F. HODGKINSON.

STEAM TURBINE CYLINDER LINING.

APPLICATION FILED JUNE 12, 1908.

950,330. Patented Feb. 22, 1910.

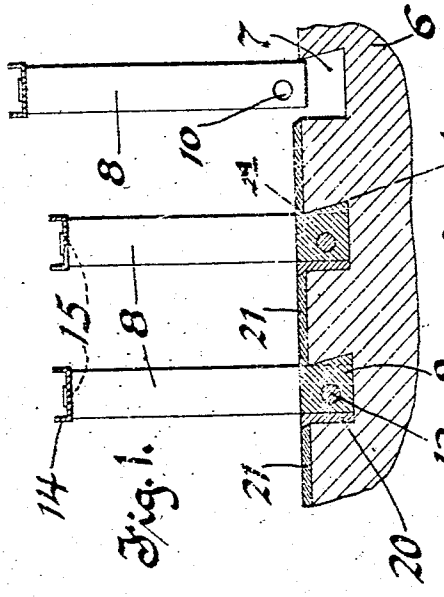

Fig. 1.

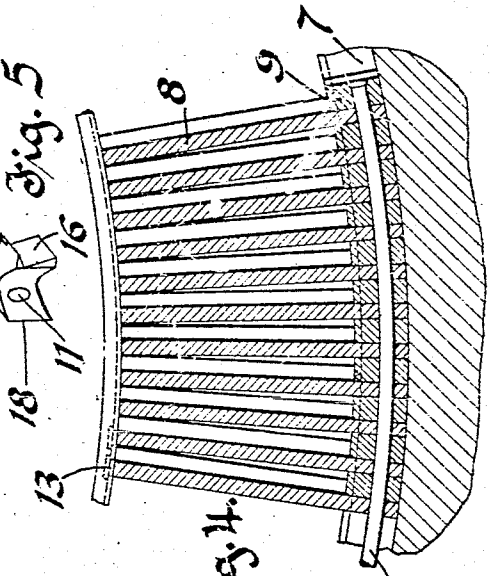

Fig. 5.

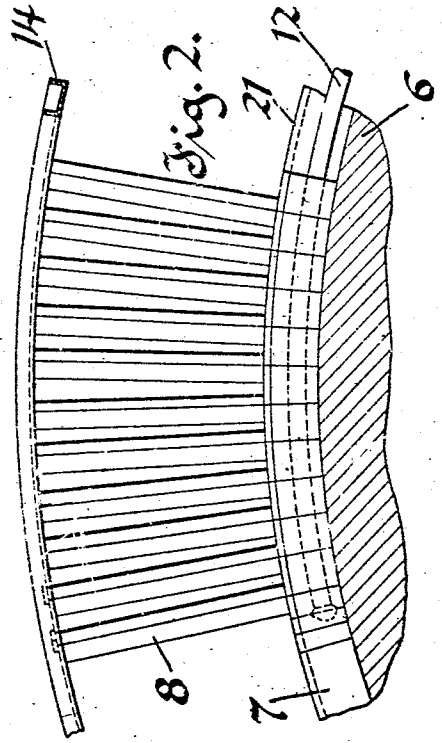

Fig. 2.

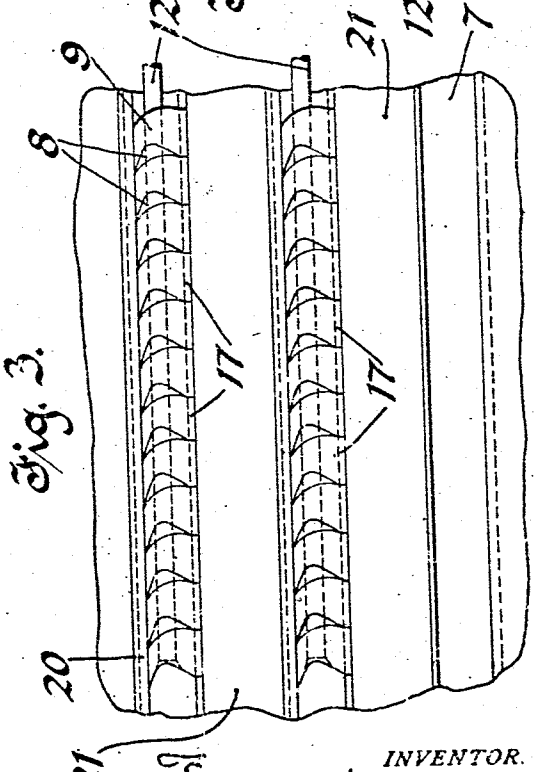

Fig. 3.

