Aug. 11, 1942. B. D. BARTON 2,292,862

PRIMER FOR PUMPS

Filed Jan. 10, 1942

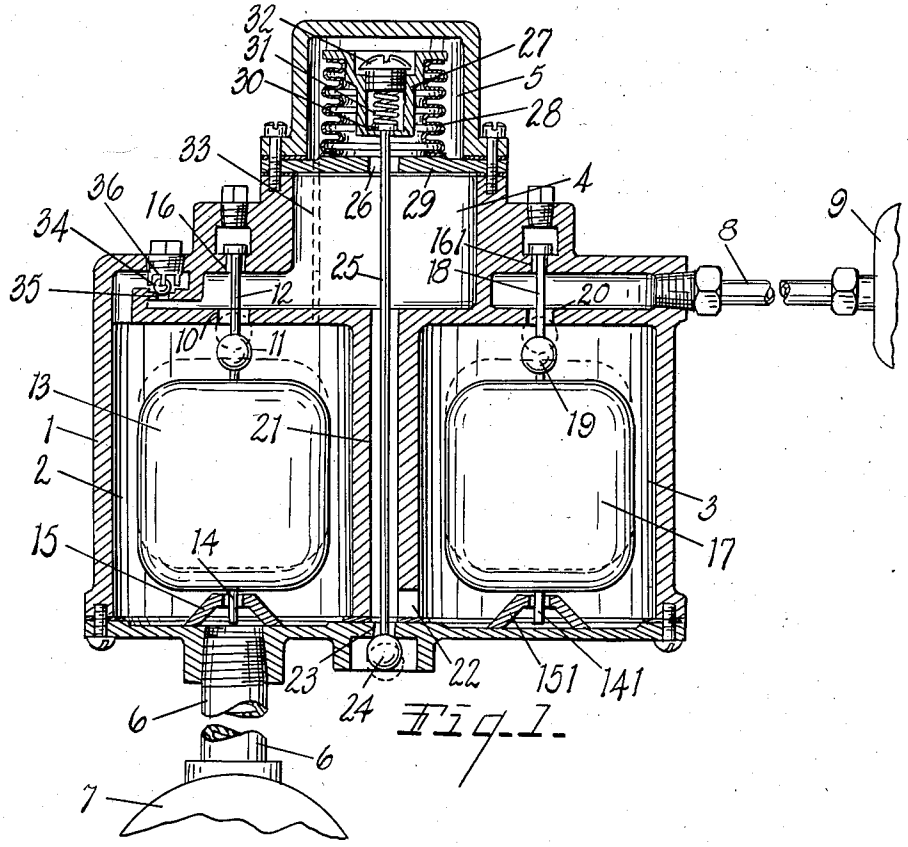


Fig. 1.

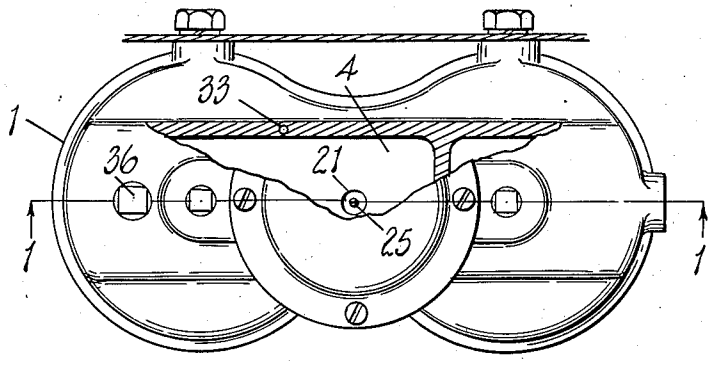


Fig. 2.

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Patented Aug. 11, 1942

2,292,862

UNITED STATES PATENT OFFICE

2,292,862

PRIMER FOR PUMPS

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Application January 10, 1942, Serial No. 426,298

13 Claims. (Cl. 103—236)

The main objects of this invention are:

First, to provide an improved priming device for centrifugal or rotary pumps which is very rapid and effective in action.

