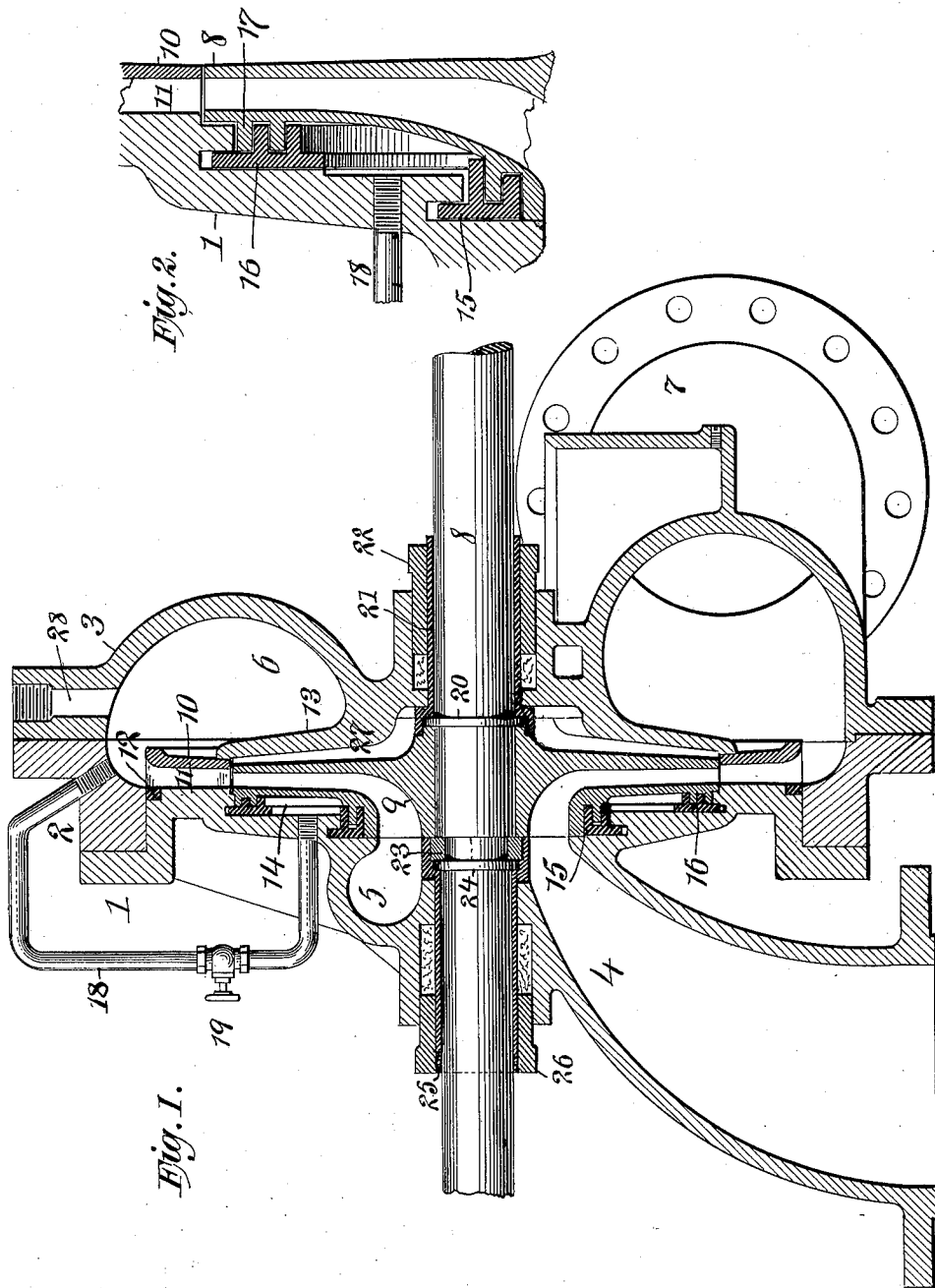


R. SALZER.
CENTRIFUGAL PUMP.

APPLICATION FILED APR. 7, 1906. RENEWED SEPT. 20, 1910.

976,400.

Patented Nov. 22, 1910.



WITNESSES:
Gustav Dietrich
Edwin H. Dietrich

INVENTOR
Rudolf Salzer
BY *Paul Benjamin*
his ATTORNEY

UNITED STATES PATENT OFFICE.

RUDOLF SALZER, OF TRENTON, NEW JERSEY, ASSIGNOR TO THE DE LAVAL STEAM TURBINE COMPANY.

CENTRIFUGAL PUMP.

976,400.

Specification of Letters Patent. Patented Nov. 22, 1910.

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To all whom it may concern:

Be it known that I, RUDOLF SALZER, a subject of the Emperor of Austria-Hungary, residing at Trenton, in the county of Mercer and State of New Jersey, have invented a certain new and useful Improvement in Centrifugal Pumps, of which the following is a specification.

The invention relates to centrifugal pumps and to a means of balancing liquid pressure on opposite faces of the rotary impeller.

The invention consists in the construction of the diffuser ring; also in the construction of the shaft journals; also in the construction of the pump casing and arrangement of chambers and conduits therein; also in the various combinations set out in the claims.

In the accompanying drawings—Figure 1 is a vertical axial section of my centrifugal pump. Fig. 2 is an enlarged partial section of the impeller and front head showing the balancing chamber 13 and loose rings.

Similar numbers of reference indicate like parts.

The casing has a front head 1, an intermediate portion 2 and a rear head 3. In the front head 1 is the suction passage 4, which communicates with the annular chamber 5. In the rear head 3 is the annular chamber 6 communicating with the discharge pipe 7.