Fig. 4.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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STEAM-TURBINE-CYLINDER LINING.

950,330. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed June 12, 1908. Serial No. 438,166.

To all whom it may concern:

Be it known that I, FRANCIS HODGKINSON, a subject of the King of Great Britain and Ireland, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Steam-Turbine-Cylinder Linings, of which the following is a specification.

This invention relates to blading for elastic fluid turbines, and also to means for securing a protective covering to the blade-carrying element of the turbine.

An object of this invention is the production of simple and effective means for blading turbines in conjunction with means for effectively securing a protective covering for the blade-carrying element in place on the element.

A further object is the production of simple and effective means for assembling the blades in segmental strips and for rendering the operation of renewing blades in a turbine a simple matter.

The inner peripheral face of the stationary element or casing of the turbine is frequently corroded and pitted by the motive fluid of the turbine. The pitting of the casing, and, in some instances, of the rotating blade-carrying element, results from an erosive and corrosive action which may be the result of chemical impurities in the boiler feed water, such, for instance, as organic or inorganic acids. It may result from the corrosive action of the distilled water, that is, the water of condensation, and the erosive action of the motive fluid and the water of condensation in their passage through the working passages of the turbine. Whatever the cause, the fact remains that the exposed surfaces of the working elements are at times and under certain conditions badly pitted and corroded. The cast iron casing is usually more actively attacked than the rotor element, but I contemplate providing a protective covering which may be effectively secured to both the stationary and rotating blade-carrying elements of a turbine.

This invention contemplates assembling blades and intermediate spacing pieces in segmental blade rings, and providing means for securing the blade rings and also a protective covering for the blade-carrying element to that element.

In the drawings accompanying this application and forming a part thereof: Figure 1 is a fragmental section of a rotor or rotating blade-carrying element, and discloses an embodiment of my invention; Fig. 2 is a section along the line A—A of Fig. 1; Fig. 3 is a plan view of a rotating blade-carrying element, to which blades are secured in accordance with my invention; Fig. 4 is a transverse section of a fragment of a stationary blade-carrying element embodying my invention; and, Fig. 5 is a perspective view of a spacing piece, which forms a detail of my invention.

A blade-carrying element 6 of the turbine is provided with a plurality of blade-mounting slots 7, in which blades 8 and intermediate spacing pieces 9 are assembled. Each blade is provided, near its base, with a hole 10, which extends transversely through it, and each piece 9 is provided with a hole 11, which extends transversely through it and which is so located within the piece as to register with a hole 10 of an adjacent blade 8 when the blades and pieces are assembled in a blade mounting slot.

The blades 8 and the spacing pieces 9 are, before they are introduced into the blade-carrying slot, assembled into segmental blade rings or sections by being threaded onto and secured in place on a binding wire 12, which is adapted to extend through the holes 10 and 11 of the blades and pieces respectively. The blades and pieces are alternately arranged upon the wire and, if desired, the ends of each wire may be riveted over to permanently secure them in place. Any suitable method may be employed for assembling the blades and pieces on the wire.

The outer or free ends of the blades are each provided with a tip 13, which extends longitudinally of the blade and which is adapted to secure a channel 14 onto the outer end of the blade. The channel 14 is provided, in its web portion, with holes 15 which are spaced to correspond to the spacing of the outer or free ends of the blades, and through which the tips 13 of the blades are adapted to extend. After the channel is in place on the blades it is permanently secured to them by riveting over each tip 13. This construction in conjunction with the binding wire 12 permanently assembles the blades and spacing pieces into a segmental ring.

