

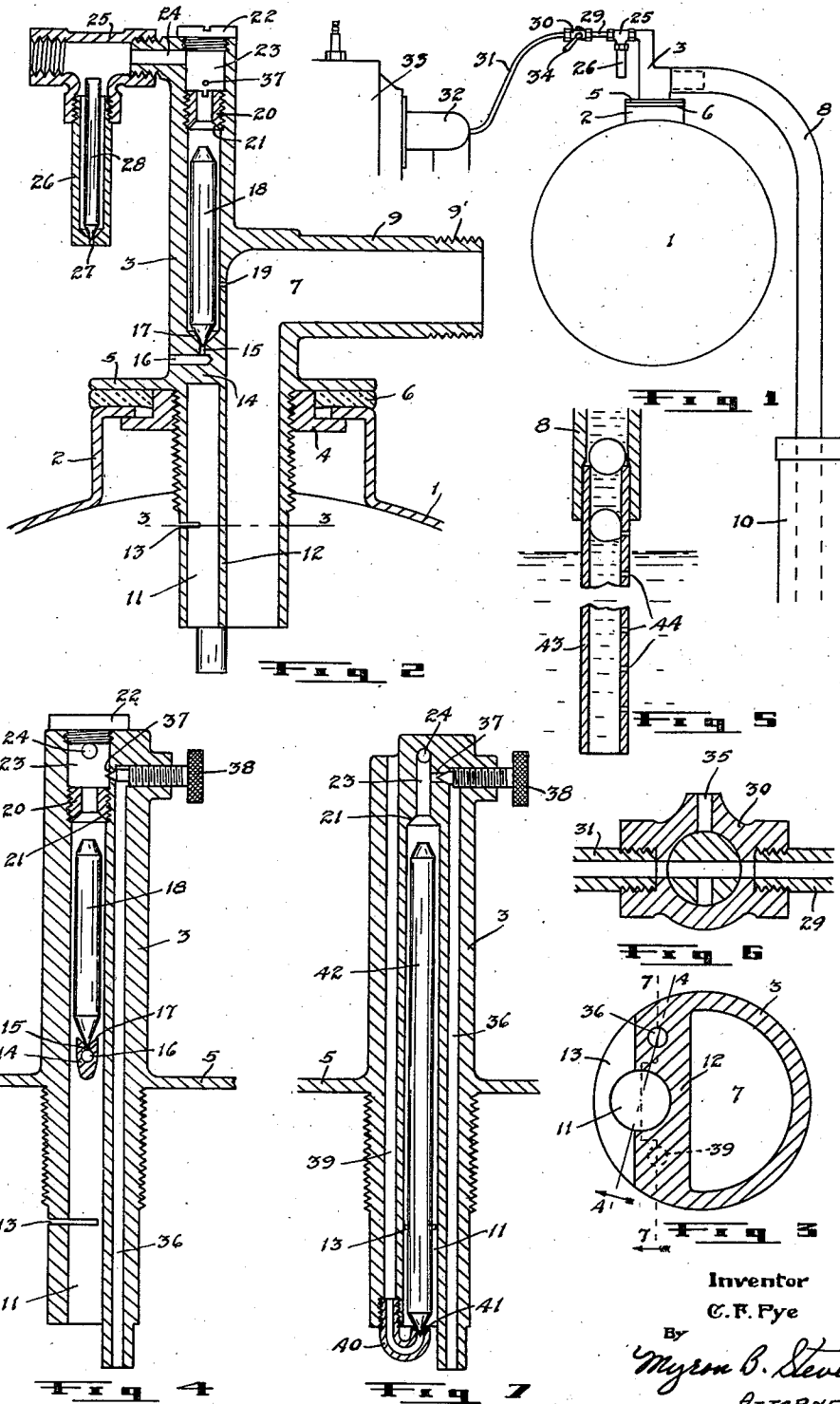
May 26, 1942.

