

Dec. 9, 1924.

1,518,890

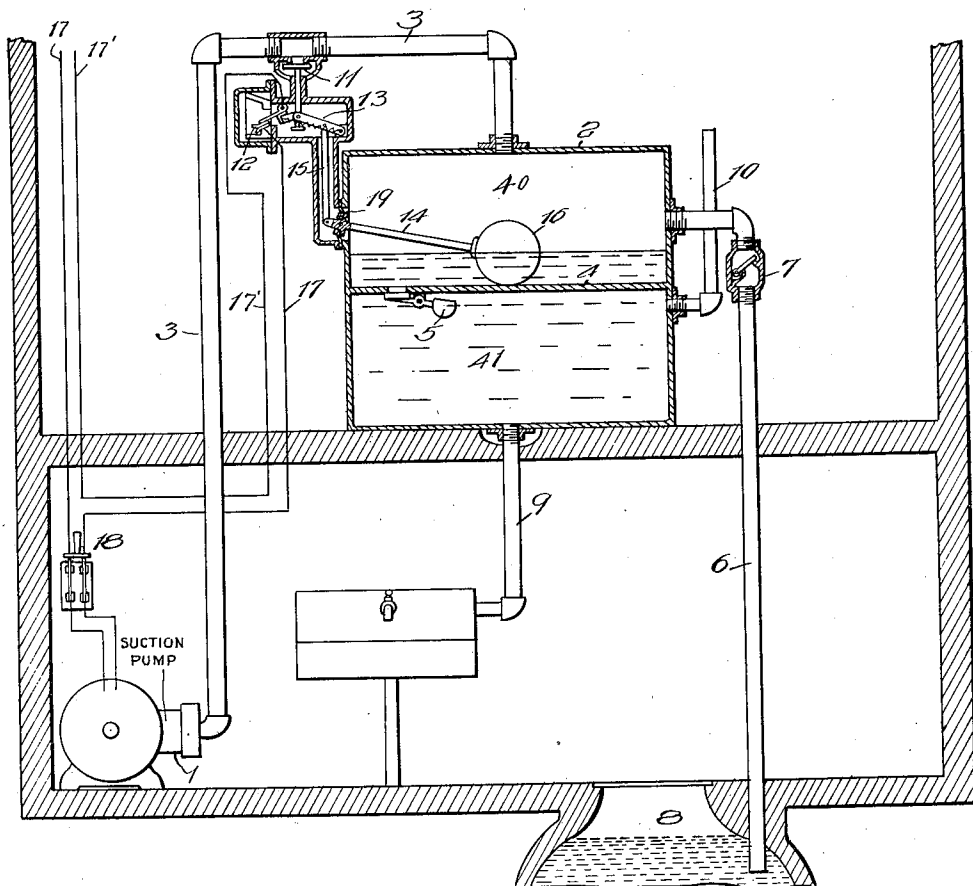
B. S. AIKMAN

PUMPING SYSTEM

Filed March 12, 1921

2 Sheets-Sheet 1

Fig. 1.



Witnesses:

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2 Sheets-Sheet 2

Fig. 2.

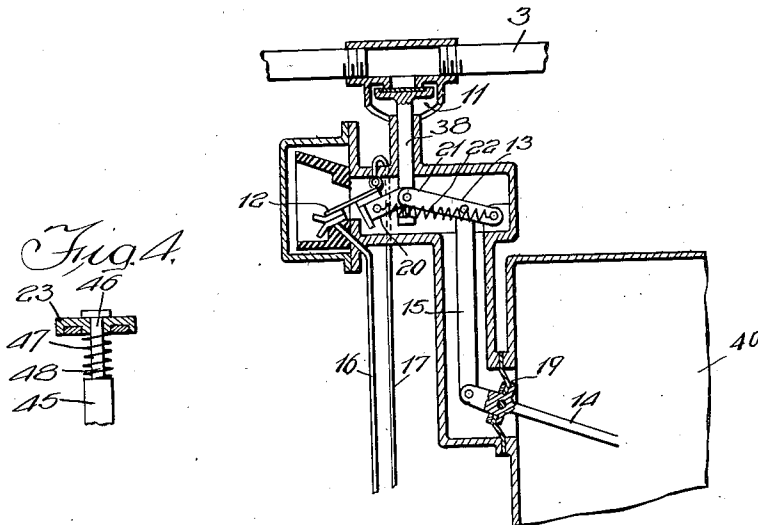


Fig. 4.

