J. S. GREEN.

ELASTIC FLUID TURBINE.

APPLICATION FILED MAR. 8, 1906. RENEWED OCT. 12, 1907.

953,526. Patented Mar. 29, 1910.

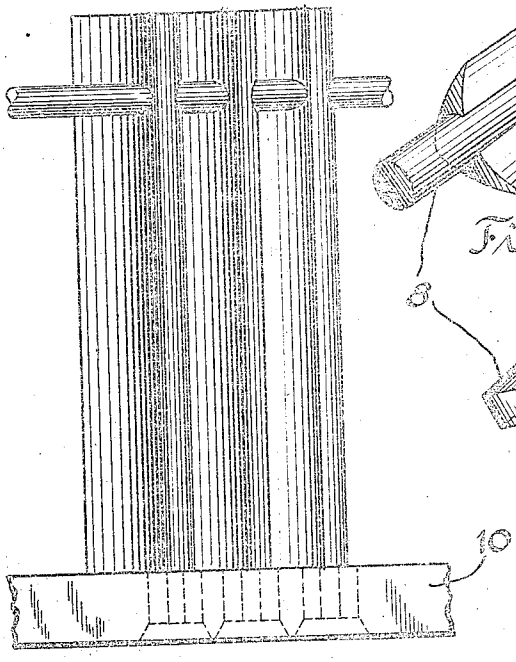

Fig. 6.

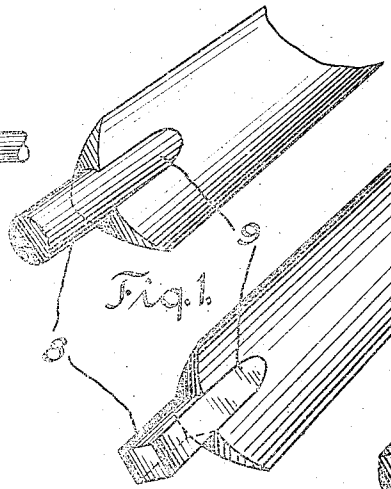

Fig. 1.

Fig. 2.

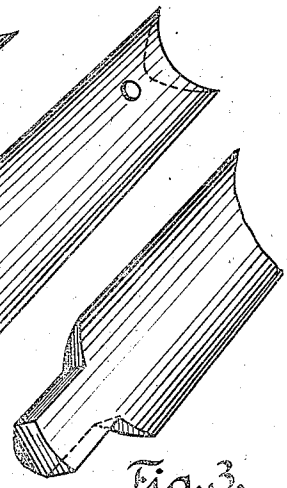

Fig. 3.

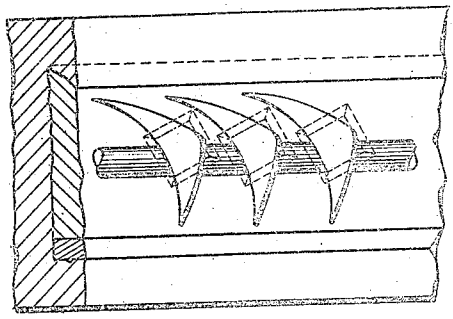

Fig. 7.

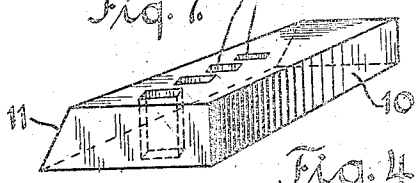

Fig. 4.

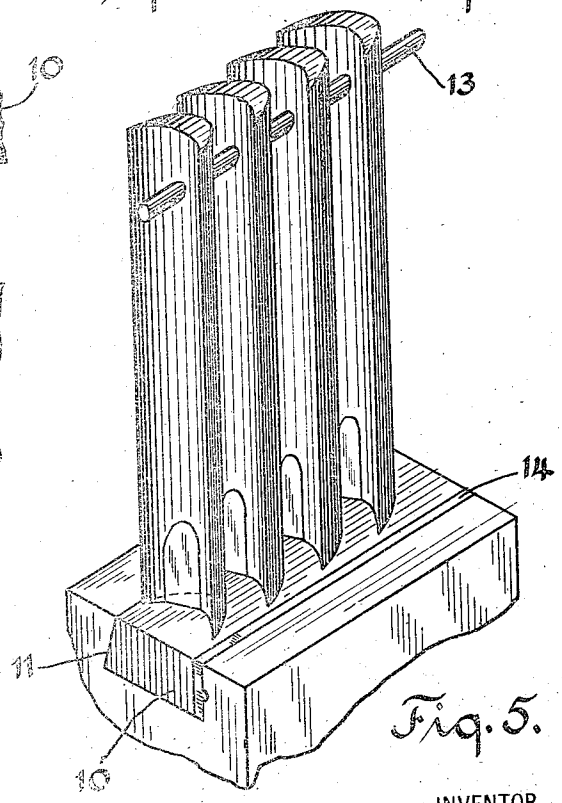

Fig. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

953,526. Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed March 8, 1906, Serial No. 304,921. Renewed October 12, 1907. Serial No. 397,171.

