C. E. SWEET.

BLADE MOUNTING MEANS.

APPLICATION FILED JULY 30, 1908.

945,204.

Patented Jan. 4, 1910.

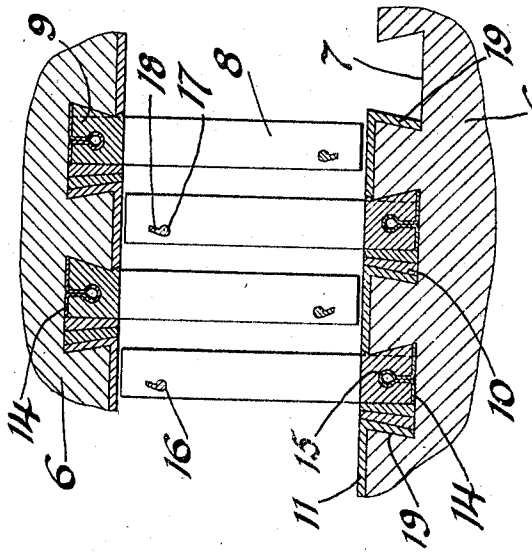

Fig. 3.

Fig. 5.

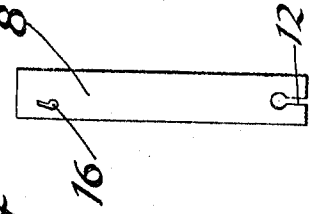

Fig. 4.

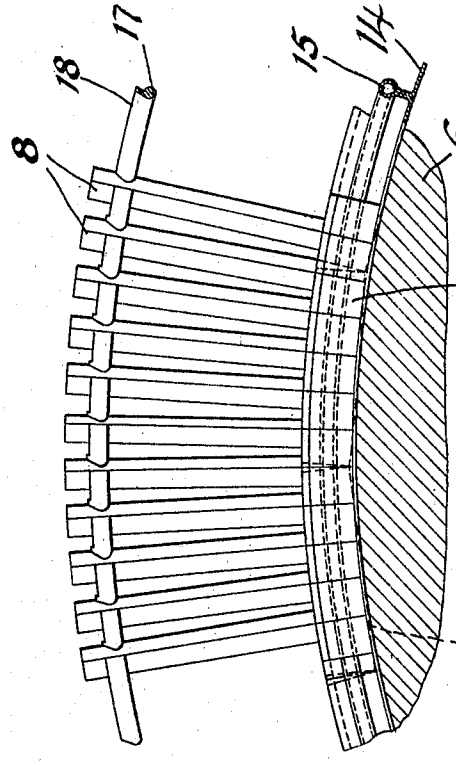

Fig. 1.

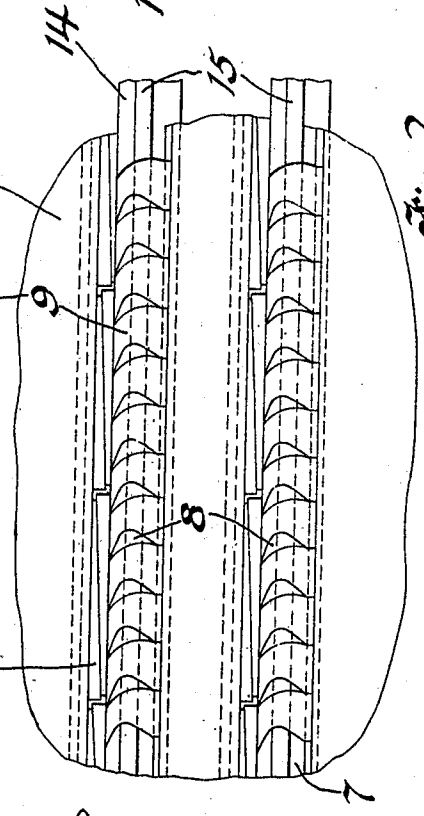

Fig. 2.

WITNESSES:

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UNITED STATES PATENT OFFICE.

CHARLES E. SWEET, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

BLADE-MOUNTING MEANS.

945,204. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed July 30, 1908. Serial No. 446,099.

To all whom it may concern:

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

This invention relates to elastic fluid turbines and more particularly to blading means for such 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 element of the turbine.

In carrying out my invention I provide a binding member for the blades and the intermediate spacing pieces, which are located between the blades. The base of each blade is provided with a slot which is adapted to register with a similarly shaped slot provided in each intermediate spacing piece. These slots in the blades and spacing pieces coöperate in receiving and holding in place the binding member, which secures the blades and spacing pieces into a blade ring or ring segment.

In the drawings accompanying this application and forming a part thereof: Figure 1 is a transverse fragmental section of the rotor element of a turbine provided with blades (shown in elevation) mounted in accordance with my invention; Fig. 2 is a partial plan view of a rotor element provided with blades; Fig. 3 is a fragmental longitudinal section of a turbine and discloses fragmental sections of the rotor and stator of a turbine, respectively provided with blades and vanes mounted in accordance with my invention; Fig. 4 is an elevation of a blade forming a detail of my invention; and Fig. 5 is a perspective view of a spacing piece embodied in my invention.