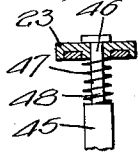
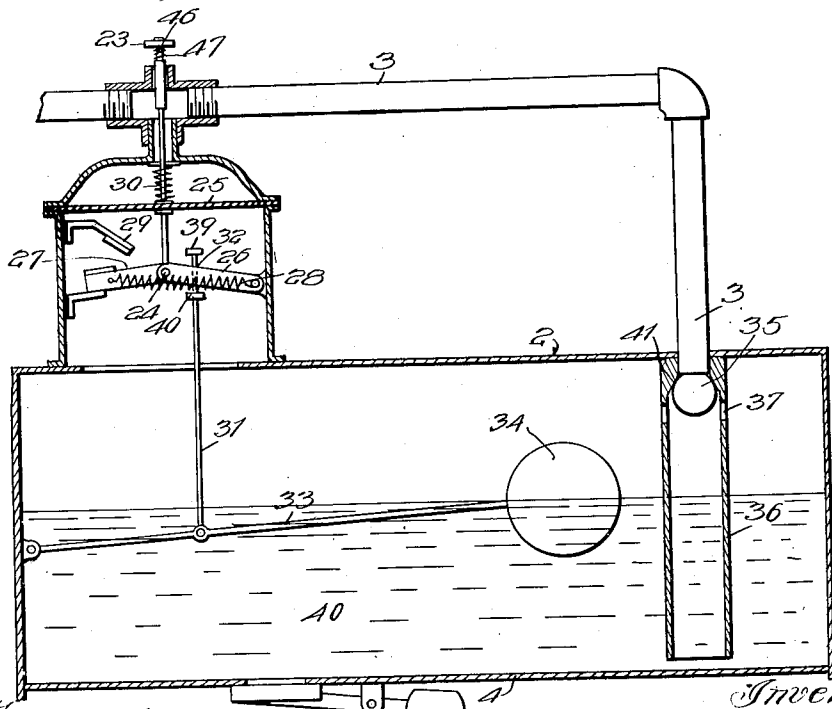


Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

BURTON S. AIKMAN, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO NATIONAL BRAKE & ELECTRIC COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

PUMPING SYSTEM.

Application filed March 12, 1921. Serial No. 451,713.

To all whom it may concern:

Be it known that I, BURTON S. AIKMAN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Pumping Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to pumping systems of the suction pump type which discharge directly to a supply tank connected to the consumption system of a residence or the like.

The main object of my invention is to provide a pumping system which automatically operates to keep a supply of liquid in the supply tank between certain upper and lower predetermined levels.

One of the outstanding advantages of this system is the elimination of a storage tank, the supply tank being made to serve this purpose also.

A further object is the provision of an automatic pumping apparatus wherein power is obtained for actuating the pump from a feed or service wire in the building in connection with means, controlled by the liquid level in the supply tank for automatically starting and stopping the motor when the level of the liquid falls below and rises above the predetermined levels respectively.

Another object of the invention is to provide a valve opening mechanism which automatically opens the suction pipe to atmospheric pressure, independently of whether the motor is shut off or started, with means controlled by the water level in the supply tank, said means automatically opening and closing said valve when the water falls below and reaches the predetermined level respectively.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts hereinafter described and claimed.

In order that those skilled in the art may be fully acquainted with the nature and scope of my invention, I shall describe a specific embodiment of the invention in connection with the accompanying drawings which form a part of the present specification.

Figure 1 is a cross-sectional view through

the supply tank showing the location of the motor, the pump, the level controlled valve and various other parts essential to successful operation of the system.

Figure 2 is an enlarged view of the valve operating mechanism of Figure 1, showing clearly how the suction pipe can be opened to atmospheric pressure.

Figure 3 is a cross sectional view showing an alternative embodiment of a valve operating and shut-off mechanism; and

Fig. 4 is a fragmentary sectional view of the atmosphere admission valve shown in Fig. 3.

The system of my invention comprises a motor operated suction pump 1 connected to the upper or suction compartment 40 of the tank 2 by a suction pipe 3. The tank 2 is divided into two compartments 40 and 41 by an air-tight horizontal partition 4 containing a counterweighted valve 5. A supply pipe 6 containing a check valve 7 connects the upper compartment 40 of the tank 2 with the source of supply 8. A discharge pipe 9 leads from the bottom or supply compartment 41 of the tank 2 to the distributing system, and a vent pipe 10 is connected to the lower compartment 41 as shown.

