

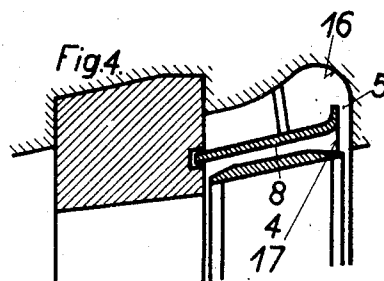
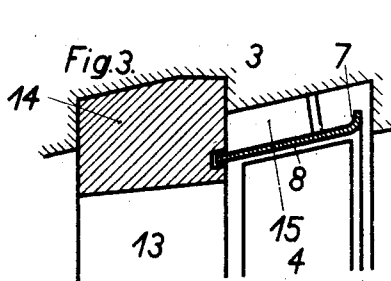
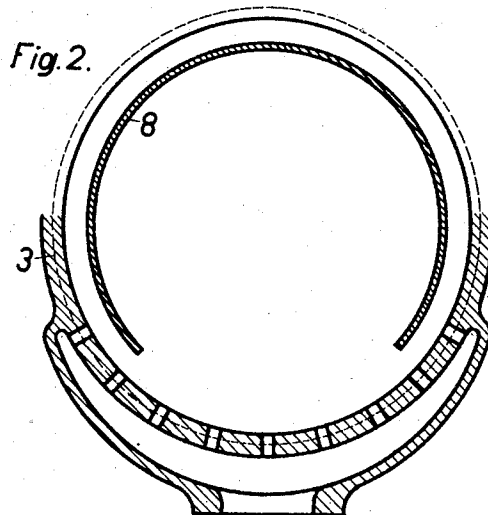
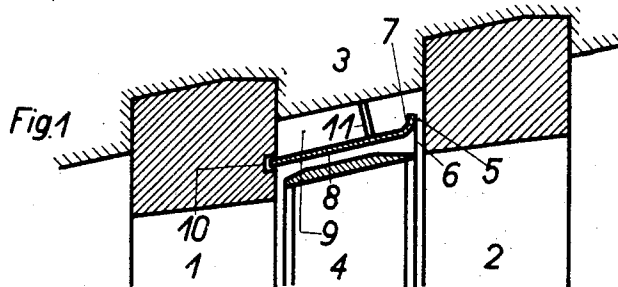
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K. FREY

MEANS FOR DRAINING THE LOW PRESSURE BLADING OF STEAM TURBINES

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K. Frey  
INVENTOR

By: Marks & Clerk  
ATTORNEYS

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# UNITED STATES PATENT OFFICE.

KARL FREY, OF ENNETBADEN, SWITZERLAND, ASSIGNOR TO AKTIENGESSELLSCHAFT BROWN, BOVERI & CIE., OF BADEN, SWITZERLAND.

## MEANS FOR DRAINING THE LOW-PRESSURE BLADING OF STEAM TURBINES.

Application filed January 19, 1928, Serial No. 247,968, and in Switzerland January 11, 1927.

Most of the arrangements hitherto proposed for draining the low-pressure blading of steam turbines possess the drawback of not affording effective means for withdrawing the whole of the water which condenses in the upper portion of the casing, so that a part if not the whole of such water is liable to flow back into the blading and cause damage in the succeeding stages.

According to the present invention special means are provided in the upper part of the casing whereby the water thrown off from the moving blades is not only collected with certainty but any tendency to flow back is absolutely prevented. This is accomplished by arranging an annular partition outside the moving blades, curved outwardly at one or both edges and thus not only promoting the entry of the water, but at the same time preventing its return to the blading.

The invention will be described with reference to the accompanying drawing, in which Figures 1 and 2 are sectional views showing one form of my invention, and Figures 3 and 4 show modifications thereof.

Figure 1 of the drawing illustrates one example embodying the invention. The moving blades 4 rotate between the fixed guide blades 1 and 2 which are secured in the casing 3. The water thrown off from the moving blades enters a narrow slit 5 formed on one side by the entering edge 6 of the fixed blading and on the other side by the lip 7 of the annular partition 8. The water passes through this slit and enters the passage 9 formed on one side by the cylinder wall 3 and on the other side by the annular partition 8. To ensure tightness this partition member is let into a slot 10 in the base of the preceding row of fixed blading, which has the additional effect of providing an effective means of centering the member 8. Other methods of attaching the member 8 and ensuring tightness may also be employed. Additional support for the annular partition may be provided by spaced stay members 11. The supporting members may also be made flexible so that in the event of the partition 8 being fouled by the blades and becoming hot, expansion is permitted, which is equivalent to increasing the clearance between the partition 8 and the moving blades.

Figure 2 shows the arrangement accord-

ing to Figure 1 in elevation. The annular partition 8 occupies the upper part of the casing 3 and preferably extends somewhat below the middle flange. In the lower part of the casing a partition is not necessary as the water drains away by gravity.

Figure 3 illustrates the special construction adopted for unshrouded blades, i. e. where the clearance is radial. The fixed guide blades 13 are mounted in the casing 3 and held in place by spacers 14. Instead of carrying the blades right to the cylinder wall as is customary with this type of construction they are made shorter in order to leave an annular space 15 in which the partition 8 may be accommodated with the necessary clearance to the ends of the moving blades and the casing wall respectively. The partition is provided with a lip at 7 as in Figure 1. Since the radial blade clearance must be maintained over the entire periphery it is essential to provide a continuous partition all the way round, contrary to the arrangement shown in Figures 1 and 2. The efficacy of the drainage is in no way impaired thereby.

Figure 4 illustrates an arrangement in which the corner at the base of the drainage chamber is replaced by a well rounded fillet 16 with the object of fully utilizing the kinetic energy of the water thrown off from the moving blades in order to guide it to a point behind the partition 8 with as little reflux as possible. To assist this action the plane of the outer edge 17 of the moving blade should lie in the middle of the slit 5.

The figures show drainage slits arranged opposite the leaving edges of the moving blades only. It may be an advantage, however, particularly with cylindrical blading, to construct the partition with an inlet slit and retaining lip on both sides so that water thrown off from the entering edges of the blades as well as that from the leaving edges may be caught and conducted away. The partition may approximate in shape either to a cylinder or to a cone.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. Means for draining the low-pressure blading of steam turbines, comprising a casing, an annular partition member arranged outside the moving blades and secured at one edge to the side wall of a guide blade by a

tight joint, an outwardly turned flange or lip on the other edge of said partition, said flange or lip being spaced from an adjacent guiding portion of said casing.

5 2. Means for draining the low pressure blading of steam turbines, as claimed in claim 1 in which the partition is inclined to the plane of the radii of the movable vanes.

10 3. Means for draining the low pressure blading of steam turbines, as claimed in claim 1 in which the fixed blade is provided with a slot in which the edge of the partition is mounted.

15 4. Means for draining the low pressure blading of steam turbines as claimed in

claim 1 and in combination therewith of means for supporting said partition from the inner wall of the turbine casing, said supporting means being flexible to permit of movement of the partition in a radial direc- 20 tion.

5. Means for draining the low pressure blading of steam turbines as claimed in claim 1 in which the adjacent wall of the turbine casing is curved to overlies the free 25 edge of the partition.

In testimony whereof I have signed my name to this specification.

KARL FREY.