

June 13, 1939.

J. L. DEAN ET AL

2,162,247

PUMPING APPARATUS

Filed Oct. 23, 1937

4 Sheets-Sheet 1

Fig. 2.

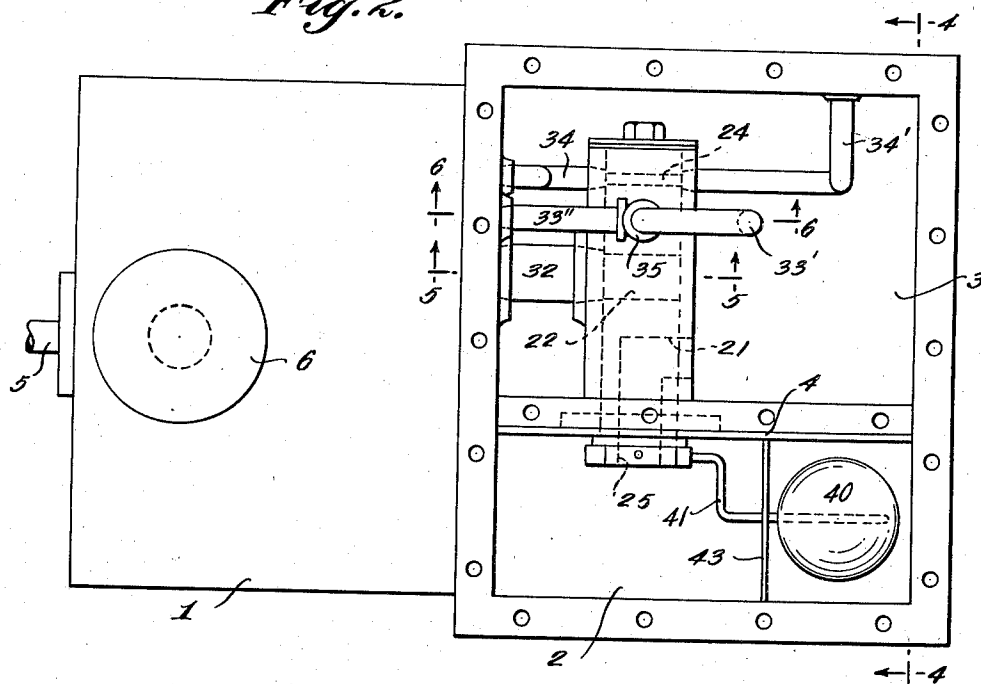
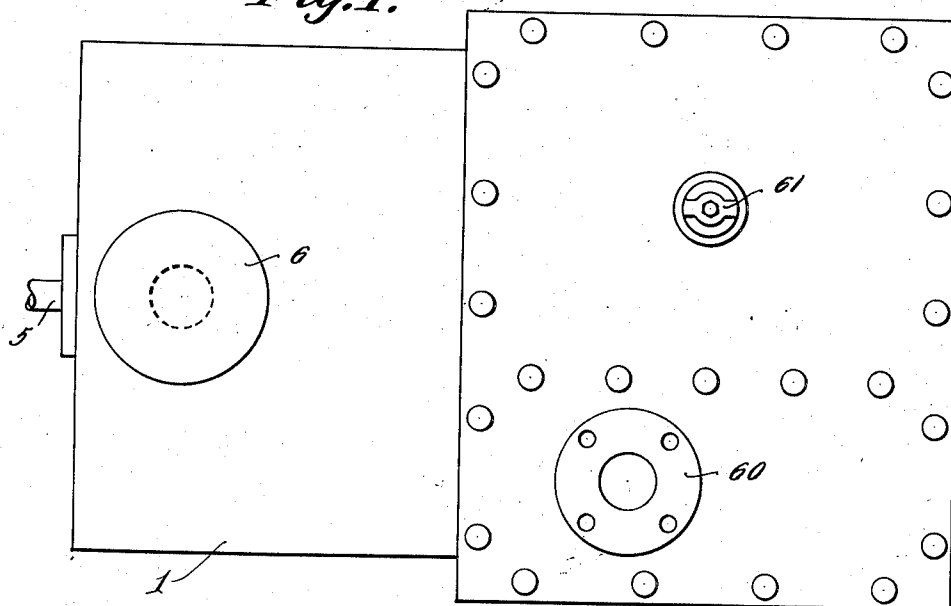


Fig. 1.