The throw-out switch 12 and valve 11 for opening the suction pipe 3 to atmospheric pressure are operated by a toggle joint 21 formed by the levers 13, 20 and the spring 22, which are connected to the float 16 by the rod 15 and the lever 14. The throw-out switch 12 is connected in the circuit of the motor by the conductors 17 and 17', which, in turn, are connected to the source of power through a switch 18. The lever 14 pivots about a diaphragm 19 which is water-tight and seals off the valve space from the tank proper.

The alternative embodiment indicated in Figure 3 shows an atmospheric valve 23 operated by the toggle joint 24 or by the diaphragm 25 for opening the suction pipe 3 to atmosphere. The toggle joint 24 is composed of levers 26 and 27, and the spring 28, and operates the throw out switch 29 in addition to operating the valve 23. A spring 30 tends to hold the diaphragm 25 in position. The lever 26 is actuated by the rod 31 working through a slot 32, in the lever 26. The rod 31 is actuated by the lever 33 connected to the float 34. The suction pipe 3 is cut off from tank 2 by a ball 35

which rises and falls with the water level in a tube 36 having apertures 37 as shown.

The operation of the system is as follows: Assuming that the supply compartment 41 of the tank 2 is empty or at a low level the float 16 is in such a position that the atmospheric pressure valve 11 and the throw out switch 12 are each closed. The throw out switch 12 being closed, the circuit is completed and the motor started which puts in operation the suction pump 1. Operation of the pump 1, with the valve 11 closed tends to produce a vacuum in the suction pipe 3, the suction compartment 40 of the tank 2 and the supply pipe 6 permitting the liquid to flow from the source of supply 8 through the supply pipe 6 and stop valve 7 into the suction compartment 40.

The counterbalanced valve 5 is adapted to be normally closed with very little pressure, but it is promptly sealed by the application of suction to the compartment 40. This valve 5 is provided to permit dumping of the contents of the suction tank 40 into the storage or supply tank 41 when the pressures on the valve 5 are equalized. As the pressure is reduced in the suction tank 40 the liquid is driven by atmospheric pressure from the source of supply 8 up through the suction pipe 6 past the check valve 7 and into the compartment 40. Due to the action of the suction the liquid rises in the upper compartment carrying with it the float 16 actuating the lever 14 pivoting in the watertight diaphragm 19. As the float 16 rises, it actuates the toggle joint 21 through the lever 14, the connecting rod 15 and the lever 13 bringing the toggle joint 21 down through its neutral position. The spring 22 is connected to the toggle joint 21 so as to snap and hold the joint open as soon as it passes its neutral position thereby opening the throw out switch 12 through the motion of the lever 20. This snapping of the toggle joint in its downward motion also opens the valve 11 by bringing the toggle joint 21 into contact with the head of the shank 38 of the valve 11, thereby opening the suction pipe to atmospheric pressure practically simultaneously with the opening of the throw out switch 12 and the resultant stopping of the suction pump 1.

As soon as the pressures are substantially equalized, that is to say, atmospheric pressure is permitted to prevail in the suction tank 40, the liquid opens the valve 5 and flows down into the supply tank 41 and distributing pipe 9. As soon as the liquid drops to the point where the float 16 moves to low level position, the parts again come into the position shown in Fig. 1, starting the suction pump 1 and proceeding to fill the suction tank 40. This operation is repeated until both the supply compartment 41 and the suction compartment 40 are full, where-

upon the apparatus awaits the drawing off of liquid through the distributing pipe 9.

Drawing off the liquid causes the lowering of the float 16 and the resultant raising of the toggle joint through its neutral position permitting the spring 22 to "snap" the throw out switch 12 shut and also to close the valve 11 by bringing the toggle joint 21 into contact with the shank 38 whereby simultaneous starting of the pump 1 and closing of the suction pipe 3 from atmospheric pressure is effected.

It is evident that the above described mechanism provides a system which automatically operates to keep the liquid level between certain predetermined points.

