Sept. 16, 1930. H. E. LA BOUR 1,775,860

PUMPING SYSTEM

Filed Jan. 5, 1927 2 Sheets-Sheet 1

Fig. 1.

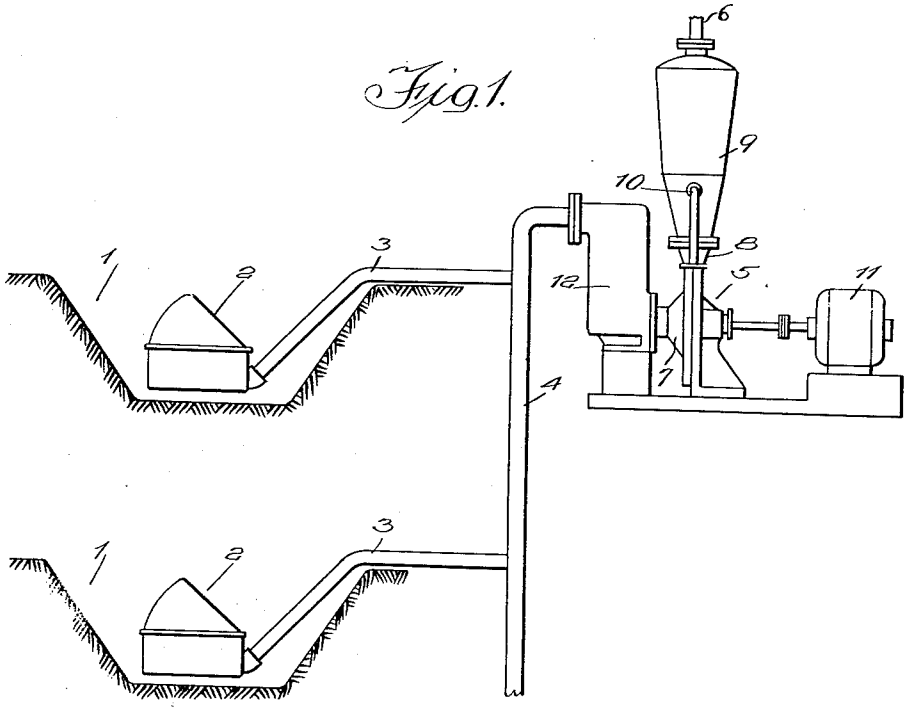
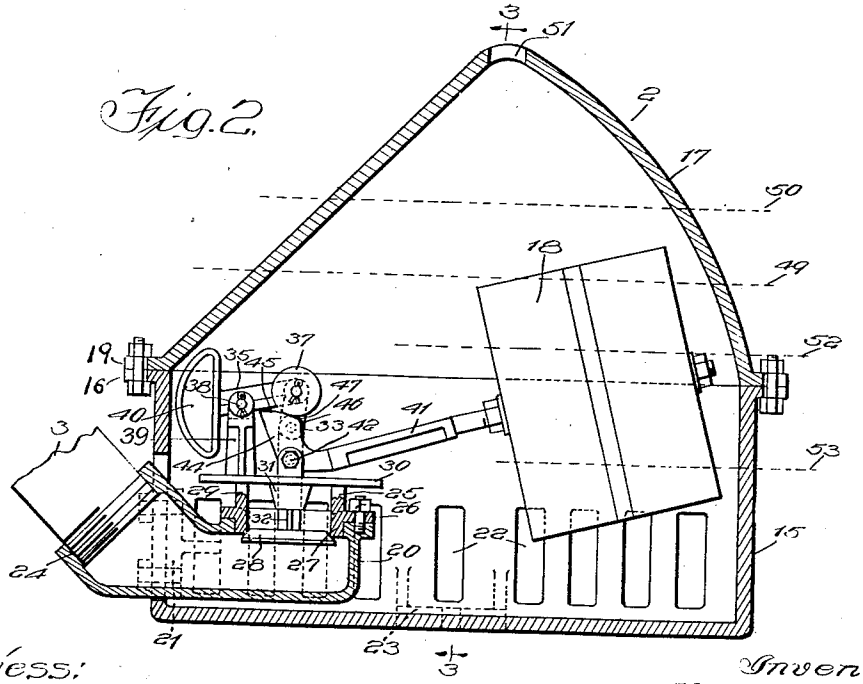


Fig. 2.