Second, to provide a primer of this character which is well adapted to be operatively associated with the intake manifold of an internal combustion engine employed in driving the pump, the engine being safe-guarded from damage in the priming operation.

Third, to provide a priming device of the type described which is not likely to become inoperative in use or as a result of jamming of the parts and one which cannot become waterclogged.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a fragmentary view mainly in vertical section on line 1—1 of Fig. 2 of a structure embodying the features of my present invention.

Fig. 2 is a fragmentary top plan view partially broken away and in horizontal section illustrating further details.

My present invention is particularly desirable for use in priming centrifugal pumps which are driven by an internal combustion engine, the intake manifold of the engine being employed as a source of vacuum for the priming operation. However, other sources of vacuum may be used or employed with many of the advantages of the structure illustrated which is shown in operative relation to a manifold.

In the embodiment of my invention illustrated, the reference numeral 1 generally designates a housing, the main body or portion of which is formed as a casting suitably cored to provide chambers and parts to be hereinafter described. Within this housing 1 I provide a main float chamber 2 and an auxiliary float chamber 3 disposed in side by side relation. Above or in elevated position relative to these float chambers I provide a vacuum chamber 4 and above this I provide a chamber 5 for housing an expansible and contractible pressure responsive element to be described.

The main float chamber 2 is provided with a connection 6 at the bottom thereof to the pump to be primed indicated at 7.

The auxiliary float chamber 3 is provided at the top thereof with a connection 8 to a manifold 9 or other source of vacuum. A manually actuable control valve (not shown) is desirably included in this connection. It will be understood that these several chambers constitute a closed system except for venting and draining means to be described.

The main float chamber 2 is connected to the bottom of the vacuum chamber 4 by means of the port 10 at the top of the chamber 2, this port being controlled by the upwardly seating valve 11 mounted on the stem 12 carried by the float 13 arranged within the float chamber 2 for vertical movement therein, being guided at its lower end by the guide stem 14 engaging the spider 15 and at its upper end by the stem 12 which is arranged through a guide opening 16 so that the valve is seated by the accumulation or entry of a suitable volume of water in the float chamber 2.

A float 17 is arranged in the auxiliary float chamber and carries a stem 18 for the upwardly seating valve 19 coacting with the port 20. This float 17 is provided with a guide stem 141 at its lower end coacting with the spider 151 at its upper end with a guide opening 161 corresponding to that previously described for the main float and designated 16.

A vertical passage 21 opens from the bottom of the vacuum chamber and into the bottom of the auxiliary float chamber through the lateral opening 22. This passage is formed in the main body casting between the main and auxiliary float chambers. At its lower end, the passage 21 is provided with a combined venting and drain port 23 controlled by the valve 24 which is exposed on its outer side to atmospheric pressure. The stem 25 of this valve extends through the passage 21 and through an opening 26 at the top of the vacuum chamber and into a coupling element 27 carried by a bellows type of pressure responsive element 28.

This thimble-like coupling member is mounted at its outer end on the outer movable end of the bellows element 28, its inner or lower end being spaced above the partition 29 between the vacuum chamber 4 and the chamber 5. The lower end of bellows 28 is secured to partition 29 and the bellows is interiorly in communication with the vacuum chamber through the opening 26 in the partition.

At its upper end, the valve stem 25 is provided with a head 30 which is engaged by the thrust spring 31, the outer end of this spring being in engagement with the threaded plug 32,

Head 30 is restrained from downward movement relative to coupling member 27. Chamber 5 is connected by a passage 33 to the top of the main float chamber 2 at the outside of the pressure responsive element or bellows 28.

A relief valve 34 controls the relief port 35 which connects the vacuum chamber 4 with the top of the main float chamber 2. This valve is retained by a cage 36.

