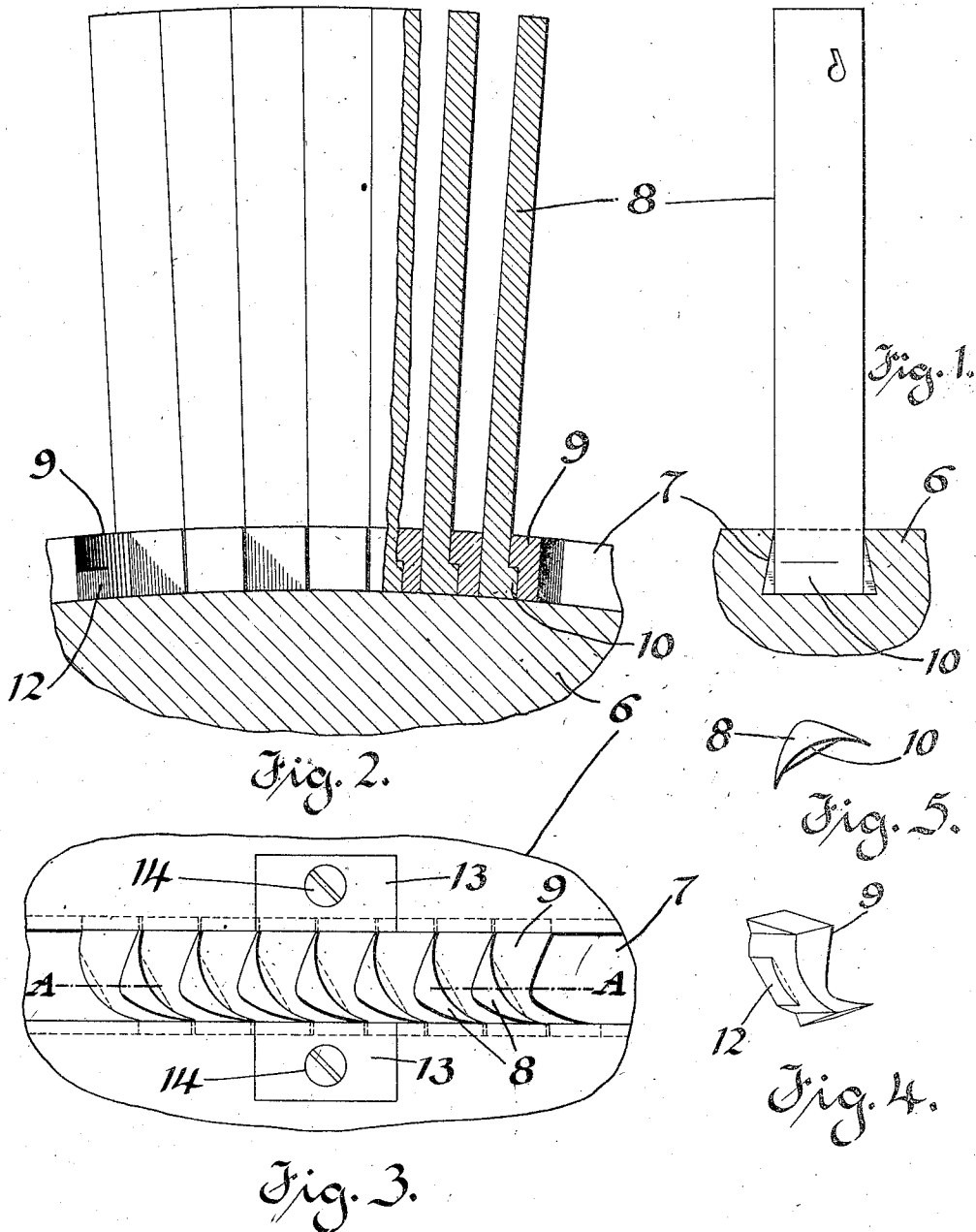


F. HODGKINSON.  
BLADE HOLDING MEANS FOR TURBINES.  
APPLICATION FILED MAY 26, 1908.

1,010,630.

Patented Dec. 5, 1911.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## BLADE-HOLDING MEANS FOR TURBINES.

1,010,630.

Specification of Letters Patent.

Patented Dec. 5, 1911.

Application filed May 26, 1908. Serial No. 435,078.

*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 Blade-Holding Means for Turbines, of which the following is a specification.

