Feb. 6, 1934. O. JACOBSEN 1,946,212

CENTRIFUGAL PUMP

Filed March 15, 1933

Fig. 1.

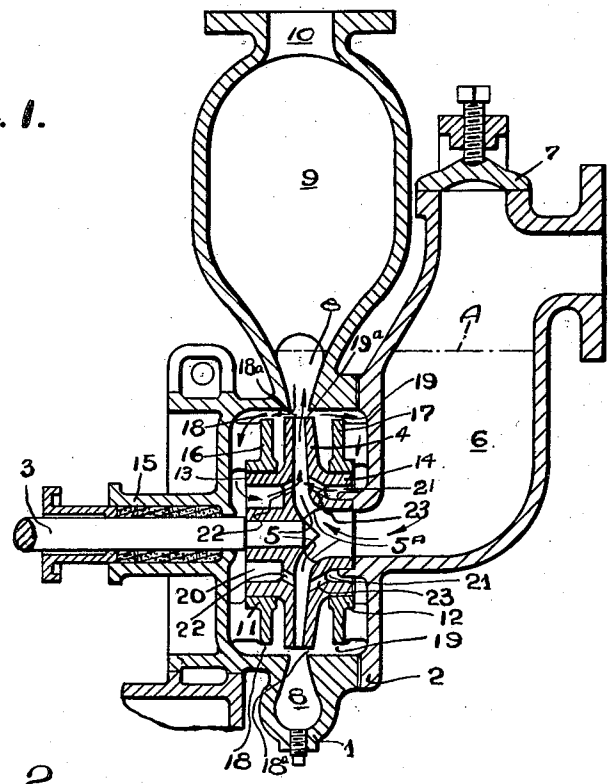
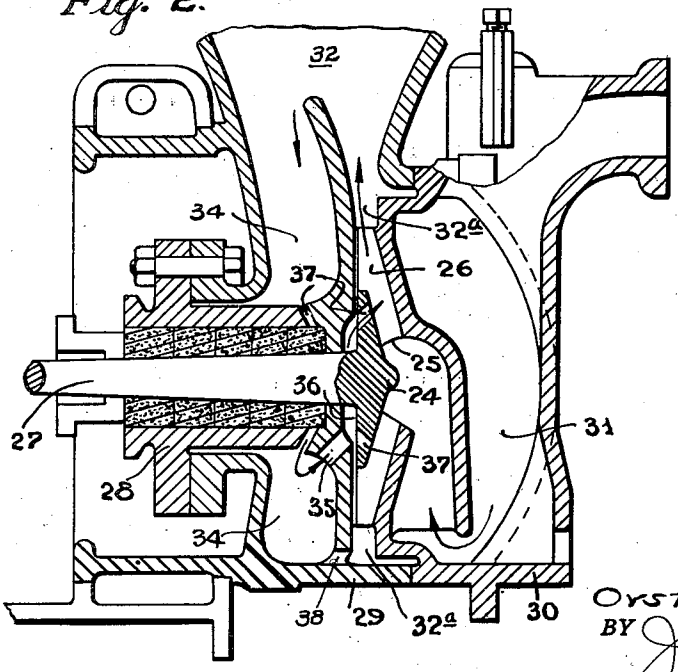


Fig. 2.



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1,946,212

CENTRIFUGAL PUMP

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1 Claim. (Cl. 103—113)

The invention relates to self-priming centrifugal pumps and involves an improvement over the construction of my Patent No. 1,755,217, dated April 22, 1930. The object of the invention is to provide a simplified construction which will give a self-priming action, which is equally as effective as that secured by the structure of my prior patent, and in which there is no interference to the inflow of water through the inlet eye, such as that offered by the circulation nozzle of my patent which has its outlet end located in the center of the eye. Two embodiments of the invention are illustrated in the accompanying drawing, wherein:

Figure 1 is a vertical section through a centrifugal pump of the closed runner or impeller type with my improvement applied thereto. And Fig. 2 is a vertical section through a pump of the open runner type with the improvement applied thereto.

In both forms of apparatus, the principal of operation is the same as that set forth in my patent. The operation of the runner carries the priming water in the suction elbow up into a separation pipe or chamber above the runner. Provision is made to permit water from this elevated body to flow back into the pump to a point near the center of the runner and discharge to the stream of water flowing outward along the impeller vanes or passages from the center thereof to their periphery. This provides a continuous circulation of the priming water which picks up some additional air from the suction elbow each time it makes its circuit, so that the elbow is finally freed from air and filled with water, thus completing the priming operation. In the present apparatus, provision is made for conducting the gravity flow of liquid from the separation chamber to a cavity or chamber at one side of the impeller and thence through ports in the impeller to the spiral passages of the runner, instead of conducting the water back into the suction elbow through a return nozzle as is done in my patent.

