inserted in the casing 10 through a screw-threaded opening 12, normally closed by means of, e. g., a plug 13.

In the embodiment shown, the liquid fuel thus supplied through the passageway 9 passes downwardly into the tank 5 through an angular passageway 14 in a fitting 15, preferably secured to the lower face of the cover plate 6 in any desired manner, and shown as provided at the outlet end of the passageway or pocket 14 with a flap valve 16 made of brass or any other desired metal, loosely supported against a flat inclined valve seat 17 on the fitting 15 by means such as a screw 18 passing through the same in such a manner as to permit freedom of movement of the lower end of the flap valve 16 in a horizontal direction. In the lower end

of the flap valve 16, there is provided a vertically elongated opening 19, through which a screw 20 passes, carried by the lower portion of said fitting 15 in such a manner as to permit freedom of movement of the flap 16 horizontally within the limits permitted by the length of the screw 20. As will be seen in the figure, there is an extension 21 on the lower end of the flap valve 16, so that said valve may be held in open position when the tank 5 is filled with fuel, by means of a float 22 shown as having a strap 23 riveted thereto, which strap has an inclined upwardly-directed projection 24 thereon, which contacts with the extension 21 on the lower end of the flap valve 16. Said float 22 may be made of any desired buoyant material, but is preferably made from balsa wood, which is coated with a varnish which will not be dissolved or attacked by the liquid fuel contained within the tank 5. At the other side of the float 22, the latter may carry a strap 25, which is shown as riveted thereto, and which may have pressed upwardly from the same, a rectangular projection 26, which may be pivoted in a bearing bracket 27, projecting downwardly from the cover plate 6. The bearing bracket 27 is preferably arranged in such a manner as to provide a shoulder 28 spaced a short distance above the upper end of the projection 26, so that, when the fuel within the tank 5 is at a low level, the float 22 will be supported only a short distance below the end of the flap valve 16.

In the embodiment shown, the interior of the tank 5 is always vented to the outer air by means of a vent pipe 29, which may be screw-threaded in the cover plate 6 and locked in position by means of a lock-nut 30. As shown, the said vent pipe 29 has an inverted U-shaped bend, in order to extend the vent opening a sufficient distance above the level of the fuel in the tank 5 to prevent the same from splashing out of said tank, and at the same time so as to prevent foreign substances from falling into said tank.

At the bottom of the tank 5 there may be secured thereon, by soldering or otherwise, a bottom plate 31, which may have a screw-threaded outlet opening 32, in which there is shown screw-threaded a pipe 33, which supplies the fuel to a carburetor 34 of any desired type.

Communicating with the passageway 9 in the cover plate 6, there is shown an upwardly-directed screw-threaded outlet 35, which may have at its lower portion a screen 36, to prevent the entry of dirt or other foreign materials, as well as to insure protection against any possibility of ignition by a flash from the engine.

Within the screw-threaded opening 35, there is shown a nut 37, to hold in place the end of a suction pipe 38, which is shown as secured at its other end by a nut 38a, which may be screw-threaded to one side of a casting 39, preferably forming a portion of a flash box, said casting having a horizontal passageway 40, which, in the form shown, leads to a tapering chamber 41, which has screw-threaded therein a tapering plug 42, which is shown provided with an annular recess 43 opposite the passageway 40, as well as a transverse opening 44, which, as shown, leads from the annular recess 43 to, e. g., a vertical passageway 45 in said plug 42. At its lower end, the plug 42 is shown as screw-threaded in a pet-cock opening 46 in the top of an engine cylinder 47 of an automobile engine or any other desired type of internal combustion engine. Furthermore, the lower end of the plug 42 is shown constructed with a very small opening 48 at the point where the passageway 45 communicates with the interior of the cylinder 47, said opening 48 being smaller in cross-sectional area than any of the other openings in the system of piping with which the apparatus is connected.

In the operation of the described form of my invention, when it is desired to start the engine after the apparatus has been first connected thereto, the vent pipe 29 may be removed, and the tank 5 is supplied with a small quantity of the liquid fuel. In this way, liquid fuel will be supplied from the tank 5 to the carburetor 34, from which mixed gas and air will, in the usual manner, be supplied to the engine cylinder 47. The engine will thereafter operate, and as the piston within the cylinder 47 is reciprocated, upon the suction stroke of the piston decreased pressure will be produced in the passageway 9, so that liquid fuel will be drawn from the tank 1 by means of the pipe 3, through the check valve 11, into the passageway or elevated chamber 9, and thence into the elevated chamber or pocket formed by the passageway 14.

The proportions of the parts are so constructed, however, that no more liquid fuel is withdrawn in this manner upon a single stroke of the engine piston from the main supply tank 1 than is necessary to approximately fill the chamber in the passageway 14 formed when the flap valve 16 is in closed position. Furthermore, the proportions of the parts are so arranged that, if this quantity of liquid fuel were withdrawn from the main fuel tank 1 at every stroke of said piston, there would be a larger quantity of fuel supplied to the engine than would be necessary for the operation of the same. It will be seen that the valves 11 and 16 are oppositely acting in the sense that one opens toward and the other opens from the passageway or chamber 9.

Upon one of the succeeding strokes of the piston, when the vapors within the engine

cylinder are under increased pressure, this increased pressure will be communicated to the body of liquid fuel within the chamber formed by the passageway 14 and will thus force outwardly in a most positive manner the charge of liquid fuel located in said chamber, past the flap valve 16 and into the tank 5, after which the flap valve 16 will close by gravity and will be maintained closed by the decreased pressure of the suction stroke of the piston taking place thereafter, so as to permit the accumulation of another similar charge of the liquid fuel in the chamber 14.

