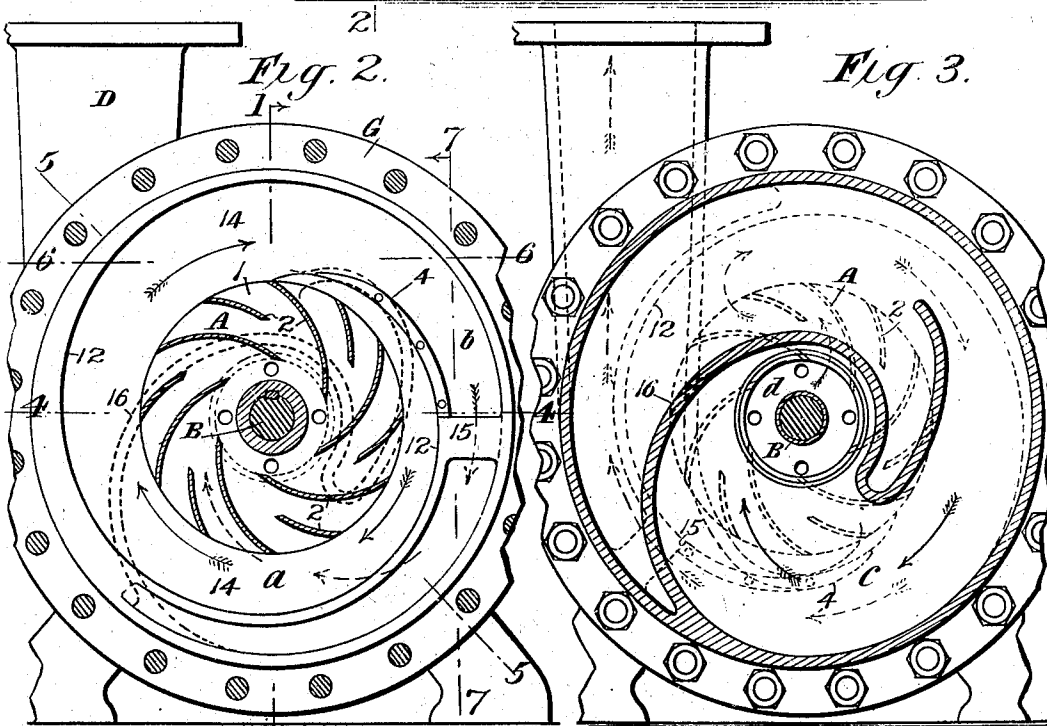
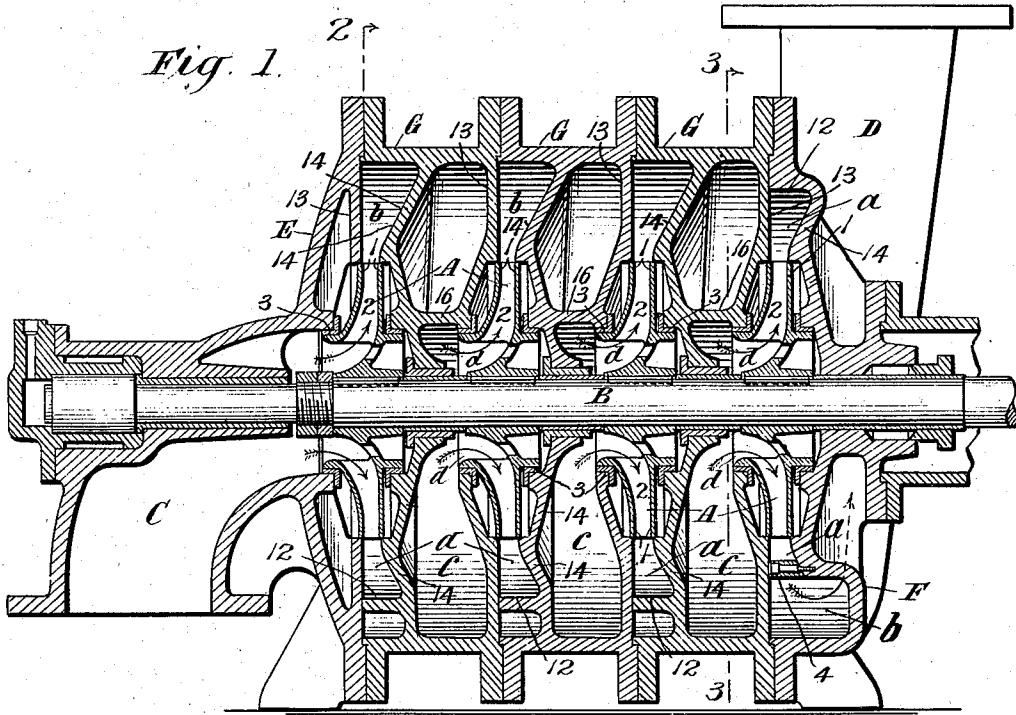


