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PATENTED APR. 28, 1908.

R. SALZER.
CENTRIFUGAL PUMP.

APPLICATION FILED MAY 18, 1907.

2 SHEETS—SHEET 1.

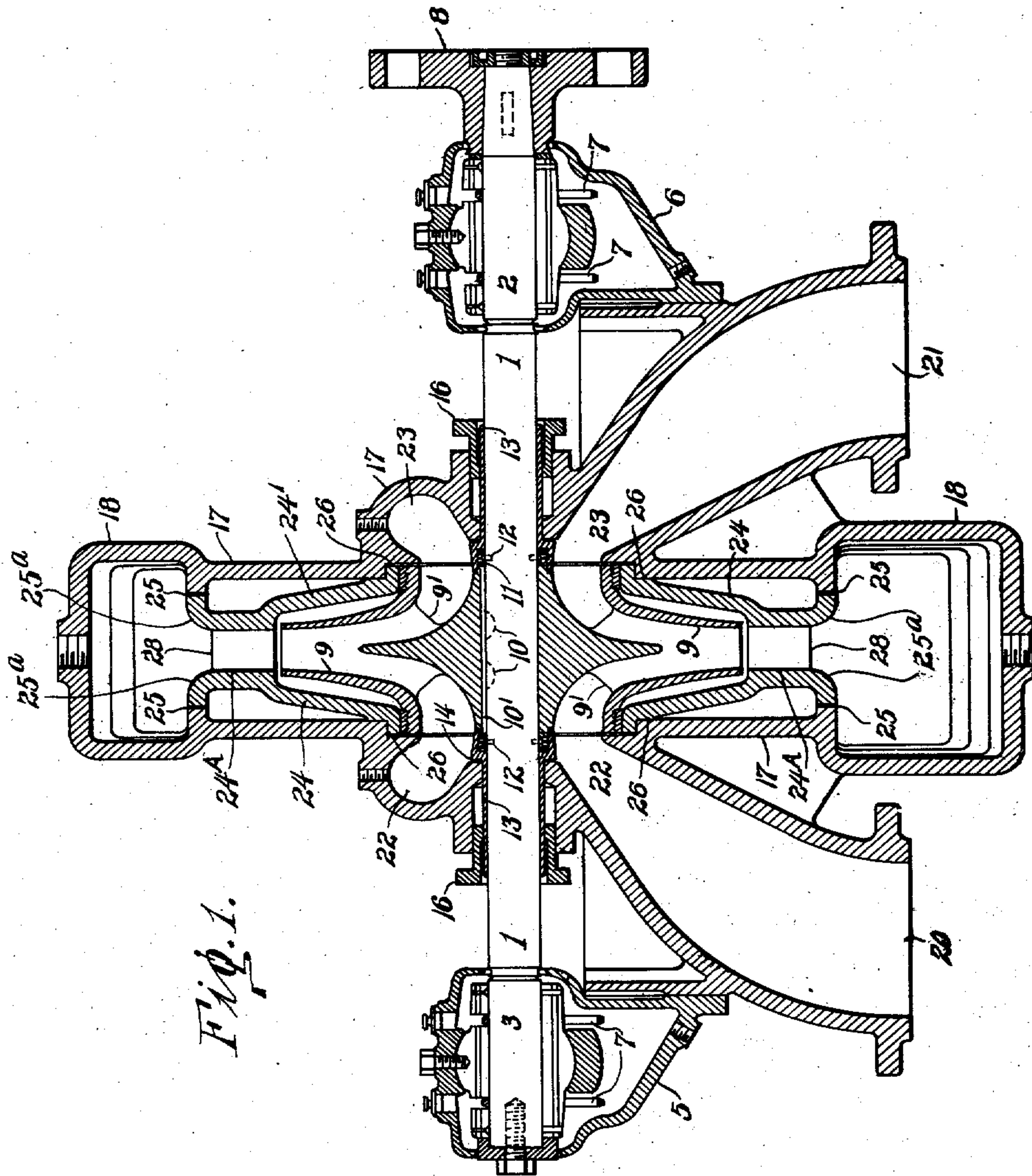


Fig. 1.