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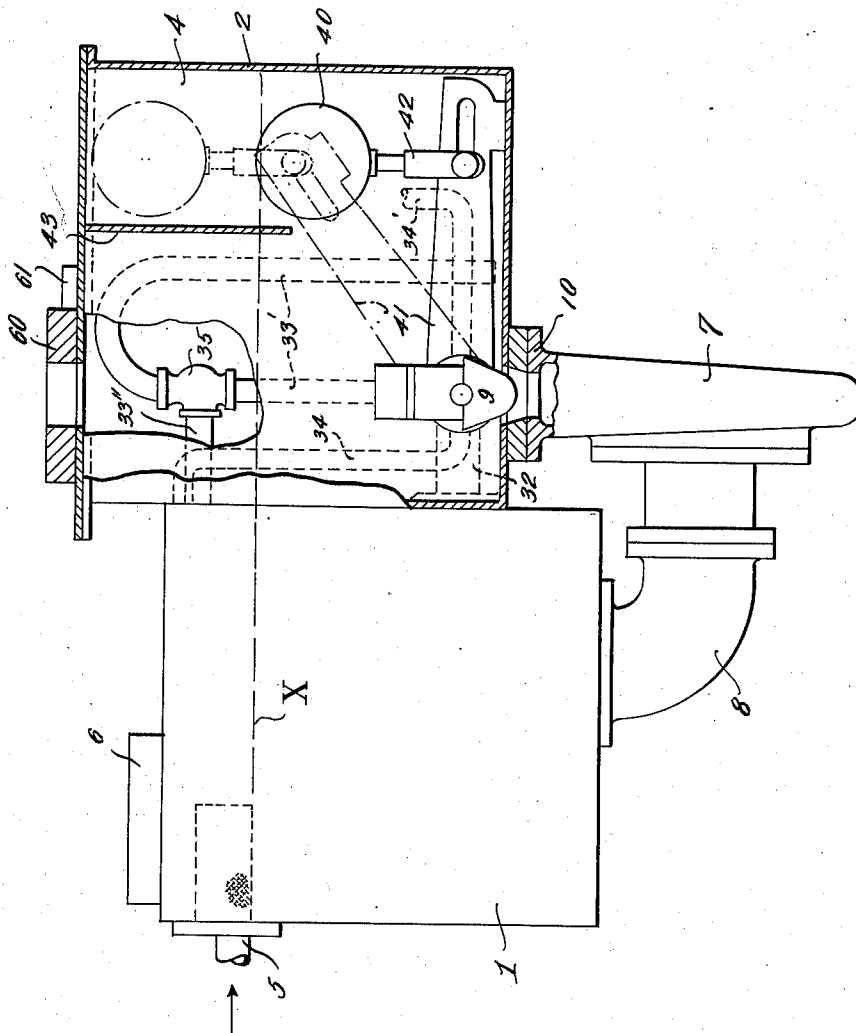
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4 Sheets-Sheet 2

Fig. 3.



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4 Sheets-Sheet 3

Fig. 4.

