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C. H. JAEGER.

CENTRIFUGAL AND TURBINE PUMP AND THE LIKE.

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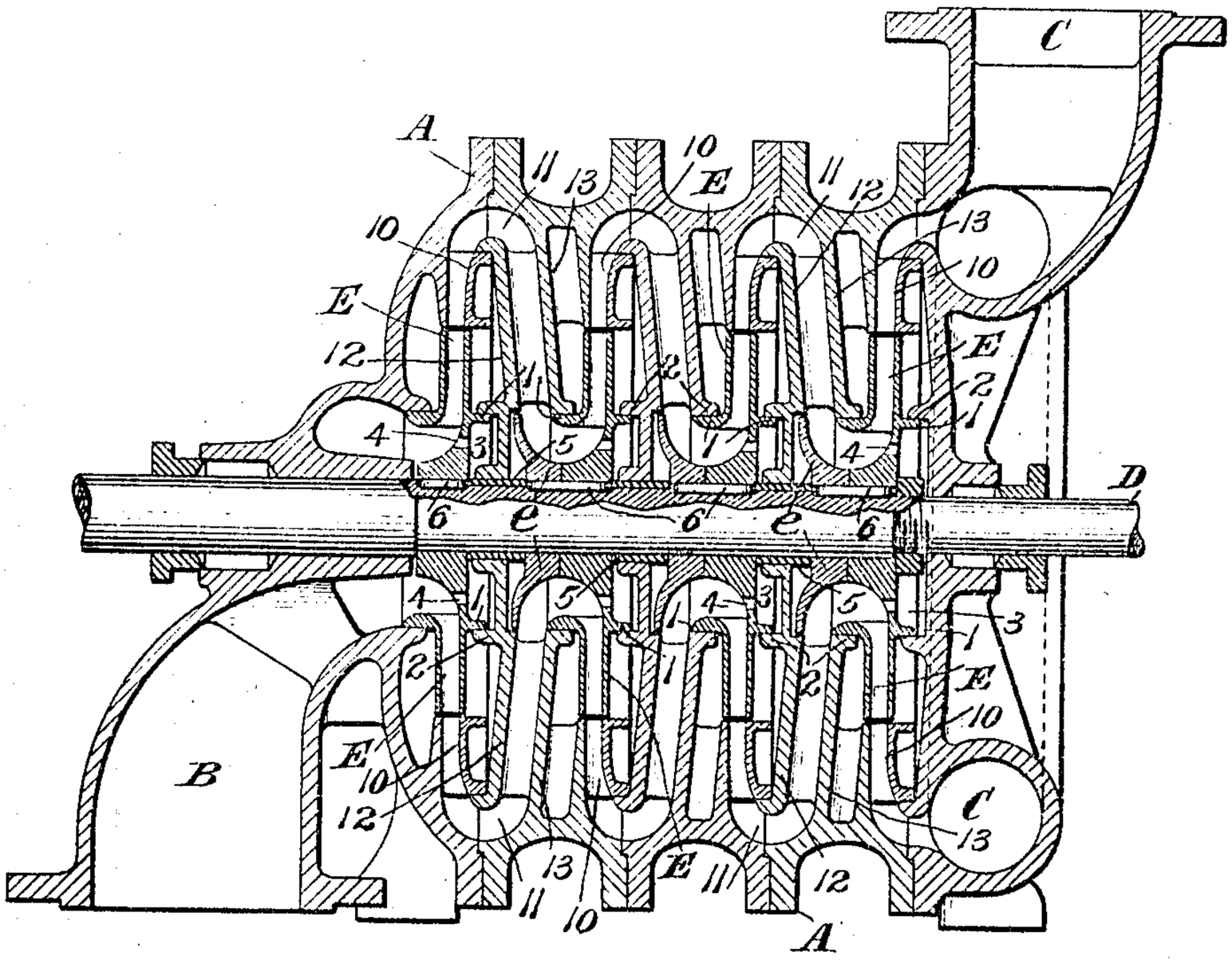

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL AND TURBINE PUMP AND THE LIKE.

No. 871,341. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed January 14, 1907. Serial No. 352,128.

To all whom it may concern:

Be it known that I, CARL HERMANN JAEGER, a subject of the King of Saxony, residing at Leipzig, Germany, have invented certain new and useful Improvements in Centrifugal and Turbine Pumps and the Like, fully described and represented in the following specification, and the accompanying drawings forming a part of the same.

This invention relates to centrifugal and turbine pumps, blowers and similar constructions, the object of the invention being to provide an improved balancing construction.