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PUMPING SYSTEM

Filed Jan. 5, 1927 2 Sheets-Sheet 2

Fig. 3.

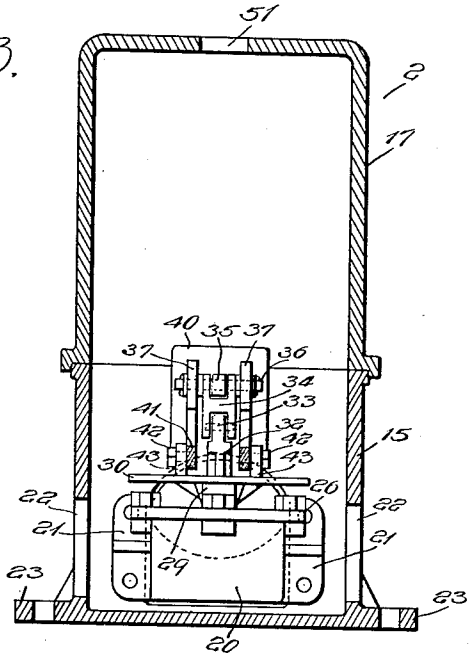


Fig. 4.

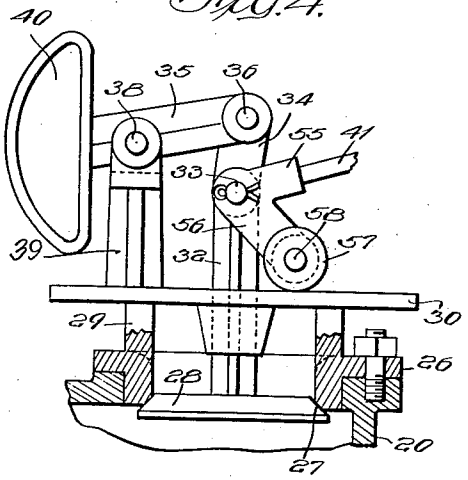
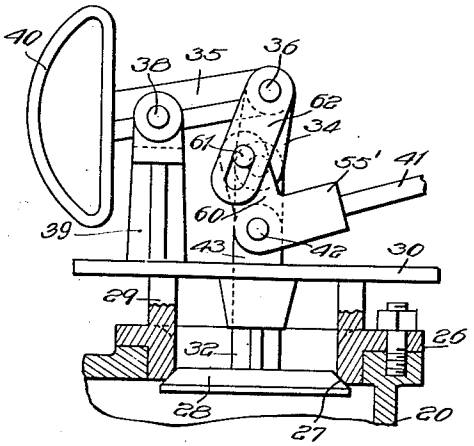


Fig. 5.



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Patented Sept. 16, 1930

1,775,860

UNITED STATES PATENT OFFICE

HARRY E. LA BOUR, OF HOMEWOOD, ILLINOIS

PUMPING SYSTEM

Application filed January 5, 1927. Serial No. 159,032.

My invention relates to pumping systems, generally termed gathering systems, for collecting or gathering liquid from a plurality of locations by means of a single pump.

The system comprises a novel form of gathering valve which operates in a novel manner in co-ordination with the self-priming pump of my invention such as is described and claimed in my prior Patent No. 1,578,236. While any other form of self-priming pump such as a piston pump might conceivably be employed in this combination, it is to be noted that under the circumstances in which this system is required to operate, namely, in mines, excavations and the like, a positive displacement piston type of pump is less desirable.

In the removal of the small local pockets of water which are constantly present in the advanced workings in mines, it is customary to use several suction openings on one pump. The suction lines are often one thousand feet or more long and often there are six or more branches which terminate at different levels so that while one opening may be only a few feet below the pump, others may be fifteen to twenty feet below the pump. The quantity of water flowing into the sumps, or pockets, is variable and it will readily be seen that the pump will naturally pump from the higher opening more rapidly and that as soon as any one sump, or pocket, is exhausted the air fills the suction line with the result that the pumping is stopped from all of the sumps. To prevent this in previous systems the operators of the mines equip each branch with a hand operated valve and then have men constantly circulating through the workings and regulating the valves to keep the pump in operation.