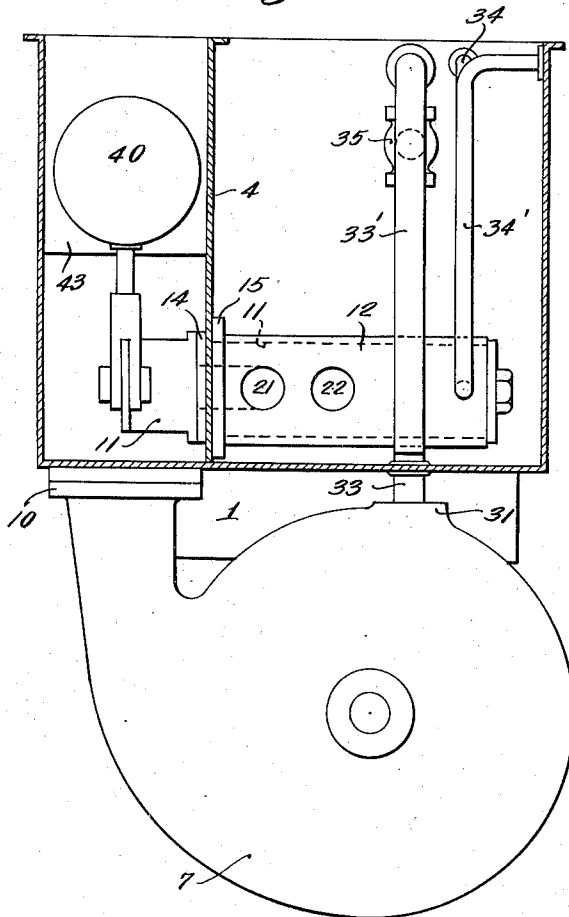


Fig. 6.

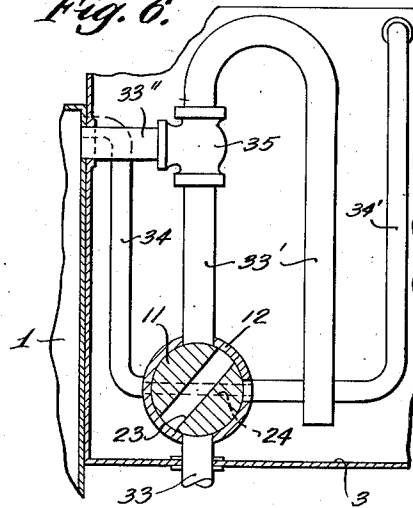
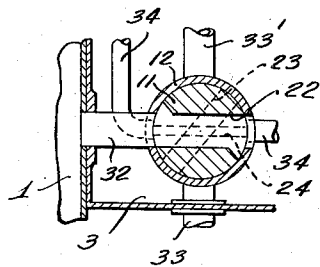


Fig. 5.



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4 Sheets-Sheet 4

Fig. 7.

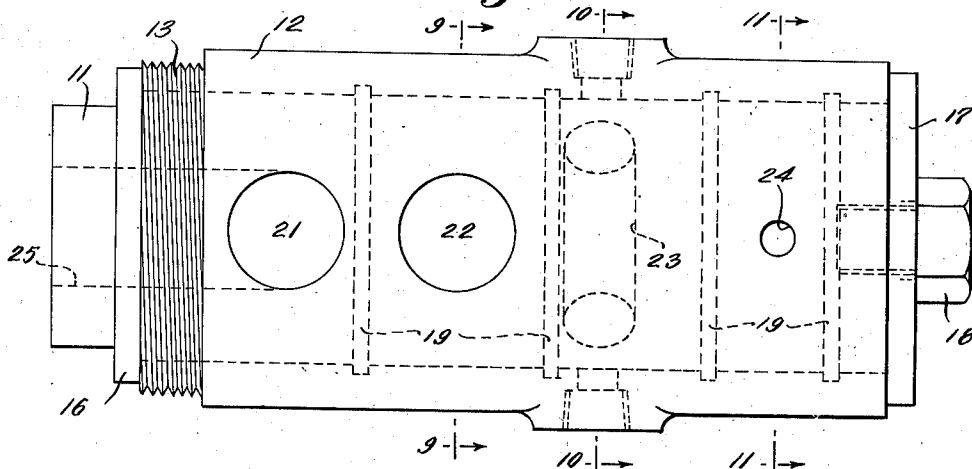


Fig. 8.

