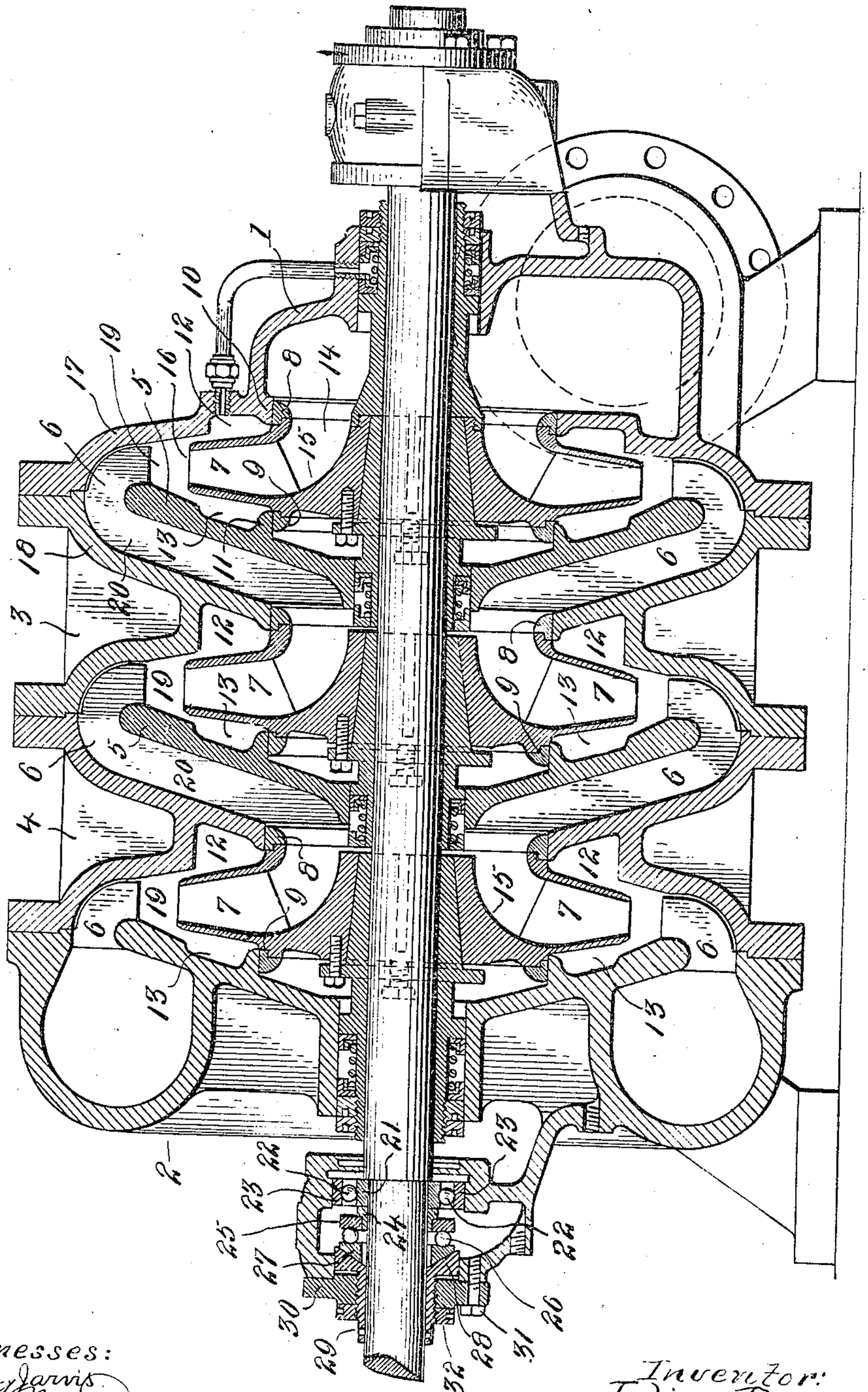
No. 841,642. PATENTED JAN. 15, 1907.

J. DEGEN.

METHOD OF BALANCING CENTRIFUGAL PUMPS.

APPLICATION FILED JAN. 18, 1906.



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UNITED STATES PATENT OFFICE.

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METHOD OF BALANCING CENTRIFUGAL PUMPS.

No. 841,642. Specification of Letters Patent. Patented Jan. 15, 1907.

Application filed January 18, 1906. Serial No. 296,584.

To all whom it may concern:

Be it known that I, JULIUS DEGEN, a citizen of the Republic of Switzerland, residing at Trenton, in the county of Mercer and State of New Jersey, have invented new and useful Improvements in Methods of Balancing Centrifugal Pumps, of which the following is a specification.

The object of my invention has been to provide a method of balancing centrifugal pumps whereby the end thrust of the shaft may be reduced to a minimum; and to such ends my invention consists in the method of balancing centrifugal pumps hereinafter specified.

My method is adapted to be practiced by such a pump, for instance, as that illustrated in the patent granted to Edward S. Lea and myself May 23, 1905, No. 790,795.