Many like situations arise where it is desired to gather from different levels, or the same level, liquids as they accumulate in tanks, pockets, sumps, or the like. Such systems have been proposed heretofore in which automatic valves were provided in the sumps, or pockets, but such systems have not been wholly successful, in mine service where the water is usually dirty and contains corrosive ingredients, and where from the character of the lifts vacuums of, from twenty-five to twenty-eight inches, often develop under the valve seat. Hence although much work has been done to try to develop an automatic valve controlled by the water level for this service no satisfactory device is on the market.

According to the present invention I provide a valve which has a large valve area opening in the direction of suction. This permits the valve to be used as a check-valve and provides ample operating force to open the valve and to hold it open.

I provide a float to control the valve, but do not necessarily depend upon the float to provide the closing force of the valve, in fact the lower position of the float does not necessarily correspond to the low level of the liquid in the sump, or tank. The valve in the preferred form of my invention is not closed until the level has lowered to a point where air is drawn into the intake port whereupon the valve is closed and the full weight of the float may be applied to locking the valve closed.

While this entry of air appears to be undesirable and would in conjunction with ordinary centrifugal pumps be likely to cause the pump to become air-bound and to destroy the pump suction, I co-ordinate this valve with my self-priming pump, above referred to, which pump is capable at all times of maintaining its own suction even if air is admitted. Thus by co-ordinating the present valve with a centrifugal pump, capable of pumping air along with liquid, I provide a new and highly advantageous system.

After the air has once entered the suction pipe through the valve, the valve is closed and before it can again be opened, the level of liquid must rise to a predetermined level whereupon the float unlocks the valve and suction opens it.

It will be seen that by the above mode of operation marginal operation is avoided, and wire drawing is prevented.

The mechanism which connects the float and the valve member is a lost motion connection permitting the valve member at all times to operate as a check-valve. This con-

necting mechanism is an inter-lock between the valve and the float. The float prevents the valve from opening until the liquid reaches high level and the valve hinders the float in dropping until the liquid has reached the minimum level.

This inter-locking relation is wholly new and a wide variety of means which therein is the equivalent of the specific means herein disclosed may be employed within my invention.

Now in order to acquaint those skilled in the art with the manner of constructing and operating a system embodying my invention, I shall describe in connection with the accompanying drawings a specific embodiment of the same.

In the drawings:

Figure 1 is a diagrammatic layout of a system embodying my invention;

Fig. 2 is a vertical longitudinal section through the same showing the working parts in elevation with the valve in closed position;

Fig. 3 is a vertical transverse section taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary elevational view partly in section showing a modified form of operating mechanism wherein the pivot for the float lever is connected to the valve stem, and

Fig. 5 is a like view of a modified form using a toggle between the float lever and the valve stem.

Referring now to Fig. 1, there is shown a system in which a plurality of shallow pits, or sumps 1, are provided, these sumps being arranged to gather the liquid which it is desired to pump away. In each sump I arrange a gathering valve 2 connected by branch pipes 3—3 to the suction main 4 which suction main is connected to the intake of the self-priming pump 5, the discharge pipe 6 of which leads to a remote point for discharging the liquid so gathered. The pump 5 is fully disclosed in my prior patent above referred to, or it may embody the invention disclosed in my co-pending application Serial No. 751,210 filed November 21, 1924, which constitutes an improvement upon the pump shown in the patent. This pump comprises a pump body 7 with an impeller therein which fits relatively closely in a channel formed therein. The pump has a discharge throat 8 leading to a separator 9 where air and water are separated and it has a supplementary passageway 10 leading from the channel of the pump casing 7 to the interior of the separator 9 serving part of the time, that is during the priming stage, as a return for liquid to prime the pump at a point posterior to the main discharge opening and serving at other times when liquid only is pumped as a supplementary discharge passageway. The pump is driven by an electric motor 11. The intake of the pump is connected directly to a trap member 12 which contains a suitable screen as disclosed in the aforesaid patent. This pump is capable of exhausting the air from the suction main and the pipes connected thereto and establishing its vacuum. The gathering valves 2, as will be described hereinafter may permit the entry of air into the intake port of the valve and then into the intake passageway of the pump, and because of the ability of the pump 5 to maintain a suction in spite of the entry of air into the mains, the particular form of valve is operable in the system, and the resulting system is capable of securing results not heretofore obtainable.