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2,284,166

TANK FILLING DEVICE

Filed April 24, 1941



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2,284,166

TANK FILLING DEVICE

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Application April 24, 1941, Serial No. 390,174

7 Claims. (Cl. 123—136)

This invention is an improvement over my previous inventions of Tank filling devices embodied in Patent Number 2,225,844, dated December 30, 1940, and in application Serial Number 300,460, filed October 20, 1939.

The principal object of this invention is the same as the above mentioned inventions, namely; to provide a valve which may be positioned on the filler member of an elevated tank, and by utilizing the low pressure developed in an internal combustion motor, through a pipe connected therebetween, liquid may be drawn up into said elevated tank through a secondary pipe from a lower container.

Further similar objects are to prevent waste, spilling or contamination of the elevated liquid and so 1st; reduce expense, 2nd; eliminate fire hazard, and 3rd; avoid injury to the mechanical parts of the motor. At the same time, no alterations will be required in the tank or motor during installation, nor will the operations of same be interfered with.

The principal new objects to be attained by this invention are; to maintain a pre-determined pressure within the elevated tank during the filling operation to prevent same from collapsing, shut off the suction when the elevated tank is filled, and supply atmospheric air to the elevated tank after the suction has been shut off, all by the operation of one moving part.

A further object of the invention is to provide means whereby the pre-determined pressure can be changed to a second pre-determined pressure without requiring adjustment or an addition of parts, or any required pre-determined pressure can be had by substitution.

A further object of the invention is to provide means in the liquid elevating pipe for assisting in the elevation of said liquid and so permit the use of higher pressures in weak tanks for the purpose.

A further object of the invention is to provide means for supplying fuel to the motor during and after the filling operation and until the carburetor of said motor is supplied with sufficient fuel for said motor operation.

A further object of the invention is to provide means for preventing the foam, formed in the elevated tank during the filling operation, from interfering with the operation of the mechanical parts of the device.

A still further object of the invention is to construct the device in a simple, cheap and durable manner and such, that a variety of materials

may be utilized for the principal working part thereof.

With the above important objects in view, together with other minor ones that will become apparent as the description proceeds; the invention consists essentially in the arrangement and construction of parts hereinafter more particularly described, reference being had to the accompanying drawing in which:

Figure 1 is a diagrammatic view showing an elevated tank with the invention installed and connected to a motor and a lower tank.

Figure 2 is an enlarged vertical section through the upper part of the elevated tank and the filling device.

Figure 3 is an enlarged horizontal section taken on the line 3—3, Figure 2.

Figure 4 is a reduced vertical section taken on the line 4—4, Figure 3, and looking in the direction of the applied arrow.

Figure 5 is an enlarged section taken through the lower part of the liquid elevating pipe.

Figure 6 is an enlarged section through the shut-off valve.

Figure 7 is a view similar to Figure 4, taken on the dotted line 7—7, Figure 3, looking in the direction of the applied arrow, and showing a modified construction.

In the drawing like characters of reference indicate corresponding parts in the several figures.

An elevated tank is indicated at 1, provided with a filler member 2 on which the filler valve 3 is supported. The lower part of the filler valve is circular and threaded to receive a nut 4, having its periphery shaped similar to the ordinary filler cap (not shown). The valve is provided with a circular flange 5 which rests on a gasket 6 supported from the filler member and the nut and threaded portion above mentioned projects through the filler member into the tank. Due to the shape of the nut, an operator can attach the valve and, by giving it a rotating twist, lock it to the filler member, the gasket forming a resilient seal to make the connection air tight.

As the construction of this nut and the filler member is detailed in both my previous applications, a repetition of same here is felt to be unnecessary. If desired, on the other hand, the nut 4 can be dispensed with and the operator can hold the valve down against the gasket during the filling operation.

An L shaped passageway 7 passes through the valve 3 and connects the interior of the elevated tank with a flexible tubing 8, which is suitably fastened to said valve as by being slid over the

projecting portion 9 thereof, or screwed to the threads shown at 9'. The lower end of the tubing projects downwardly into a lower liquid filled tank 10 where it is immersed. A special construction for this end of the tubing is used in certain cases and will later be described.

