

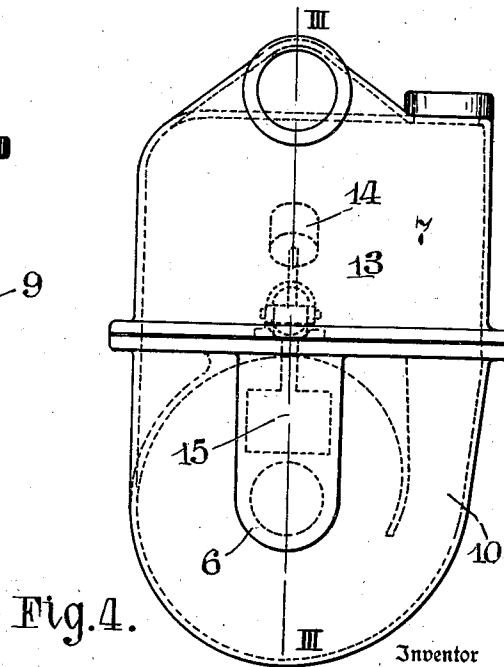
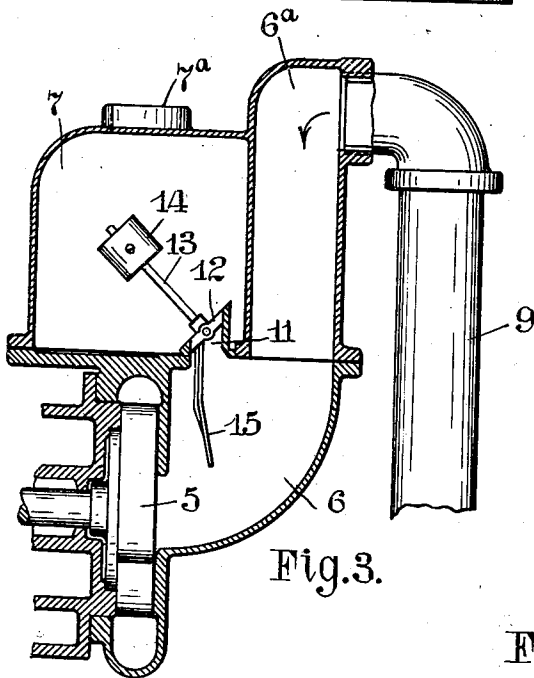
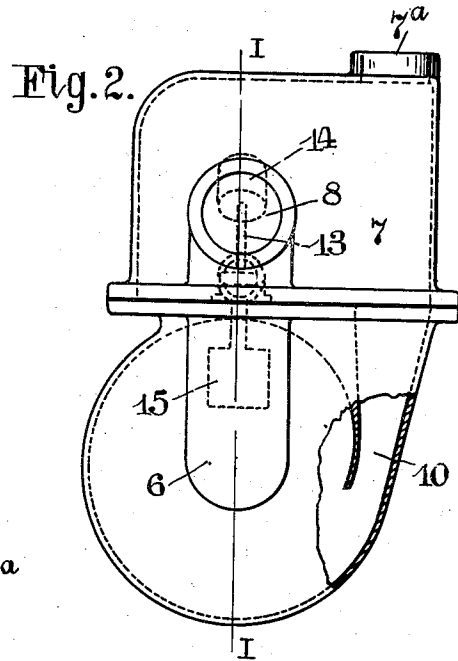
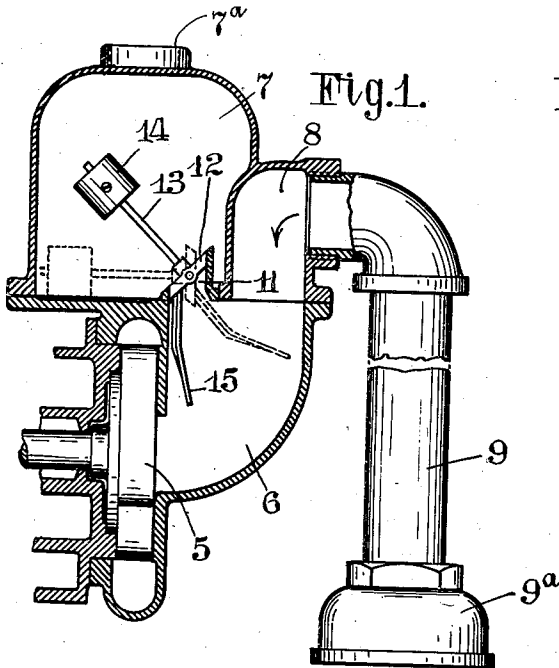
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SELF PRIMING PUMP