The valve 2 comprises a two-part housing preferably made of castings. The lower part is substantially rectangular and oblong in shape, this bottom part 15 having flanges 16 and the top part 17 which is of a shape suitable to house the float 18 in its swinging movement, likewise has companion flanges 19, these flanges 16 and 19 being bolted together to enclose the valve mechanism therein. A valve body 20 which, in the present instance, is generally L-shaped is provided with bolting flanges 21—21 by which said valve body, or housing, is bolted to the end-wall of the lower housing section 15.

The lower housing section 15 is provided with a number of relatively narrow openings, or louvers to permit the entry of water and to exclude coarse material therefrom. Suitable legs, or bolting flanges 23, are formed along the sides of the bottom portion 15 so that the valve 2 may be fastened down if so desired.

The valve body or case 20 extends laterally in a horizontal direction and then upwardly terminating in a threaded socket 24 to receive the threaded end of a suction pipe branch 3. Obviously, bolting flanges may be substituted for the threaded socket, but in the present instance the pipe socket is more convenient since it permits the end of the valve body to be projected through an opening in the end of the casing section 15 from the inside thereof.

This valve body 20 has a vertical opening into which is seated a frame member 25, this frame member comprising a flange 26 overhanging the edge of the opening in the top of the valve body and a downwardly projecting cylindrical portion 27, the lower inner edges of which form a valve seat to cooperate with the lift or poppet valve 28. The upper part of the frame member 25 comprises a plurality of legs 29, in the present instance two in number, supporting a frame plate 30. This frame plate 30 has a central hub, or hollow boss 31, in which is guided the stem 32 of the valve 28. This stem is fluted to reduce friction and likelihood of fouling, and at its upper end is then jointed as indicated at 33 to a short link 34 which in the present

instance is shaped like an H, the upper arms of the link receiving between them the end of a lever 35 and a long pivot pin 36 being passed therethrough. This pivot pin 36 bears at its outer ends, adjacent the arms of the short link 34, a pair of rollers 37—37. The lever 35 is pivoted at its central portion on the pin 38 which pin is supported in the upper end of a post 39, said post being formed integral with the plate 30 and the frame 25. The rear end of lever 35 has a counterbalance 40 of a weight suitable for closing the valve 28 against its seat and as will be explained later for assisting the free release of the float cam.

The float 18 is connected by a rod or lever 41 to swing about a pair of pivot pins 42—42 mounted in lugs 43—43 integral with the plate 30. The rod or lever 41 is forked adjacent the pivot.

These forked ends comprise cam members 44 extending substantially at right angles in the present instance from the longitudinal portion of the lever.

The cam members 44 each lie under the rollers 37 and comprise two different dwells 45 and 46 separated by a relatively sharp knee 47. The two dwells 45 and 46 are distinctive in function, the positive dwell 45 being of such a character as to serve to lock the valve 28 closed. That is to say the rise is that of a small angle or thin wedge so that the relatively small weight of the float 18 operating through the leverage of the arm 41 is able to hold the valve 28 closed against maximum suction thereupon. As a matter of fact, I prefer to make this angle of rise so small that the motion is irreversible. That is to say the tangent of the angle of rise is less than the coefficient of friction between the roller 37 and the base of the cam dwell 45.

The negative cam dwell 46 is of an entirely different character. In fact its function is to provide so steep a rise that the impact pressure of liquid flowing against the valve 28 will tend to hold the float 18 in elevated position.

The rise of the cam dwell 46 is such as to be reversible. It is so shaped as to give a quick drop after the roller 37 passes the knee 47. This is of service in permitting maximum valve opening with minimum float travel.