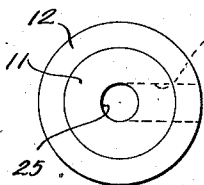


Fig. 9.

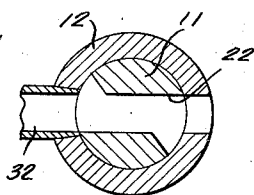


Fig. 10.

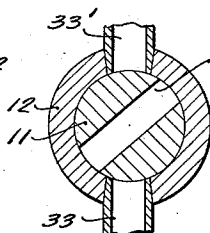


Fig. 11.

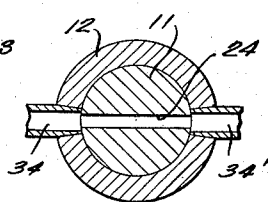


Fig. 12.

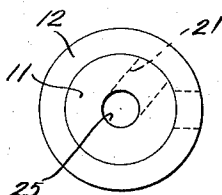


Fig. 13.

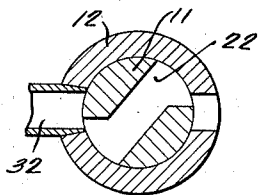


Fig. 14.

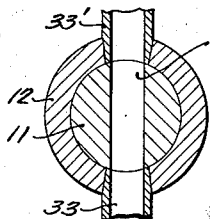
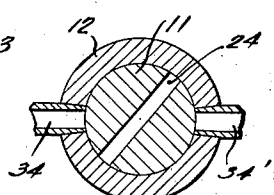


Fig. 15.



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UNITED STATES PATENT OFFICE

2,162,247

PUMPING APPARATUS

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of Massachusetts

Application October 23, 1937, Serial No. 170,516

12 Claims. (Cl. 103—113)

This invention relates to means for priming pumps, particularly pumps of the centrifugal type where the water (or other liquid) escapes from the suction pipe (or hose) when the pump stops. To start such a pump it is necessary to refill the suction pipe with water. For this purpose it has been proposed to employ a storage tank having sufficient capacity to refill the suction pipe, but where the pipe is long this method involves a tank of excessive dimensions, especially for portable apparatus.

Objects of the present invention are automatically to effect quick and reliable priming, with apparatus which is compact and if desired readily portable, and without a large storage tank or tanks superposed one above another or check valves, and generally to improve the art to which the invention relates.

In one aspect the invention involves a priming tank on the inlet side of the pump and means for recirculating liquid from the pump through the priming tank back to the pump, with an aspirator or other air pump operated by the recirculated liquid, the air inlet to the aspirator communicating with the upper portion of the priming tank to draw air out of the suction pipe during recirculation of water, thereby to refill the suction pipe with water. The apparatus also preferably comprises means for automatically controlling the recirculation of water, either completely stopping the recirculation after the pump is primed or reducing the circulation until it is approximately sufficient to remove the small amount of air which continually tends to accumulate in the upper portion of the priming tank during normal operation of the apparatus.

In another aspect of the invention the apparatus comprises means for venting the priming tank when the pump stops, thereby to prevent the water from siphoning from the priming tank through the suction pipe, together with one or more storage tanks to insure that the priming tank and pump are left substantially full of water after all of the water in the suction pipe has escaped.

In the preferred embodiment of the invention two storage tanks are employed, the first comprising a portion of the outlet or discharge conduit leading from the pump and the second being located intermediate the first storage tank and the priming tank and forming a part of the bypass or recirculation conduit. The first storage chamber also preferably serves as a float chamber for a float controlling valve for the various conduits through the apparatus.

