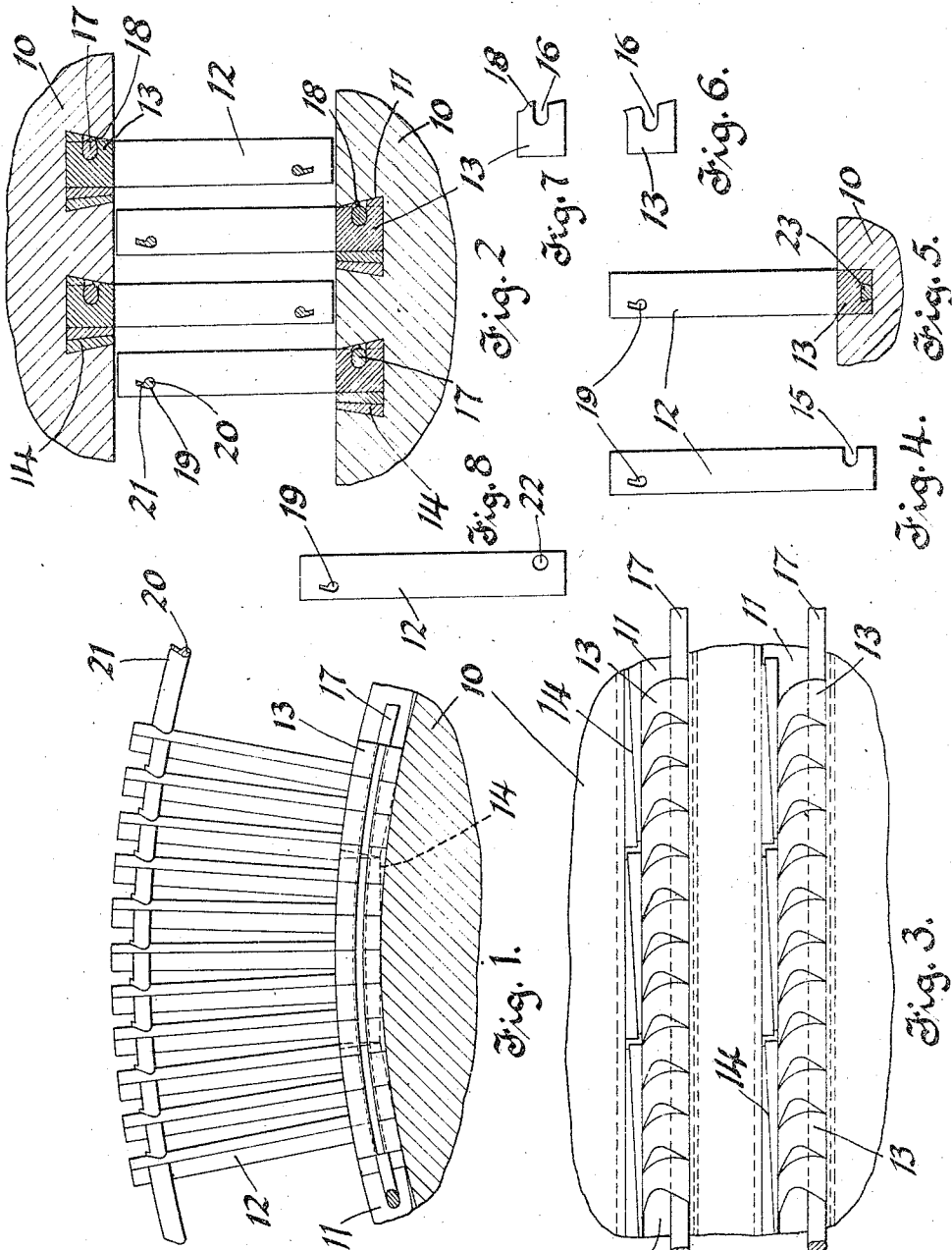


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BLADING MEANS FOR TURBINES.
APPLICATION FILED JULY 30, 1908.

1,012,749.

Patented Dec. 26, 1911.



WITNESSES:

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BLADING MEANS FOR TURBINES.

1,012,749.

Specification of Letters Patent.

Patented Dec. 26, 1911.

Application filed July 30, 1908. Serial No. 446,100.

To all whom it may concern:

Be it known that I, CHARLES E. SWEET, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Blading Means for Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines and more particularly to blading means for turbines.

An object of this invention is the production of means for assembling the blades into rings or ring segments before they are secured to the blade-carrying elements of the turbine.

My invention contemplates assembling the blades and intermediate spacing pieces, which are located between the bases of the blades, on a wire, then locking each spacing piece to the wire to permanently secure the blades and spacing pieces together into a segmental ring. I also contemplate providing a binding member for the outer or free ends of the blades so that the blades and pieces are permanently organized into a rigid segmental blade ring which may be secured to the blade-carrying element of the turbine.

In the drawings accompanying this application and forming a part thereof: Figure 1 is a fragmental transverse section of a rotor element in connection with blades (shown in elevation) secured thereto in accordance with my invention; Fig. 2 is a fragmental transverse section of a portion of the rotor element and a portion of the stator element of a turbine located substantially in their relative positions and respectively provided with rotor blades and stationary vanes mounted in accordance with my invention; Fig. 3 is a fragmental plan view of the rotor blades assembled in accordance with my invention; Fig. 4 is an elevation of a blade embodying my invention; Fig. 5 is a fragmental view of a blade-carrying element illustrating a modification of my invention; Fig. 6 is an end view of a spacing piece forming a detail of my invention; Fig. 7 is an end view of a modified form of spacing

piece; and, Fig. 8 is an elevation of a blade which forms a detail of a modification of my invention.