Witnesses

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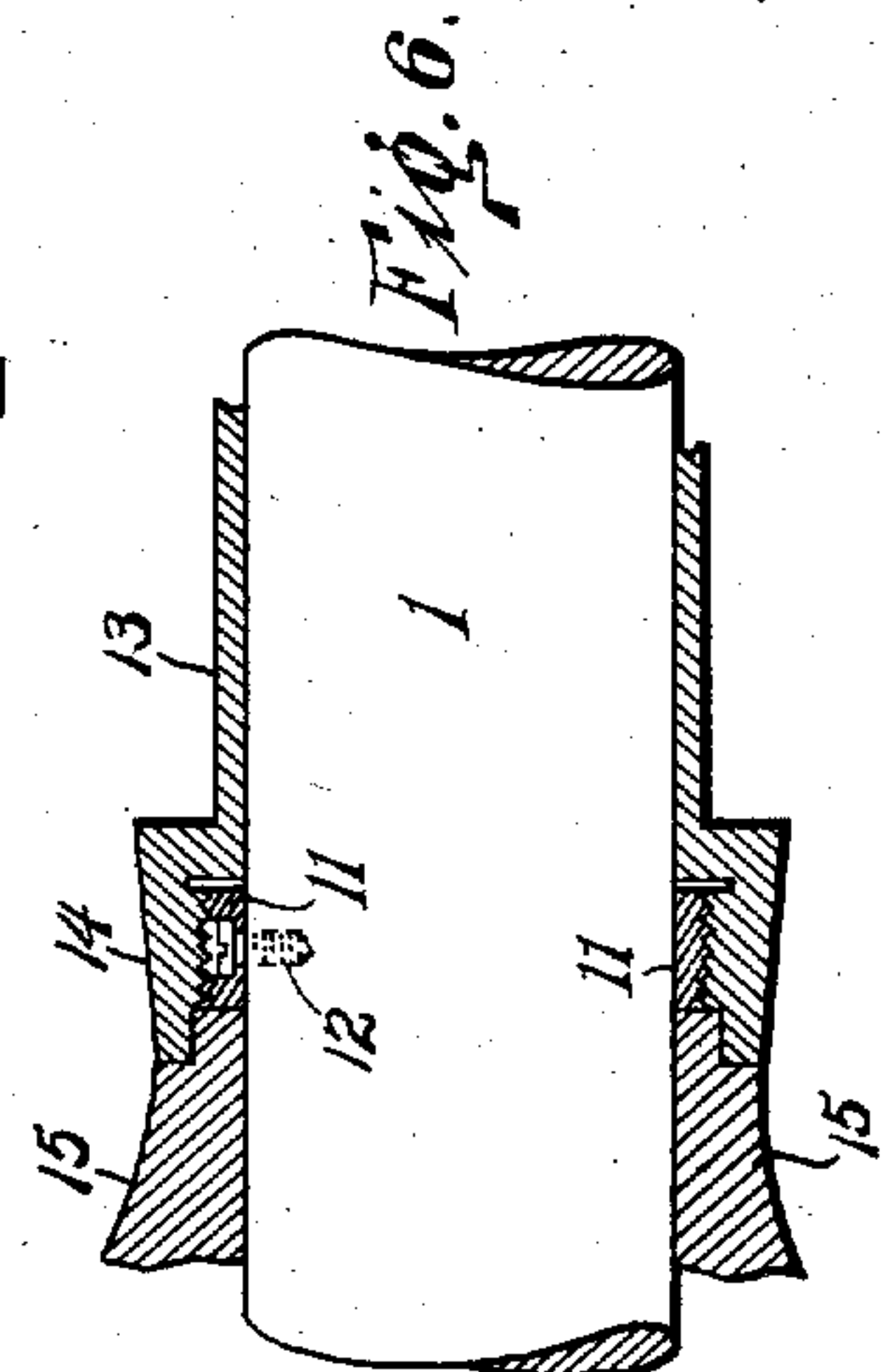
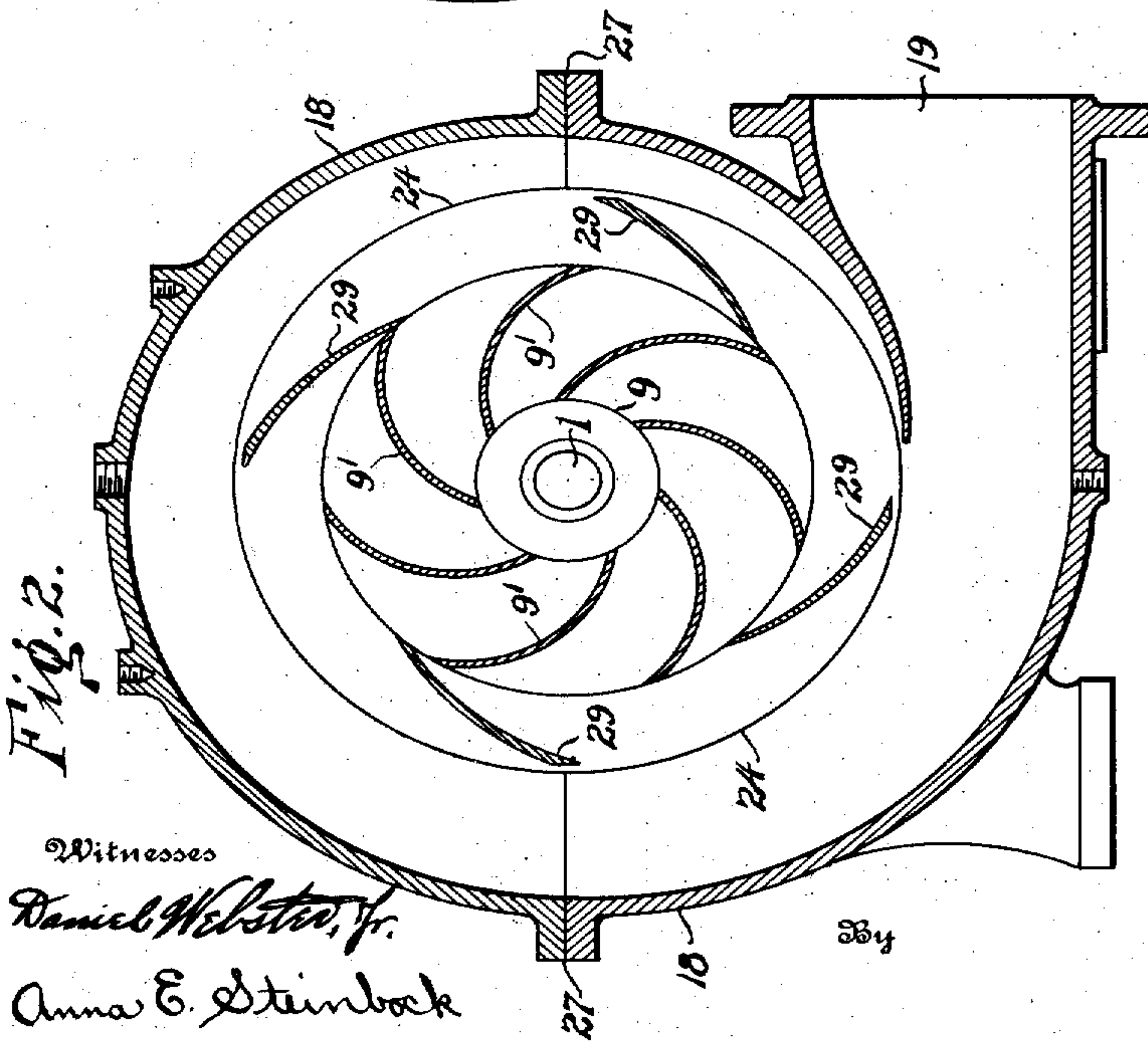