In Figure 3 is shown an alternative mechanism for automatically starting and stopping the suction pump 1 and closing and opening the suction pipe 3 to atmospheric pressure. Float 34 by its rising and falling with the liquid level actuates the toggle joint 24 through the lever 33, the rod 31 and the lever 26. As the liquid level falls, the downward motion of 34 brings the projection 39 on the rod 31 into contact with the lever 26, and continued downward motion of float 34 presses lever 26 down until the toggle joint 24 passes its neutral position, when the spring 28 "snaps" it shut, closing the throw-out switch 29 and the valve 23, starting the suction pump 1 and closing the motor substantially simultaneously. The rising of the float 34 has no effect upon the switch and relief valve, the sole function of this float being to close the switch and the relief valve, so that the pump will be started and suction applied to the suction chamber. As soon as the level of liquid in the top chamber rises to a point adjacent the top of said chamber, the suction should be shut off and atmosphere should be admitted. For this purpose, the floating valve 35, which may be in the shape of a ball, a billet or the like, closes the opening in the seat 41, being floated to seat, with the result that the suction of the pipe 3 rises to a relatively high point, causing operation of the diaphragm 25 to open the switch and the atmosphere valve 23. This atmosphere valve is shown on an enlarged scale in Figure 4, and consists of the stem 45 having a reduced end 46, upon which the valve 23 is slidably mounted. A spring 47 lies between the bottom of the valve 23 and the shoulder 48 on the stem 45. The spring 47 is first compressed by the upward movement of the stem 45, and a point is finally reached when the coils of the spring are compressed against each other, and the positive motion of the rod 45 is transmitted to the valve 23, whereupon the valve is forced from its seat. At substantially the same time, the toggle switch is thrown to the

open position. When this occurs, the compressor stops and atmosphere enters under the valve 23, permitting the floating valve 35 to drop down in the slotted tube 36.

5 As soon thereafter as the level in the upper tank drops to the predetermined low level, the float 34 will again operate the toggle mechanism to close the valve 23, and to close the switch 29. The operation is
10 then repeated. It will be seen that the diaphragm is thus operated by an increase in suction in the pipe 3, the spring 42 which opposes this diaphragm being so adjusted as to permit this operation to occur with-
15 in the limits of suction.

If desired, the rod 31 on the switch operating float valve may be provided with a collar 40, which assists in opening the switch against the action of the spring,
20 adding its effort of buoyancy to the effect of suction to open the valve and the switch, but this is not essential.

This device cannot be flooded because of the positive shut-off which occurs with the
25 use of the floating valve 35, and its seat 41.

A special advantage of each of these devices is that their "positive" action prevents any possibility of intermittent pump action around a neutral position.

30 The pump continues to operate uniformly until the throw-out switch is snapped open, when it remains inoperative until the switch is snapped shut at a predetermined level of the liquid, which again sets the
35 pump in operation to be continued until the switch is again snapped open.

From the foregoing description taken in connection with the accompanying drawings, the construction and mode of operation of my improved pumping system will be readily understood, and it can be seen
40 that the invention provides a suction pump operated by an electric motor combined with means controlled by the level of the
45 liquid in the supply tank. to throw the motor into and out of operation whenever a replenishment of the supply tank up to a predetermined level is desired, combined with a device to prevent flooding of the
50 pump, the arrangement being such that the apparatus requires slight or no attention care being necessary only to keep the parts in good working order, thereby furnishing a safe, reliable and automatically operated
55 pumping system of the suction pump type.

While I have shown and described preferred embodiments of my invention, I reserve the right to make changes in the details thereof which do not depart from the
60 spirit and scope of the invention as claimed.

I claim:

1. The combination with a suction pump, a tank, a source of liquid supply, and a conduit connecting said pump with the source
65 of liquid supply, of level controlled means

for opening and closing said conduit to atmospheric pressure and means operating simultaneously with said level controlled means for controlling the pump.

2. The combination with a suction pump, 70 a tank, a source of liquid supply, and a conduit connecting said pump with the source of liquid supply, of level controlled means in said tank for opening and closing said conduit to atmospheric pressure and means 75 operating simultaneously with said level controlled means for controlling the pump.

3. The combination with a suction pump, a tank, a source of liquid supply, and a conduit connecting said pump with the source 80 of liquid supply, of level controlled means for opening and closing said conduit to atmospheric pressure and means connected directly with said level controlled means for stopping and starting the pump simultaneously with said level controlled means. 85

4. The combination with a suction pump, a tank, a source of liquid supply, and a conduit connecting said pump with the source 90 of liquid supply, of level controlled means in said tank for opening and closing said conduit to atmospheric pressure and means connected directly with said level controlled means for stopping and starting the pump 95 simultaneously with said level controlled means.

5. The combination with a suction pump, a tank, a source of liquid supply, and a conduit connecting said pump with the source 100 of liquid supply, of level controlled means for automatically opening and closing said conduit to atmospheric pressure, means connected directly with said level controlled means for automatically stopping and starting 105 the pump simultaneously with said level controlled means.

