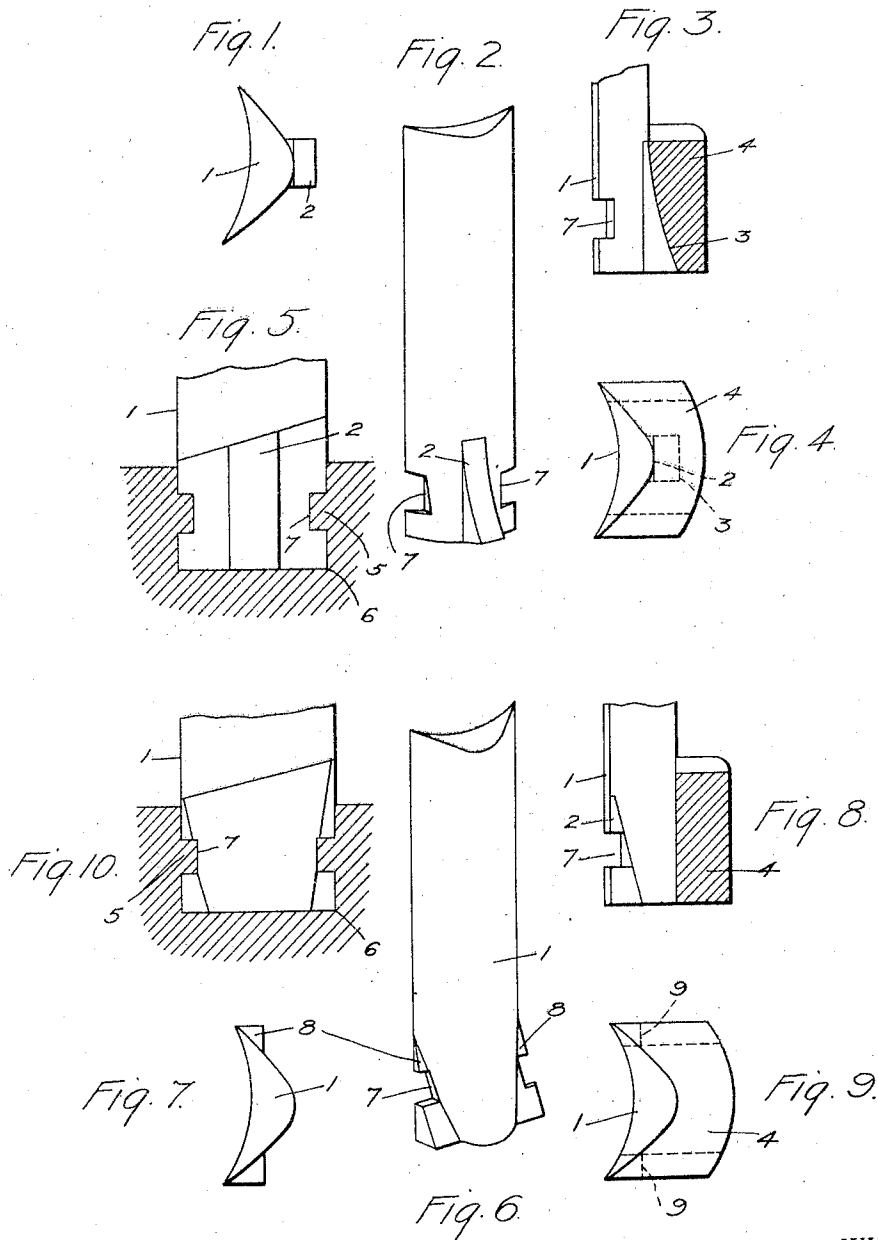


A. W. CLARKE.
 FLUID PRESSURE TURBINE.
 APPLICATION FILED DEC. 29, 1909.

1,029,489.

Patented June 11, 1912.



WITNESSES:

[Signature]

[Signature]

INVENTOR.

Arthur W. Clarke

BY

[Signature]

HIS ATTORNEY IN FACT.

UNITED STATES PATENT OFFICE.

ATHOL WILFRID CLARKE, OF MANCHESTER, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLUID-PRESSURE TURBINE.

1,029,489.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed December 29, 1909. Serial No. 535,524.

To all whom it may concern:

Be it known that I, ATHOL WILFRID CLARKE, a subject of the King of Great Britain, and a resident of Manchester, in the county of Lancaster, England, have made a new and useful Invention in Improvements in or Relating to Fluid-Pressure Turbines, of which the following is a specification.

10 My invention relates to fluid pressure turbines and has for its object to provide an improved arrangement for securing the blades or vanes by means of spacing pieces in grooves in the rotor or stator of machines of this description.

15 According to my invention I provide each blade or vane with one or more wedge-shaped projections formed integrally therewith near the root thereof adapted to engage with corresponding recesses formed in the spacing pieces next adjacent, the spacing pieces being secured in slots in the rotor or stator in any suitable manner.

