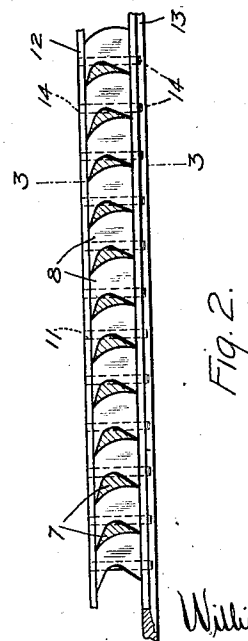
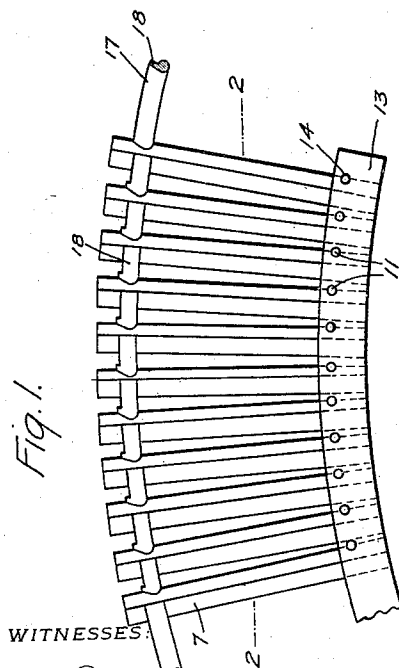
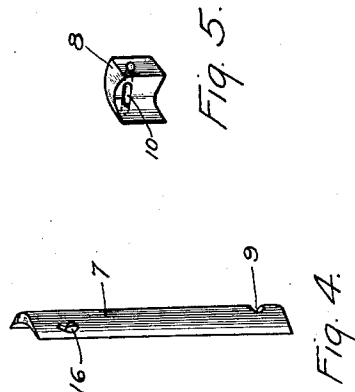
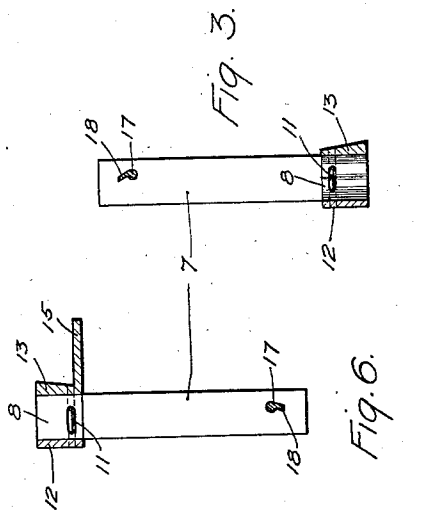


W. A. BOLE.
BLADE MOUNTING.
APPLICATION FILED NOV. 15, 1910.

1,026,651.

Patented May 21, 1912.



WITNESSES:

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INVENTOR.

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UNITED STATES PATENT OFFICE.

WILLIAM A. BOLE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BLADE-MOUNTING.

1,026,651.

Specification of Letters Patent.

Patented May 21, 1912.

Application filed November 15, 1910. Serial No. 592,419.

To all whom it may concern:

Be it known that I, WILLIAM A. BOLE, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Blade-Mountings, of which the following is a specification.

This invention relates to the general class of turbines, but more particularly to means for securing the blades and packing pieces to the blade carrying element of the turbine.

One of the objects of my invention is to provide a built up structure, preferably in the form of a segment, whereby a plurality of blades and packing pieces may be secured together outside the turbine and applied thereto.

Another object of the invention is to provide means whereby the blades will be securely held in place and any liability of their becoming loose when in service due to the action of centrifugal force or for any other purpose will be reduced to a minimum if not wholly avoided.

In the form of my invention selected for illustration, I have shown the built up structure comprising the segment made up of blades, packing pieces and side pieces or base strips, which serve to bind the packing pieces and blades together in proper alternate relation and so secured together that a whole segment may be made preparatory to being applied to the turbine, or the whole segment may be removed for the purpose of inspection or repairs.

In the drawings, Figure 1 is a side elevation of a portion of a blade segment for a rotor and constructed in accordance with my invention; Fig. 2 is a sectional view on the line 2—2 of Fig. 1; Fig. 3 is a sectional view on the line 3—3 of Fig. 2; Fig. 4 is a detailed perspective view of the blade; Fig. 5 is a detailed perspective view of one of the packing pieces; and Fig. 6 is a sectional view through a segment constructed for the stator of the turbine.