In normal position, or position of rest, the movable parts are positioned as shown in Fig. 1. When the engine or other vacuum means is started or turned on, the vacuum is communicated through the pipe 8 and the port 20 to the auxiliary chamber 3 and through to the connections 21 and 22 with the vacuum chamber 4 and from the vacuum chamber through the port 10 to the main float chamber 2. Since this chamber 2 is connected to the pipe 6, the air is drawn out of the pump and when it is exhausted, liquid is drawn into the main float chamber, gradually filling the same and causing the main float to rise and close the port 10.

So long as the liquid does not completely fill chamber 2 to the point of seating valve 11 the vacuum therein which is the same as that in chambers 4 and 5 is communicated to bellows enclosing chamber 5 externally of the bellows by passage 33, hence the same amount of vacuum exists externally and internally of the bellows. However, when the liquid fills chamber 2 sufficiently to cause valve 11 to close, the communication of passage 33 with vacuum chamber 4 is interrupted with the result that the vacuum inside the bellows increases over that externally of the bellows, which is cut off from the engine source by closing of valve 11, causing the bellows to collapse downwardly.

If the valve actuating rod or stem 25 were rigidly connected to valve 24 it would result in an undesirable "balanced" operation as follows. Inasmuch as the valve 24 is subject to the same vacuum as the pressure responsive bellows the tendency would be for valve 24 to remain in practically closing relation to port 23, fluttering thereagainst as the bellows first thrust the valve down and then returning upwardly under the influence of the spring of the bellows when the vacuum is diminished in vacuum chamber 4. This would not satisfactorily open fully port 23 to atmospheric pressure, hence I have incorporated a lost motion connection between the bellows 28 and stem 25 including the coil compression spring 31. With this structure, when bellows 28 is initially compressed as described above by the greater vacuum effective on its interior, the stem 25 is not at first shifted downwardly, valve 24 being maintained against port 23 by the vacuum effective thereon. However, after predetermined movement of the bellows the resistance of spring 31 is overcome, with the result that stem 25 is snapped downwardly abruptly by the spring with sufficient force and to a sufficient extent to fully open up port 23, without the aforesaid balanced condition of the valve which results in unsatisfactory operation.

When valve 24 is opened in the foregoing manner it communicates vacuum chamber 4 with the atmospheric pressure, with the result that the check or relief valve 34 is raised from port 35 by reason of the existing suspension of liquid in chamber 2. This in turn vents the top of this chamber with atmosphere and allows the liquid therein to quickly fall in or drain from the chamber.

It will be appreciated from the foregoing that passage 33 is a pressure equalizing link between chambers 2 and 5 for preventing pressure actuation of the bellows and consequent actuation of drain valve 24 until float chamber 2 comes to the point of actuating the valve 11 at which time the operation of drain valve 24 takes place to drain any liquid from the vacuum chamber which may have accumulated therein. Coacting with this arrangement is the relief valve 34 and port 35 to simultaneously restore the parts to initial condition for succeeding operations.

The valve 19 and its actuating float in the auxiliary float chamber are in effect safety means as in the event float 13 should be collapsed or become inoperative water would be drawn through the vacuum chamber 4 and into the auxiliary float chamber, the float chamber and the float 17 actuated to close the valve and thus prevent water being drawn into the engine manifold. Float 17 is not subject to severe rushes or impacts of water and this float and its valve serve as an effective safety means guarding the source of vacuum.

My improved priming device is very rapid and efficient in its operation and the parts thereof are not likely to become injured or inoperative. However, as stated, should the float 13 be injured or become ineffective for any reason to close the valve 11, the float 17 controlling the valve 19 serves as a safety means.

The primer is automatically self-vented and drained and is entirely automatic in its operation.