8 is the shaft on which is keyed a centrifugal impeller 9 provided with the usual vanes. Surrounding the impeller is an annular diffuser formed of an annular plate 10 carrying the usual lateral vanes 11. Supported on said vanes is a ring 12, which is seated in a recess in the wall of head 1, the vanes then abutting against said wall. The diffuser plate and vanes are held in position by means of this ring 12, and also because said plate bears against the inner wall 13 of the discharge chamber 6. Between the front side of the impeller and the head 1 is formed an annular chamber 14 which surrounds the loose ring 15 and is surrounded by the loose ring 16. The outer circumferential edges of both of these rings are seated in recesses in the head 1. The ring 16 has two lateral flanges, the outer one of which enters between two similar flanges 17 on the impeller 9, and the inner

one of which comes below said flanges 17, as shown in Fig. 2. The ring 15 also has two lateral flanges, one of which comes between the head 1 and the impeller 9, and the other is seated in a recess in the wall of said impeller. The chamber 14 and the delivery chamber 6 are connected by a pipe 18, provided with a valve 19.

The hub of the impeller on one side bears against a fixed collar 20 on the shaft, and is shouldered to receive an enlargement of the bushing 21, which is in a bearing in head 3. Said bushing is received in the packing gland 22. The hub of the impeller on the opposite side bears against two half rings 23, which are seated in a groove in the shaft adjacent to which is a fixed collar 24. Said half rings and collar are surrounded by an enlargement of the bushing 25. The bushing 25 is received in a packing gland 26.

Between the inner wall 13 of the discharge chamber and the impeller there is a clearance chamber 27, which surrounds the enlargement of bushing 21. This space receives liquid from the impeller discharge, which hence exerts pressure on the impeller. The object of the chamber 14 is to counterbalance this pressure and hence said chamber is connected by the pipe 18 with the chamber 6 at a point close to the delivery from the diffuser. The area of the impeller subjected to pressure in the chamber 14 is obviously less than the area of the impeller subjected to pressure in the clearance chamber 27; but on the other hand the pressure of the liquid which enters clearance chamber 27 through the narrow space between the impeller and the diffuser is less per unit of area than the pressure of the liquid which passes directly from the delivery chamber 6 to the front chamber 14. Hence by suitably proportioning the two pressure areas on opposite sides of the impeller with respect to the pressures exerted on each, a counterbalancing of the impeller is effected. It is preferable, however, to construct the pressure areas approximately to secure this counterbalancing and then relatively adjust the liquid pressures by means of the valve 19 in pipe 18. The opening 28 is for the admission of liquid to prime the pump, and may be closed by a screw plug.

The joint between the clearance chamber 27 and the shaft journal is sufficiently loose

to enable the liquid under pressure to keep air from entering at said journal, and also to assist in lubricating the bearing.

I claim:

5 1. In a centrifugal pump, an impeller and a casing therefor, having (1) an annular clearance chamber between the rear side of said impeller and a casing wall and (2) a conduit receiving the discharge of said im-
10 peller, two loose concentric rings seated between the front side of said impeller and a casing wall and forming with said impeller and wall, an annular front chamber, and a duct connecting said annular front chamber
15 and said conduit.

2. In a centrifugal pump, a casing, an impeller having a shoulder at one end of its hub, a shaft, a fixed collar on said shaft against which said hub bears at said should-
20 ered end, a bushing surrounding said shaft and said collar and received on said hub shoulder, and a bearing in said casing receiving said bushing.

3. In a centrifugal pump, a casing, an im-
25 peller, a shaft having a circumferential groove, two half rings disposed in said groove and bearing against one end of the hub of said impeller, a fixed collar on said shaft adjacent to said groove, a bushing sur-
30 rounding said shaft and said collar and said half rings and abutting on said end of said impeller hub, and a bearing in said casing receiving said bushing.

4. In a centrifugal pump and in combina-
35 tion with an impeller, and a casing therefor, a diffuser surrounding said impeller and having its inlet registering with the impeller outlet; the said diffuser comprising a sub-
40 stantially flat ring, a second substantially flat ring of less width and vanes secured between said rings and extending across said first named ring; the said narrower ring being seated in a wall of said casing and the exposed edges of said vanes abutting against
45 said wall.

5. In a centrifugal pump, and in combina-
tion with an impeller, and a casing there-

for having walls forming an annular pas-
sage beyond the impeller outlet, a diffuser
50 formed of a substantially flat ring and vanes secured at their edges to and extending across said ring; the said diffuser being seated in said annular passage and having the exposed edges of its vanes abutting
55 against a prolongation of one of the casing walls forming said passage; and a second ring of less width than said first named ring secured to said edges and supported on said last named wall.

6. In a centrifugal pump, and in combina-
60 tion with an impeller, and a casing therefor having walls forming an annular passage beyond the impeller outlet, a diffuser formed of a substantially flat ring and vanes secured at their edges to and extending across said
65 ring; the said diffuser being seated in said annular passage and having the exposed edges of its vanes abutting against a prolongation of one of the casing walls forming
70 said passage; and a second ring of less width than said first named ring secured to said edges and seated in said last named wall.

7. In a centrifugal pump of the type here-
in set forth, a diffuser comprising a substan-
75 tially flat ring, vanes each secured at one edge to said ring and a second substantially flat ring of less width than said first named ring secured to the opposite edges of said vanes.

8. In a centrifugal pump of the type here-
80 in set forth, a diffuser comprising a substantially flat ring, vanes each secured at one edge to said ring, and a second substantially flat ring of less width than said first named ring secured to the opposite edges of
85 said vanes; the outer circumferences of said rings being equidistant from an axis passing through their centers.

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

RUDOLF SALZER.

Witnesses:

WM. H. SIEGMAN,
PARK BENJAMIN, JR.