The blades 7 are concave-convex in cross-section throughout their lengths and are adapted to be spaced by intermediate spacing pieces 8, which fit snugly between the mounting ends of the blades when the blades and spacing pieces are assembled into a segment. Each intermediate spacing piece 8 is provided with curved faces, one of

which is convex and corresponds to the concave face of the blade, while the other is concave and corresponds to the convex face of the blade. The faces may be inclined to each other so that the blades will extend radially when assembled, with the spacing pieces, into a segment. The lateral faces of each spacing piece extend at right angles or are normal to the top and bottom faces.

A slot 9 is cut across the convex side of each blade 7 and registers with slot 10, which is cut across the concave face of spacing pieces 8. The two slots cooperate in receiving a binding member, such for example as a rivet 11 which extends transversely through the assembled blades and pieces.

Prior to being secured to a blade carrying element, the blades may be made up into segmental sections for convenience in handling; that is, the blades 7 and the spacing pieces 8 may be confined between two arcuate base strips 12 and 13 which are adapted to lie adjacent to the row of blades and spacing pieces. Each base strip is a segment and is provided with a segmental row of holes 14 which register with the end of the slot 10. Each binding member 11 is adapted to be forced through the holes 14 in the base strips 12 and 13 and to engage in the slots 9 and 10 in the blades 7 and the spacing pieces 8 respectively, thereby binding the said mentioned parts together in a compact and secure segment.

The members 11 are preferably riveted over or in some other way upset at their ends so as to effectively secure the base strips 12 and 13 in place. The binding members 11 perform two functions, that is, they bind the separate parts comprising the blade segments together by engaging the strips 12 and 13, and they also positively lock each blade 7 and each spacing piece 8 in place by passing through the slots 9 and 10, provided in the blades and the spacing pieces respectively. This arrangement of the binding members 11 produces a secure and compact blade segment, and each binding member is under double shear when subjected to centrifugal force tending to remove the blades from the segment. The base strips 12 and 13, in addition to binding the blades and packing pieces together, stiffen the segment and also present smooth

flat lateral surfaces which overcomes difficulties sometimes encountered in the operation of mounting the blade segments on the blade carrying element.

5 In the apparatus illustrated, I have shown the strip 13 provided with one incline face, which is adapted to engage the undercut wall of the blade mounting slot provided in the blade carrying element. The lateral
10 face of the strip 12 is normal to the ends of the spacing pieces 8; or in other words, it is parallel to the longitudinal axes of the blades. Where compound tapered wedges
15 are employed in mounting the blade segments on the blade carrying elements, the wedges will be forced against the strip 12, which, by presenting a smooth flat surface, will eliminate the tendency of the wedges to bend or break when forced into place.

20 The base strip 13 when it is to be used in the stator of a turbine may be provided with a protecting flange 15, which is adapted to lie between adjacent rows of blades and to prevent corrosion of the metal between the blades.

The outer or free ends of the blades are provided with comma shaped apertures 16 through which a binding wire 17 of comma shaped cross-section extends. The binding
30 wire is secured to the blades 7 by having the tail-shaped fin 18, with which it is provided, sheared and bent over between the adjacent blades. The bent-over portions form spacers which lock the outer ends of
35 the blades 7 against relative motion.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention together
40 with the apparatus which I now consider to represent 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, blades, spacing pieces,
45 each provided with a transversely extending slot, a pin in said slot and projecting beyond the concave face of the spacing piece and engaging a notch in the convex
50 face of the blade, and means engaged by the pins for connecting the said pieces and blades.

2. In combination, blades, spacing pieces,
55 each provided with a transversely extending slot, a pin in said slot and projecting beyond the concave face of the spacing piece and engaging a notch in the convex face of the blade, and side pieces engaged
60 by the pins for connecting the said pieces and blades.

3. In combination, blades, spacing pieces,
each provided with a transversely extending slot, a pin in said slot and projecting
65 beyond the concave face of the spacing piece and engaging a notch in the convex face of the blade, and side pieces comprising strips engaged by the pins for connecting the said pieces and blades.

4. In combination, blades, spacing pieces,
70 each provided with a transversely extending slot, a pin in said slot and projecting beyond the concave face of the spacing piece and engaging a notch in the convex face of the blade, and side pieces comprising
75 strips and engaged by the said pins for connecting the said pieces and blades.

In testimony whereof, I have hereunto subscribed my name this 12th day of November, 1910.

WILLIAM A. BOLE.

Witnesses:

C. W. McGHEE,
B. F. FUNK.