Referring to Fig. 1 of the drawing, 1 and 2 are parts of the pump casing which are bolted or clamped together; 3 is the drive shaft provided at one end with the impeller or runner 4, which in this instance, is of the closed type having the usual spiral passages 5 separated by the walls or vanes 5*a*, and at the other end having suitable driving means (not shown), such as a pulley; and 6 is the suction elbow located in the casing part 2, and having at its upper end a priming opening provided with a cover 7 suitably secured in place.

Extending upward from the volute 8 of the casing, is a separation pipe or chamber 9 having an outlet opening, 10 at its upper end, to which an outlet pipe (not shown) is connected. The casing parts 1 and 2 are provided, respectively, with the integral bearing members 11 and 12, in which are journaled the hubs 13 and 14 which are integral with the runner 4. The casing member 1 is provided with the usual stuffing box 15, through which the drive shaft 3 extends.

The bearing members 11 and 12 are provided with annular flanges 16 and 17, whose peripheries are spaced away from the walls of the casing members to provide the passages 18 and 19 to permit a gravity flow of liquid from the separation chamber 9 and the volute through the annular spaces 18*a* and 19*a* provided by the spacing of the periphery of the impeller from the inner wall of the pump casing to the central portion of the pump for priming purposes, as later described. The hubs 13 and 14 are cored out, as indicated at 20 and 21, and these recesses communicate at their inner ends with the spiral runner passages 5 via the ports 22 and 23. Provision is thus made for a flow of liquid from the passages 18 and 19 to the inner ends of the runner passages via the recesses 20 and 21 and the ports 22 and 23.

When the pump is primed, the liquid lies at about the level A, filling the elbow and the volute. The pump is then started, and the action of the runner withdraws the liquid in the elbow and forces it up to a higher level in the separation chamber 9, such movement of the liquid carrying with it some of the air in the elbow 6. The head pressure built up in the chamber 9, due to the rise of the level therein, now causes a gravity flow through the annular passages 18 and 19 to the front and rear sides of the impeller and thence through the recesses 20 and 21 and ports 22 and 23 to the inner ends of the impeller passages 5, where the liquid is picked up and caused to flow up into the separation chamber again. Provision is thus made for a repeated circulation of the priming liquid in a circuit including the separation chamber, the casing of the pump at the sides of the impeller and the impeller passages; and this movement of the liquid carries with it some of the air from the elbow 6. This quickly exhausts the air from the elbow, causing it to fill with liquid from the inlet end of such elbow, thus completing the priming operation. After the priming operation is completed, there is lit-

tle backflow through the passages 18 and 19, as the liquid now flowing through the volute at considerable velocity causes a drag which counteracts the gravity flow which would otherwise occur. The efficiency of the pump is thus only slightly reduced incident to the self-priming construction.

In the Fig. 2 construction, an impeller or runner 24 of the open type is used, such runner being provided with the usual spiral vanes 25 with passages 26 therebetween. In this case, the drive shaft 27 is integral with the impeller, and is made tight by the stuffing box 28. The casing is in two parts 29 and 30 bolted or clamped together, the part 30 being provided with the suction elbow 31 discharging to the eye of the pump. The volute 32*a* discharges into a separation chamber 32 having a discharge outlet and a priming passage 34 leading via the passage 35 to a cavity 36. Ports 37 permit the priming water to flow through the impeller to the passages between the vanes 25. A passage 38 provides a means for drainage whereby any dirt collecting in the volute is washed into the lower end of the passage 34.

The operation of the Fig. 2 construction is similar to that described in connection with Fig. 1. When the pump is started, the priming liquid flows up into the separation chamber from which a return circulation occurs through the passages 34 and 35, the cavity 36 and the ports 37, the liquid then being again carried up into the separation chamber by the impeller. This repeated circulation finally clears the suction elbow of air so that it fills with liquid, thus completing the priming operation.

What I claim is:

In combination in a centrifugal pump, a casing having an inlet eye at its center and a volute around its periphery, a suction elbow leading to the eye, a separation chamber above the volute to which the volute discharges, a runner or impeller of the closed type having vanes with passages therebetween mounted for rotation in the casing with its center in opposition to said eye and arranged to receive the liquid supplied to the eye, a drive shaft, a hub on each side of the runner, said drive shaft being secured to one of said hubs, and each hub having an annular chamber concentric with the drive shaft and provided at its inner end with ports leading to the passages between the vanes, a bearing on each side of the runner in which the respective hubs are mounted, a cavity in the casing on each side of the runner concentric with the drive shaft with which the outer ends of said annular chambers communicate, and communications between the separation chamber and said cavities.

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