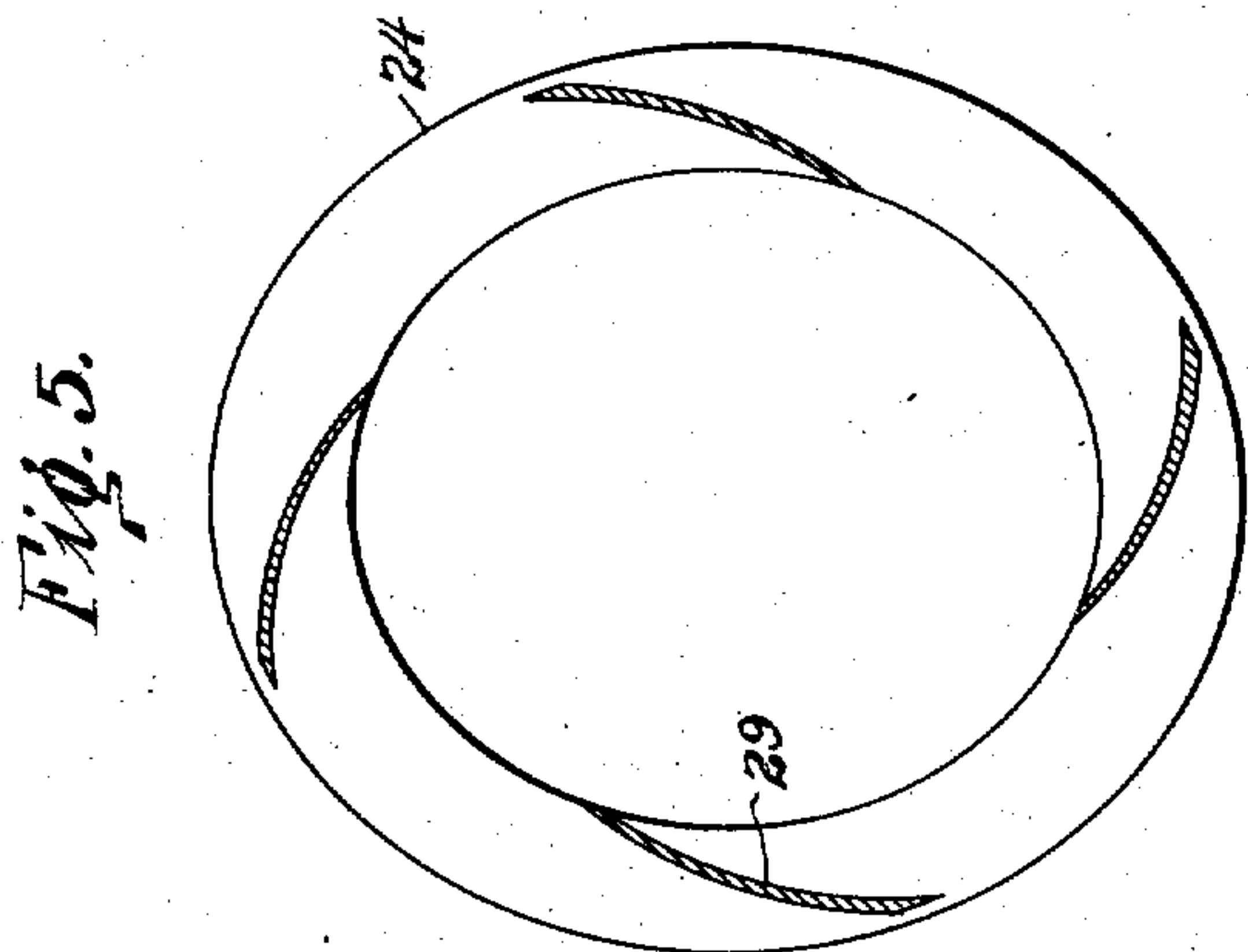
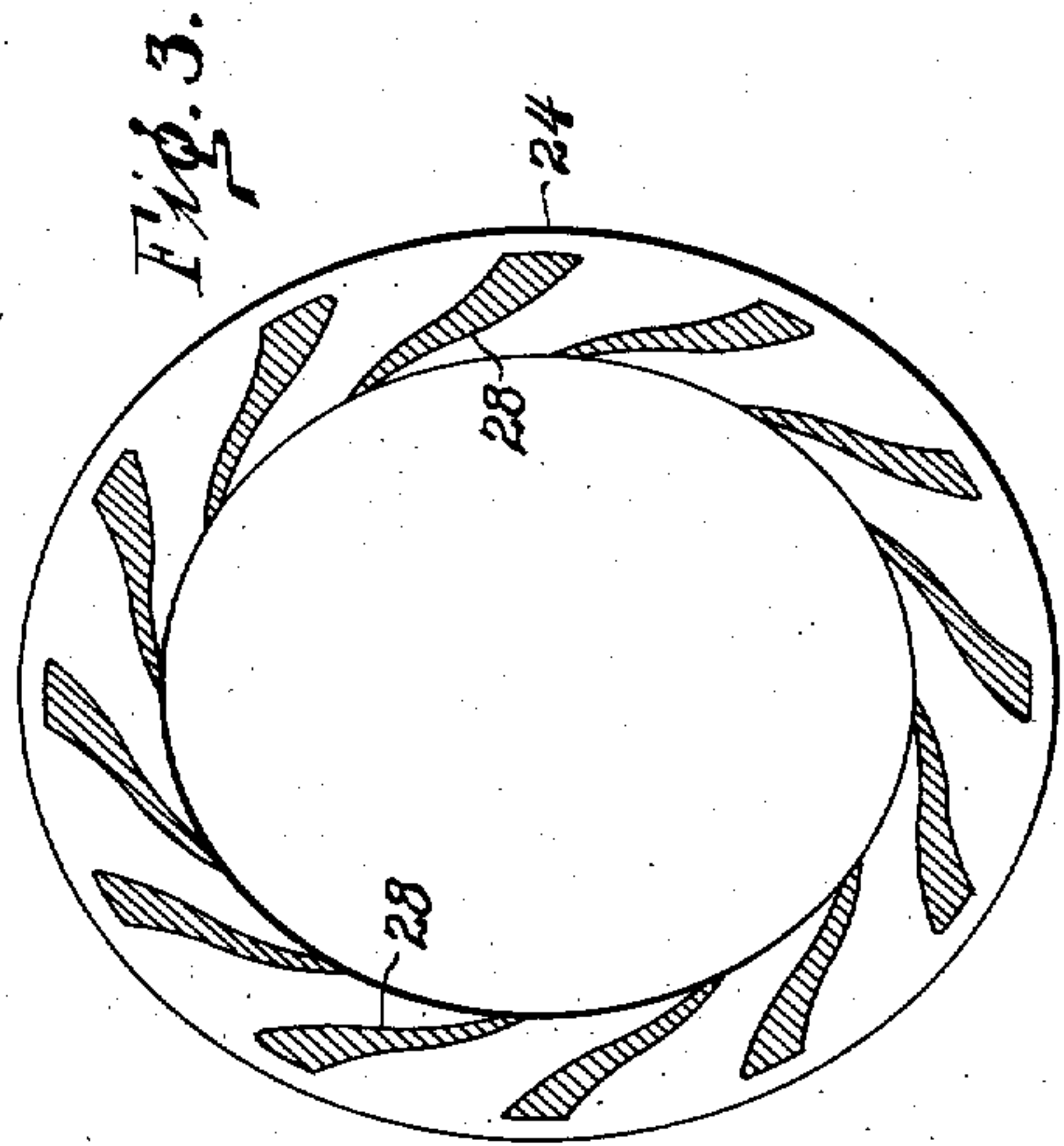