For the purpose of illustration a preferred embodiment of the invention is illustrated in the accompanying drawings in which:

Fig. 1 is a top plan view;

Fig. 2 is a top plan view with the cover removed;

Fig. 3 is a front elevation with parts broken away;

Fig. 4 is an end elevation with parts in section;

Fig. 5 is a section on line 5—5 of Fig. 2;

Fig. 6 is a section on line 6—6 of Fig. 2;

Fig. 7 is a side elevation of the valve viewed from the right-hand side of Figs. 2, 3, 5 and 6;

Figs. 8 to 11 show the valve in idle position, Fig. 8 being a left end elevation, Fig. 9 being a section on line 9—9, Fig. 10 being a section on line 10—10, and Fig. 11 being a section on line 11—11 of Fig. 7; and

Figs. 12 to 15 are corresponding views of the valve in normal running position.

The particular embodiment of the invention chosen for the purpose of illustration comprises a priming tank 1, a first storage tank 2 which serves as an outlet or discharge chamber and as a float chamber, and a second storage tank 3 which also serves as a valve chamber and as a portion of the recirculation conduit. The chambers 2 and 3 are formed in a single casing with a partition 4 therebetween completely to separate the two chambers from each other except for a valve passage hereinafter described. As shown in Fig. 3 the priming tank 1 is at approximately the same elevation as the tanks 2 and 3 but is downwardly offset so that the tanks 2 and 3 extend somewhat above the tank 1. The suction pipe 5 enters the priming tank at the left-hand side near the top, and in its top the priming tank is provided with a clean-out opening closed by cover 6. The pump 7 is connected on its inlet side to the bottom of the priming tank through a pipe 8 and on its outlet side to the bottom of the outlet or storage chamber 2. A conical deflector 9 is fixedly mounted over the outlet 10 of the pump to deflect the water entering the tank 2. The top of tank 2 is provided with an outlet 45 coupling 60 and the top of tank 3 is provided with a valve 61 which permits the escape of air but not water.

Near the bottom of the chamber 3 is a valve comprising a rotary portion 11 and a fixed tubular casing 12 having a threaded portion 13 of reduced diameter which extends through the partition 4, the casing being mounted on this partition by means of nuts 14 and 15 (Fig. 4) threaded on the reduced portion 13. At the left-

hand end (Fig. 7) the valve 11 projects from the casing and is provided with an angular flange 16 seating against the end of the casing. At the right-hand end the valve 11 carries a ring 17 which overlaps the casing and is secured to the valve by means of a machine screw 18. The inner periphery of the casing 12 is provided with annular grooves 19 which are filled with felt or other suitable packing material.

The valve 11 is provided with passageways 21, 22, 23 and 24. As shown in Figs. 2 and 7 the passageway 21 is L-shaped, the end 25 extending through the end of the valve and the other end extending radially to the periphery of the valve. The passageways 22 and 24 are straight and their axes are parallel to the axis of the radial portion of passageway 21. The passageway 23 is also straight but in its idle position (Fig. 10) its axis is inclined to the vertical by an angle approximately equal to the extent of rotation of the valve 11 (approximately 50° in the illustration). As shown in Figs. 9 and 13 the passage 22 is shaped and/or disposed so that in the normal operating position (Fig. 13) the passageway is not entirely closed.

The axial end of the passageway 21 communicates with the chamber 2 and the radial portion communicates with the chamber 3. One end of the passageway 22 also communicates with the chamber 3, the other end communicating with the priming tank 1 through a pipe 32. In the operating position the lower end of the passageway 23 communicates with an auxiliary outlet 31 of the pump through a pipe 33 and the upper end of the passageway communicates with chamber 3 through a pipe 33' which extends almost to the top of chamber 3 and then turns through 180° with its free end terminating near the bottom of the chamber. Connected in the pipe 33' is an aspirator 35 having an air inlet which communicates with the upper portion of the priming tank through a pipe 33''. In the idle position the passageway 24 communicates at its left-hand end with the upper portion of the priming chamber through a pipe 34 and at its right-hand end with the atmosphere through a pipe 34' extending through the chamber 3.

