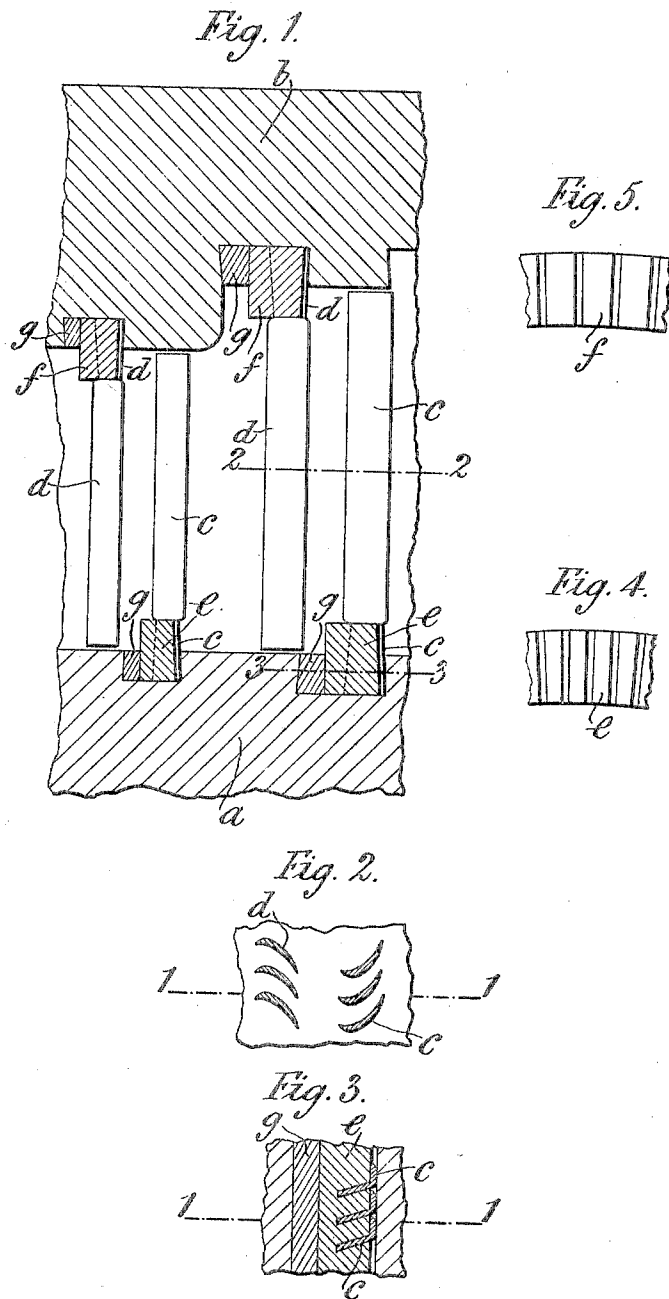


M. H. P. R. SANKEY.

TURBINE.

APPLICATION FILED SEPT. 12, 1904. RENEWED APR. 11, 1905.



Witnesses.

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# UNITED STATES PATENT OFFICE.

MATTHEW HENRY PHINEAS RIALI SANKEY, OF BILTON, NEAR RUGBY, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALLIS-CHALMERS COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TURBINE.

No. 797,460.

Specification of Letters Patent.

Patented Aug. 15, 1905.

Application filed September 12, 1904. Renewed April 11, 1905. Serial No. 255,010.

*To all whom it may concern:*

Be it known that I, MATTHEW HENRY PHINEAS RIALI SANKEY, late captain Royal Engineers, a subject of the King of Great Britain, residing at Bawnmore, Bilton, near Rugby, England, have invented certain new and useful Improvements in Turbines, of which the following is a specification.

My invention relates especially to steam-turbines of the class in which radial blades are held in rings or segments (hereinafter called "rings") arranged in annular grooves in the casing or drum of the turbine.

The object of my invention is to provide a way by which the blades may be very quickly assembled and securely held in place.

According to my invention the roots or those ends of the blades of each series which are connected with the casing or drum are constructed, as by being tapered, to coact with properly-formed slots in a ring fitting a groove in the casing or drum, means, such as a calking-strip, being provided for locking the roots of the blades in the ring.

In the preferred form of my invention the roots of the blades of each series are held between one wall of the groove and one side of the ring by the pressure caused by a calking-strip or locking device. Preferably the root end of each blade is stamped or otherwise formed to a right-angled or approximately right-angled section or tang, one side of which enters a slot in the ring, while the other lies flat against the side of the ring and between it and the adjacent side or wall of the groove. In this way not only can the blades and rings be quickly assembled; but the blades will be rigidly held in place against any movement by centrifugal or other force.

In the accompanying drawings, Figure 1 shows a part longitudinal section on the line 1 1 of Figs. 2 and 3 of a turbine constructed according to this invention, the bodies of the blades being shown in elevation. Figs. 2 and 3 are local sections on the lines 2 2 and 3 3 of Fig. 1, the views being developed from cylindrical cuts. Figs. 4 and 5 are elevations of parts of the slotted rings.