One wall of each blade-mounting slot 7

is undercut, and one face 16 of each spacing piece is so inclined, relative to the top and bottom faces of the piece as to conform to the inclination of the undercut wall of each slot. A laterally-projecting lug 17 is formed at or near the top of each piece and on the same side of the inclined face 16. The lug 17 is so located on each piece 9 as to project beyond the walls of the slot and to overhang the undercut wall of the slot when the pieces are located in place in a slot. The other lateral face 18 of each piece extends at right angles to the top and bottom faces of the piece and, when the pieces are located in a slot 7, is normal to the peripheral face of the blade-mounting slot.

After the blades and spacing pieces have been assembled into a segmental ring, the ring segments are introduced into the blade-mounting slots 7 in such a way that the inclined lateral face of each ring, formed by the inclined faces 16 of the intermediate pieces 9, comprised in each segmental ring, contacts with the undercut wall of the mounting slot. The rings are then secured in place in the blade-mounting slot by means of a calking strip 20, which is inserted in the slot between the faces 18 of the intermediate pieces 9 and the vertical wall of the slot.

Protective strips 21 are located between adjacent blade-mounting slots 7 and are secured in place on the blade-carrying element by means of the lugs 17 of the spacing pieces 9 located in one slot and the calking piece 20 located in the next adjacent slot.

The method of mounting the protective strips is as follows: One row of blades is located in the blade-mounting slot and is permanently secured in place in the slot by means of a calking piece 20 which is calked into the slot and thereby forced into gripping contact with the vertical wall of the slot and which forces the inclined face of the blade ring into gripping contact and positive engagement with the undercut wall of the slot. A blade ring is then introduced into the next adjacent slot and a protective strip 21 is so located between the two adjacent slots that one edge contacts with and is overhung by the lugs 17 of the spacing pieces 9 secured into the first mentioned slot. These spacing pieces are of such height that they project beyond the walls of the blade-carrying slots an amount which is about equal to the thickness of the protective strips 21, and the protective strips are beveled at each edge. Each calking piece 20 is so constructed that when calked into the blade-mounting slot, it will flow around and engage the adjacent edge of the protective strip 21. This construction secures the protective strips rigidly in place and prevents them from being dislodged by centrifugal or any other dislodging force. The protective strips are curved to correspond to the curvature of the peripheral face of the blade-carrying element and they are preferably cut into sections for convenience in handling and mounting them on the blade-carrying element. Each section of a ring is so arranged at its ends that the sections may be inserted into the blade-mounting slot end for end without destroying the spacing of the blades in one annular row. It will be apparent that for convenience in handling, the calking pieces 20 may also be introduced into the slots in short sections.

Throughout this specification and in the claims, I have utilized the terms "blade" and "blades" in their broadest sense, that is, to mean either the moving or stationary blades of a turbine. The term "blade-carrying element" has also been utilized in the broad sense, and means wherever it occurs either the stationary or rotating blade or bucket-carrying element of a turbine. I, therefore, wish it to be understood that I do not limit the scope of this invention to either a stationary or moving blade-carrying element of a turbine, and that the specification is broad enough to include various and different kinds of blades and buckets.

In accordance with the provisions of the patent statutes, I have described the principle of my invention together with the apparatus which I now consider the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:

1. In combination in a turbine, a blade-carrying element provided with a slot, a segmental blade-ring comprising blades, intermediate spacing pieces, and means for securing said blades and said pieces together, a protective covering for said element and a calking strip for securing said covering and said blade ring to said element.

2. In combination in a turbine, a blade-carrying element provided with a plurality of slots, blades and intermediate spacing pieces located in said slots, protective strips between adjacent slots, means formed integrally with each spacing piece for engaging a protective strip, and a calking strip for securing said blades and said spacing strips into said slots and said protective strips to said element.

In testimony whereof, I have hereunto subscribed my name this 4th day of June, 1908.

FRANCIS HODGKINSON.

Witnesses:
CHARLES W. McGHEE,
E. W. McCALLISTER.