No. 791,743. PATENTED JUNE 6, 1905.

E. E. ARNOLD.

ELASTIC FLUID TURBINE.

APPLICATION FILED MAR. 18, 1905.

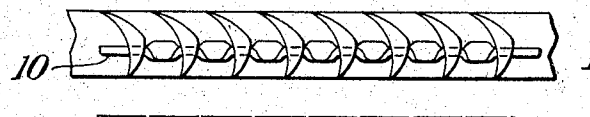


Fig. 2.

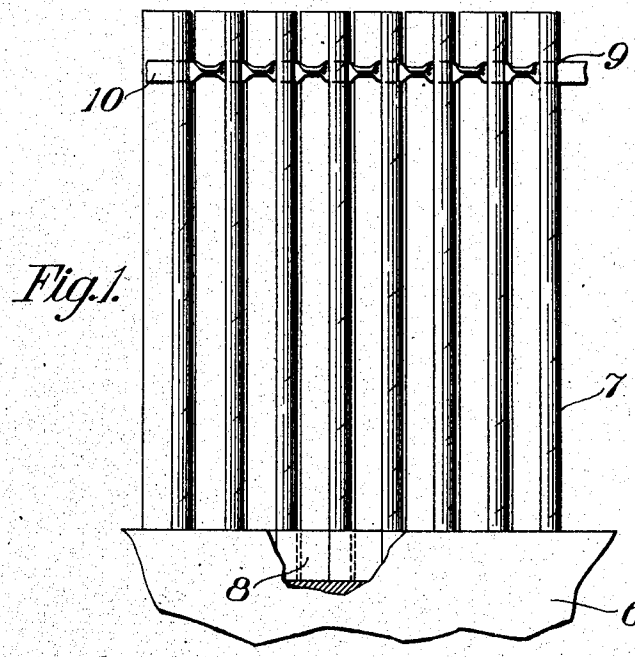


Fig. 1.

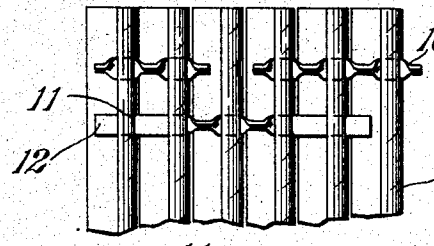


Fig. 4.

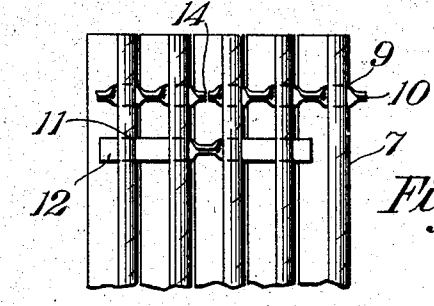


Fig. 3.

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No. 791,743. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

EDWIN E. ARNOLD, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

ELASTIC-FLUID TURBINE.

SPECIFICATION forming part of Letters Patent No. 791,743, dated June 6, 1905.

Application filed March 18, 1905. Serial No. 250,820.

To all whom it may concern:

Be it known that I, EDWIN E. ARNOLD, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to elastic-fluid turbines, and more particularly to tying or binding means for the blades or vanes thereof.

It is now common in elastic-fluid turbines in which the vanes and blades thereof are arranged in annularly-extending rows to secure the outer ends of the blades or vanes comprised in one such row together, and, as shown by Patent No. 639,608 of December 19, 1899, attempts have been made to this end by soldering or brazing the blades comprised in a row to a binder strip or wire passing through openings therefor in said blades or vanes. In practice it has been found that the results secured by the method described and illustrated in said patent are not as satisfactory as might be desired; and to the end of reducing the cost of manufacture by reducing both the cost of labor and material, to the securing of a stronger construction, as well as numerous other results, which will readily appear to one skilled in the art to which this invention pertains, my invention consists in the method hereinafter described and the means illustrated in the drawings accompanying this application and forming a part thereof.

In the drawings, Figure 1 is a view in side elevation of a plurality of turbine blades or vanes, the outer or free ends of which are shown bound or tied together by my method. Fig. 2 is a plan view of the said blades or vanes, showing the arrangement of the binding member. Fig. 3 is a fragmentary view similar to Fig. 1 and illustrates the method and means of caring for the blades or vanes adjacent to the ends of the binder wires or strips which are utilized. Fig. 4 is a modification of this method of caring for the blades or vanes adjacent to the ends of the binder wires or strips.