The operation of the valve heretofore described is as follows:—

Assuming that the parts are in the position shown in Figures 1, 2 and 3 and that the pump 5 is being driven by the motor 11 holding a vacuum in the pipes 3—4 and under the seat of the valve 28. The relatively large area of the valve 28 with the difference in pressures which exist thereupon provides a large opening force which, however, is prevented from operating to open the valve 28 by the cam 44 the dwell 45 of which is thrust under the roller 37 by the weight of the float 18. The weight of the float working through the mechanical advantage secured by the lever 41 and the cam dwell 45 is capable of closing and holding closed the valve 28 even against the maximum difference of pressure established by the pump. Assume now that the liquid level in the pocket 1 rises to the release level line 49, indicated on Figure 2, this line corresponding to a level which will raise the float to a point where the knee 47 passes the line of centers between the roller 37 and the pivot 42 of the cam 44. In other words, this level 49 is the point where the cam relation is changed. That is to say when the liquid raises the float to this position the valve 28 is unlocked and the valve 28 begins to open. The roller 37 then operates on cam dwell 46 and the angle of this cam dwell is such that after the roller once passes over the knee 47 the fluid pressure on the valve 28 is able to throw the valve wide open and simultaneously raise the float to a small lift above its previous position, that is, above its release position. The float then occupies the high float position indicated by the line 50 on Figure 2. As a matter of fact the amount of raise between the line 49 and the line 50 may be made as small as desired since all that is necessary is that the valve 28 be permitted to be opened wide and to assume with respect to the cam 44 a retarding relation. That is to say when the float has risen to the position where it unlocks the valve 28, the valve 28 then moves to a position where it takes control of the float. The weight 40 tends at all times to raise the roller 37 and valve 28, but the impingement of the liquid flowing through the valve port against the face of the valve 28 overcomes the pull of the weight 40 and retains control of the float 18.

The pump then continues to draw liquid through the intake port of the valve, holding the port in the position just described, the level of the liquid dropping. It will be observed that the top of the casing 17 contains an opening 51 to prevent trapping of air or liquid in the dome formed by the top half of the cover or housing.

The plate 30 upon which the interlocking mechanism is mounted serves another useful purpose when the valve 28 is open, that is, to prevent the drawing of air down into the valve passageway, such drawing of air being a familiar phenomenon where liquid is rapidly withdrawn through a relatively large port opening. The plate 30 prevents the formation of an air cone and the supporting post 29 prevents a swirling of the liquid which sets up such an air cone.

In the preferred form of the invention the float follows the level of liquid down partially closing the valve until the knee 47 of the cam engages the roller 37 on the return movement. At this point the knee of the cam affords sufficient retarding force to permit

the level to drop ahead of the float until sufficient differential is secured to permit the weight of the float to snap the knee over the roller 37 and close the valve 28 with a snap action and to lock the same closed. The liquid may have dropped to a point where the port is uncovered and some air is drawn into the suction mains. While this is not desirable it does no harm in this system.

It is to be observed that the weight of the float so long as it is submerged is less effective than when it is above the descending water level in accordance with the law of Archimedes.

The closing of the valve entails two operations; first, the release of the float, which is secured through the passing of the roller 37 to the knee 47 of the cam 44. After it is released by passing over the knee 47 it then brings the valve against its seat even against the force of suction of the pump.

It will now be seen that the valve 28 has a positional control over the mechanism and vice versa the float 18 has a positional control over the valve.

When the knee of the cam is against the roller, the float 18 assumes a position as shown on the line 52, whereas the actual low level of liquid 53 is below the low float position.

As the liquid collects and rises above the low liquid level it will finally come to a position where it tends to raise the float. During all this time the valve 28 is shut tight. As the liquid further collects and raises the float the valve 28 may be cracked open and a slight amount of liquid may pass therethrough. This, however, is inconsequential and even if it is sufficient to keep the liquid level from rising, air will not be drawn into the valve intake for if this flow of liquid should continue to a point where the liquid level would drop below the low float position, the float would thereupon lock the valve completely closed.

It will be observed that when the valve 28 opens it opens suddenly and thereby tends to clean itself by the sudden in-rush of liquid.

The valve 28 is so placed that the impingement of liquid thereupon coming into the intake port is substantially a maximum. This is secured preferably by making a right angle turn at such a point that the face of the valve 28 takes the entire pressure of the liquid in changing its direction.

It is to be observed that while I have shown a lift valve and this is preferable where the liquid to be handled is charged with foreign matter or non-fluid particles, a piston valve may be employed instead. With a piston valve it is possible to over-lap the knee 47 or substantially over-lap the same, so that there is a minimum tendency to wire draw the liquid between changes of position.

The principles of my invention may be embodied in a variety of forms and while in the above embodiment I have shown the preferred form, I wish to call attention to the fact that other mechanism, than the specific one which I have shown, may be employed. For example, it is possible to employ a spring instead of the weight 40 although the weight is more advantageous where the valve is likely to be put in corrosive liquids or liquids apt to contain matter which would foul the parts. Obviously, the position of the cam and the roller may be reversed within my invention.