Throughout the specification and in the claims I will utilize the terms "blade" and "blades" in their broadest sense, that is to mean 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 rotating blade-carrying elements of the turbine.

Turbine blade carrying elements 6 are each provided with a plurality of undercut blade-mounting slots 7 in which blade rings, which comprise alternately arranged blades 8 and spacing pieces 9, are secured by means of compound tapered wedges 10. Protective strips 11 are located on the blade-carrying element between each blade-mounting slot. One flange of each strip extends into an adjacent slot and, with the blade ring, is secured in place by the compound tapered wedges 10.

Each blade 8 is substantially crescent shaped in cross-section throughout its length. The intermediate spacing pieces are adapted to fit snugly between the mounting ends of the blades when the blades and pieces are assembled in segmental rings. Each intermediate spacing piece is provided with curved end faces, one of which is convex and corresponds in contour to the concave faces of the blades, and the other is concave and corresponds in contour to the convex faces of the blades. These faces are inclined to each other so that, when the blades and pieces are assembled in a ring, the blades will extend radially. One lateral face of each piece is inclined to correspond to the inclination of the undercut walls of the slots. The other lateral face extends at right angles or is normal to the top and top faces of the pieces which are parallel to each other.

A slot 12 is cut across one end of each blade and a slot 13 is cut across the bottom face of each spacing piece. The slots 12 and 13 are adapted to register with each other when the blades and pieces are assembled, and they coöperate in receiving a binding member 14 which extends longitudinally of the assembled blades and pieces.

Each slot 12 and 13 is enlarged at its inner end to an aperture of circular cross section. The binding member 14 is formed, from a flat strip, into an arch-shaped member of T-section and is provided with a flange 15 of circular cross section which is adapted to fit into the enlarged portion of each of the slots 12 and 13. The other flange of the member is flat and is adapted to lie in close proximity with the bases of the blades and the intermediate pieces on each side of their respective slots. The web portion of the T-shaped section fits snugly into the narrower portion of each slot.

Blades and alternate spacing pieces are strung onto the binder member and, if desired, are locked in place by being secured, in any suitable manner, against longitudinal

motion. The spacing pieces and the binding member form a base strip for the blades which is adapted to be secured into one of the blade-mounting slots 7.

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 wire is secured to the blades by having the tail shaped fin 18, with which it is provided, sheared and bent over between adjacent blades. The bent over portions form spacers which lock the outer ends of the blades against relative motion.

After the blades and spacing pieces are assembled into segmental rings, they are secured into the mounting slot 7 by means of the wedges 10. Each segmental ring is so located within the slot that the inclined faces of the spacing pieces 9, comprised in the ring, contact with one of the undercut walls of the slot. Each protective strip 11 is provided with a flange 19 which is adapted to project into a slot 7 when the strip is in place between the slots, on the blade-carrying element.

The wedges 10 are introduced into the slot in pairs and are located between the normal faces of the pieces 13 comprised in the blade ring and the flange of the protective strip. The wedges are so constructed and are so arranged that, when driven home, the two wedges of each pair conjointly form a wedge-shaped key which effectively secures the blade ring and the flange 19 of the protective strip in place, and which is prevented, by its shape and the shape of its component wedges, from being dislodged from the slot by centrifugal or any other force.

Lugs or flanges 20 are formed integrally with each piece 9 and are located near the top of the piece and on the same side as the inclined face. These flanges project from the slot 7 when the blade rings are in place and are adapted to overhang and engage the outer or free edge of the protective strip 11, which is secured into the next adjacent slot 7.

A number of wedges are employed to secure each segmental ring into a slot 7 and they are preferably so spaced that the component wedges of one pair abut against the component wedges of the next adjacent pairs. Since it is necessary to leave considerable space between the first and last pairs of wedges introduced into a slot, some special means must be employed for securing the component wedges of these pairs against longitudinal movement.

In accordance with the provisions of the patent statutes I have described an apparatus which I now consider to represent the best embodiment of my invention, 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 with a blade-carrying element provided with a slot, blades, a plurality of intermediate spacing pieces, a combined base and binding member for said blades and pieces, and means for securing said blades and pieces in said slot.

2. In combination with a blade-carrying element provided with a blade-mounting slot, a plurality of alternately arranged blades and spacing pieces, a binding member therefor located in holes provided in the ends of the blades and the bottom faces of the bases, and means for securing said blades and pieces into said slot.

3. In combination with a turbine blade-carrying element provided with alternately arranged blades and spacing pieces, a base strip contacting with the ends of the blades and the bottom faces of the bases and provided with a flange, which projects into notches provided in said blades and said pieces, and means for securing said blades and pieces to said element.

4. A segmental blade ring comprising alternately arranged blades and spacing pieces, and a base piece provided with a flange which projects into slots provided in the bases of the blades and the bottom faces of the pieces.

5. A segmental blade ring comprising alternately arranged blades and intermediate spacing pieces, and a combined base strip and binding member for the blades and pieces.

6. A segmental blade ring comprising alternately arranged blades and spacing pieces, and a base piece provided with means for binding said blades and pieces together.

7. A segmental blade ring comprising alternately arranged blades and spacing pieces, and a T-shaped binding member for said blades and pieces.

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.