As this invention may be utilized in various types of turbines and also in various types of compressors and pumps and is applicable either to the rotor-blades or stator-vanes therefor, the blades or vanes may be of any desired contour in cross-section, of any desired length, or formed of any desired material in any desired manner. The blades or vanes may be secured to the rotors or stators in any desired manner; but they are preferably secured to their holding member—that is, either the rotors or stators—as illustrated and described in said Letters Patent No. 639,608.

As illustrated in the drawings, the rotor or stator member, which may be represented by 6, is provided with an annular or circumferentially-extending slot or channel, within which the inner ends of the blades or vanes 7 are secured by means of calking or spacing elements or pieces 8, as is now common. For the sake of clearly describing this method it will be understood that the side walls of these channels or slots are roughened or undercut and that by means of suitable calking-irons or other tools the spacing pieces or blocks 8 are caused to spread transversely to the applied pressure and to grip the walls of the channels and the vanes or blades, whereby said vanes or blades are securely held to the stator or rotor, as the case may be.

Each of the blades at its outer end, as at 9, is provided with an elongated or rectangular hole or opening through which is inserted a binding-strip 10, having a rectangular or elongated cross-section. The holes or slots in the blades or vanes are so formed that the long sides of the binder-strip at its portion lying within the same will be substantially parallel to the edges of the blades or vanes. If desired, this binding-strip may be cut into lengths sufficient to embrace only a few blades or vanes, or it may extend through an entire row.

After the blades have been secured to the

rotor and the vanes to the stator, or during the operation of mounting them, the strip 10 is inserted through the holes 9. After the strip is in position and the blades or vanes are locked to their carrying member it is distorted or twisted, as shown in the drawings. This distortion of the binding-strip locks the blades or vanes together and secures them against movement toward or away from one another circumferentially, as well as against movement out of the plane of the row.

In Fig. 3 a joint between two groups of blades is shown. The ends of the binding-strips 10 terminate between adjacent blades or vanes, as at 14, and both ends are distorted or twisted. Extending through a second series of holes or openings 11, provided in several of the blades below the holes or openings 9, is another binding strip or member 12, and between the blades or vanes adjacent to the ends of the binder strip or wire 10 this supplemental binding-strip is distorted or twisted, as shown in Fig. 3. By this method it will be seen that the two blades or vanes adjacent to the separated ends of the primary binder-strip 10 may be prevented from moving laterally out of the plane of the row, and an expansion-joint is provided between the adjacent groups of blades or vanes.

In Fig. 4 a modification of the expansion-joint is shown. The ends of the primary binding-strips 10 terminate at either side of an intermediate blade or vane, and a supplemental binding-strip, which extends through the holes 11, as described, is distorted on either side of the intermediate blade or vane. As in the previous case, this method secures the blades or vanes against lateral motion.

It will be seen that the distorting or twisting of the binding-strip may be accomplished in various ways and that any method will fall within the scope of this invention in which the outer ends of a plurality of blades or vanes are locked together by means of a locking or binding strip which is elongated or rectangular in cross-section and which between adjacent blades and vanes is distorted.

Having thus described my invention, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. In combination with an annular row of turbine blades or vanes, a locking-strip elongated in cross-section passing through said blades or vanes and which between adjacent blades or vanes is distorted.

2. In a turbine, an annular row of blades or vanes and a rectangular binding-strip passing through substantially alined holes therein and which between adjacent blades or vanes is distorted.

3. In a turbine, an annular row of blades or vanes and means for preventing relative movement of said blades or vanes consisting of a binder-strip of elongated cross-section which passes through substantially alined holes therein and which between adjacent blades or vanes is distorted.

4. In combination with a turbine blade or vane holding element, a plurality of blades or vanes arranged in an annular row, and a rectangular locking-strip passing through the outer ends of said blades or vanes and which, between adjacent blades or vanes, is distorted.

5. In combination with a turbine blade or vane holding element, a plurality of blades or vanes arranged in an annular row, and a locking-strip of elongated cross-section passing through the outer ends of said blades or vanes and which, between adjacent blades or vanes, is distorted.

In testimony whereof I have hereunto subscribed my name this 16th day of March, 1905.

E. E. ARNOLD.

Witnesses:
DAVID WILLIAMS,
JNO. S. GREEN.