The embodiment of my invention illustrated and described is highly desirable on account of compactness and structural simplicity. Further, the parts are very simple and economical and are arranged so that none of them are likely to become damaged or inoperative. I am aware, however, that other embodiments within the scope of the invention will suggest themselves to those skilled in the art. It should be understood that the foregoing terminology is only used descriptively rather than in a limiting sense and with the full intent to include equivalents of the features shown and described within the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a priming device the combination of a main float chamber and an auxiliary float chamber disposed in side by side relation, the main float chamber being adapted for connection at the bottom thereof with a pump to be primed, the auxiliary float chamber having a vacuum port at the top thereof adapted for connection to a vacuum source, a vacuum chamber disposed in elevated position relative to said main float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating the bottom of said vacuum chamber with the bottom of said auxiliary float chamber for normal communication of said vacuum source with the vacuum chamber through said vacuum port, auxiliary float chamber and passage, said passage having a drain port at the lower end thereof, a main float arranged in said main float chamber having an upwardly seating valve coacting with said main chamber port, an auxiliary float in said auxiliary chamber provided with an upwardly seating valve coacting with said vacuum port, pressure responsive vent-

ing means connecting said vacuum chamber to the top of said main float chamber, including a pressure relief valve subject to pressures in the vacuum and main float chambers, a hollow expansible and contractible element responsive to difference in pressures on opposite sides thereof, a chamber therefor disposed in elevated relation to said vacuum chamber, there being a passage connecting said element enclosing chamber externally and on one side of said element with the top of said main float chamber, the element being internally and on the other side thereof in communication with and subject to the vacuum chamber, and the exterior of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and main float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the main float valve closes said main float chamber port, whereby the vacuum chamber vacuum effective interiorly of said element increases above that exteriorly thereof, and an upwardly seating valve coacting with said drain port and having a lost motion spring actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere, said relief valve being actuated thereby to equalize the pressures on either side thereof and enable restoration of said main float valve to original condition out of seating engagement with said main chamber port.

2. In a priming device the combination of a main float chamber and an auxiliary float chamber, the main float chamber being adapted for connection with a pump to be primed, the auxiliary float chamber having a vacuum port adapted for connection to a vacuum source, a vacuum chamber disposed in elevated position relative to said main float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating said vacuum chamber with said auxiliary float chamber for normal communication of said vacuum source with the vacuum chamber through said vacuum port, auxiliary float chamber and passage, said passage having a drain port, a main float arranged in said main float chamber having an upwardly seating valve coacting with said main chamber port, an auxiliary float in said auxiliary chamber provided with an upwardly seating valve coacting with said vacuum port, pressure responsive venting means connecting said vacuum chamber to the top of said main float chamber, including a pressure relief valve subject to pressures in the vacuum and main float chambers, a hollow expansible and contractible element responsive to difference in pressures on opposite sides thereof, a chamber therefor, there being a passage connecting said element enclosing chamber externally and on one side of said element with the top of said main float chamber, the element being internally and on the other side thereof in communication with and subject to the vacuum in said vacuum chamber, and the exterior of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and main float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the main float valve closes said main float chamber port, whereby the vacuum chamber vacuum effective interiorly of said element increases above that exteriorly thereof and a valve coacting with said drain port and having a lost motion spring actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere, said relief valve being actuated thereby to equalize the pressures on either side thereof and enable restoration of said main float valve to original condition out of seating engagement with said main chamber port.

3. In a priming device the combination of a main float chamber and an auxiliary float chamber, the main float chamber being adapted for connection with a pump to be primed, the auxiliary float chamber having a vacuum port adapted for connection to a vacuum source, a vacuum chamber adjacent said main float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating said vacuum chamber with said auxiliary float chamber for normal communication of said vacuum source with the vacuum chamber through said vacuum port, auxiliary float chamber and passage, said passage having a drain port, a main float arranged in said main float chamber having a valve coacting with said main chamber port, an auxiliary float in said auxiliary chamber provided with a valve coacting with said vacuum port, pressure responsive venting means connecting said vacuum chamber to the top of said main float chamber, including a pressure relief valve subject to pressures in the vacuum and main float chambers, a hollow expansible and contractible element responsive to difference in pressures on opposite sides thereof, a chamber therefor, there being a passage connecting said element enclosing chamber externally and on one side of said element with the top of said main float chamber, the element being internally and on the other side thereof in communication with and subject to the vacuum in said vacuum chamber, and the exterior of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and main float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the main float valve closes said main float chamber port, whereby the vacuum chamber vacuum effective interiorly of said element increases above that exteriorly thereof, and a valve coacting with said drain port and having an actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere, said relief valve being actuated thereby to equalize the pressures on either side thereof and enable restoration of said main float valve to original condition out of seating engagement with said main chamber port.