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

Various methods are employed for securing the blades to the blade-carrying elements of the turbine. The method most generally employed utilizes blade-mounting slots which are provided in the peripheral face of the rotor element and in the inner peripheral face of the stationary casing or stator element.

An object of my invention is to provide simple and effective means for securing the blades in blade-mounting slots provided for their reception in the stationary and moving blade-carrying elements. This and other objects I attain by means of the apparatus illustrated in the accompanying drawings which form a part of this application.

In the drawings, Figure 1 is a fragmental transverse section of a blade-carrying element illustrating my invention; Fig. 2 is a fragmental longitudinal section taken on the line A—A of Fig. 3, a portion of the blades being shown in section and a portion in elevation; Fig. 3 is a plan view of a blade-carrying element embodying my invention; Fig. 4 is a perspective view of a detail of my invention; and Fig. 5 is a plan view of a blade utilized in carrying out my invention.

Blades have heretofore been secured into blade-mounting slots by means of intermediate spacing and calking pieces, which are inserted into the slots between adjacent blades and which, by being transversely expanded, are caused to grip the walls of the slot and the exposed faces of the blades and to thereby secure the blades into the slots.

My present invention contemplates utilizing intermediate spacing pieces which are secured in place in the blade-mounting slots between adjacent blades, but it further contemplates utilizing blades with specially formed base or mounting portions and spe-

cially formed spacing pieces which cooperate with the base portions to provide a positive locking means between each blade and one of the adjacent calking pieces.

Referring more particularly to the drawings: The blade-carrying element 6 is provided with circumferentially-extending and undercut blade-mounting slots 7, in which the blades 8 are secured by means of separate spacing pieces 9 located within the slots between adjacent blades of one row. Each blade 8 is substantially crescent shaped in cross-section and is provided near its base and on its concave face with a shoulder or offset 10, which is formed by upsetting or swaging the mounting end of the blade. The lateral faces of each spacing piece are inclined to conform to the inclination of the walls of the undercut slot and the piece is of such size as to fit snugly into the slot. The top and bottom faces of the piece are parallel to each other. One end face is concave to conform to the convex faces of the blades and the other is convex, conforming in contour to the concave faces of the blades, but it is also notched out at 12, as illustrated in Fig. 4, to receive the shoulder or offset 10 formed on the blade.

It is necessary to provide special means for introducing the spacing pieces 9 into the under-cut slots. In Fig. 3 I have shown a plan view of a slot and I have illustrated the slot in which each of the undercut walls are cut away and replaced by removable keys 13, which are secured in place on the blade-carrying element 6 by means of screws 14. In assembling the blades on the blade-carrying element the keys 13 are removed and the spacing pieces 9 are introduced into the slot at the widened portion. Alternate blades and spacing pieces are located in the slot and are so arranged that the blades are held in place by the cooperating shoulders 10 and notches 12, formed respectively on the individual blades and spacing pieces. After all the blades and spacing pieces are located in place, the keys 13 are secured to the blade-carrying element. Each blade is then positively locked to one of the spacing pieces by means of the cooperating shoulders 10 formed on the blade and the notch 12 is provided for its reception on the spacing piece and each spacing piece is positively locked into the

slot by means of the under-cut walls of the slot and the dove-tail or wedge shape of the piece. The keys 13 may be replaced by simple wedges, which, instead of being secured in place by screws, are secured by being calked.

Under some conditions it may not be absolutely essential to provide the blade-carrying element with undercut slots, as slots made with straight walls may be employed, provided the individual spacing pieces are secured into the slots by being transversely expanded and thereby forced into gripping contact with the walls of the slot.

The methods described may be utilized in securing the moving blades or the stationary vanes to their respective blade-carrying elements, and while, throughout this specification, I have used the term "blade" I wish it understood that it is used in a broad sense and includes both the moving blades and the stationary vanes.

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. A blade spacing element for fluid driven devices, comprising a body portion having inclined ends and a recess extending only partially through the body portion to receive a projection on a blade.

2. A turbine element having an undercut slot, alternately arranged blades, spacing pieces in the slot, the spacing pieces having inclined ends snugly fitting the walls of the undercut portion of the slot and having recesses extending partially through the walls of the said spacing pieces and projections on the blades received by the recesses.

In testimony whereof, I have hereunto subscribed my name this 16th day of May, 1908.

FRANCIS HODGKINSON.

Witnesses:

CHARLES W. MCGHEE,  
E. W. MCCALLISTER.