

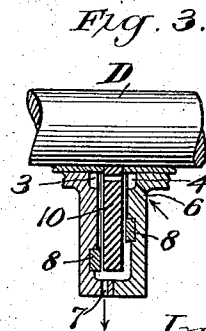
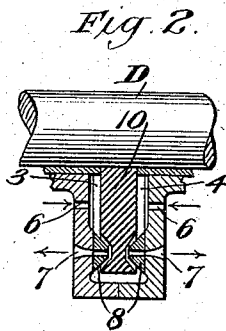
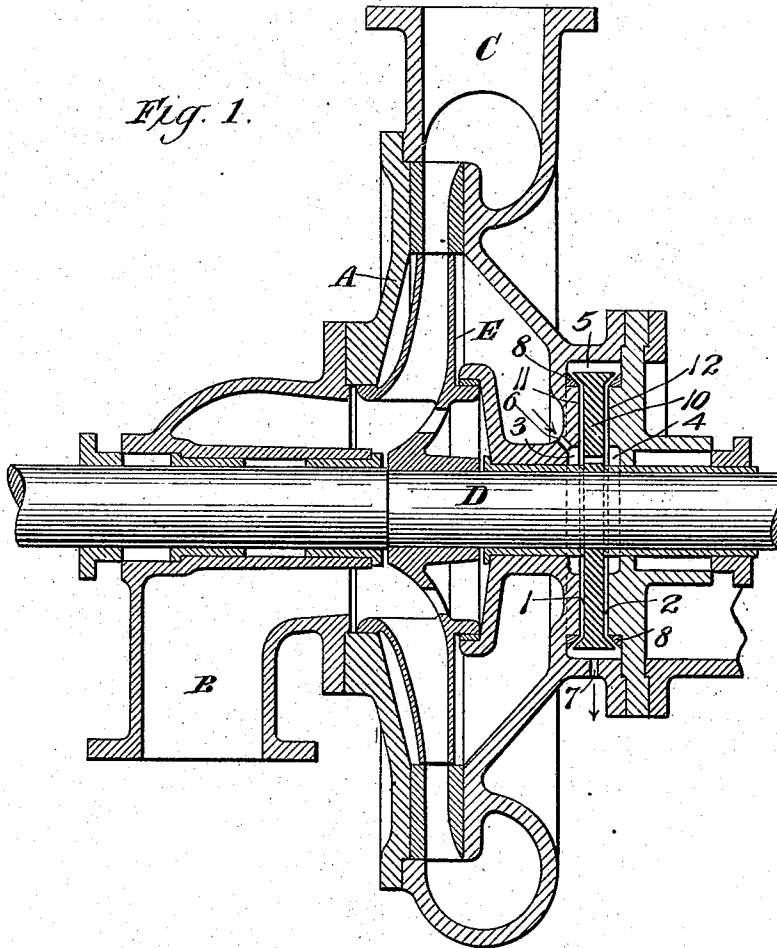
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BALANCING DEVICE FOR CENTRIFUGAL AND SIMILAR PUMPS, BLOWERS, AND THE LIKE.

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933,345.

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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER SCHEURMANN, a citizen of the Republic of Switzerland, residing at Newark-on-Trent, England, have invented certain new and useful Improvements in Balancing Devices for Centrifugal and Similar Pumps, Blowers, and the Like, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The especial object of the present invention is to provide simple and efficient means for balancing the axial thrust in centrifugal pumps, but the invention is applicable also to other rotating pumps and blowers, and to motors, such as water turbines, steam and gas turbines, etc., and similar machinery in which the balancing of axial thrust is required.

In accordance with my invention, I employ a pressure disk or piston moving with the shaft axially, in combination with fixed abutments forming pressure chambers on opposite sides of the disk through which pressure chambers fluid is circulated, each of these chambers being supplied with fluid from a suitable source the chambers being of small axial width throughout or in places so that the velocity of flow and the pressure will be varied as the disk moves with the shaft to increase or decrease the axial width of the circulating chamber between the disk and abutment, the pressure on the opposite side of the disk being at the same time reversely varied, as the chamber on one side increases in axial width as the other decreases and vice versa. A double balancing effect is thus secured by the movement of the disk, securing an efficient balancing with a small amount of fluid and small pressure surfaces and reducing the axial movement of the shaft within small limits. Since each of the balancing chambers is supplied with fluid independently of the flow through the other chamber, the control of the pressure of the fluid on each side of the disk is dependent solely on the axial width of its chamber, and not on the varying width of the chamber on the opposite side of the disk, so that the desired balancing effect may be readily and accurately secured by proper proportioning of the surfaces and positioning of the disk. A restricted outlet common to the chambers on opposite sides of the disk is preferably

used, but there may be separate outlets for the opposite sides of the disk.

