J. H. SEBALD.

MULTISTAGE CENTRIFUGAL PUMP.

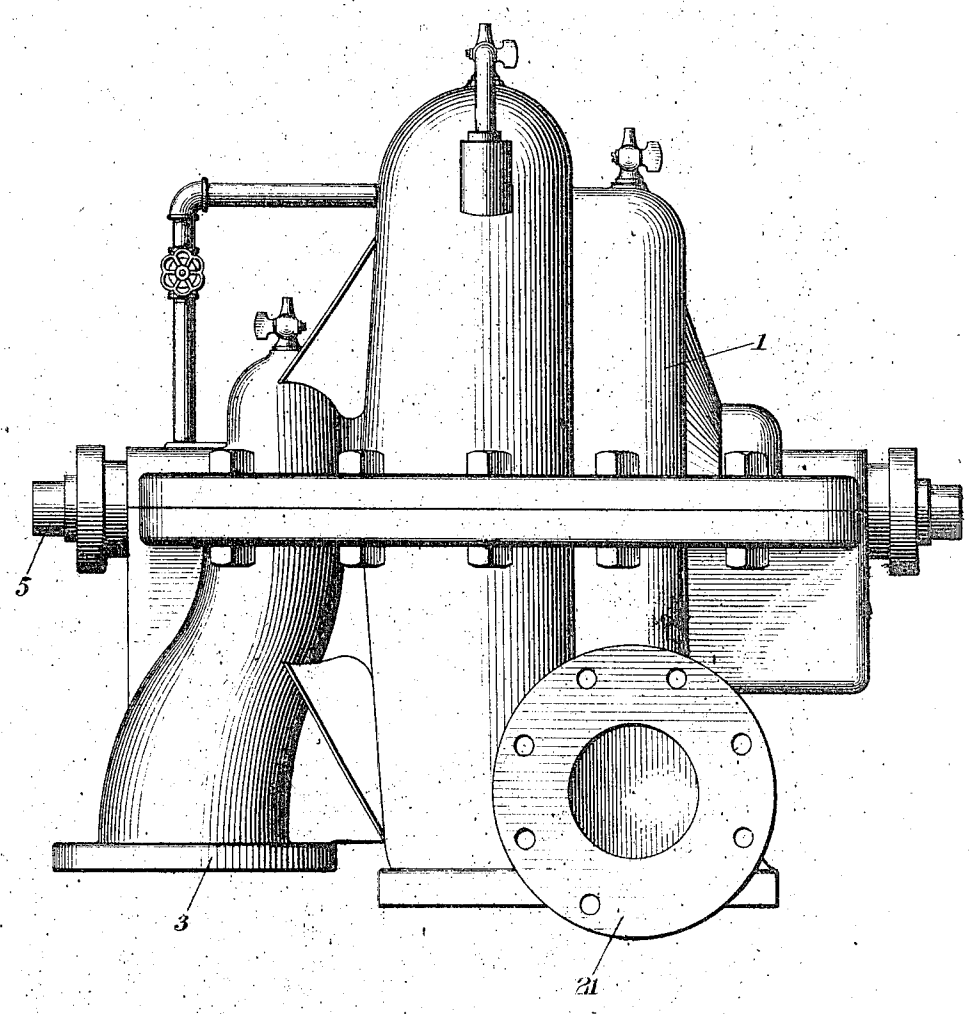
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1,165,543.

Patented Dec. 28, 1915.