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2,109,804

SELF-PRIMING PUMP

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6 Claims. (Cl. 103-113)

This invention relates to self-priming centrifugal pumps, the object being chiefly to provide an improved construction whereby a by-pass having a valve between the discharge and suction chambers is closed by the impact of the suction line water when the air or gases have been exhausted from said line. Other objects will appear from the disclosure.

The invention is embodied in the example herein shown and described, the features of novelty being finally claimed.

In the accompanying drawing—

Figure 1 is vertical section on the line I—I Fig. 2 with parts in full and broken out.

Fig. 2 is a view in elevation looking at the right-hand side of Fig. 1 with the suction line removed.

Fig. 3 is a view like Fig. 1 of a modification, the section being taken on the line III—III Fig. 4.

Fig. 4 is an elevational view looking at the right-hand side of Fig. 3.

Referring first to the views, Figs. 1 and 2, the character 5 designates the ordinary impeller which is housed in a usual or suitable manner but has, in the present instance, a chamber 6 constituting a suction or intake chamber. Mounted above the impeller housing and intake chamber are a priming water and discharge chamber 7 and a chambered portion 8 forming an extension of the intake chamber but leading downward into the suction chamber 6. The suction line 9 has a check valve at 9^a, for example, at its lower end and is connected at its upper end with the chambered portion 8.

The discharge from the impeller chamber extends upward from the bottom of the housing into the discharge chamber 7 through a passage 10 in the rear.

The discharge chamber 7 communicates with the suction chamber 6 by means of a passage 11 formed with a valve seat, a valve 12 being pivoted, as shown, in said passage, said valve adapted when suitably rocked to open and close the passage. Said valve 12 carries at its upper side within the discharge chamber 7 an arm 13 on which is secured a weight 14; and said valve at its lower side within the suction chamber carries an arm with a blade 15. The weight 14 is of sufficient mass when placed at a given point on the arm 13 to hold the valve 12 normally in open position and with the blade 15 opposing the inlet to the suction chamber. When, in operation, air or gas, or water carrying a considerable quantity of air or gas, enters the suction chamber the blade and valve are not actuated; but when the water is substantially freed from gas it presses the

blade to rock the valve to closed position, where it is held until released by reason of the presence of air or gas again coming from the suction line. It will be noted that the priming port 11 which leads from the priming fluid container to the impeller chamber is of less area than the port leading from the suction chamber into the impeller chamber.

The operation is this:

To prime the pump water is supplied through the discharge or priming hatch 7^a of the discharge chamber until such water reaches the level fixed by the opening of the suction line and the rotation of the impeller is started. The rotation of the impeller first exhausts a mixture of air or gas and water from the suction chamber, after which both water and air or gas come together from the suction line, and finally water alone. When water alone is drawn from the suction line its impact or pressure on the blade 15 urges that member downward and the valve to closed position, after which water alone is pumped through the suction line until exhausted from the source at the foot of the suction line.

It will be noted from Figures 1 and 2 that the arm 13 and weight 14 are so arranged that weight 14 has its greatest moment arm about the pivot of valve 12 when the latter is open. This moment arm decreases as the valve moves towards closed position and as the member 15 moves out of the direct path of liquid in the suction line. The result is that there is a tendency for the valve to be kept open until the velocity head of fluid in the suction line reaches a selected degree but when the valve is once started towards closed position, closing of the valve is facilitated by decrease in the length of the moment arm.