For the sake of brevity and also for the sake of convenience of description, the terms "blade" and "blades" will be employed throughout this specification and in the claims to denote either the rotating blades or the stationary vanes of the turbine and the term "blade-carrying element" will be employed to denote either the stationary or the rotating blade-carrying element.

Each blade-carrying element 10 of the turbine is provided with a plurality of undercut blade mounting slots 11, in each of which an annular row of blades 12 and intermediate spacing pieces 13 are secured by means of compound tapered wedges 14. Each blade 12 is substantially crescent-shaped in cross-section throughout its length and is provided with a notch 15 which is located at one end of the blade near the mounting end.

The intermediate spacing pieces 13 are adapted, by their shape, to fit snugly between the mounting ends of the blades when the blades are assembled in a ring or a ring segment. Each piece is provided with a concave face which corresponds in contour to the curvature of the convex face of the blades and a convex face which corresponds in contour to the concave faces of the blades. These faces are so inclined, relative to each other, that the blades, when assembled in rings, occupy radial positions. One lateral face of each spacing piece is inclined to correspond to the inclination of the undercut walls of the blade mounting slots. The other lateral face extends at right angles to the top and bottom faces of the pieces which are parallel to each other.

A notch 16 is cut across the inclined face of each intermediate spacing piece and is so located as to register with the notches 15 of adjacent blades when the piece and the blades are assembled. The notches 15, in the blades and 16, in the pieces, cooperate in receiving a wire or rod 17 which is adapted to bind the blades and spacing pieces together. Each spacing piece is so construct-

ed, or the notch 16 is so cut in the piece, that the piece can be positively and permanently locked in place on the binding wire 17. In Figs. 2 and 7, I have shown a spacing piece in which the notch is so cut as to provide an overhanging tip 18 which is abnormally distorted to admit the wire 17 and which is then moved to its normal position to secure the wire in place.

In Fig. 6 I have shown a different arrangement for securing the piece 13 to the wire 17. The spacing piece disclosed is of a peculiar shape, being provided on its top face with a projecting tip which, when calked or pressed down flush with the major portion of the top face, secures the piece to the wire by causing the metal of the piece, at one edge of the notch 16, to flow inwardly and inclose the wire. Various methods may be employed for securing the piece to the wire and it will be noted by referring to Fig. 3 that the blades are locked in place between adjacent spacing pieces when the pieces are secured to the wire.

The outer or free ends of the blades are provided with comma-shaped holes 19 through which a binding wire 20 of comma-shaped cross section extends. The binding wire 20 is secured to the blades and is caused to space the outer or free ends of the blades by having the tail or fin portion 21, with which it is provided, sheared and bent over between adjacent blades. This construction, together with the binding wire 17 for the base of the blades, assembles the blades into rigid rings or segments of rings which may be mounted in the blade-mounting slots 11 of the turbine.

After the blades and spacing pieces are assembled into a segmental ring, the segments are located in one of the slots 11 so that the inclined faces of the intermediate spacing pieces contact with one of the undercut walls of the slot. The ring is then secured in place by means of the compound tapered wedges 14 which are located within the slot between the other undercut wall of the slot and the normal faces of the intermediate spacing pieces.

The ring segments are preferably of such length that several are located within one slot. The wedges 14 are arranged in pairs and are so constructed that, when driven home, the two wedges of each pair conjointly form a wedge-shaped key which effectively secures the blade rings in place and which is prevented, by its shape and the shape of its component wedges, from being dislodged from the slot by centrifugal force or any other dislodging force.

In Fig. 8, I have shown a modification in which each blade 12 is provided with a cylindrical hole 22 which takes the place of the slot 15 and which is so located as to register with the notches 16 of the intermedi-

ate spacing pieces 13. In assembling the blades and pieces the binding wire 17 is adapted to extend through the holes 22 and to be located in the notches 16 of the spacing pieces. With this arrangement the blades, as well as the intermediate spacing pieces, are positively locked to the wire 17.

In Fig. 5 I have shown still another modification in which the bottom faces of the spacing pieces and the ends of the blades are provided with registering dove-tailed notches through which a dove-tailed strip 23 is adapted to extend. The blades and pieces are strung onto the ends of the strip 23 and are held in place by riveting over the ends of the strip.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together 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 in a turbine, a plurality of turbine blades assembled in a row, intermediate spacing pieces located between adjacent blades, a binding member located in slots provided in said blades and said pieces, and means for securing said member to said pieces.
2. In combination in a turbine, a plurality of turbine blades assembled in a row, intermediate spacing pieces located between the bases of adjacent blades and a binding member located in slots provided in said blades and pieces, the outer edges of the slots being distorted to close in the slots to engage the binding member.
3. In combination in a turbine, a plurality of blades and intermediate spacing pieces, a binding member located in slots provided in said blades and pieces, and a tip formed integrally with each piece for positively locking each piece to said member.
4. In combination in a turbine, a plurality of blades and intermediate spacing pieces, a binding member located in slots provided in said blades and pieces, and a tip formed integrally with each piece and adapted to be abnormally distorted to admit said member into the slot of said piece, and to be bent to a normal position to secure said strip into said slot.
5. In combination in a turbine, a plurality of blades having openings, a binding member adapted to extend through the openings provided in the bases of the blades, and intermediate spacing pieces, said spacing pieces having slots, the edges of which are bendable over the binding member.
6. In combination in a turbine, a plurality of alternately arranged blades and slot-

ted intermediate spacing pieces, blades being provided with openings, a binding member extending through the openings provided in the blades and a bendable edge for the slot and closing in said slot for permanently securing each spacing piece to said member.

In testimony whereof, I have hereunto subscribed my name this 23rd day of July, 1908.

CHARLES E. SWEET.

Witnesses:

C. W. MCGHEE,
E. W. MCCALLISTER.