A further passage 11 passes through the valve 3 from the top to the bottom. This passage is separated from the passageway 7 by a partition 12 and a short distance up from the bottom, a horizontal slot 13 is provided in the wall thereof such as by a hack saw cut. Nearly half way up the passage, a bridge 14 partly obstructs and cuts centrally through the area of this passage to form two passages therearound. The upper face of the bridge is provided with a jet hole 15 which connects the passage 11 with a centrally drilled hole 16 in the bridge for the entrance of atmospheric air. The jet hole 15 is provided with a tapered seat 17 which is normally closed against the atmospheric air by the pointed lower end of a pencil shaped member 18 positioned freely within the passage 11. The partition 12, opposite the member 18, is provided with a pin hole 19 which connects the passage 11 with the L shaped passageway 7 at the bend. Just above the pencil shaped member 18, the passage 11 is further obstructed by a reduction nipple 20 having a lower tapered seat 21 adapted to receive the frustrum shaped top of the pencil shaped member 18 as later described. The upper end of the passage 11 is closed by a screw cap 22 to provide a chamber 23 above the nipple 20. A hole 24 connects this chamber with a T connection 25 screwed to the side of the valve 3.

The lower connection of the T 25 threadedly receives a circular hollow casing 26, having a pin hole 27 in the bottom. The inner end of this pin hole is normally closed by the lower pointed end of a pencil shaped member 28 freely positioned in the casing and similar to the member 18 previously mentioned.

The third connection of the T 25 is connected by a short pipe 29 with a manually operable valve 30 shown in detail in Figure 6. The opposite end of this valve is connected by a pipe 31 with the intake manifold 32 of an internal combustion motor 33. The valve 30 is of the three way type and as shown in Figure 6, directly connects the intake manifold with the valve 3. By moving the control lever 34 the valve 30 can be operated to disconnect said manifold and connect the valve 3 to atmospheric air through the port 35 in the valve 30.

The valve 3 is also provided with a further passage 36 as shown in Figures 3 and 4 and this passage connects the interior of the elevated tank with the chamber 23 through a jet hole 37 controlled by a manually operable screw threaded needle 38. In this connection, it will be noticed that the lower end of the passage 36 connects with the interior of the elevated tank at a point much lower than that of the other two passages 7 and 11.

In operation, assuming that the valve 30 is set as shown in Figure 6, the motor running, the parts positioned as shown in Figures 2 and 4 and the hose or tubing 8 inserted and immersed in the lower liquid filled tank. The suction created by the motor will draw air from the elevated tank 1 through the passage 11 and this reduction in pressure will cause the liquid in the lower tank to rise up the tubing and into the elevated tank. Assuming also that the liquid being raised in gasoline and the gasoline in the elevated tank 1

is normally supplying a carburetor (not shown) on said internal combustion motor by gravity, it will be seen that the partial vacuum in the elevated tank will interfere and shut off this flow, and as the motor continues to operate the said carburetor will become depleted or empty. In order to maintain said motor operating during the filling operation, liquid gasoline passes through the pin hole 19 in the partition 12 and mixes with the passing vapor which also carries strong gasoline fumes, and this forms a highly explosive mixture receivable by the motor. Some of this liquid gasoline will not become vaporized in its movement along the passage and will pass down into the casing 26 around the member 28 forming a small reserve. The value of this reserve will be later explained.

If, for any reason, the air pressure in the elevated tank should become reduced to a dangerous level such as by the clogging of the tubing 8 or passageway 7, the member 18 will be of a weight such, that the air pressure from the passage 16 will be sufficient to lift same and permit atmospheric air to enter. In other words; the member 18 will bob up and down, opening and shutting the jet and so maintain the elevated tank at a safe pressure. During such operations and while only vapor is passing, the member will never rise high enough to enter the seat 21 and shut off the suction, due to its specific gravity.