W. SCHEURMANN.
CENTRIFUGAL AND SIMILAR PUMP, BLOWER, AND THE LIKE.
APPLICATION FILED JUNE 14, 1907.

939,333.

Patented Nov. 9, 1909.

4 SHEETS—SHEET 1.



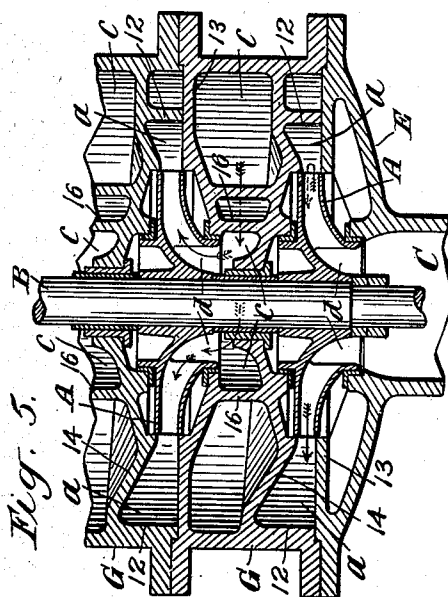
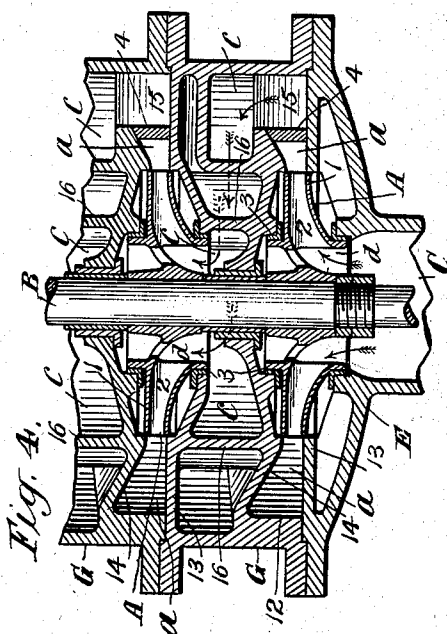
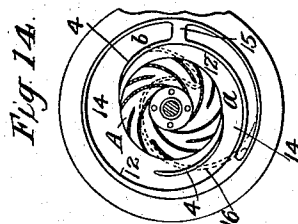
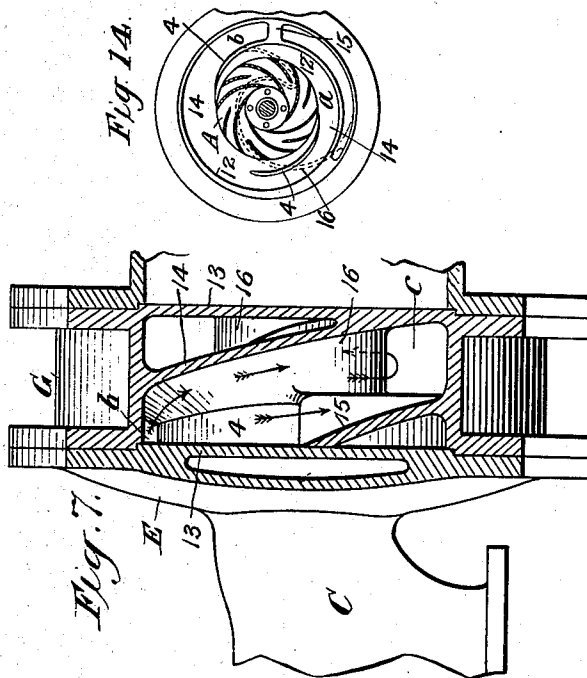
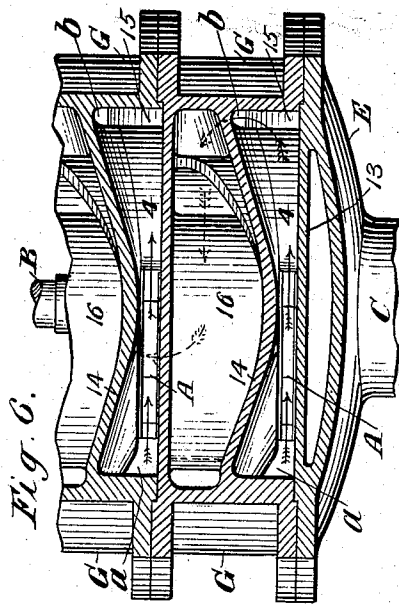
Witnesses:
Albert Journeay
J. A. Graves