In Figure 4 I have shown a modified form of interlocking mechanism, the valve 28 being connected through the link 34 to the lever 35 by the pin joint 36. The float 18 is connected by a lever 41 to a double or forked lever arm 55 pivoted on the pin 33, and having the extending arm 56. The rollers 57 engage the top surface of the plate 30 and being arranged to pass a critical position where the control of the interlock changes from the float 18 to the valve 28 and vice versa. In this case, the float 18 is pivoted on a moving pin 33 on the end of the stem 32 of the valve 28.

The rollers 57 may operate over a knee, or projection, in order to secure a quick throw over the critical neutral position as is the case with the knee 47. This in effect constitutes a reverse of the cam and roller above referred to.

In Figure 5 I have shown the use of a toggle mechanism to secure the interlocked relation between the float and the valve. In this case, the float lever 41 is connected to a forked member 55′ the ends of which are pivoted on pins 42 mounted in the lugs 43. Arms 60 integral with the fork member 55′ extend upwardly and their pins 61 move in the slotted ends of links 62. The link 62 is pivoted on the pin 36 which pin is also connected to the short link 34 that in turn is pinned to the upper end of the valve stem. The slot in the link 62 permits the independent operation of the valve 28 as a check valve.

The operation of the forms shown in Figures 4 and 5 is broadly like that shown in Figure 2.

It is to be observed that the valve of my invention has the capability of operating in two distinct manners.

Assume that the pressure exerted by the pump upon the valve 28 is relatively so great as to hold the float in raised position regardless of the liquid level. Then the liquid level will fall to such a point that air will be admitted through the valve which will release a large part of the pressure tending to hold the valve open with the result that the float will fall suddenly to its lowest position and lock the valve closed.

Now assume that the pressure exerted by the pump upon the valve is such that the float follows the liquid level down until the knee on the cam is reached. Then the float will be retarded until a force differential is attained by further drop of the level, whereupon the cam passes the knee and locks the valve.

The first above described condition tends to prevail in the upper valve shown in Fig. 1 and the second condition tends to prevail on the lower valves in Fig. 1.

I do not intend to be limited to the details shown or described.

I claim:

1. In combination, a valve body having an inlet port, a check valve therefor opening with normal flow and checking upon reverse flow, a float and an interlocking connection between the valve and the float.

2. In combination, a valve body having an inlet port, a check valve therefor, a float and an interlocking connection between the valve and the float, said interlocking connection comprising a lost motion connection which permits the valve to operate at all times to prevent return flow of liquid through the said port independently of the float.

3. In combination, a valve body having an inlet port, a check valve therefor, a float, an interlock between the float and the valve, said interlock being operated by the float upon the attainment of high level of liquid to release the valve and the float thereupon being held in raised position by the valve operating through the inter-lock until the level of liquid is lowered to a predetermined point, the weight of the float being then operative through the inter-lock to lock the valve closed, and means tending at all times to close the valve.

4. In combination, a valve body having an inlet port, a plate overlying said port, a check valve for said port having a stem extending through said plate, said check valve opening with normal flow and checking up on reverse flow, a float and an interlocking connection between the float and said stem, said connection being mounted on said plate.

5. In a liquid gathering system the combination of a downwardly extending suction pipe for liquid terminating in a valve port, a lift check valve for said port opening in the direction of flow produced by suction and closing by action of the column of liquid in the pipe, a float and irreversible actuating means connecting the float and valve to permit the float to move the valve to closed position and to prevent the suction on the valve from actuating the float.

6. In combination, a valve body having an inlet port, a check valve for said port, a float, means controlled by the float for locking the valve in closed position and means controlled by the valve for holding the float in raised position.

7. In a device of the class described, a valve body, an inlet port into the same, a check valve for said port opening inwardly, means to apply said valve to its seat, a float and means connecting the valve to the float, said means serving to hold the float in raised position while the valve is held open by the flow of liquid therethru.

8. In combination, a valve body having an inlet port of relatively large area, a float, a valve having a stem, a connection between said valve stem and said float, said connection having a position in which the impact pressure of the liquid on the valve holds the float in raised position.

9. In combination, a valve body having an inlet port, a check valve for said port, a float for operating the valve, a connection between the float and the valve including means for permitting the valve to hold the float in raised position.

10. In combination, a valve body having an inlet port, a check valve for said port for liquid flow, a float for operating the valve, a connection between the float and valve, said liquid flow being adapted to exert a pressure upon said valve to cause the same to hold the float in raised position, and means exerting less force than the flow pressure tending to close the valve.