I have shown in the drawings the preferred specific way of carrying out my invention; but my invention comprehends many modifications, the subject-matter deemed novel being set forth in the claims.

The revolving drum *a* and the fixed outer casing *b* carry sets of blades *c* and *d*. The foundation-rings *e* and *f* are arranged in grooves formed in the drum and casing. Preferably, as shown in Fig. 1, both the rings and grooves are dovetailed or tapered, the rings being formed with a number of parallel tapered slots arranged to make approximately a right angle to one of the faces of the ring, preferably to that toward the exhaust end of the turbine, and these slots extend from their inner to their outer circumferential faces, but not across the ring to the opposite side. As indicated, one end of each blade is stamped into an angle corresponding with the slot, one side of the angled root of the blade entering a slot in the ring while the other side lies against the face thereof.

As shown in Fig. 1, the root ends or tangs of the blades are preferably dovetailed or tapered, and the slots are dovetailed or tapered to correspond—that is to say, the slots and root ends of the blades are constructed to coact with each other to securely hold the blades in place. Calking rings or strips *g* are preferably employed to hold the rings and the blades in place in the grooves. In the construction shown, since part of the end or tang of each blade is outside of its slot, the pressure caused by the calking-ring forces this projecting portion of the blade against the adjacent wall of the groove in the drum or in the casing, so that the blades are held much more securely than they would be if otherwise formed.

What I claim is—

1. The combination of a grooved turbine casing or drum, a ring having a series of slots on one side, a series of blades whose ends enter the slots but project beyond them at the side of the ring, and means for holding the ring and the blades in the groove.

2. The combination of a grooved turbine casing or drum, a ring in the groove having a series of slots on one side, a series of blades whose ends enter the slots but project beyond them at the side of the ring, the projecting portions of the blades being in contact with one side of the groove, and a calking-strip between the unslotted side of the ring and the other side of the groove.

3. The combination of a grooved turbine casing or drum, a ring having a series of slots

on one side, a series of blades whose ends enter the slots but project beyond them at the side of the ring, such slots and ends being dovetailed, and means for holding the ring and the blades in the groove.

4. The combination of a turbine casing or drum having a dovetailed groove in it, a ring having a series of slots on one side, a series of blades whose ends enter the slots but project beyond them at the side of the ring such slots and ends being dovetailed, and means for holding the ring and the blades in the groove.

5. The combination of a turbine casing or drum having a groove in it, a ring having a series of slots on one side of it, such slots making approximately a right angle with the face of the ring, a series of blades whose ends are in the form of a corresponding angle, one side of each angle entering a slot and the other lying against the side of the ring, and means for holding the ring and blades in the groove.

6. The combination of a turbine casing or drum having a groove in it, a ring in the groove having a series of slots on one side of it, such slots making approximately a right angle with the face of the ring, a series of blades whose ends are in the form of a corresponding angle, one side of each angle entering a slot and the other lying against the side of the ring, and a calking-strip in the groove between one side of it and the unslotted side of the ring.

7. The combination of a turbine casing or drum having a groove in it, a ring having a series of slots on one side of it, such slots making approximately a right angle with the face of the ring, a series of blades whose ends are in the form of a corresponding angle, one side of each angle entering a slot and the other lying against the side of the ring, such slots and the sides of the angles in them being dovetailed, and means for holding the ring and blades in the groove.

8. The combination of a turbine casing or drum having a groove in it, a ring in the groove having a series of slots on one side of it, such slots making approximately a right angle with

the face of the ring, a series of blades whose ends are in the form of a corresponding angle, one side of each angle entering a slot and the other lying against the side of the ring, such slots and the sides of the angles in them being dovetailed, and a calking-strip in the groove between one side of it and the unslotted side of the ring.

9. The combination of a grooved turbine casing or drum, a ring, tapered slots in the ring, blades having tapered ends coacting with the slots, and separate means for holding the ring and blades in the groove.

10. The combination of a grooved turbine casing or drum, a ring, tapered slots in the ring, blades having tapered ends coacting with the slots, and means acting upon the blade ends for holding the ring and blades in the groove.

11. The combination of a grooved turbine casing or drum, a ring, tapered slots in the ring, blades having tapered ends coacting with the slots, and a calking-strip for holding the ring and blades in the groove.

12. The combination of a grooved turbine casing or drum, a ring, tapered slots in the ring, blades having tapered ends coacting with the slots, and means acting upon the blade ends and including a calking-strip for holding the ring and blades in the groove.

13. The combination of a grooved turbine casing or drum, a ring, tapered slots in the ring, blades having tapered ends coacting with the slots and a calking-strip for locking the blades to the ring and for holding the ring in the groove.

14. The combination of a grooved turbine casing or drum, a slotted holding-ring in said grooved portion, blades having ends arranged in said slotted ring and coacting therewith and with one wall of the grooved portion, and separate means for holding said ring in the groove and the blade ends against one wall thereof.

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