Inventor:
Walter Scheurmann
by his Atlys:
Philip S. Sauer & Keweenaw

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4 SHEETS—SHEET 2.



Witnesses:
Albert Journeay
J. L. Graves

Inventor:
Walter Scheurmann
by his Attys:
Philip L. Sawyer & Co. Kew-Forest, N.Y.

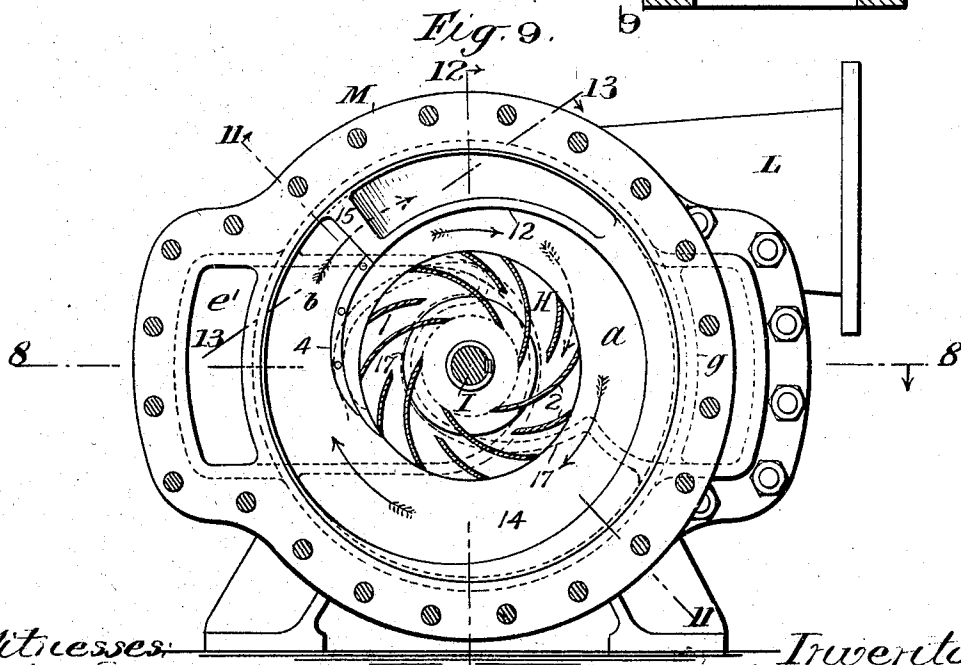
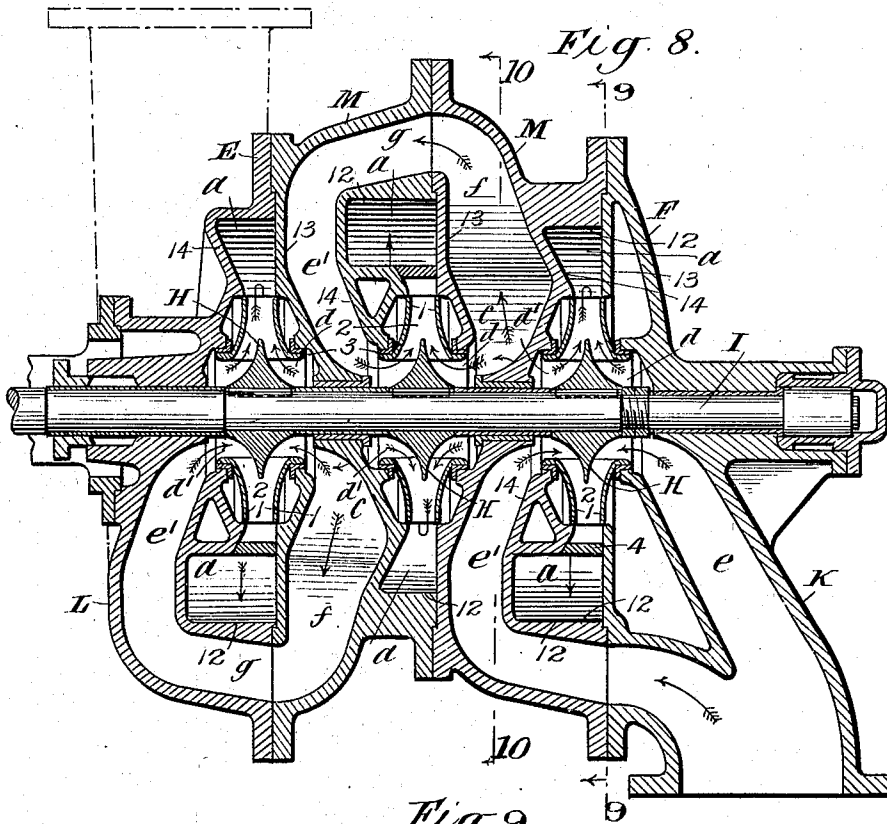
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4 SHEETS—SHEET 3.



Witnesses:
Albert J. J. J.
J. J. J.

Inventor
Walter Scheurmann
by his Attys:
Philip J. J. J.

APPLICATION FILED JUNE 14, 1907.

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4 SHEETS—SHEET 4.

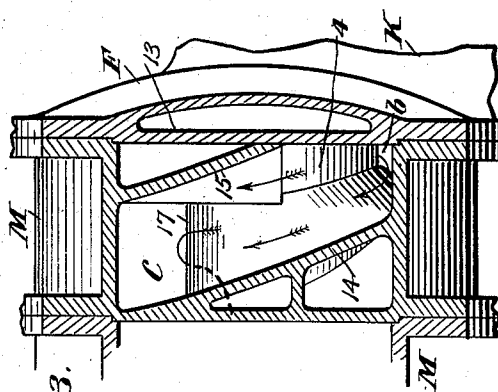


Fig. 13.

