Dec. 30, 1924. 1,520,830

F. LJUNGSTROM

PACKING MEANS FOR THE BLADES OF STEAM TURBINES

Filed Aug. 17, 1922

Fig. 1.

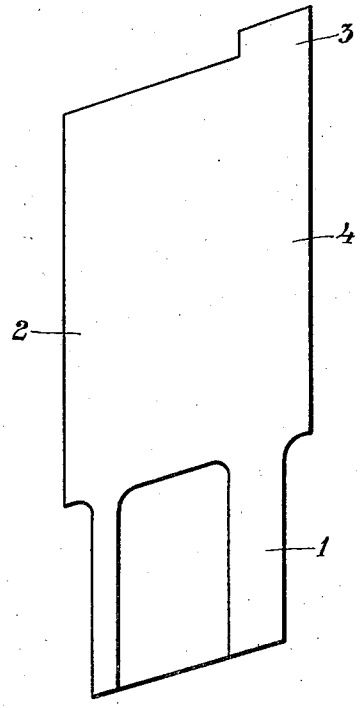


Fig. 3.

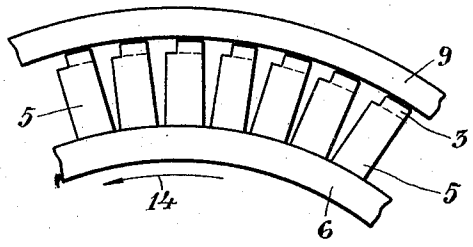


Fig. 4.

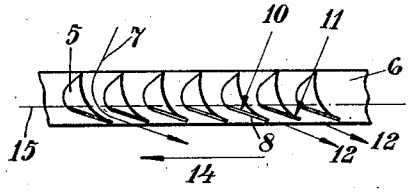


Fig. 2.

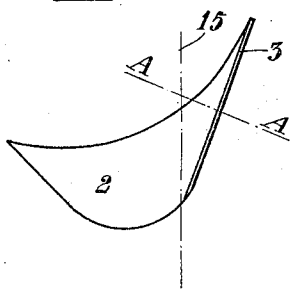
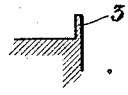


Fig. 5.



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UNITED STATES PATENT OFFICE.

FREDRIK LJUNGSTRÖM, OF LIDINGO-BREVIK, SWEDEN, ASSIGNOR TO AKTIEBOLAGET LJUNGSTROMS ANGTURBIN, OF STOCKHOLM, SWEDEN, A CORPORATION.

PACKING MEANS FOR THE BLADES OF STEAM TURBINES.

Application filed August 17, 1922. Serial No. 582,548.

To all whom it may concern:

Be it known that I, FREDRIK LJUNGSTRÖM, a subject of the King of Sweden, residing at Lidingo-Brevik, Sweden, have invented certain new and useful Improvements in Packing Means for the Blades of Steam Turbines, of which the following is a specification.

The present invention relates to such steam turbines or similar motors in which the rotating and the fixed blades are attached at only one of the ends thereof.

In such motors it has been proposed to arrange a tightening between the rotating parts in the form of projecting thin edges passing adjacent to a ring or the like, after which ring the said edges are adjusted automatically by their being worn off. Such edges have been arranged on the blades at their free ends in such a manner that one of the curved sides of the blades has been lengthened in the direction of the blade. Such edges, in addition to their becoming unnecessarily large, while during the wear they cause great bending moments in the buckets, are also difficult and expensive to manufacture, in that the blades must each be subjected to a separate treatment in the process of manufacture.

The present invention refers to a tightening edge which is suitably arranged for being worn off, and which is easy to manufacture and consists of an edge projecting from the free end of the blade, said edge lengthening the blade in the part corresponding to the exhaust side for the steam flowing therethrough.

By reason of the small size of the part of the blade bearing against the ring, the strains in the blade will be smaller, on the edges being worn off, than if the packing edge would extend around the whole edge of the blade as in earlier constructions. From a manufacturing point of view, this packing edge is also more advantageous, in that all of the packing edges may be produced at the same time by turning after the blades have been mounted in their places.

An embodiment of the invention is illustrated in the accompanying drawing. Figs. 1 and 2 illustrate a blade provided with a tightening edge according to the invention. Figs. 3, 4 and 5 show partly the place of this blade in a turbine disk, and partly a detail in the packing edge.

In Figs. 1 and 2, 1 designates the root of the blade by means of which the blade is attached in the turbine disk or in the guide blade disk, if the blade is a guide blade. 2 denotes the part of the blade around which the steam passes, and 3 is the tightening edge which lengthens the blade in the part 4 corresponding to the exhaust side of the steam.

In Figs. 3 and 4, 5 designates a number of blades made in this manner, the said blades being attached into the blade ring 6. The arrow 7 denotes the path of the steam relatively to the blades. The exhaust direction from the blades corresponds to the extension of the packing edges 3, said edges passing close to the surrounding ring 9, against which they are being worn off in case there is some eccentricity between the rings 6 and 9, or if the blades or other parts within the turbine should be expanded by the heat. As will be seen from Fig. 3, the blade proper, not counting the packing edge, ends some distance inside the ring 9, by reason of which the steam may have a free passage over the blades near the ring 9 according to the direction of the arrows 10 and 11 in Fig. 4. However, the packing edges are placed according to the invention in such a manner that a steam jet flowing forth will always hit a tightening edge so as to obtain a normal direction of exhaust according to the arrows 12. By reason of the passage of the steam through the blades, the latter, if they consist in driven blades, are caused to rotate together with the blade ring 6 according to the direction of the arrow 14, that is to say approximately in parallel to the extension of the tightening edges.

From a manufacturing point of view, the present tightening edge will be easy to manufacture, in that the whole part situated to the left of the chain-dotted line 15 in Fig. 2 may be entirely turned off, the remaining portion being then easily removed with a file. According to prior constructions, it has been necessary to pro-

duce the tightening edge extending over the whole blade by milling each blade separately.

Fig. 5 shows a section of the tightening edge on line A—A in Fig. 2.

Tightening edges formed in this way may be arranged in all cases where a blade is attached only at its one end, independently of whether the blade is a guide blade or a driven blade, or whether the steam turbine or the motor operates according to the reaction- or action principle.

A number of embodiments may be conceived, without the limits of the invention being exceeded.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A turbine blade having a narrow tightening edge projecting from the end of the blade, said edge being of less width than the blade along substantially the whole length of the edge and having a length less than the length of the end of the blade.

2. A blade having a tightening edge projecting from the free end of the blade and extending from the outlet edge of the blade over part of the length of the end of the blade only and having along substantially the whole length of the edge less width than the blade has at that part of the end where the edge is provided.

3. A turbine blade having a tightening edge projecting from the free end of the blade and extending from the outlet edge of the blade over a part of the blade end only and having along the whole length less width than the corresponding blade width.

4. A turbine blade having a tightening edge projecting from the free end of the blade extending in straight line from the outlet edge of the blade across the blade end and having along substantially the whole length the same width.

5. A turbine blade having a tightening edge projecting from the free end of the blade and extending across the end at the back-surface of the blade and having along substantially the whole length the same width.

In testimony whereof I affix my signature in presence of two witnesses.

FREDRIK LJUNGSTRÖM.

Witnesses:

L. Borg v. Linde,

Iver Falk.