At this time, it might be mentioned, that the gasoline pouring into the elevated tank from the valve 3 creates a foam on the top of the gasoline already in the tank. As the level of the gasoline in the elevated tank approaches the bottom of the passage 11, foam will pass therein until the liquid level rises and shuts off the supply. At such time, the air in the tank above the liquid and foam, enters the passage 11 through the horizontal slot 13. The foam trapped in said passage is no longer agitated and is carried off to the motor as vapor leaving a clear liquid level rising in said passage. When the foam on the gasoline in the elevated tank reaches the horizontal slot 13 it shuts off the air entering same similar to a plug. Accordingly, the foamless liquid already in the passage 11 rushes thereup and impacts against the lower end of the pencil shaped member 18. This sudden impact together with the air pressure from the jet 15 throws the member 18 into the seat 21 of the nipple 20 thus shutting off the suction, except for the slight amount acting through the jet hole 37. As the bottom of the passage 36 is immersed in the gasoline, the fuel is drawn thereup and meters past the needle 38 to the intake manifold to keep the motor running. The needle, of course, will be suitably adjusted.

When the member 18 has shut off the suction, the atmospheric air from the jet 15 moves down the passage 11 to bring the elevated tank back to atmospheric pressure. Accordingly, the surplus liquid in the elevated tank siphons back to the lower tank via the passage 7 and tubing 8 until the bottom of the passageway 7 is exposed and breaks the liquid connection. At the same time, the elevated tank walls which were previously drawn in by the suction, resume their normal shape. When all this has occurred, the gasoline level in the elevated tank is just slightly above and covering the bottom of the passage 36 so that gasoline is still fed by suction past the needle 38.

In tests made, it was found that the gasoline going up the passage 36 and past the jet hole 37, entered the chamber 23 so slowly, that a

period of possibly ten seconds might elapse before it reached the motor. Obviously, under such circumstances the motor might stop. Further, when the elevated tank was being filled, liquid entered the passage 11 through the pin hole 19 and was carried thereup by the passing air and fumes from the elevated tank thus forming a good combustible mixture. The member 18 has now cut this supply of air off. To maintain an air supply, the casing 26 and member 28 was designed.

When the member 18 enters the seat 21 and shuts off the suction below this point, the air pressure in the passage above the member 18 lowers. This causes the member 28 to rise under the pressure of atmospheric air through the hole 27. The sudden rush of air therethrough raises the small reserve of gasoline around the member 28 and carries it to the intake manifold of the motor. This small supply is sufficient to keep the motor running until the supply from the jet 37 arrives. From then on the air entering through the hole 27 carries the jet fuel to the motor and insures an explosive mixture until the motor carburetor again supplies the proper mixture in the usual way.

Where the filling device is used on motors having two gasoline supply tanks, the T 25 and associated parts 26, 27 and 28 will be dispensed with while the needle 38 will be screwed in to close the jet 37 and the pin hole 19 can be closed or dispensed with. This is possible because one tank can be filled by the device while the other is supplying the carburetor in the usual manner by gravity. The same thing applies where the motor carburetor is fed by a gasoline pump as such pumps will draw the gasoline from the elevated tank against the pull of the suction and feed such gasoline to the carburetor.

In the construction above described, the member 18 has been preferably made from aluminum and of a weight to close the jet 15 until the pressure in the elevated tank has been reduced below a pre-determined value. At the same time it is heavy enough to resist the pressure of passing vapor but will be lifted by the impact pressure of rising sucked liquid plus the pressure of the incoming atmospheric air through the jet 15 and so shut off the suction. In order to die cast this valve and at the same time use a variety of other materials, especially lighter ones, for the movable pencil shaped member, I have designed a modified form of valve shown in Figure 7 and now described.