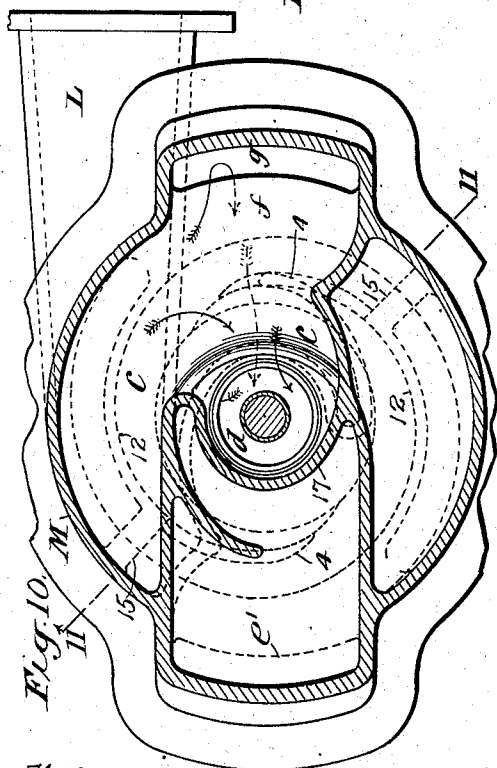


Fig. 10.

Witnesses:
Albert Journey
J. A. S. W. C.

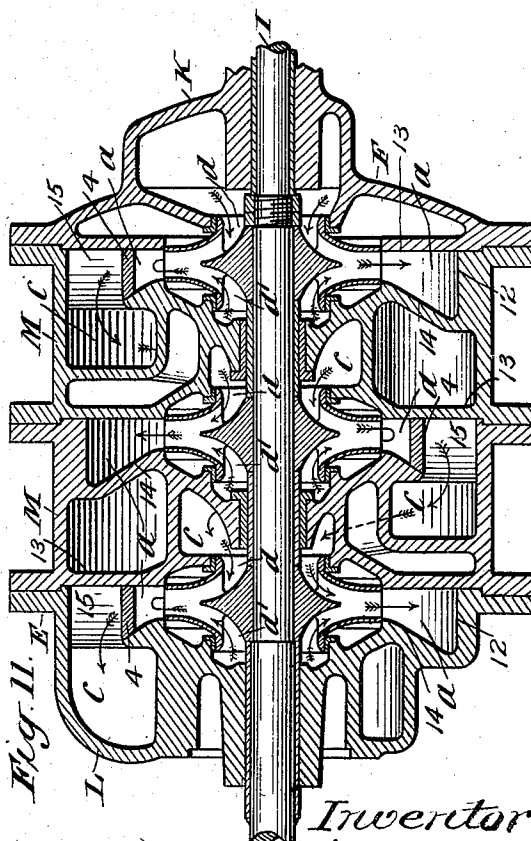


Fig. 11.

Inventor:
Walter Behnemann
by his Attys:
Philipp Sawyer, Esq. Kennedy

UNITED STATES PATENT OFFICE.

WALTER SCHEURMANN, OF NEWARK-UPON-TRENT, ENGLAND, ASSIGNOR TO HENRY R. WORTHINGTON, A CORPORATION OF NEW JERSEY.

CENTRIFUGAL AND SIMILAR PUMP, BLOWER, AND THE LIKE.

939,333.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed June 14, 1907. Serial No. 378,885.

To all whom it may concern:

Be it known that I, WALTER SCHEURMANN, a citizen of Switzerland, residing at No. 8 The Park, Newark-upon-Trent, England, have invented certain new and useful Improvements in Centrifugal and Similar Pumps, Blowers, and the Like, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to provide a centrifugal pump in which a high efficiency shall be secured with a simple and cheap construction, and without the diffusing vanes now generally employed.

The invention is especially intended for pumps of that class employing a series of impellers through which the water passes successively, and commonly known as multi-stage pumps, but the broader features of the invention may be used in single stage pumps employing one or more impellers.

The invention includes a novel design of the fluid passages by which the fluid travels in a continuous helical path from the impeller to the delivery, or from each impeller of a multi-stage pump to the suction of the succeeding impeller, and thus through the series of impellers to the delivery, without sudden changes in direction of flow. In this design, a diffusing passage or chamber of gradually increasing area surrounds the impeller, forming a spiral or volute increasing in area with the fluid delivered to it by the impeller and gradually developing to form a helical passage which conducts the fluid to the delivery of a single-stage pump, or into a suction spiral or volute of decreasing radius for the next impeller of a multi-stage pump.