4. In a priming device the combination of a float chamber adapted for connection with a pump to be primed, a vacuum source, a vacuum chamber adjacent said float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating said vacuum chamber with said vacuum source, said passage having a drain port, a float arranged in said float chamber having a valve coacting with said chamber port, pressure responsive venting means connecting said vacuum chamber to the top of said float chamber, including a pressure relief valve sub-

ject to pressures in the vacuum and float chambers, a hollow expansible and contractible element responsive to difference in pressures on opposite sides thereof, a chamber therefor, there being a passage connecting said element enclosing chamber externally and on one side of said element with the top of said float chamber, the element being on the other side thereof in communication with and subject to the vacuum in said vacuum chamber, and the exterior of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the float valve closes said float chamber port, whereby the vacuum chamber vacuum effective interiorly of said element increases above that exteriorly thereof, and a valve coacting with said drain port and having an actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere, said relief valve being actuated thereby to equalize the pressures on either side thereof and enable restoration of said float valve to original condition out of seating engagement with said chamber port.

5. In a priming device the combination of a float chamber adapted for connection with a pump to be primed, a vacuum source, a vacuum chamber adjacent said float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating said vacuum chamber with said vacuum source, said passage having a drain port, a float arranged in said float chamber having a valve coacting with said chamber port, pressure responsive venting means connecting said vacuum chamber to the top of said float chamber, including a pressure relief valve subject to pressures in the vacuum and float chambers, an element responsive to difference in pressures on opposite sides thereof, a chamber therefor, there being a passage connecting said element enclosing chamber on one side of said element with the top of said float chamber, the element being on the other side thereof in communication with and subject to the vacuum in said vacuum chamber, and said one side of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the float valve closes said float chamber port, whereby the vacuum chamber vacuum effective on said other side of said element increases above that on said other side thereof, and a valve coacting with said drain port and having an actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere, said relief valve being actuated thereby to equalize the pressures on either side thereof and enable restoration of said float valve to original condition out of seating arrangement with said chamber port.

6. In a priming device the combination of a float chamber adapted for connection with a pump to be primed, a vacuum source, a vacuum chamber adjacent said float chamber, the latter having a port at the top thereof communicating the same with said vacuum chamber, there being a passage communicating said vacuum chamber with said vacuum source, said passage having a drain port, a float arranged in said float chamber having a valve coacting with said chamber port, an element responsive to difference in pressures on opposite sides thereof, a chamber therefor, there being a passage connecting said element enclosing chamber on one side of said element with the top of said float chamber, the element being on the other side thereof in communication with and subject to the vacuum in said vacuum chamber, and said one side of said element being likewise subject to the vacuum in said vacuum chamber through said last named passage and float chamber port when said port is open, to equalize the pressure on opposite sides of the element, said equality of pressure being terminated when the float valve closes said float chamber port, whereby the vacuum chamber vacuum effective on said other side of said element increases above that on said other side thereof, and a valve coacting with said drain port and having an actuating connection to said pressure responsive element for actuation thereby to open said drain port and expose said vacuum chamber to atmosphere said float chamber being provided with a relief valve to relieve the liquid suspension therein.