11. In combination, a valve body having an inlet port, a check valve therefor, a float having a high level position and a low level position, the inlet port being located below said low level position, means controlled by impingement pressure of liquid flowing against the valve for raising the float into high level position and holding it in raised position, said float being released upon lowering of the liquid.

12. In combination, a valve body having an inlet, a check valve therefor, a float having three positions, a lost motion operating connection for the valve and float, the three positions comprising first a release position corresponding to level of liquid where the float permits the valve to open, second, a raised position to which the float is drawn above release level by opening of the valve, said float being held in said position by impingement of liquid on the valve, and third, a lowered position into which the float drops by its own weight, said position being above low level of the liquid, the weight of the float in said lowered position operating said connection to lock the valve closed.

13. In combination, a valve body having an air inlet port, a check valve therefor, said valve being adapted to be impinged by inflowing liquid, a float, means under the control of the float at its low level position for locking the valve in closed position, the impingement pressure on said valve holding

the float in raised position and means tending to close said valve, said means being overcome by the impingement pressure of the liquid on the valve while liquid is drawn through the valve inlet port.

14. In combination, a valve body having an inlet port, a check valve therefor having a relatively large area exposed to suction when closed and subject to impingement of inflowing liquid when open, locking means for locking the valve closed against suction and a float for actuating said locking means, said float operating at high level only for unlocking said locking means to permit suction to open said valve, said valve when open being held open by impingement pressure of liquid and thereby holding the float in raised position, means tending to close the valve, said means being overcome by the impingement pressure of liquid on the valve.

15. In a system of the class described, a gathering valve adapted to be connected to suction pipe of a pump, said valve having a valve member, a float controlling the valve member, said valve being held open by impact of the liquid drawn thereinto until air enters the same.

16. In a system of the class described, a gathering valve adapted to be connected to suction pipe of a pump, said valve having a valve member, a float controlling the valve member, said valve being held open until air enters the same, and means for closing the valve member when air enters the suction pipe.

17. In combination, a valve body having an inlet port, a check valve therefor, means for applying the valve to its seat, the valve being held in open position by the flow of liquid through the inlet port, a float and a lost motion interlocking connection between the float and the valve, said connection having two positions, one position permitting the valve when in open position to hold the float in raised position, and the other position permitting the float when in lowered position to bring the valve into closed position.

18. In combination, a valve body having an inlet port, a check valve therefor, means for applying the valve to its seat, the valve being held in open position by the flow of liquid through the inlet port, a float and a lost motion interlocking connection between the float and the valve, said connection having two positions, one position permitting the valve when in open position to hold the float in raised position, and the other position permitting the float when in lowered position to bring the valve into closed position, said lost motion connection permitting the float when in lowered position to lock the valve in closed position.

19. In combination, a valve body having an inlet port, a check valve therefor adapted when opened to be impinged by inflowing liquid, means for applying the valve to its seat, a float and means controlled by low level position of the float for locking the valve closed, said means being restrained by the impingement of inflowing liquid upon the valve when the float is in raised position.

20. In combination, a valve body having an inlet port opening upwardly, said body providing a passage extending laterally with respect to said inlet port, a valve for controlling said inlet port, said valve being adapted to be subjected to the difference in pressure between the inside and the outside of said valve body and to be moved to open position by such difference in pressure, locking means normally holding the valve closed and a float for actuating said locking means, said float being operated on a predetermined level for unlocking said locking mechanism to permit the valve to open, said locking mechanism having means permitting the valve when wide open to hold the float in raised position.

21. In combination, an L shaped valve body having a suction connection and having an inlet port facing upwardly and adapted normally to receive liquid, a valve closing said inlet port, a plate overlying said inlet port to prevent the entry of air until the level of liquid drops below the same and float controlled mechanism mounted on said plate for controlling said valve.

22. In combination, an angular valve body having an inlet port in one leg thereof facing upwardly, a valve for controlling said port, said valve being adapted to move into the corner of said angular body and to be subjected to the impingement of liquid flowing into the valve body through said inlet port, a plate overlying said inlet port and providing a guide for said valve, means tending to close the valve and means mounted on said plate for locking said valve against opening and a float controlling said means.