In addition to the broader features of the design, the invention includes certain specific features of construction by which important advantages are secured in simplicity and convenience of constructing and machining the pump.

For a full understanding of the invention, a detailed description of constructions embodying the same in preferred forms will now be given in connection with the accompanying drawings forming a part of this specification, and the features forming the invention then specifically pointed out in the claims.

In the drawings:—Figure 1 is a central

vertical longitudinal section on the line 1 of Fig. 2, showing a four-stage centrifugal pump embodying the invention in the preferred form, with single suction impellers; Figs. 2 and 3 are vertical cross-sections on, respectively, the lines 2 and 3 of Fig. 1. Figs. 4, 5, 6, and 7 are sections on, respectively, the lines 4, 5, 6 and 7 of Fig. 2. Fig. 8 is a horizontal, central, longitudinal section on the line 8 of Fig. 9, showing a three-stage double suction impeller pump embodying certain features of the invention. Figs. 9 and 10 are cross sections on, respectively, the lines 9 and 10 of Fig. 8. Figs. 11, 12 and 13 are sections on, respectively, the lines 11, 12 and 13 of Fig. 9. Fig. 14 is a view similar to Fig. 2, on a smaller scale, showing a modification employing two dividing fins.

Referring now particularly to Figs. 1 to 7, A are the impellers, B the shaft carrying the impellers, C the suction at one end of the pump, and D the delivery at the opposite end of the pump. The casing consists of the suction head E, the delivery head F, and three intermediate sections G, in which are formed the passages connecting each impeller with the next impeller. The sections G, and the suction and delivery heads are shown as connected by bolted flanges with sunk joints, but may be connected otherwise. The impellers A are shown as of the common inclosed impeller form, having the side walls 1 and vanes 2, and running joints 3 formed by flanges at opposite sides of the impeller running on the casing or packing rings, and as having the usual suction balancing chambers at the rear of the impellers connected by openings with the suction. It will be understood, however, that these detail features are not essential to the invention. Referring now to the fluid passages through the pump, each impeller A delivers to a volute or spiral diffusing chamber or passage *a* of gradually increasing depth, which is formed by spiral wall 12 terminating in dividing fin 4. The impellers deliver to the diffusing passages *a* through a narrow throat surrounding the impeller, which is of substantially the width of the impeller delivery, so that the diffusing passage lies outside the impeller periphery and does not include the side chambers on the opposite sides of the impeller but forms a true volute or spiral diffusing chamber. The outer wall 13 of

this diffusing passage is formed by the inner flat side of the suction head E, in the case of the first impeller, and of the preceding section G, in the case of the succeeding impellers, but the inner wall 14 of the passage gradually develops inward helically, through and beyond the diffusing passage, so as to form a helical passage *b*, which extends over and at the side of the fin 4, until it reaches the partition 15 behind which it passes and develops into the volute or spiral *c* of gradually decreasing area, by which the fluid is conducted to the suction *d* of the next impeller, this suction volute or spiral *c* being formed by spiral partition 16. The passages for the succeeding impellers are the same except that in the case of the final impeller, the helical passage *b* is shown as developing into the tangential delivery D, instead of into a volute or spiral *c* for axial delivery, as in the case of the preceding impellers. The dividing fin 4 of the last impeller is in a different position from those of the preceding impellers, which are in line, this change of position on the last impeller resulting from the vertical delivery from the diffusing chamber. The dividing fin 4 may terminate at the point shown, or be extended to terminate closer to the impeller. It may be cast with the shell, or formed separately of a suitable tough material. If formed separately and removable, as shown, the wall 14 may be readily machined, by removing this fin, down to the partition 15 behind which the passage passes. This removable feature also permits the substitution of a longer fin for the use of a smaller impeller.

In large pumps it may be found desirable to employ two or more dividing fins 4 about the impeller for balancing. In Fig. 14 there is shown such a modification, in which two such fins are used, located at opposite sides of the impeller, the construction otherwise remaining the same.