It will also be noted from Figures 1 and 3 that when the valve is closed, it is slightly hydrostatically unbalanced so that the unbalanced hydrostatic pressure will aid in keeping the valve closed. From these figures it will be noted that the upper surface of the valve 12 is so arranged that that portion of the area which is disposed to the right of the pivot pin thereof is of greater area than that portion which is disposed to the left of the pivot pin. This difference in area brings about the hydrostatic unbalance of the valve so that the pressure in the chamber 7 acting on the upper surface of the valve tends to keep the valve closed. However, as soon as the velocity head in the suction line acting on the blade 15 falls below the selected degree, the weight 14 will be sufficient to overcome the hydrostatic unbalance and open the valve.

In this operation it will be noted that the priming water merely churns around in the impeller housing and discharge chamber until all the air or gas is exhausted from the suction line and suction chamber, but that when the water, minus the air or gas begins to flow, that is when the pump is primed, the pumped water is discharged through the hatch 7^a of the discharge chamber.

In Figs. 3 and 4 the parts are substantially the same and are correspondingly designated except that the suction chamber, as shown at 6^a, has greater upward extension and to a point substantially in line with the top of the discharge chamber. The modification shown permits a large quantity of priming water to be initially supplied to the pump, the level of which as in the former case can be at the bottom of the connection of the suction line with the extension intake chamber. With such construction no foot or check valve is required in the suction line to prevent loss of water by syphoning, which loss may occur when the operation of the pump is stopped.

The forms of the parts can be changed without departing from the gist of the invention as claimed.

What I claim is:

1. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming fluid associated with said chamber, a port leading from said container to said impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming fluid to said impeller chamber when open and to substantially exclude priming fluid therefrom when closed, and means for holding said valve open to admit priming fluid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with a selected velocity head is established therein and thereafter closing said valve and maintaining it closed while this condition continues to exist, said last named means comprising a baffle member of less area than the cross-section of the suction line projecting into the path of flow of the fluid therein but movable substantially entirely out of said path of flow by the action thereon of said selected velocity head of fluid, and a weight associated therewith and pre-selected to prevent initiation of the closing movement of said valve until said member is subjected to said selected velocity head of fluid, said weight being so related to said valve that movement of the valve towards closed position decreases the effectiveness of the weight as said baffle member moves away from the center of flow.

2. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming fluid associated with said chamber, a port leading from said container to said impeller chamber, said port being of less area than the port leading from the suction chamber into the impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming fluid to said impeller chamber when open and to substantially exclude priming fluid therefrom when closed, means for holding said valve open to admit priming fluid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with a selected velocity head is established therein

and thereafter closing said valve and maintaining it closed while this condition continues to exist, said last-named means comprising a baffle member of less area than the cross-section of the suction line projecting into the path of flow of the fluid therein but movable substantially out of said path of flow by the action thereon of said selected velocity head of fluid, and a weight associated therewith and preselected to prevent initiation of the closing movement of said valve until said member is subjected to said selected velocity head of fluid, said weight being so related to said valve that movement of the valve towards closed position decreases the effectiveness of the weight as said baffle moves away from the center of flow, said valve being slightly hydrostatically unbalanced when in closed position so that the unbalanced hydrostatic pressure will aid in keeping the valve closed, said weight being sufficient to overcome the slight hydrostatic unbalance to open the valve when the velocity head of fluid acting on said baffle member falls below the selected degree.

3. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming fluid associated with said chamber, a port leading from said container to said impeller chamber, said port being of less area than the port leading from the suction chamber into the impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming fluid to said impeller chamber when open and to substantially exclude priming fluid therefrom when closed, means for holding said valve open to admit priming fluid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with a selected velocity head is established therein and thereafter closing said valve and maintaining it closed while this condition continues to exist, said last-named means comprising a baffle member of less area than the cross-section of the suction line projecting into the path of flow of the fluid therein but movable substantially out of said path of flow by the action thereon of said selected velocity head of fluid, and a weight associated therewith and preselected to prevent initiation of the closing movement of said valve until said member is subjected to said velocity head of fluid, said valve being slightly hydrostatically unbalanced when in closed position so that the unbalanced hydrostatic pressure will aid in keeping the valve closed, said weight being sufficient to overcome the slight hydrostatic unbalance to open the valve when the velocity head of fluid acting on said baffle member falls below the selected degree.

4. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming fluid associated with said chamber, a port leading from said container to said impeller chamber, said port being of less area than the port leading from the suction chamber into the impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming fluid to said impeller chamber when open and to substantially exclude priming fluid therefrom when closed, means for holding said valve open to admit priming fluid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with

a selected velocity head is established therein and thereafter closing said valve and maintaining it closed while this condition continues to exist, said last-named means comprising a baffle member projecting into the path of fluid flowing through the pump, and a weight associated therewith and preselected to prevent initiation of the closing movement of said valve until priming is completed, said valve being slightly hydrostatically unbalanced when in closed position so that the unbalanced hydrostatic pressure will aid in keeping the valve closed, said weight being sufficient to overcome the slight hydrostatic unbalance to open the valve when the velocity head of fluid in the suction line falls below the selected degree.

5. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming fluid associated with said chamber, a port leading from said container to said impeller chamber, said port being of less area than the port leading from the suction chamber into the impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming fluid to said impeller chamber when open and to substantially exclude priming fluid therefrom when closed, means for holding said valve open to admit priming fluid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with a selected velocity head is established therein and thereafter closing said valve and maintaining it closed while this condition continues to exist, said valve being slightly hydrostatically unbalanced when in closed position so that the unbalanced hydrostatic pressure will aid in keeping the valve closed, said means including a member for overcoming the slight hydrostatic unbalance to open the valve when the velocity head of fluid in the suction line falls below the selected degree.

6. A self-priming centrifugal pump comprising an impeller chamber, a suction line leading into said impeller chamber, an impeller in said chamber, a container for priming liquid associated with said chamber and disposed directly adjacent to said suction line, a port leading from said

container into said suction line, said port being of less area than the port leading from the suction line into the impeller chamber, a discharge passage leading from said impeller chamber, a valve for controlling said port to admit priming liquid to said impeller chamber when open and to substantially exclude priming liquid therefrom when closed, means for holding said valve open to admit priming liquid to said impeller chamber until the air is substantially exhausted from the suction line and until a fluid flow with a selected velocity head is established therein and thereafter closing said valve and maintaining it closed while this condition continues to exist, said last-named means comprising a baffle member connected to said valve and located in the suction line, said baffle member being of less area than the cross sectional area of the suction line and projecting into the path of flow of the liquid therein but being movable substantially out of said path of flow by the action thereon of said selected velocity head of liquid, and an arm connected to the valve and projecting from the opposite side of the priming port into said priming liquid container, said arm carrying a weight which is disposed in said priming liquid container and which is preselected to prevent initiation of the closing movement of said valve until said baffle member is subjected to said selected velocity head of fluid, said weight being so related to said valve that movement of the valve towards closed position decreases the effectiveness of the weight as said baffle member moves away from the center of flow, said valve being hydrostatically unbalanced when in closed position so that the unbalanced hydrostatic pressure will aid in keeping the valve closed, the decrease in effectiveness of said weight and the unbalanced hydrostatic force serving to compensate for the decrease in effectiveness of the velocity head force produced by movement of the baffle member away from the center of flow, said weight being sufficient to overcome the hydrostatic unbalance to open the valve when the velocity head of liquid acting on said baffle member falls below the selected degree.

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