In the accompanying drawing the figure is a vertical longitudinal sectional view of a pump adapted for the practice of my invention.

The pump illustrated in the accompanying drawing is or may be in all respects like the pump which is the subject of the said patent.

The pump consists of a suction-head 1 and a delivery-head 2, connected by sections 3 and 4. Between the suction-head and the section 3 is a partition 5, that is separated from the outer casing by deflectors 6. Between the partition 5 and the suction-head is mounted an impeller 7, the latter carrying rings 8 and 9, which have running contact with flanges 10 and 11, thus forming front and rear chambers 12 and 13, respectively, between the impeller and the casing. The water enters the impeller through the opening 14 and is deflected outwardly by the wall 15 and passes from the mouth 16 of the impeller into the passages between the deflectors 6. The walls 17 and 18, between which the water passes in leaving the impeller, are inclined toward each other in the direction of the flow of the water and are sufficiently wide apart in the region of the mouth of the impeller to form passages 19 and 20, which respectively afford communication between the front and rear chambers 12 and 13 and the passages through which the water goes to reach the next impeller. The clinging of the water in the passages 19 and 20 to the sides of the stream of water escaping from the impeller causes the water in the said passages to be carried along with the water from the impeller, and thus causes a suction in the chambers 12 and 13. The centrifugal force imparted to the water in the chambers 12 and 13 where it comes in contact with the sides of the impeller also has a tendency to direct the water in said chambers in the direction of the flow of the water from the impeller, and thus there is a further tendency to increase the suction in the chambers 12 and 13. I utilize the said suctions to balance the end thrust caused by the striking of the water against the wall 15 after it comes through the entrance 14 and as it is deflected toward the mouth of the impeller. I have found that by shifting the impeller to increase or decrease the width of the passages 19 and 20 I can increase or decrease the suction in the chambers 12 and 13, the smaller the passages being the greater the amount of suction. Each impeller has chambers 12 and 13 and passages 19 and 20, and the action of each impeller is the same.

In order to shift the impeller to increase or decrease the width of the passages 19 and 20, I provide, as in the said patent, bearings consisting of a ball-race 21, that rests against a shoulder on the said shaft, and balls 22, that are supported by a race 23, seated in a bearing on the frame. A collar 24 rests against the race 21 and holds the inner ball-race 25 of a step-bearing, the balls 26 running against an outer race 27, that has a spherical surface and is supported by a corresponding surface formed on a flange 28, that is part of a threaded sleeve 29. The sleeve 29 is threaded into a disk 30, which is secured to the bearing by bolts 31, and the sleeve 29 is locked in place by a lock-nut 32. By loosening the lock-nut 32 and turning the sleeve 29 the ball-race 27 can be shifted back and forth, the similar bearing at the other end of the shaft being of course correspondingly operated. By this means the impeller can be moved toward or from the surfaces 17 and 18, and the width of the passages 19 and 20 can be correspondingly regulated.

In the practice of my method if by calculation or experiment I find that the suction in the chamber 13 will be sufficiently large so that there will not remain enough pressure to counterbalance the end thrust caused by the kinetic energy of the water in flowing through the entrance 14 and striking the surface 15 and being deflected toward the mouth of the impeller I adjust the impeller toward the right, as seen in the figure, thus increasing the width of the passage 20 and decreasing

the suction in the chamber 13 until the pressure remaining in the said chamber will sufficiently balance the end thrust, the pressure in the chamber 12 of course being taken into account. If, on the other hand, the pressure in the chamber 13 is more than sufficient to balance the end thrust, I shift the impeller to the left as seen in the figure, thus decreasing the passage 20 and increasing the suction and at the same time increasing the passage 19 and increasing the pressure in the chamber 12.

The apparatus above described is not claimed in the present application, but is the subject of claims in another application.

I claim—

1. The method of balancing centrifugal pumps, consisting in shifting the impeller axially to a position in which the suction caused in front of and in the rear of the impeller by the water issuing from the impeller so controls the pressures upon the sides of the impeller that a resultant pressure is established equal and opposite to the end thrust.

2. The method of balancing centrifugal pumps, consisting in shifting the impeller axially to a position in which the suction caused in front of and in the rear of the impeller by the water issuing from the impeller so controls the pressures upon the sides of the impeller that a resultant pressure is established equal and opposite to the end thrust, and fixing the impeller in such position.

3. The method of balancing centrifugal pumps, which consists in producing a suction on opposite sides of the impeller, and so governing said suctions by relatively positioning the impeller and the walls between which it runs as to produce a resultant force equal and opposite to the end thrust.

4. The method of balancing centrifugal pumps, consisting in producing variations of pressures on opposite sides of the impeller by the action of the jet issuing from the impeller, and governing the said variations by an axial movement of the impeller.

5. The method of balancing centrifugal pumps which consists in producing changes in the pressure on opposite sides of the impeller and so governing said changes in pressure by relatively positioning the impeller and the walls between which it runs, as to produce a resultant force equal and opposite to the end thrust.

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