23. In combination, a valve body having an inlet port, a valve for controlling said port, said valve having two operative positions, a float associated with said valve and having two operative positions, the valve when in its operative closed position being adapted to be subjected to suction for opening the same, interlocking means between the float and the valve having two operative positions, one of said operating positions corresponding to lowered position of the float and closed position of the valve, and serving in said position to lock the valve closed by the weight of the float, said interlocking mechanism having other cam means in the other operative position corresponding to opened valve and raised float, said valve when open being subjected to the impact pressure of liquid flowing through the valve to hold the float in raised position through the interlocking mechanism in said second position.

24. In combination, a valve housing having

an inlet port, a check valve for said port, a valve stem, a frame member connected to said valve housing, said check valve having a stem projecting through said frame member, cam means pivoted on the frame member, a cam follower connected to the upper end of the valve stem, said cam member having a positive dwell and a negative dwell and means to move the cam.

25. In combination, a valve housing having an inlet port, a check valve for said port, a valve stem, a frame member connected to said valve housing, said check valve having a stem projecting through said frame member, cam means pivoted on the frame member, and a cam follower connected to the upper end of the valve stem, a float connected to the cam member, said cam member having two dwells, one of which is operated by the float to lock the valve in closed position, the other of which is operated by the valve to hold the float in raised position.

26. In combination, a valve housing having an inlet port, a frame member mounted over the port, a check valve for the inlet port, said check valve having a stem projecting through the frame, a link connected to the upper end of the stem, a lever connected to the opposite end of the link, means for said lever tending to apply the valve to its seat over the inlet port, said valve being free at all times to close under back flow through the inlet port, cam means pivoted on the frame and a cam follower connected to the upper end of the valve stem and a float connected to the cam member.

27. In combination, a closed housing comprising a base, a cover for the same, a valve body bolted to the base and having a suction connection extending to the outside of the housing opening with normal flow of liquid into the inlet port and checking upon reverse flow, said body having an inlet port, a check valve therefor, a frame member overlying said inlet port, a float contained within the cover member and inter-locking mechanism connecting the float and check valve and mounted on said frame member.

28. In combination, a valve body having an inlet port, a check valve for said port opening inward and closing on outward flow, said valve having a stem, a pivoted float arm bearing a float, a pair of coacting members one of which is pivotally connected to said stem and the other is rigidly connected to the pivoted float arm, said members having engagement between them substantially in line between their mounting pivots when the float is in lowered position, and adapted to have engagement substantially out of line with the mounting pivots when the float is in raised position, the check valve being adapted to be held in inward open position by the flow pressure of the liquid drawn through the inlet to exert sufficient holding force through said members when they are out of line with the mounting pivots to hold the float in raised position until the flow pressure decreases due to the entry of air into the inlet port.

29. In combination a lift valve, a float having an upper position and a lower position, connecting means between the float and valve said connecting means affording a leverage between the float and valve which varies with the position of float, there being a relatively sharp change of leverage as the float approaches its upper position to give the valve a greater mechanical advantage said leverage providing the float with sufficient mechanical advantage to permit the float in its lower position to hold the valve closed against suction.

30. A float controlled gathering check valve having an inlet and an outlet, said valve being adapted to have a difference of pressure maintained between the inlet and the outlet, said valve comprising a valve member held open by liquid flowing through the valve and float controlled means for closing the valve member only when air passes through the valve.

In witness whereof, I hereunder subscribe my name this 29th day of December, 1926.

HARRY E. LA BOUR.

CERTIFICATE OF CORRECTION.

Patent No. 1,775,860. Granted September 16, 1930, to

HENRY E. LA BOUR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, lines 90 and 91, claim 10, for "inlet port, a check valve for said port for liquid flow" read inlet port for liquid flow, a check valve for said port; page 6, line 118, claim 23, for "operating" read operative; page 7, lines 41 to 43, claim 27, strike out the words "opening with normal flow of liquid into the inlet port and checking upon reverse flow" and insert the same to follow after the word "therefor" in line 44, same claim; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of October, A. D. 1930.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)

CERTIFICATE OF CORRECTION.

Patent No. 1,775,860. Granted September 16, 1930, to

HARRY E. LA BOUR.

It is hereby certified that in Certificate of Correction issued October 28, 1930, the name of the patentee was erroneously given as "Henry E. La Bour", whereas said name should have been given as Harry E. La Bour; and that the said Certificate should be read with this correction therein that the same may conform to the record of the office.

Signed and sealed this 7th day of April, A. D. 1931.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)