In this design the screw cap 22 and the nipple 20 and the bridge 14 are eliminated. The chamber 23 is formed as a reduced extension of the passage 11 to provide the seat 21. A passage 39 passes through the valve on the opposite side to that of the passage 36. The upper end of this passage communicates with the atmosphere while the bottom end is tapped to receive a screw threaded U-shaped tube 40 having its curved end formed into a tapered jet 41 and positioned centrally under the passage 11. A long pencil shaped member 42, similar to the member 18, is freely positioned in the passage 11 and seats in the jet 41 while its upper end is a frustrated cone shape and adapted to register with the seat 21 when lifted. This member 42 can be made of Celluloid, Bakelite, lucite or any of the well known resins and other compounds having a specific gravity slightly heavier than gasoline or water. The operation of this device is exactly the same as the description for the member 18

except that the gasoline or liquid will rise slightly up the walls of the member before the foam reaches the slot 13 and as this member is considerably longer, the sudden rush of liquid up the passage 11, when the air is excluded, will cause so much frictional pressure on the walls thereof, plus the air pressure thereunder, that it will lift just as fast and close the seat 21. Thereafter, the operation is the same as previously explained for the member 18. The operator, of course, can turn the lever of the valve 30 at any time after the suction is shut off and the air through said valve to the chamber 23 will cause either the member 18 or 42 to drop back to its original position on its respective jet.

In some cases the fuel tank is rather thin and very liable to collapse if the inside pressure is reduced very much. In order to raise the liquid the requisite distance and still have a safe pressure in the elevated tank, a novel construction is employed on the intake pipe or tubing 8 and is now described.

A straight metal pipe 43 is frictionally pressed into the bottom end of the flexible tubing 8. At intervals down this pipe a line of pin holes 44 pass through the wall thereof. The pipe will be approximately the height of the lower liquid container into which it is immersed. If the container is full of liquid the line of holes will be covered and accordingly, sufficient suction will be required from the motor to raise the liquid from the liquid level in the lower tank to the elevated tank. As the liquid in the lower tank falls, the holes 44 will become uncovered to admit atmospheric air. In actual tests it has been found that this air will form in pockets at intervals up the pipe separating the liquid and so lowering the total weight of liquid in the pipe and tubing between the lower tank and the elevated tank. The speed of the liquid up the pipe and tubing keeps the air pockets in position. The more holes exposed to the atmosphere, the longer or the more air pockets and the less weight of liquid per foot of pipe. Accordingly, liquid can be raised a given distance up such a pipe with less suction than would be required for an unperforated pipe. The size and spacing of the holes can be so arranged that, as the liquid level falls in the lower tank the intensity of the suction required to lift the liquid need not be increased. Of course, as more air enters the pipe it will take longer to fill the elevated tank as the flow is reduced. This system has been found ideal for filling the weak tanks above mentioned.

From the above it will be seen that either of the members 18 or 42 will regulate the amount of pressure in the elevated tank during the filling operation. The same members will shut off the suction when the tank is full, and as they lift to shut off said suction, they will permit atmospheric air to enter the elevated tank through either the jets 15 or 41 and bring the tank back to atmospheric pressure.

In the drawing it will be noticed that the members 18 and 42, positioned as shown, will maintain the elevated tank at a given pre-determined pressure for a given size of jet hole. By removing either of these members and replacing them, inverted with their frustrated ends in the jets, the pre-determined pressure in the elevated tanks will be altered. The frustrated ends rest on the tapered walls of the jets and so expose a greater area of said members to the atmosphere. Accordingly, the members will lift and admit air when the elevated tank is at a

higher pressure than when the members had their pointed ends in the jets. After once lifting, the members will bounce, so to speak, on the incoming air, letting in just sufficient to maintain the required pre-determined pressure. Obviously, any desired pressure can be obtained in the tank by substituting members of different specific gravity.

The slot 43 assures that the foam entering the passage 44 will be passed away in vapor before the liquid suddenly rushes up the passage 44. In this way the foam cannot interfere with the proper operation of either of the members 48 or 42.