3 SHEETS—SHEET 1.

Fig. 1




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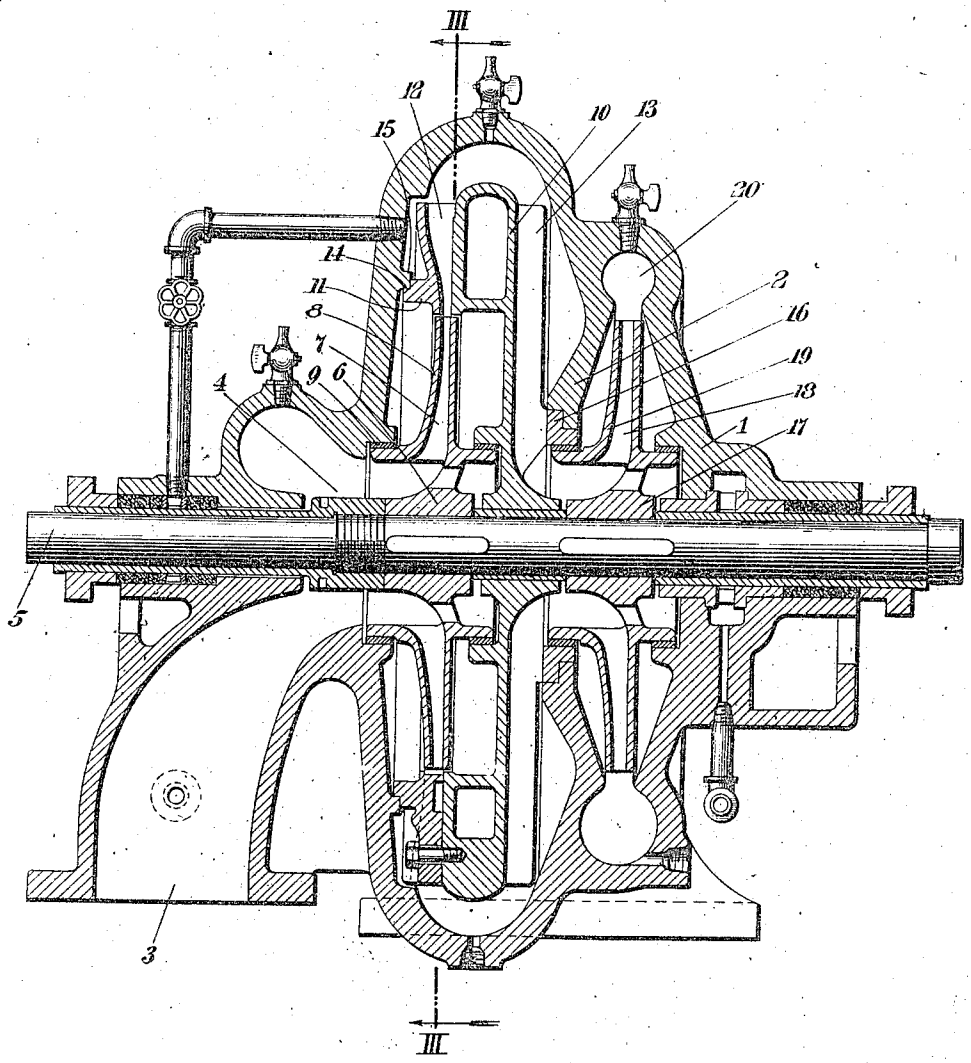
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3 SHEETS—SHEET 2.