It is well-known that the dynamic pressure parallel to the axis of the impeller wheel caused by the change of the axial movement of the fluid into a radial movement can be balanced by forming an equal or similar curve on the impeller wheel opposite the inlet which is merged into the impeller curve. Heretofore, however, constructions employing such balancing curve have been such that much fluid is lost and no intermediate bearing for the shaft between the impellers is provided.

In constructions embodying the present invention, the intermediate casing or partition extends to the shaft so as to form an intermediate bearing for the latter and the balancing curve disk is separated from the previous impeller by this partition, so that there is no communication past the edge of the disk between chambers of different pressures, and it is unnecessary to pack the edge of the disk. I thus avoid the dynamic side pressure on the impeller without substantial loss of fluid and provide the desired intermediate bearing for the shaft.

In the accompanying drawing forming a part of this specification, in which the invention is shown as applied in its preferred form to a four stage turbine pump of a well-known type, the drawing being a longitudinal section with the shaft partly broken away for purpose of illustration—A is the pump casing, B the pump suction, C the delivery, D the pump shaft, and E the impellers, which are shown of the usual inclosed type delivering through diffusion rings 10 provided with the usual diffusion vanes, and passages 11 shown as provided with the usual fixed vanes extending between the diaphragms or partition walls 12, 13 which separate the chambers of the successive impellers. The impellers E have flanges 1 on opposite sides forming the usual running joints with surfaces 2 formed on the outside and intermediate casings, these running joints preferably being provided with the usual packing rings to substantially prevent the passage of water from the impeller side chambers to the hub.

Each of the impellers is shown as provided on its rear side with the usual suction balancing chamber 3 connected to the suction by openings 4. Each of the impellers except the first is provided also with a balancing disk *e* opposite the inlet or suction opening, which is preferably formed, as shown, with a curve similar to the curve of the impeller inlet so as to form a continuous curve connecting the radial passage 11 with the radial portion of the impeller. These disks *e* rotate with the shaft D, and are shown as keyed on the shaft with the impellers E by keys 6. They may be mounted and secured in any other suitable manner so as to rotate with the shaft, and except for convenience in manufacture may be integral with the impellers.

So far as above described, the construction is similar to previous designs but in such previous designs the outer edge or periphery of the disks *e* run in contact with the inner edges of the casing or partition walls 12, so that the passages on the curved side of the disks *e* are separated from the balancing chambers 3 only by the disks, and there is no intermediate bearing for the shaft between a disk and the preceding impeller. In accordance with the present invention, however, the casing or partition walls 12 are extended to the shaft D between the disks *e* and the preceding impellers, so as to form intermediate bearings for the shaft between the impellers, the usual bearing and packing rings 5 being shown between the shaft D and the bearing surfaces of the walls 12. The spaces between the disks *e* and the walls 12 are thus substantially closed to the balancing chambers 3 on the rear side of the preceding impellers, so that there is no substantial difference in pressure on opposite sides of the disks *e* and these disks need not be packed or form tight running joints at the edge to avoid leakage.

It will be understood that the invention is not limited to the special type of pump shown, but is applicable generally to single impeller and multiple impeller centrifugal

and turbine pumps, blowers, and similar motors. The balancing surface of the disks *e* may be varied in form within the broader features of the invention but the similar curves on the impeller inlets and the disks are important and preferably used.

What I claim is:—

1. A centrifugal, turbine, or similar pump or motor having an impeller provided with a balancing disk facing the impeller inlet, and a casing wall on the opposite side of the disk from the impeller inlet closing the space behind the disk and forming a shaft bearing.

2. A centrifugal, turbine, or similar pump or motor having an impeller provided with a balancing disk facing the impeller inlet, the adjacent faces of said impeller inlet and disk forming a continuous curve, and a casing wall on the opposite side of the disk from the impeller inlet closing the space behind the disk and forming a shaft bearing.

3. A multi-stage centrifugal, turbine, or similar pump or motor having a plurality of impellers, the second and subsequent impellers being provided with balancing disks opposite the impeller inlets, in combination with casing or partition walls between the successive impellers extending to the shaft and forming shaft bearings between the disks and preceding impellers.

4. In a multi-stage centrifugal, turbine, or similar pump or motor, the combination with impellers E having the curved inlets and curved counter-balance disks *e* facing the inlets, of partition walls 12 forming shaft bearings and closing the chambers between the disks and the preceding impeller chambers.

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

CARL HERMANN JAEGER.

Witnesses:

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