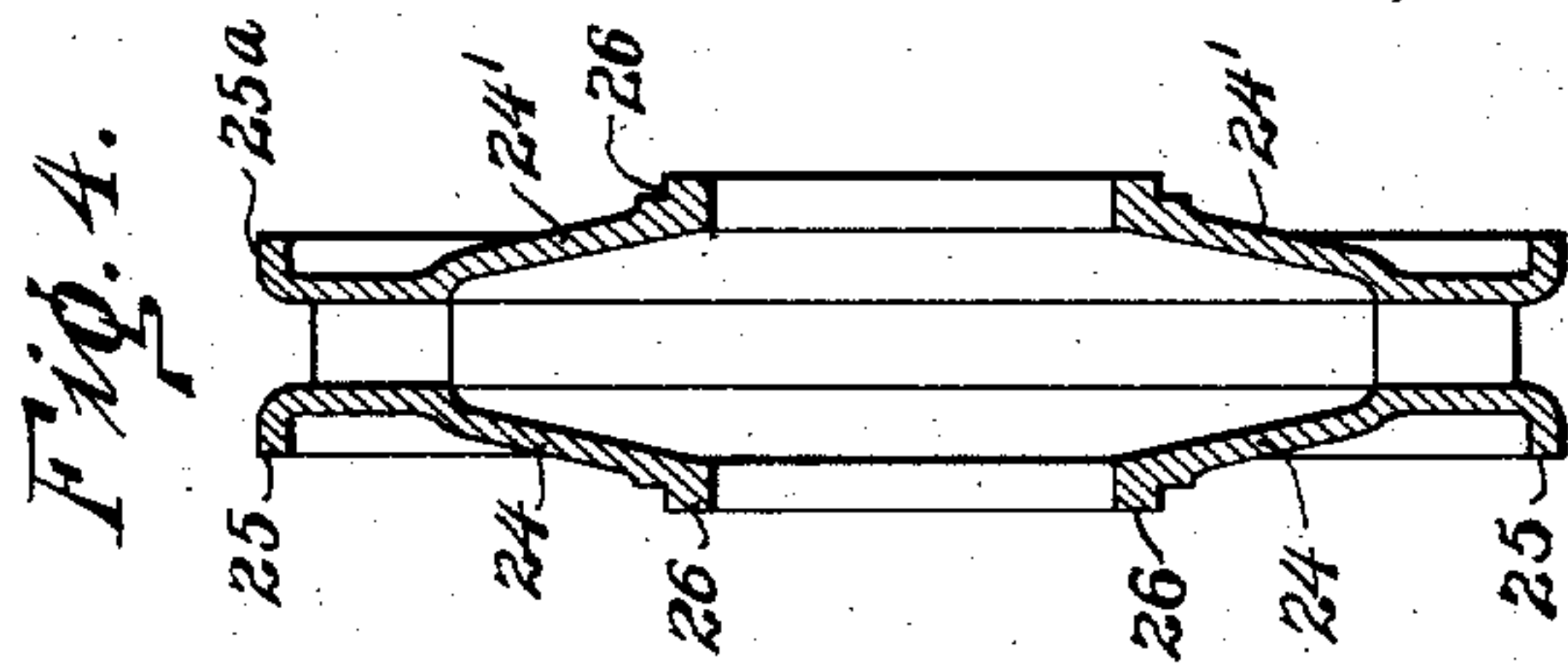
Inventor