The valve 11 is actuated by a float 40 in chamber 2, the float being connected with the valve by means of a crank-arm 41 and a link 42 having a pin and slot connection with the crank-arm. The float is shielded from water agitation in chamber 2 by means of a partition 43 extending from the top of the chamber part way toward the bottom of the chamber.

When the pump is idle the water stands in each of the chambers 1, 2 and 3 at the level X (Fig. 3), chambers 1 and 2 communicate through pump 1, chambers 2 and 3 communicate through valve passage 21 and chambers 3 and 1 communicate through valve passage 22. When the pump is started water is pumped from chamber 1 to chamber 2, causing float 40 to rise, the excess water recirculating through valve passages 21 and 22 back to the priming tank. As the valve rises the vent pipe 34—34' to the top of the priming tank is closed at 24 and the aspirator pipe 33—33' is opened at 23 to cause air to be pumped from the top of the priming tank 1 to the bottom of storage tank 3, whence it bubbles upwards through the tank to the air discharge valve 61. As air is drawn from the suction pipe 5 to the priming tank it is removed by the aspirator until the apparatus is operating normally; and thereafter the function of the aspirator is merely

to remove the relatively small amount of air which continually tends to accumulate in the top of the priming tank. When the apparatus arrives at normal operating condition, or shortly thereafter, the float reaches its uppermost position, the passageway 21 from chamber 2 to chamber 3 is completely closed and the passageway 22 from chamber 3 to chamber 1 is almost closed, leaving an opening only approximately large enough to permit egress of the water flowing through the aspirator to chamber 3. In the normal running operation of the apparatus the chambers 2 and 3 are substantially full of water.

When the pump is stopped the weight of the water in the suction pipe 5 tends to syphon the water backwards out of the apparatus. The loss of water from the priming tank is replenished by water flowing through the pump from the float chamber. As water escapes from the float chamber the float drops, opening vent 34—34' at valve 24 to break the vacuum in the priming tank, thereby stopping the syphoning action. The actuation of valve 11 also opens the passageways 21 and 22 to permit water to flow from storage chamber 3 to the float chamber 2 and to the priming chamber 1. Thus tank 2 serves as a storage chamber to replenish the priming tank until the syphon is broken and the storage chamber 3 then replenishes both chambers 1 and 2, leaving the water level at X (Fig. 3).

From the foregoing it will be evident that instead of having to store a body of water equal to or greater than the capacity of the suction pipe 5 the size of the apparatus is greatly reduced by recirculating the stored water while air is being pumped out of the suction pipe by the recirculating water passing through the aspirator. The apparatus is also rendered more readily portable by virtue of the arrangement of the chambers at approximately the same elevation instead of in superposed relationship. Another practical advantage consists in that no check valves are required.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

We claim:

1. Pumping apparatus comprising a pump, a priming tank, first and second storage tanks, connections from the priming tank to the pump, thence to the first and second storage tanks, a by-pass conduit for recirculating liquid from the outlet side of the pump back to the priming tank when the pump starts pumping, means for automatically venting the priming tank when the pump stops pumping, and means for automatically returning liquid from said second tank to said first tank and to the priming tank after the latter is vented by said venting means.

2. Pumping apparatus comprising a pump, a priming tank, first and second storage tanks, said tanks being located at approximately the same elevation, connections from the priming tank to the pump, thence to the first and second storage tanks, a by-pass conduit for recirculating liquid from the outlet side of the pump back to the priming tank when the pump starts pumping, means for automatically venting the priming tank when the pump stops pumping, and means for automatically returning liquid from said second tank to said first tank and to the priming tank after the latter is vented by said venting means.