20 In the accompanying drawings in which corresponding parts are indicated by the same numerals, Figure 1 is a plan view of a blade or vane constructed in accordance with this invention; Fig. 2 is a perspective view of the blade or vane illustrated in Fig. 1; 25 Fig. 3 is a view in side elevation, partly sectional, of a portion of a blade or vane and a spacing piece constructed in accordance with the invention; Fig. 4 is a plan view of the blade or vane and the spacing piece illustrated in Fig. 3; Fig. 5 is a view in front elevation, partly sectional, showing one arrangement for securing the blades or vanes and spacing pieces within slots in the stator or rotor; Fig. 6 is a perspective 30 view of a modified form of a blade or vane constructed in accordance with this invention; Fig. 7 is a plan view of the blade or vane illustrated in Fig. 6; Fig. 8 is a view in side elevation, partly sectional, showing the blade or vane illustrated in Fig. 7 and a spacing piece assembled; Fig. 9 is a plan view of the blade or vane and spacing piece illustrated in Fig. 8; and Fig. 10 is a view in front elevation, partly sectional, illustrating one arrangement for securing the 35 blade or vane illustrated in Fig. 7 in a slot in the stator or rotor.

Referring now to Figs. 1 to 4, the blade or vane 1 is shown provided with a projection 2 formed integrally therewith. The 55 projection 2 is wedge shaped with its widest portion at the root of the blade and is adapted to engage with corresponding recesses 3 formed in the spacing pieces 4.

A convenient method of securing the 60 blades or vanes and spacing pieces in the groove in the stator or rotor consists in providing a rectangular projection on one or both sides of the groove adapted to engage with corresponding recesses in the distance pieces or in the blades or vanes and 65 distance pieces. This arrangement is illustrated in Fig. 5 in which the rectangular projections 5 are shown formed on the walls of groove 6 in the stator or rotor engaging with corresponding recesses 7 formed in the blades or vanes and distance pieces. 70

In the modification illustrated in Figs. 6 to 9, the blade or vane is shown provided with two projections 8, 8, one at each edge 75 of the blade, and the spacing pieces 4 instead of being provided with a single recess are provided with two recesses 9, 9 located at opposite sides of the spacing pieces.

The blades or vanes may be made in any 80 suitable manner. A convenient method of producing the projections consists in drawing the blade or vane with a rib extending from one end of the blade to the other, and subsequently machining off that portion 85 which would project above the distance pieces when the blades or vanes are in position, the remaining portion being wedge shaped with its widest portion at the root of the blade. The spacing pieces may be 90 formed in any suitable manner, but on that side which is to receive the projection or projections on the blade or vane a groove or grooves is or are made to exactly fit the projection or projections on the blades or vanes. 95 When the projections on the blades or the recesses in the spacing pieces are being formed, allowance may be made for the variation in the pitch of the blades or vanes or in the angle of inclination between the 100 blades or vanes of the rotors or stators at different radii, thus insuring a perfect fit between each blade and spacing piece.

The blade or vane illustrated in Figs. 6 to

9 is shown by way of example in Fig. 10, secured in slots in the stator or rotor by means of rectangular projections formed on the walls of the slot engaging with recesses
5 formed in the blade or vane and spacing piece in a manner similar to that hereinabove described with reference to Fig. 5.

Although in both cases which I have illustrated the projections upon the blades or vanes are shown formed on the convex side of the blade, it will be understood that these projections may be formed equally well upon the concave side of the blade or vane irrespective of whether a single projection is
15 employed on each blade or vane located in the center of the blade, or whether two projections are employed one at each edge of the blade or vane. Moreover, although I have shown the blades or vanes and spacing
20 pieces secured in a groove in the rotor or stator by means of rectangular projections on the sides of said groove adapted to engage with corresponding recesses in the distance pieces, the invention is not limited in
25 this respect, since the blades and distance pieces may be secured in a slot or groove in any other suitable manner.

It will be apparent from the foregoing description that when the distance pieces and
30 blades are in position in the rotor or stator, it is impossible to withdraw the blade or vane without destroying the projection and since the depth of the projection or projections corresponds substantially to the depth
35 of the slot or groove in which the blades or vanes are secured, it may have a cross sectional area equal to that of the blade or vane and may therefore be as strong as the blade or vane.

40 Having now particularly described and ascertained the nature of my said invention

and in what manner the same is to be performed, I declare that what I claim is:

1. In a turbine a blade carrying element having slots therein, blades and spacing
45 pieces in the slots, and projections on the blades, the width of said projections being less than the width of the blades and the lengths of the projections extending lengthwise of the faces of the blades to engage corresponding recesses in the spacing pieces. 50

2. In a turbine a blade carrying element having slots therein, concavo-convex blades, and spacing pieces in the slots, and wedge
55 shaped projections on the convex portions of the blades to engage corresponding recesses in the spacing pieces, said wedge shaped projections being thickest at the bases of the blades.

3. In a turbine a blade carrying element having a slot, blades and spacing pieces in the slot, and a longitudinally disposed wedge
60 shaped projection on one of said elements and engaging a recess in the other element, said wedge having its length extending lengthwise of the blade. 65

4. A turbine blading having a wedge shaped projection on its convex face, the length of the projection extending lengthwise of the blade. 70

5. A turbine blade having a wedge shaped projection on its convex face, the length of the wedge extending lengthwise of the blade and having its thickest portion at the base of the blade. 75

In testimony whereof, I have hereunto subscribed my name this 16th day of December 1909.

ATHOL WILFRID CLARKE.

Witnesses:

JAS. STEWART BROADFOOT,
H. R. KITSON.