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

RUDOLF SALZER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO D'OLIER ENGINEERING COMPANY, A CORPORATION OF NEW JERSEY.

CENTRIFUGAL PUMP.

No. 885,867.

Specification of Letters Patent.

Patented April 28, 1908.

Application filed May 18, 1907. Serial No. 374,388.

To all whom it may concern:

Be it known that I, RUDOLF SALZER, a subject of the Emperor of Austria-Hungary, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Centrifugal Pump, of which the following is a specification.

My invention relates to centrifugal pumps single or double suction and has for its object the provision of means whereby with a given pump case, shaft, etc., different and interchangeable impellers or pump wheels with correspondingly different and interchangeable distributors may be employed to suit different conditions.

The independent distributor is preferably cast and is so secured both with relation to the pump case and the impeller that it forms, in effect, a wall of the pump case and part of the discharge passage. This construction permits interchangeability for different services, as above referred to, and obviates the difficulties of construction heretofore found when casting a distributor integral with the pump case, under which circumstances the coring, anchoring of cores, etc., gave rise to imperfections and difficulties.

It is the further object of my invention to provide suitable means for securing the impeller on the driving shaft in desired position. To this end the impeller is held by a Woodruff key upon the shaft, and held against endwise motion by collars secured to the shaft, and over these collars is fastened a bushing forming a water-tight connection with the impeller hub, and as well, around the shaft, a suitable stuffing box intervening between the pump case and the bushing.

My invention resides also in other features of construction hereinafter described and pointed out in the claims.

For an illustration of a form my invention may take reference is to be had to the accompanying drawings, in which:

Figure 1 is a vertical sectional view through the bearings, pump case, impeller, and distributor. Fig. 2 is a vertical sectional view in a plane at right angles to the view in Fig. 1. Fig. 3 is a vertical sectional view, at right angles to the driving shaft, of the distributor when taking the form of a guide vane ring. Fig. 4 is a horizontal sectional view of the independent distributor. Fig. 5 is a vertical sectional view, at right angles to

the shaft, of the distributor when taking the form of a diffuser. Fig. 6 is a horizontal sectional view showing the means for securing the impeller, the shaft being shown in plan.

Referring to said drawings, the shaft 1 is shown as supported by the bearings 2 and 3, having suitable oil wells 5 and 6, adapted to contain oil to sufficient depth to permit the oil rings 7 to drip therein and to continuously and automatically oil the bearings. A coupling member 8 is secured upon one end of the shaft 1, and is adapted to cooperate with the coupling member on any suitable driving means as, for example, a steam turbine or electric motor. The impeller or pump wheel 9, having the usual vanes 9', is secured upon the shaft 1 by the Woodruff keys 10, 10' engaging in key way 10' in the impeller hub, and driven at suitable speed by said shaft 1. To prevent movement of the impeller lengthwise of the shaft 1, externally screw-threaded collars 11 surround the shaft 1 and abut against the ends of the impeller hub. These collars 11 are secured by screws 12 threaded into the shaft 1. Bushings 13 have a snug fit over the shaft 1 and terminate in internally screw-threaded enlargements 14 adapted to engage the screw threads upon the peripheries of the collars 11. The inner ends of the enlargements 14 have a finish fit with the impeller hub 9 as indicated at 15. At their outer ends the bushings 13 pass through the stuffing boxes or glands 16 having a water-tight connection with the pump case 17. The pump case has the discharge passage 18 of the usual volute form, the discharge orifice being at 19. This construction for securing the impeller upon the shaft permits the mounting of the shaft in place and coupling the same to the driving means, and thereafter moving the impeller to exactly correct position with respect to the stationary parts of the pump. This movement of the impeller to exact alinement is made possible by the Woodruff keys. When the impeller has been properly alined the collars 11 are secured in place and then the shaft drilled to receive screws 12. It follows, therefore, that the impeller has been secured in exactly proper position longitudinally on the shaft. Furthermore, if there should be any slight play between the impeller and the collars, the bushings 13 being screwed snug over the collars against the impeller, hold the same firmly in

exactly proper alinement. The screw-threads upon one collar 11 are right handed, while those on the other collar 11 are left handed, the purpose being that with a given direction of rotation of the impeller the bushings 13 will have a tendency to move in such direction as to tighten up against the impeller hub.

Suction pipes 20 and 21 communicate with the suction ports or cavities 22 and 23 respectively, which, in turn, communicate with the suction orifice of the impeller or pump wheel in the manner well understood in the art.