Fig. 2




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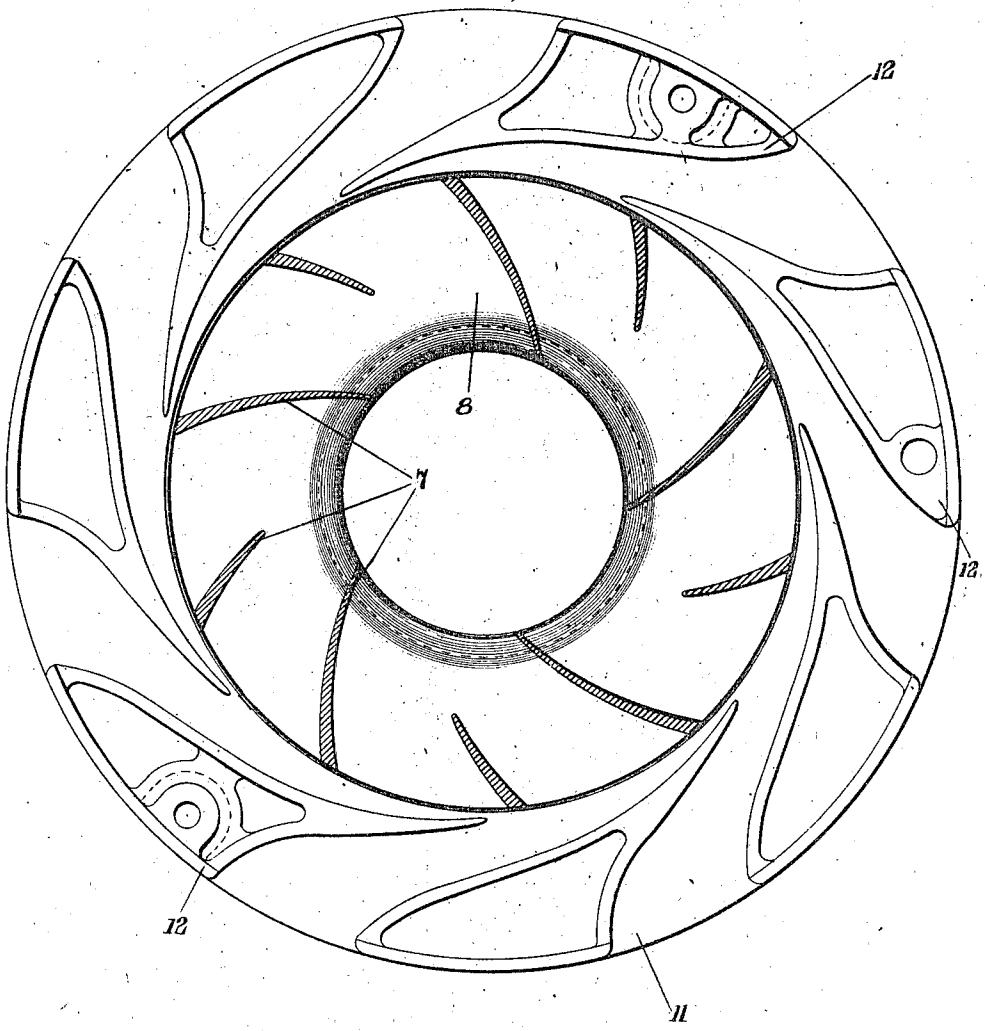
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3 SHEETS—SHEET 3.

Fig. 3




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# UNITED STATES PATENT OFFICE.

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## MULTISTAGE CENTRIFUGAL PUMP.

1,165,543. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed November 14, 1913. Serial No. 800,930.

*To all whom it may concern:*

Be it known that I, JOSEPH H. SEBALD, a subject of the Emperor of Austria-Hungary, having taken out my first naturalization papers in the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented a certain new and useful Improvement in Multistage Centrifugal Pumps, of which the following is a specification.

This invention relates to multistage centrifugal pumps and has for its object first the increasing of the efficiency of such pumps and second the facilitation of the construction of such pumps.

The main object of my invention, namely; the increasing of the efficiency of a multistage centrifugal pump, is accomplished, broadly speaking, by the use in the first stage or stages of impellers discharging immediately into diffusing channels directed outwardly, perpendicularly or substantially so, to the shaft line, these diffusing channels being provided with diffusing vanes, together with a final stage in which the impeller conducts the fluid from the prior stage and discharges it, without the intervention of directing vanes, directly into a peripheral volute which is provided with a tangential discharge opening.

A practical embodiment of my invention is shown in the accompanying drawings in which—

Figure 1 shows a side elevation of the pump, Fig. 2 shows a vertical section of the pump on the line of the shaft, and Fig. 3 shows a transverse section through the diffusing ring on the line III—III of Fig. 2.