7. In a priming device, the combination of a float chamber adapted for connection with a pump to be primed, a vacuum chamber, said float chamber communicating with said vacuum chamber, a valve controlling the communication between said chambers, a vent valve for said vacuum chamber, a float arranged within said float chamber and operatively connected with said first named valve, a relief valve connection for said vacuum chamber to said float chamber, a pressure responsive element responsive to differential in pressure at opposite sides thereof, a chamber for said element, said element being in operative communication at one side with said vacuum chamber, there being an equalizing passage for said element chamber opening thereto at the other side of the element and to said float chamber, and operating connections for said vent valve to said pressure responsive element, said vent valve being subject to atmospheric pressure acting to open the same, said connection to said pressure responsive element including a thrust spring providing a lost motion operating connection for said pressure responsive element to said vent valve.

8. In a priming device, the combination of a float chamber adapted for communication with a pump to be primed, a vacuum chamber, said float chamber communicating with said vacuum chamber, a valve controlling the communication between said chambers a vent valve for said vacuum chamber, a float arranged within said float chamber and operatively connected with said first named valve, said float chamber having a relief valve for equalizing the pressure therein with that of the vacuum chamber when the latter is vented by said vent valve, a pressure responsive element responsive to differential in pressure at opposite sides thereof, a chamber for said element, said element being in operative communication at one side with said vacuum chamber, there being an equalizing passage for said element chamber opening thereto at the other side of the element and to said float chamber, and operating connections for said vent valve to said pressure responsive element, said vent valve being subject to atmospheric pressure acting to open the same.

9. In a priming device, the combination of a float chamber adapted for connection with a pump to be primed, a vacuum chamber, said float communicating with said vacuum chamber, a valve controlling the communication between said chambers a vent valve for said vacuum chamber, a float arranged within said float chamber and operatively connected with said first named valve, a relief valve connection for said vacuum chamber to said float chamber, a pressure responsive element, a chamber for said element, said element being in operative communication with said vacuum chamber, there being an equalizing passage for said element chamber opening thereto at the outside of the element and to said float chamber, and operating connections for said vent valve to said pressure responsive element.

10. In a priming device, the combination of a float chamber adapted for connection with a pump to be primed, a vacuum chamber, said float chamber having a valved connection with said vacuum chamber, a vent valve for said vacuum chamber, said float chamber having a relief valve for relieving vacuum condition therein when the vacuum chamber is vented, a float arranged within said float chamber and operatively connected with said valve, a pressure responsive element, a chamber for said element, said element being in operative communication with said vacuum chamber, there being an equalizing passage for said element chamber opening thereto at the outside of the element and to said float chamber, and operating connections for said vent valve to said pressure responsive element.

11. In a priming device, the combination of a float chamber, and a vacuum chamber, a float controlled valved connection for said float chamber to said vacuum chamber, the float thereof being arranged in said float chamber, a vent valve for venting said vacuum chamber to the atmosphere, said float chamber having a relief valve for relieving vacuum condition therein when said vacuum chamber is vented, vacuum means connected to said vacuum chamber, there being a float controlled safety valve in said vacuum means connection, and a pressure responsive element operatively associated with said vacuum chamber and with said vent valve therefor, said vent valve also constituting a drain valve for said vacuum chamber.

12. In a priming device, the combination of a float chamber, and a vacuum chamber, a float controlled valved connection for said float chamber to said vacuum chamber, the float thereof being arranged in said float chamber, a vent valve for venting said vacuum chamber to the atmosphere, said float chamber having a relief valve for relieving vacuum condition therein when said vacuum chamber is vented, vacuum means connected to said vacuum chamber, and a pressure responsive element operatively associated with said vacuum chamber and with said vent valve therefor.

13. In a priming device, the combination of a float chamber, and a vacuum chamber, a float controlled valved connection for said float chamber to said vacuum chamber, the float being arranged in said float chamber, a vent valve venting said vacuum chamber, vacuum means connected to said vacuum chamber, a pressure responsive element operatively associated with said vacuum chamber and with said vent valve therefor, and a relief valve connection for said vacuum and float chambers.

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