It is found in practice that a high efficiency is secured with this design of multi-stage pump, and it will be seen that it avoids the objections to the commonly used diffusing vanes in respect to cost of construction and machining, and the failure to secure the best results, unless the vanes be designed especially for each new set of working conditions. There being only one edge of the dividing fin against which the liquid can strike, or two, in the possible construction for large pumps shown in Fig. 14, the shock and possible loss of efficiency from this cause is reduced to a minimum, and the rest of the passage is a clear, gradually increasing, diffusing area, in which the liquid can adjust itself gradually to the direction and velocity of the main body of liquid flowing in the passage. The continuous helical flow, also, avoids the disadvantages common

to existing types of multi-stage pumps without diffusing vanes, in which there is a sudden change of direction as the liquid passes through the branch passages from one impeller to the next.

In the construction shown, it will be seen that the diffusing passages *a* are closed on one side by the flat disks forming one side of the heads and sections, and that these passages are open until the parts are assembled. This feature is important in manufacturing, as the flat face is readily machined and the open passages readily accessible before assembling.

While the invention is especially adapted for single suction impeller pumps, the broader features of the invention may be applied also to pumps having double suction impellers, and in Figs. 8 to 13 there is shown such a modification. In this construction, the double suction impellers H are carried by the shaft I, and the pump casing consists of the suction head K, delivery head L, and two sections M. To provide for the suction at opposite sides of the impeller, it is necessary to carry a branch passage around the impeller, and this involves a change in direction of flow of the liquid for one suction of each impeller. For the other suction of each impeller, the flow is substantially as in the construction previously described. The first impeller receives the liquid from the two suction branches *e*, *e'* for opposite sides of the impeller, and the impeller delivers to the volute or spiral diffusing passage, within the wall 12, and fin 4, and inclosed by the flat wall 13 and helical wall 14, and the helical passage *b* passes down behind the partition 15 and develops into the suction volute *c*, which delivers to the suction *d* on the adjacent side of the impeller, all as in the construction shown in Figs. 1 to 7. The volute partition 17 in this construction, however, differs from the volute partition 16 of the construction of Figs. 1 to 7, in that it does not extend from the outer wall of the passage *b*, so as to receive all the fluid from passage *b*, but is formed to provide a passage *f*, through which the fluid passes to opening *g* and thus to the suction branch *e'* for the other suction *d'* of the impeller. The passages between the second and third impellers are the same as just described, except that, as shown, the suction branches *e'* are at opposite sides of the pump. The helical passage *b* on the last impeller is shown as developing into a tangential discharge, as in Figs. 1 to 7.

While the invention is especially intended for use in centrifugal pumps for liquids, it may be used also in blowers and the like for gaseous fluids.

It will be understood that the invention is not limited to the exact form or arrange-

ment of the passages shown, nor to the special class or detailed construction of impellers illustrated, but that all these may be varied while retaining the invention as defined by the claims.

What is claimed is:—

1. A centrifugal pump, blower or the like, having a spiral diffusing passage of increasing area surrounding the impeller and connecting with the impeller through a narrow throat and developing gradually into a helical passage through which the impeller delivers.

2. In a multi-stage centrifugal pump, blower or the like, an impeller having a spiral diffusing passage of increasing area surrounding it and connecting with the impeller through a narrow throat and developing gradually into a helical passage connecting with the suction passage of the next impeller.

3. In a multi-stage centrifugal pump, blower or the like, an impeller having a spiral diffusing passage of increasing area surrounding it and connecting with the impeller through a narrow throat and developing gradually into a helical passage connecting with a spiral passage of decreasing area delivering to the axial suction of the next impeller.

4. A multi-stage centrifugal pump, blower or the like, having a spiral diffusing passage of increasing area surrounding each impeller and connecting with the impeller through a narrow throat and developing gradually into a helical passage, and a spiral passage of decreasing area surrounding the axial suction of the second and subsequent impellers and into which the helical passage from the preceding impeller delivers.