In the accompanying drawings forming a part of this specification, there is shown for the purpose of illustration a centrifugal pump of a well known type embodying the invention in a preferred form, and certain modifications thereof, and this construction will now be described in detail and the features forming the invention then specifically pointed out in the claims.

In the drawings:—Figure 1 is a vertical central section of a centrifugal pump embodying the invention. Figs. 2 and 3 are details showing modifications.

In the drawings A is the pump casing, B the suction, C the discharge, D the pump shaft, and E the impeller. All these parts may be of any suitable construction and are shown as of a common type.

Referring now to the features especially embodying the invention, 10 is the balancing disk or piston which may or may not be fixed to the shaft to rotate therewith but is arranged to move with the shaft axially. On opposite sides of the disk 10 are abutments 11, 12 forming narrow chambers or circulating spaces 1, 2 on opposite sides of the disk, these spaces 1, 2 connecting inner chambers 3, 4, on opposite sides of the disk adjacent to the shaft, with discharge chamber 5 surrounding the disk. Balancing fluid may be taken from any suitable supply but is shown as supplied through opening 6, from the side impeller chamber, the two chambers 3, 4 being shown as connected by a passage through the disk, and the fluid is discharged from the chamber 5 through a restricted discharge outlet 7. Wear plates 8 are preferably used on the abutments, where the balancing pressure is especially applied.

The operation of this construction will be understood from a brief description. The balancing fluid from supply passage 6 passes from the chambers 3, 4 through chambers 1, 2 to the discharge chamber 5 and outlet 7. If the shaft is in central position so that the passages 1, 2 are of equal width, the pressure on opposite sides of the disk 10 is the same. If the axial thrust be such as to tend to move the shaft D to the left, for instance, the movement of the disk 10 to the left will narrow the passage 1 and increase the fluid

pressure on that side of the disk and simultaneously widen the passage 2 and decrease the pressure on this side of the disk, until the axial thrust upon the shaft is balanced 5 by the difference of pressures on opposite sides of the disk. On an axial thrust to the right, the operation is reversed, the pressure on the right side of the disk 10 being increased and that on the left side decreased.

10 Many modifications may be made in this construction, and the arrangement of the abutments and chambers, and of the supply and discharge passages, may be widely varied.

15 In Fig. 2 there is shown a construction in which separate supply passages 6 for the chambers 3, 4 on opposite sides of the balancing disk or piston 10 are used and separate discharge passages 7 for opposite sides 20 of the disk, thus permitting the balancing fluid for the opposite sides to be taken from supplies of different pressure if desired, as, for instance, in a multi-stage pump. Of course a single discharge outlet may be used 25 with the two supply passages, if desired. In this construction the wear plates 8 forming the narrow portions of the chambers, are shown as tapered on opposite sides, and the disk as similarly concaved, which will 30 provide more extended balancing surfaces, if the common discharge outlet from an annular chamber surrounding the balancing disk be used, as in Fig. 1.

35 In Fig. 3 is illustrated a feature which will be found desirable in some cases in which a considerable axial thrust in one direction is known to exist always. In this construction the narrow passages through which the balancing fluid passes are of different 40 diameters, so that the pressure upon one side of the disk is exerted at a greater distance from the shaft radially, thus in-

creasing the leverage of the pressure on one side to balance the fixed or permanent thrust. A single supply passage or separate supplies for opposite sides of the disk 45 may be used in this construction.

What I claim is:—

1. The combination with a rotating shaft, of a pressure disk or piston moving axially 50 with the shaft, fixed abutments on opposite sides of the disk forming narrow spaces between the disk and abutments, and fluid supply and discharge passages for circulating balancing fluid through the spaces on opposite 55 sides of the disk independently of each other.

2. The combination with a rotating shaft, of a pressure disk or piston moving axially 60 with the shaft, fixed abutments on opposite sides of the disk forming narrow spaces between the disk and abutments, means for supplying balancing fluid to the narrow spaces on opposite sides of the disk independently of each other, and a single re- 65 stricted discharge passage for the spaces.

3. The combination with a rotating shaft, of a pressure disk or piston moving axially 70 with the shaft, fixed abutments on opposite sides of the disk forming fluid chambers on opposite sides of the disk reduced through a portion of their diameter to form pressure surfaces of different radii on opposite sides 75 of the disk, and supply and discharge passages for circulating balancing fluid between said surfaces on opposite sides of the disk independently of each other.

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

WALTER SCHEURMANN.

Witnesses:

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