This action of the parts will be repeated until a sufficient quantity of the liquid fuel has accumulated in the tank 5 to elevate the float 22 to a point where the projection 24 will contact with the flap valve 16 and raise it away from its seat 17. Thereafter the decreased pressure produced within the passageway 9 will not withdraw liquid fuel from the tank 1, inasmuch as said passageway 9 will be vented to the outer air through the vent pipe 29. Furthermore, any increased pressure communicated from the engine cylinder to the passageway 9 will not have any influence upon the position of the parts for the same reason. The float 22 will remain in this position until a sufficient quantity of the liquid fuel in the tank 5 has been supplied to the engine to lower the float 22 to a point where it will allow the valve 16 to become seated again. When this takes place, the pumping action of the engine cylinder itself as applied to the fuel supply will again become operative to supply and maintain the required quantity of fuel within the tank 5.

It will be seen that the float 22 operates in such a manner as to merely interrupt the pumping effect of the engine when a sufficient quantity of fuel is present in the tank 5. The float 22 thus acts merely as a governor to determine the periods of operation of the pumping action of the engine, but its operation is not necessary in order to permit the supply of fuel to the tank 5 and from the tank 5 to the carburetor. Its failure to operate, therefore, will not in any way interfere with maintaining a constant supply of the fuel to the engine.

During the operation of the apparatus, the flash box 39 effectively prevents any communication of a flash from the engine cylinder 47 to the fuel in the fuel supply system, owing to the fact that any of the gases which may escape from the cylinder 47 must pass through the extremely small restricted opening 48, thence into the elongated passageway 45, from this point through the transverse opening 44, and around the annular groove 43, before it reaches the passageway 40 leading into the pipe 38. Furthermore, avoidance of any possibility of the flash being communicated to the fuel in this manner is doubly insured by the presence of the screen 36.

Furthermore, it will be noted that when the fuel is supplied in this manner its supply is more positive and uniform, inasmuch as it is not necessary to depend upon the force of gravity or difference in the heads of liquid levels in order to supply the fuel from the main supply tank to the tank 5.

Again, by applying the vacuum direct from the engine cylinder to the main supply tank, a more effective vacuum is utilized than would be the case if the system were connected with the engine manifold or some other part of the apparatus between the engine and the carburetor. In this way, greater efficiency is obtained in the supply of fuel to the engine.

Again, inasmuch as the upper portion of the tank 5 is always vented to the outer air, a tight joint is not necessary between the flange 8 and the cover plate 6, and, therefore, any loosening of this joint by the vibration from the engine will not have any detrimental effects upon the operation of the fuel feeding system.

Again, it will be seen that it is very easy to install the apparatus, inasmuch as the connection to the engine is made at a petcock opening, thus avoiding the necessity of drilling a hole in the manifold or some other part which connects the carburetor to the engine.

Furthermore, all of the moving parts in my apparatus are located upon or connected with the cover plate 6, so that they may be readily removed, inspected and repaired when desired.

Also, by repeatedly refillling only one auxiliary tank 5, said tank may be much smaller for a given supply of liquid fuel than in the case where more than one tank is required for this purpose.

While I have described my invention above in detail, I wish it to be understood that many changes may be made therein without departing from the spirit of my invention.

By the term flash box, which I have used herein, I mean any device or apparatus which will prevent the high temperature in the engine cylinder from igniting the fuel in the auxiliary chamber, or supply tank.

I claim:

1. A liquid feeding apparatus comprising a main supply tank, an elevated auxiliary tank continuously open to atmospheric pressure at the top and containing a float, a chamber at the top of said auxiliary tank having fluid flow connection therewith, a valve controlling said connection opening for flow into the auxiliary tank, a conduit connecting the supply tank to said chamber and containing a valve opening toward the latter, means by which the float opens the first men-

tioned valve when the auxiliary tank is filled with liquid to a predetermined level, an engine cylinder, and a conduit connecting the same with said chamber and a carbureter connected to the auxiliary tank and to the engine cylinder.

2. A liquid feeding apparatus comprising a main supply tank, an elevated auxiliary tank open to atmosphere and containing a float, a chamber on top thereof having a valve opening towards the auxiliary tank, a conduit connecting the supply tank to the said chamber and containing a valve opening toward the latter, means on the float for opening said first named valve, an engine cylinder having a flash box thereon, a conduit connecting the latter with the said chamber, a screen in the conduit near the said chamber, and a carburetor connected to the auxiliary tank and cylinder.

3. A fuel feeding device for supplying an internal combustion engine comprising a chamber constituting a source of fuel; a second chamber and a fuel flow connection between the two chambers; a third chamber connected with the second chamber for fuel discharge from said second chamber to said third chamber; means for alternating relatively higher and lower fluid pressures in the second chamber; a normally seated check valve controlling fuel discharge from the second chamber into the third chamber positioned in the third chamber above a predetermined fuel level, and a float in the third chamber having means for opening said normally seated valve upon the rise of liquid in said third chamber above said predetermined level, the third chamber being open to atmospheric pressure, and connections therefrom for supplying the engine.

In testimony that I claim the foregoing, I have hereunto set my hand this 8th day of February, 1919.

EDWARD A. ROCKWELL.