The distributor ring is preferably cast in two pieces or rings, 24 and 24', each suitably finished at 25 to have a tight or close fit with a suitably machined or finished surface within the pump case. The pump case and the distributor rings 24 and 24', are also suitably machined or finished at 26, and at these surfaces the distributor rings 24 and 24' are supported or secured by the pump case in operative relation to the impeller and to the volute discharge passage 18. In other words, the distributor ring, as a whole, may be divided vertically in a plane at right angles to the shaft 1.

The impeller 9, as shown, has a running fit at or approximate the inner diameter of the distributor in the region where that distributor is engaged or secured by the pump casing, approximate the joint 26.

When the distributor is employed as a guide vane ring, the two rings 24 and 24' are bridged by the guide vanes which are shown in section at 28, as viewed in Fig. 3. These guide vanes 28 may be cast integral with one of the ring members, as 24', for example, and then finished along the line 24^a, Fig. 1, the ring 24 also being finished along the surface 24^a. Then, when the parts are assembled, the vanes 28 simply bear against the surface 24^a of the ring 24. Obviously, however, the distributor 24, 24' may be divided along a horizontal plane, into top and bottom halves, as the same would be viewed in Fig. 1. In such case, the half ring 24 and half ring 24' would be cast integral with each other, the vanes 28 forming part of the single casting. Or with each mode of division, the vanes 28 may be separate pieces suitably machined or otherwise treated and placed in position. Or, if the distributor is employed as a diffuser, it may have the simple ribs 29, as viewed in Fig. 5, which may either be cast integral with the halves 24, 24', or may be independent members and secured or fastened in place by suitable means and in suitable manner. These ribs 29 take a form or shape suitable to the flow of the water within the distributor, to prevent eddies, whirls, etc. The distributor, when employed as a diffuser, may be divided horizontally or vertically, as described above.

When the distributor is employed either as

a guide vane ring or as a diffuser, the rings 24 and 24' extend outwardly beyond the maximum diameter of either the guide vanes 28 or ribs 29, as shown at 25^a, and then turn laterally and join with the pump casing at 25. By this construction, the distributor forms, in effect, a wall of the discharge passage.

To meet differing conditions of service, as for example, different heads to be pumped against, or what not, different impellers may be mounted upon the shaft 1 and corresponding different distributors 24, 24' associated therewith. In such case, the pump case, the shaft, the bearings, the coupling, suction and discharge pipes may remain standard for all services, it being thus necessary to interchange only the impellers and the distributors 24, 24', to meet different conditions at the best efficiency. Furthermore, the independent or removable distributor reduces complication in casting and in manufacture of the pump case, as compared with previous practice, in which the guide vane ring or distributor has, in some instances, been cast integral with the pump case. Under such circumstances of integral casting, the coring is difficult and the numerous anchorages required for the cores introduce imperfections in the walls of the pump case and distributor, often introducing leaks or other serious troubles.

The term distributor is herein used to apply to either a guide vane ring or a diffuser.

What I claim is:

1. In a centrifugal pump or the like, the combination with a casing having a discharge passage therein, of an impeller, and an independent distributor, having guide vanes or ribs, secured in operative relation to said impeller by said casing, said distributor extending outwardly beyond said vanes or ribs and forming a wall of said discharge passage.
2. In a centrifugal pump or the like, the combination with a casing having a discharge passage therein, of an impeller, and an independent distributor, having guide vanes or ribs, said distributor extending outwardly beyond said vanes or ribs, and forming in effect a wall of said discharge passage.
3. In a centrifugal pump or the like, the combination with a pump casing, of an impeller, and an independent distributor supported by said pump casing, said distributor intervening between said casing and the intake of said impeller.
4. In a centrifugal pump or the like, the combination with the pump casing having a discharge passage therein, of an impeller, and an independent distributor, having guide vanes or ribs, embracing said impeller, said distributor extending outwardly beyond said vanes or ribs and forming a wall of said discharge passage.

5. In a centrifugal pump or the like, the combination with the pump casing, of a discharge passage therein, an impeller, and an independent distributor embracing said impeller and supported by said pump casing at regions of approximately maximum and minimum diameters of said distributor, the maximum diameter of said impeller being greater than the minimum diameter of said distributor.

6. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, a shaft, and means for securing said impeller upon said shaft in alinement with said pump casing comprising a key permitting longitudinal movement of said impeller, collars secured upon said shaft against the hub of said impeller, and members screw threaded upon the peripheries of said collars and engaging said hub.

7. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, a shaft, and means for securing said impeller on said shaft and in alinement with said pump casing comprising a key permitting longitudinal movement of said impeller, collars secured to said shaft, the impeller hub located between said collars, a bushing screw threaded upon the periphery of each collar and engaging the impeller hub, and a stuffing box forming a water-tight connection between said bushing and said pump casing.

8. In a centrifugal pump or the like, the combination with the pump casing, of a discharge passage therein, an impeller, and an independent distributor embracing said impeller and intervening between said impeller and said discharge passage.

9. In a centrifugal pump or the like, the combination with the pump casing, of a discharge passage therein, an impeller, and an independent distributor supported by said pump casing at approximately the minimum diameter of said distributor, said impeller having a running fit with said distributor in a region approximate the minimum diameter of said distributor.

10. In a centrifugal pump or the like, the combination with the pump casing, of a discharge passage therein, an impeller, and an independent distributor supported by said pump casing in a region approximate the minimum diameter of said distributor, said distributor extending to the intake of said impeller and engaging said casing in a region approximate the minimum diameter of said distributor and forming, in effect, a wall of said discharge passage.

11. In a centrifugal pump or the like, the combination with a pump casing, of an impeller, and an independent distributor supported by said casing, said impeller having a running fit with said distributor.

12. In a centrifugal pump or the like, the combination with a pump casing, of an im-

PELLER, and an independent distributor embracing said impeller, said impeller having a running fit with said distributor.

13. In a centrifugal pump or the like, the combination with a pump casing having a discharge passage therein, of an impeller, and an independent distributor supported by said casing at a diameter approximate the diameter of the intake of said impeller, said impeller having a running fit with said distributor.

14. In a centrifugal pump or the like, the combination with a pump casing having a discharge passage therein, of an impeller, and a distributor, said impeller having a running fit with said distributor approximate the impeller intake.

15. In a centrifugal pump or the like, the combination with a casing having a discharge passage therein, of a shaft, an impeller driven thereby, and an independent distributor, having guide vanes or ribs, said distributor extending outwardly beyond said vanes or ribs and turned laterally parallel with said shaft and forming in effect a wall of said discharge passage.

16. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, an independent distributor, having guide vanes or ribs, said distributor extending outwardly beyond said guide vanes or ribs and secured by said casing at a region beyond said vanes or ribs, and having a running fit with said impeller at its intake.

17. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, and an independent distributor, said distributor intervening between said impeller and said casing at the impeller intake, said impeller having a running fit with said distributor.

18. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, and an independent distributor, having guide vanes or ribs, said distributor supported by said casing at regions beyond said vanes or ribs and approximate the impeller intake.

19. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, and an independent distributor, said distributor embracing said impeller and supported by said pump casing at a region of less diameter than the outer diameter of said impeller.

20. In a centrifugal pump or the like, the combination with the pump casing, of an impeller, and an independent distributor, said distributor embracing said impeller and supported by said pump casing at regions of diameters both greater and less than the outer diameter of said impeller and having a running fit with said impeller.

21. In a centrifugal pump or the like, the combination with the pump casing, of a dis-

charge passage therein, an impeller, a distributor carrying guide vanes or ribs and supporting said vanes or ribs intermediate the impeller and discharge passage, said distributor extending outwardly beyond said ribs or vanes and forming in effect a wall of said discharge passage and extending inwardly to the impeller intake.

22. In a centrifugal pump or the like, the combination with the pump casing, of a double suction impeller, and a distributor having a running fit with said impeller at both intakes.

23. In a centrifugal pump or the like, the combination with the pump casing, of a double suction impeller, and a distributor disposed symmetrically on both sides of said impeller and embracing and having a running fit with said impeller.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

RUDOLF SALZER.

Witnesses:

ANNA E. STEINBOCK,
DANIEL WEBSTER, Jr.

DISCLAIMER.

885,867.—*Rudolf Salzer*, Philadelphia, Pa. CENTRIFUGAL PUMP. Patent dated April 28, 1908. Disclaimer filed July 5, 1913, by the assignee, *International Steam Pump Company*.

Makes disclaimer—

"Of so much of each of the claims numbered 3, 8, 11, 14, and 17 of said Letters Patent as cover constructions in which the distributor and impeller are not so arranged that different and interchangeable impellers or pump wheels with correspondingly different and interchangeable distributors may be employed with a given pump case so that impellers of different diameters may be employed to suit different conditions without changing the pump casing or other parts of the water passages, leaving said claims to cover only constructions in which impellers of different diameters with different distributors may be substituted without changing other parts of the pump."

[OFFICIAL GAZETTE, July 15, 1913.]

Disclaimer in Letters Patent No. 885,867.

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