5. In a centrifugal pump, blower or the like, the combination with an impeller, of spiral diffusing passage *a* surrounding the impeller and connecting with the impeller through a narrow throat and formed by spiral wall 12 terminating in fin 4, and having the side wall 14 on the delivery side inclined to form the helical passage *b* of increasing area.

6. In a centrifugal pump, blower or the like, the combination with the impeller, of spiral diffusing passage *a* surrounding the impeller and connecting with the impeller through a narrow throat and formed by spiral wall 12 terminating in fin 4, and having the side wall 14 on the delivery side inclined to form the helical passage *b* of increasing area, and spiral passage *c* of decreasing area to which the helical passage delivers.

7. In a centrifugal pump, blower or the like, the combination with the impeller, of spiral diffusing passage *a* surrounding the impeller and connecting with the impeller through a narrow throat and formed by

spiral wall 12 terminating in fin 4, and having the side wall 14 on the delivery side inclined to form the helical passage *b* of increasing area, a second impeller having an axial suction, and a spiral partition forming a spiral passage of decreasing area surrounding the suction of the next impeller and to which the helical passage delivers.

8. In a centrifugal pump, blower or the like, the combination with an impeller, of diffusing passage *a* of increasing area surrounding the impeller and connecting with the impeller through a narrow throat and formed by spiral wall 12 terminating in fin 4, and having the side wall 14 on the delivery side inclined to form the helical passage *b* of increasing area, a second impeller having a single axial suction, and spiral partition 16 continuous with the outer wall of the helical passage and forming a spiral suction passage through which the helical passage delivers to the next impeller.

9. A centrifugal pump, blower or the like, formed in sections and having a spiral diffusing passage of gradually increasing area formed in one section connecting with the impeller through a narrow throat and developing continuously and helically into the delivery of the impeller and closed on the other side by a flat circular wall on the adjacent section.

10. A multi-stage centrifugal pump, blower or the like, having one or more sections *G* formed with the open spiral diffusing passage *a* on one side connecting with the impeller through a narrow throat, the helical passage *b* of increasing area, and spiral suction *c*, and with the flat circular wall 13 adapted to close the diffusing passage of the next impeller.

11. A multi-stage centrifugal pump, blower or the like, having a plurality of impellers provided with suction openings at opposite sides, and having spiral diffusing passages of increasing area surrounding the impellers and developing into helical passages, the helical passages of the first and intermediate impellers connecting with spiral passages of decreasing area inclosing the adjacent suctions of the next impellers, and branch passages connecting said helical passages with the opposite suctions of the next impellers.

12. A multi-stage centrifugal pump, blower or the like, having a plurality of impellers provided with suction openings at opposite sides, and having diffusing spiral passages of increasing area surrounding the impellers and developing into helical passages, the helical passages of the first and intermediate impellers connecting with spiral passages of decreasing area inclosing the adjacent suctions of the next impellers, and branch passages connecting said helical passages with the opposite suctions of the

next impellers, said branch passages for successive impellers being arranged on opposite sides of the pump.

13. In a multi-stage centrifugal pump, blower or the like, the combination with the double suction impeller H, of the spiral diffusing passage *a* surrounding the impeller and having its inner wall 14 inclined to form the helical passage *b*, spiral wall 17 forming the spiral suction passage for the adjacent suction of the next impeller, and passages *f*, *g* connecting the helical passage with the suction passage for the opposite side of the impeller.

14. In a centrifugal pump, blower or the

like, the combination with an impeller, of spiral diffusing passage *a* surrounding the impeller and formed by spiral wall 12 terminating in fin 4, and having the side wall 14 on the delivery side inclined to form the helical passage *b* of increasing area, and an additional dividing fin in the diffusing passage to balance the impeller.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

WALTER SCHEURMANN.

Witnesses:

EDWARD WARREN HUSTED,
EDWARD PERCY SIMPSON.