6. The combination with a suction pump, a tank, a source of liquid supply, a suction pipe connecting the pump with the tank, a supply pipe connecting the source of supply 110 with the supply tank, of level controlled means for automatically opening and closing said suction pipe to atmospheric pressure, means connected directly with said level controlled means for automatically 115 stopping and starting the pump simultaneously with said level controlled means and level controlled means for automatically sealing off said suction pipe from said tank.

7. The combination with a suction pump, 12 a tank, a source of liquid supply, a suction pipe connecting the pump with the tank, a conduit connecting the source of supply with the tank, of level controlled means for automatically opening and closing the suction 125 pipe to atmospheric pressure, means connected directly with said level controlled means for automatically stopping and starting the pump simultaneously with said level 130 controlled means, level controlled means for

automatically sealing off said suction pipe from said tank, and additional means for automatically opening said suction pipe to atmospheric pressure and simultaneously
5 stopping said pump, said additional means being actuated by pressure caused by different degrees of vacuity in the tank and the suction pipe.

8. The combination with a suction pump,
10 a tank, a source of liquid supply, a suction pipe connecting the pump with the tank, a conduit connecting the source of supply with the tank of level controlled means for automatically opening and closing the suction
15 pipe to atmospheric pressure, and simultaneously stopping and starting the pump, additional means for opening the suction pipe to atmospheric pressure and stopping the pump, said additional means being actuated by pressure resulting from different
20 degrees of vacuity in the supply tank and the suction pipe and operating through the same mechanism as the level controlled means for opening said pipe and stopping
25 said pump and level controlled means for automatically sealing off the suction pipe from the tank.

9. The combination with a suction pump,
30 a tank, a source of liquid supply, a supply pipe connecting the source of supply with the tank, a suction pipe connecting the pump with the tank, a valve for opening and closing the suction pipe to atmospheric pressure, of a toggle for operating said
35 valve and stopping and starting said pump, level controlled means for actuating said toggle, spring means for holding and accelerating the movement of said toggle away from its neutral position, additional
40 means for actuating said toggle said additional means being controlled by pressure induced by different degrees of vacuity in the tank and the suction pipe and level
45 controlled means for automatically sealing off the suction pipe from the tank.

10. In a liquid fuel supply apparatus, a liquid receiving vessel having an outlet, a vacuum chamber having a liquid outlet to the vessel and a liquid inlet, and also in
50 communication with an air vent port, an air pump having its cylinder connected to the vacuum chamber, an electric motor driving the pump, a switch controlling the motor circuit, a valve for the vent port, and
55 means for simultaneously operating said switch and valve.

11. In a liquid fuel supply apparatus, a liquid receiving vessel having an outlet, a vacuum chamber having a liquid outlet to the vessel and a liquid inlet, and also in
60 communication with an air vent port, an air pump having its cylinder connected to the vacuum chamber, means for operating the pump, a valve for the vent port, and means controlled by the liquid level in the
65 apparatus for controlling the pump and the valve simultaneously.

12. In a device of the class described, a liquid receiving vessel having an outlet, a vacuum chamber having an outlet to the
70 vessel and having a liquid inlet, an atmospheric vent valve for said chamber, an air pump for creating a suction in said vacuum chamber, an electric motor for driving the pump, a switch controlling the
75 motor circuit, and common means for operating said switch and said valve.

13. In a device of the class described, a liquid receiving vessel having an outlet, a vacuum chamber having an outlet to the
80 vessel and having a liquid inlet, an atmospheric vent valve for said chamber, an air pump for creating a suction in said vacuum chamber, an electric motor for driving the pump, a switch controlling the
85 motor circuit, and common means for operating said switch and said valve, and means governed by the liquid contents of said chamber for controlling the operation of said common means.
90

14. In combination, a liquid receiving vessel having an outlet, a vacuum chamber having a liquid outlet to the vessel, and a liquid inlet, an air vent valve for said chamber, a suction pump connected to said
95 vacuum chamber, and level controlled means in the chamber for controlling the pump and the valve simultaneously.

15. In combination, a source of liquid, a liquid receiving chamber, a vacuum chamber
100 having a liquid inlet communicating with said source of liquid and having a liquid outlet communicating with said liquid receiving chamber, an atmospheric vent valve for said vacuum chamber, a suction
105 pump connected to said vacuum chamber, a motor therefor, a switch for the motor, and a float in one of said chambers for operating both the switch and the valve.

In witness whereof, I hereunto subscribe
my name this 9th day of March, 1921.

BURTON S. AIKMAN.