3. Pumping apparatus comprising a pump, a

priming tank, first and second storage tanks, said tanks being located at approximately the same location but at least one of the storage tanks projecting above the priming tank, connections from the priming tank to the pump, thence to the first and second storage tanks, a by-pass conduit for recirculating liquid from the outlet side of the pump back to the priming tank when the pump starts pumping, means for automatically venting the priming tank when the pump stops pumping, and means for automatically returning liquid from said second tank to said first tank and to the priming tank after the latter is vented by said venting means.

4. Pumping apparatus comprising a pump having inlet and outlet conduits including a priming tank and a storage tank respectively, a by-pass conduit from the storage tank to the priming tank, an auxiliary conduit for conducting a part of the water propelled by said pump, an aspirator in the auxiliary outlet for drawing air from the priming tank, and automatic means for opening the by-pass conduit and closing the auxiliary conduit when the pump stops pumping.

5. Pumping apparatus comprising a pump having inlet and outlet conduits including a priming tank and a storage tank respectively, a by-pass conduit from the storage tank to the priming tank, an auxiliary conduit for a portion of the pumped liquid, an aspirator in the auxiliary conduit, an evacuating conduit from the upper portion of the priming tank to the aspirator through which air is drawn from the priming tank by the aspirator, a vent conduit for the priming tank, valves for said by-pass and auxiliary and vent conduits, and a float responsive to the liquid level in said storage tank and connected to operate all of said valves.

6. Pumping apparatus comprising a pump having inlet and outlet conduits including a priming tank and a storage tank respectively, a by-pass conduit from the storage tank to the priming tank, an auxiliary conduit for a portion of the pumped liquid, an aspirator in the auxiliary conduit, an evacuating conduit from the upper portion of the priming tank to the aspirator through which air is drawn from the priming tank by the aspirator, a vent conduit for the priming tank, and means for automatically opening the auxiliary conduit, throttling the by-pass conduit and closing the vent conduit when the pump starts pumping.

7. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, first and second storage tanks on the outlet side of the pump, a conduit between said storage tanks, a conduit between said second tank and said priming tank, a valve in each of said conduits, and means for automatically opening said valves when the pump stops.

8. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, first

and second storage tanks on the outlet side of the pump, a conduit between said storage tanks, a conduit between said second tank and said priming tank, a valve in each of said conduits, and means including a float in said first tank for automatically opening said valves when the pump stops.

9. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, a discharge chamber on the outlet side of the pump, a storage chamber, a conduit between the discharge chamber and storage chamber, a conduit between the storage chamber and the priming chamber, a conduit for venting the priming tank, a valve in each of said conduits, and means for automatically moving each of said valves toward closed position in response to normal operation of the pump.

10. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, a discharge chamber on the outlet side of the pump, a storage chamber, a conduit between the discharge chamber and storage chamber, a conduit between the storage chamber and the priming chamber, an auxiliary conduit through which liquid is pumped by said pump, an aspirator in said auxiliary conduit, an evacuating conduit from the upper portion of the priming tank to the aspirator through which air is drawn from the priming tank by the aspirator, a vent conduit for venting the priming tank, a valve in each of said conduits, the valve in the auxiliary conduit being normally closed, and means for actuating the valves in response to operation of the pump.

11. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, a discharge chamber on the outlet side of the pump, a storage chamber, a conduit between the discharge chamber and storage chamber, a conduit between the storage chamber and the priming chamber, a conduit for venting the priming tank, a valve having a passageway for each of said conduits, and means responsive to normal operation of the pump for actuating said valve.

12. Pumping apparatus comprising a pump, a priming tank on the inlet side of the pump, a discharge chamber on the outlet side of the pump, a storage chamber, a conduit between the discharge chamber and storage chamber, a conduit between the storage chamber and the priming chamber, an auxiliary conduit through which liquid is pumped by said pump, an aspirator in said auxiliary conduit, an evacuating conduit from the upper portion of the priming tank to the aspirator through which air is drawn from the priming tank by the aspirator, a vent conduit for venting the priming tank, a valve having a passageway for each of said conduits, and means responsive to normal operation of the pump for actuating said valve.

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