F. LJUNGSTROM.

BLADE RINGS OF RADIAL TURBINES.

APPLICATION FILED JAN. 31, 1913.

1,068,512. **Patented July 29, 1913**

Fig. 1.

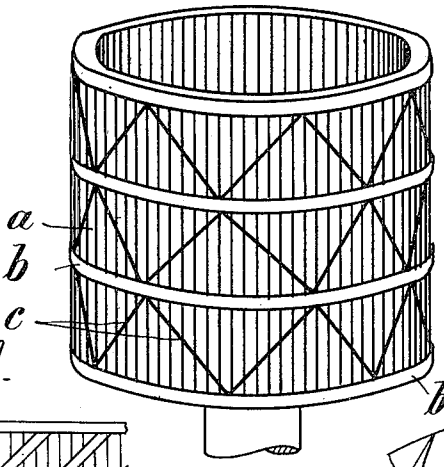


Fig. 7.

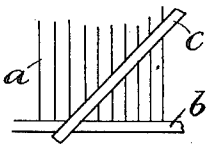


Fig. 9.

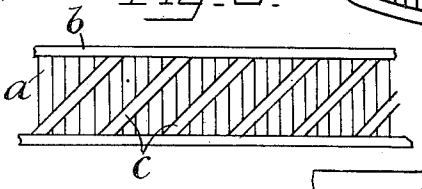


Fig. 6.

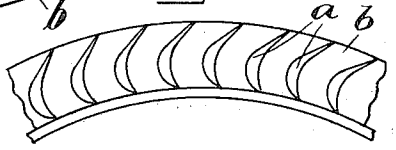


Fig. 2.

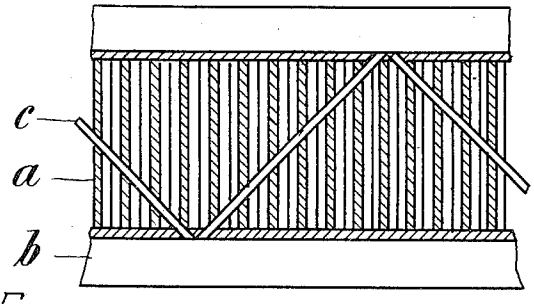


Fig. 8.

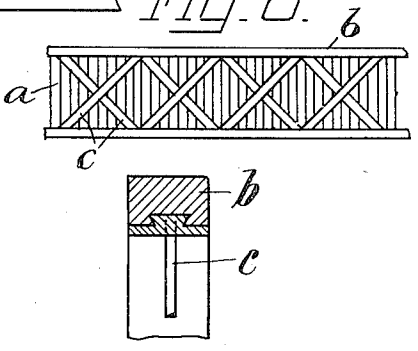


Fig. 5.

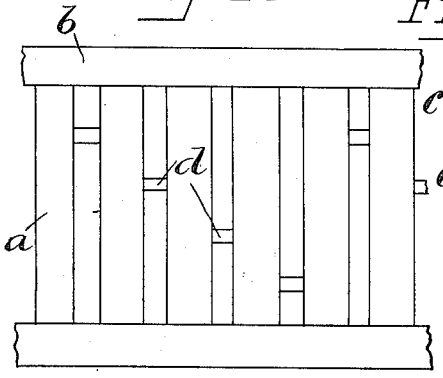


Fig. 3.

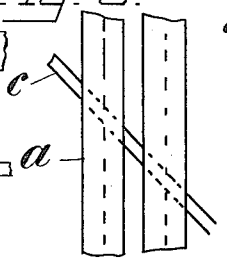


Fig. 4.

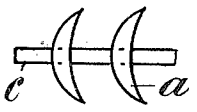


Fig. 2a.

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FREDRIK LJUNGSTRÖM, OF STOCKHOLM, SWEDEN, ASSIGNOR TO AKTIEBOLAGET LJUNGSTRÖMS ÅNGTURBIN, OF LILJEHOLMEN, SWEDEN.

BLADE-RINGS OF RADIAL TURBINES.

1,068,512. Specification of Letters Patent. Patented July 29, 1913.

Application filed January 31, 1913. Serial No. 745,416.

To all whom it may concern:

Be it known that I, FREDRIK LJUNGSTRÖM, a subject of the King of Sweden, residing at 2 Drottningholmsvägen, Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Blade-Rings of Radial Turbines, of which the following is a specification.

As well known the outermost blade rings in radial steam- or gas-turbines may not be given too great a radius on account of the increase of the centrifugal action. It is therefore necessary, when dealing with greater units to increase the axial width of the blade rings. In such case, however, certain lengths (from construction reasons) may not be exceeded because the outer blades tend to perform swinging movements.

The present invention has for its object to prevent such swinging movements. This is attained by the reinforcing or supporting rings, between which the blades are inserted, being combined by means of framings or connections crossing the blades.

Some embodiments of the invention are shown on the accompanying drawing.

Figure 1 is a perspective view of a blade drum according to the present invention. Figs. 2 and 2^a are sections thereof. Fig. 3 is a plan and Fig. 4 a side elevation of the blades of the one embodiment. Fig. 5 shows another embodiment. Figs. 6 and 7 show a third embodiment in side elevation and view from below respectively. Figs. 8 and 9 show diagrammatically two other embodiments of the invention.

As shown in Fig. 1 connections in the form of wires *c* are arranged between the reinforcing rings *b* supporting the blades *a*, such wires extending in zigzag lines between the said rings. As shown in Figs. 2, 3 and 4 the wires *c* pass through holes in the blades, the ends of which are secured to the reinforcing rings. In securing the blades to the reinforcing rings by welding the ends of the wires are secured by the same welding process.

Fig. 2 shows a known form of the supporting or reinforcing ring. The ends of the wire are welded or soldered into thin supporting rings, which then are connected with thicker reinforcing rings.

According to Fig. 5 rods *d* are substituted for the wires, said rods being inserted between the blades and subjected to pressure by a parallel movement of the reinforcing rings, whereby the rods can prevent essentially such parallel movement. The rods *d* are thereby moved in relation to each other, so that they will be equivalent with the wires *c* and act in the same manner as these latter.

Figs. 6 and 7 show that the wires *c* are not passed through the blades but are arranged at the lower edge thereof and connected with the rings by welding.

According to Fig. 8 the wires *c* are arranged in two reversely inclined series, crossing each other. According to Fig. 9 the wires are obliquely arranged only in one direction. It is only essential that the wires and the blades be set at an angle to each other. The cross section of the wire may be of any suitable shape, wires of round cross-section, however, being preferred. The connections may also be arranged only at those rings which are nearest the secured end of the drum.

Having now described my invention, what I claim and desire to protect by Letters Patent is:—

1. In combination with the blades of a radial turbine and supporting reinforcing rings between which they are inserted, devices which connect said rings to each other and extend across the intervening blades.

2. In combination with the blades of a radial turbine and supporting and reinforcing rings between which said blades are inserted, a series of wires which pass through holes in the blades and are connected to said rings.

3. In combination with the blades of a radial turbine and supporting and reinforcing rings between which said blades are inserted, a series of connecting devices fastened to said rings and welded to said blades.

In testimony whereof I have affixed my signature in presence of two witnesses.

FREDRIK LJUNGSTRÖM.

Witnesses:

FREDRIK CAUNNAR BOHR,

GRETA PRIM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."