It will be understood, of course, that the means shown for supplying an explosive mixture to the motor, during and after the filling operation, is only necessary for motors having carburetors fed by gravity. Such means are not required for motors having gasoline feed pumps.

While I have shown and described means for lifting gasoline into weak tanks by a reduced suction, I do not wish to be limited to such use as said means may be used for raising many different kinds of liquids and for many different purposes.

What I claim as my invention is:

1. In a device for filling the fuel supply tank of an internal combustion motor: a fluid connection from the intake manifold of said motor, through said supply tank, to a lower fuel filled tank to elevate said lower fuel to said supply tank; means located in said connection between said manifold and said supply tank for shutting off the suction from said supply tank when said supply tank is filled; means for supplying and storing a reserve of fuel in said connection during said filling operation; means for admitting air to said reserve to carry same to said motor; and means for supplying a continuous flow of combustible fuel to said motor subsequent to the shutting off of said suction.

2. In a device for filling the fuel supply tank of an internal combustion motor: a fluid connection from the intake manifold of said motor, through said supply tank, to a lower fuel filled tank to elevate said lower fuel to said supply tank; means located in said connection between said manifold and said supply tank for shutting off the suction from said supply tank when said supply tank is filled; primary means for supplying a combustible mixture to said motor, along said connection, during said filling operation; means for supplying and storing a reserve of fuel in said connection during said filling operation; and secondary means for feeding said stored fuel as a combustible mixture to said motor subsequent to the shutting off of said suction.

3. In a tank filling device having a source of suction connected through an elevated tank to a lower liquid filled tank to elevate said liquid to said elevated tank: means for dissipating the foam on liquid rising in said suction connection from said elevated tank; and means, operated by the impact pressure of sucked rising liquid in said suction connection from said elevated tank, for shutting off said suction from said elevated tank.

4. In a tank filling device having a source of suction connected through an elevated tank to a lower liquid filled tank to elevate said liquid to said elevated tank: a weight positioned for vertical movement in said suction connection between said elevated tank and said source of suction, normally closing an opening to atmospheric air and adapted in its movement to shut off said suction to said elevated tank; said weight adapted to lift and admit air to said connection when a pre-determined reduced pressure obtains in said connection and elevated tank; and said weight adapted to rise, admit air and shut off said suction to said elevated tank by the impact pressure of rising liquid from said elevated tank.

5. In a tank filling device wherein the suction from the moving pistons of an internal combustion motor is connected through said motor fuel supply tank with a lower fuel filled tank, to elevate said lower fuel to said supply tank: a weight positioned for vertical movement in said suction connection between said supply tank and said motor, normally closing an opening to atmospheric air, and adapted in its movement to shut off said suction to said supply tank; said weight adapted to lift and admit air to said connection when a pre-determined reduced pressure obtains in said connection; said weight adapted to rise, admit air and shut off said suction to said supply tank by the impact pressure of rising fuel in said connection from said supply tank; means for dissipating foam entering said connection from said supply tank before said liquid contacts said shut off weight; primary means for supplying a combustible mixture to said motor along said connection during said filling operation; secondary means for supplying a combustible mixture to said motor subsequent to the shutting off of said suction; and manually operable means for disconnecting said suction from said suction connection.

6. In a tank filling device having a source of suction connected through an elevated tank to a lower liquid filled tank to elevate said liquid to said elevated tank: a weight slidably mounted in said suction connection between said elevated tank and said source of suction; said weight having one end formed in the shape of a frustated cone; a tapered opening providing a communication between said suction connection and atmospheric air; said end of said weight entering into, contacting the walls of and closing said tapered opening; and said atmospheric air operable against said weight through said opening to maintain a pre-determined reduced pressure in said elevated tank.

7. In a tank filling device having a source of suction connected through an elevated tank to a lower liquid filled tank to elevate said liquid to said elevated tank: said suction connection, between said elevated tank and said lower liquid filled tank, provided with holes for the entrance of atmospheric air during the filling operation of said elevated tank.

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