The pump is shown as a two stage pump comprising a casing 1 split horizontally on the shaft line and divided into two chambers by partition 2. In one end of the casing 1 is a suction pipe 3 which opens into the first impeller chamber by an annular inlet opening 4 surrounding the shaft 5. Communicating with the inlet opening 4 is the suction opening of the first impeller which comprises a disk 6 keyed on to the shaft 5, blades 7 and a cover 8 which is bent around parallel to the shaft forming a sleeve which rotates in contact with the shoulder 9 on the interior of the casing. On the inner side of the impeller disk 6 is a channel ring 10 which is in the form of a disk of slightly smaller diameter than the interior of the casing. Secured to the inlet side of the channel ring 10 is a diffusing ring 11 which has a series of diffusing vanes which are in alinement with the blades 7 of the impeller previously described. These vanes are forwardly inclined with respect to the direction of the rotation of the impeller. On the other side of the channel ring 10 are directing vanes 13 which extend inwardly toward the shaft in a radial direction and serve to direct the fluid from the first impeller to the inlet of the next. The channel ring 10 is secured and held in position by a shoulder 14 on the diffusing ring 10 which engages an annular projection 15 on the interior of the casing and by a ring 16 which is secured to the inner portions of the directing vanes 13 and engages the inner end of the partition 2. The diffusing vanes 12 and the directing vanes 13 end near the outer edge of the channel ring 10 so that a peripheral chamber without directing vanes is provided which conveys the fluid from the diffusing vanes 12 to the return channel in which are placed the directing vanes 13. From the inner ends of the directing vanes 13 the fluid flows into the suction opening of the impeller of the last stage which consists of a disk 17, blades 18 and a cover 19 which bends parallel to the shaft forming a sleeve which rotates in contact with the inner surfaces of the ring 16. There are no diffusing blades provided for the last impeller but the fluid is discharged directly into the spiral volute 20 which discharges through a tangential pipe 21.

By means of the present invention a very high efficiency is secured for such a multistage pump. Pumps have been constructed previously with a volute for the final stage but in such pumps no diffusing vanes have been provided for the earlier stages and likewise when diffusing vanes have been provided the last stage has also been provided with such vanes, greatly decreasing the efficiency of the pump. Although the pump, as shown, has but two stages it is evident that there might be two or more stages constructed like the first stage in the modification disclosed, the idea of the present invention being that the last stage only shall be provided with a volute and it is to be understood that the present showing and description disclose only one specified modification of my invention and other forms

and modifications are included in the spirit and scope of the invention as expressed in the claims.

What I claim is:

1. In the multistage centrifugal pump, an impeller having a central fluid inlet and blades radiating therefrom, a radially directed diffusing channel having forwardly inclined diffusing vanes therein in alinement with said impeller blades, an annular peripheral chamber into which said diffusing channel discharges, a radially directed fluid return channel, an impeller into which said return channel discharges, said impeller having a central fluid opening and blades radiating therefrom, and a spiral volute chamber directly contiguous to and in alinement with the outer periphery of said second impeller, said volute having a tangential fluid outlet.

2. In a multistage centrifugal pump, an impeller having a central fluid inlet and blades radiating therefrom, a diffusing channel having forwardly inclined diffusing vanes therein in alinement with said impeller blades, an annular peripheral chamber into which said diffusing channel discharges, a fluid return channel to convey the fluid to the succeeding impeller, said return channel having directing vanes, an impeller into which said return channel discharges, said impeller having a central fluid opening and blades radiating therefrom, and a spiral volute chamber into which said second impeller directly discharges, said volute chamber having a tangential fluid outlet.

3. In a multistage centrifugal pump, a horizontally split casing forming two impeller chambers, impellers in said chambers, a partition between said chambers, a disk between said impellers, forwardly inclined diffusing vanes in alinement with one of said impellers secured to one face of said disk, radial directing vanes leading to the inlet of the succeeding impeller on the other face of said disk, a projecting ring on said diffusing vanes engaging a projecting shoulder in said casing, and a projecting ring on said directing vanes engaging the inner edge of said partition, said rings serving to support and position said disk.

4. In a multistage centrifugal pump, a horizontally split casing forming two impeller chambers, impellers in said chambers, a disk between said impellers having directing vanes leading to the inlet of the second impeller and a ring secured to said vanes and engaging a portion of the casing to support and position said disk.

5. In a multistage centrifugal pump, a horizontally split casing forming two impeller chambers, impellers in said chambers, a disk between said impellers having directing vanes leading to the inlet of the second impeller and a ring secured to said vanes and engaging a portion of the casing to support and position said disk, the second of said impellers having a cover with a sleeve portion engaging the inner surface of said ring.

In testimony whereof, I have hereunto set my hand.

JOSEPH H. SEBALD.

Witnesses:
FRED P. OVERTON,
ALICE C. BRONTUM.