To all whom it may concern:

Be it known that I, JONATHAN S. GREEN, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines.

In turbines, and especially those in which the blades and vanes are arranged in alternate annular rows, it is desirable to utilize means for securing the blades and vanes to their respective holding elements which will enable the same to be assembled in segment like groups prior to their assemblage in the holding elements.

The object of this invention has been to provide a simple and relatively cheap method and means for forming the blades and vanes into segment like groups ready for assembling in their respective holding elements.

In the drawings accompanying this application I have attempted to illustrate various methods and means for carrying out this invention and in the same, Figures 1, 2 and 3 are views in perspective of blades or vanes, or fragments thereof, formed up to be utilized in carrying out this invention. Fig. 4 is a view in perspective of a form of base element or strip adapted to be utilized with the form of blade or vane illustrated in Fig. 2. Fig. 5 is a view in perspective of four blades or vanes, of the form shown in Figs. 1 and 2, secured to a base portion in conformity with this invention, and, in this view the outer ends of the blades or vanes, as the case may be, are tied together. Fig. 6 is a side view in elevation of three blades or vanes, as the case may be, forming a portion of a segment like group, embodying this invention and Fig. 7 is a plan view of the blades or vanes illustrated in Fig. 6.

The blades or vanes, which may be of any contour in cross section, if formed of metal other than steel, will preferably be stamped or forged with a tenon 8, either formed round, as shown in Fig. 1, or rectangular, as shown in Fig. 2, or of some other suitable form, and with a fillet 9 extending a distance up the concave face. If the blade or vane is formed of steel and drawn to shape, the base portion of the same may be cut away, as shown in Fig. 3, to form a tenon.

As the blades or vanes comprised in an annular row in either the stator or rotor of turbines are preferably arranged in segmental groups, base elements or strips 10, as illustrated in Fig. 4, having one beveled edge 11, adapted to lie against the walls of an undercut slot formed in the holding element as shown in Fig. 5, are formed in lengths suitable to accommodate the number of blades or vanes which it is desired to put into a group. These elements or strips have holes 12 punched through from top to bottom for the reception of the blades or vane tenons, and these holes at the under side of the strip are preferably countersunk in order that the head of the tenon when riveted or upset may have space to flow into.

In forming the blade or vane groups, the tenons are inserted into the holes in the base elements, and after they have been secured thereto by upsetting or riveting, a tie wire or binding element, such as 13, is passed through alined holes in the blades or vanes which were previously formed for that purpose, and the group is then placed in its channel or slot in the holding element and a calking strip 14 of suitable metal is placed in the slot along side of the base strip or element. By means of suitable calking tools, this strip 14 will be spread transversely of the slot and thereby cause the base strip and the blades or vanes to be securely locked to the holding elements. After this has been accomplished the outer or free ends of the blades or vanes may be secured in any suitable manner to the binder or tie wire 13.

What I claim as new and useful is:

1. In a turbine, a blade or vane holding element provided with a slot, a blade or vane base strip located within and extending longitudinally of said slot, blades or vanes having reduced shanks which extend through said strips and which are secured within holes provided therein, means for securing said strip within said slot and means for tying the outer ends of said blades or vanes together.

2. In a turbine, a blade or vane holding element provided with a slot, a blade or vane base strip located within and extending longitudinally of said slot, a row of holes extending through the middle portion of said

strip and blades or vanes having reduced portions which extend through said strip and are secured within said holes and means for securing said strip within said slot and for tying the outer ends of said blades or vanes together.

3. In a turbine, a blade or vane holding element provided with a slot, a blade or vane base strip located within said slot, a row of circular holes extending through said strip and blades or vanes having integrally formed cylindrical shanks which extend through said strip and are secured within said holes and means for securing said strip within said slot and for tying the outer ends of said blades or vanes together.

4. In combination in a turbine, a blade or vane carrying element provided with a slot, a blade or vane base strip located within and extending longitudinally of said slot, blades or vanes having reduced shanks which extend through said strip and are secured within holes provided therein, and means for securing said strip within said slot.

5. In combination in a turbine, a blade or vane carrying element provided with a slot, a blade or vane base strip located within and extending longitudinally of said slot, a row of holes extending through the middle portion of said strip, and blades or vanes having reduced portions which extend through said strip and are secured within said holes.

6. In combination in a turbine, a blade or vane carrying element provided with a slot, a blade or vane base strip located within said slot and provided with a row of circular holes, and blades or vanes having integrally formed cylindrical shanks which extend through said strip and are secured within said holes.

7. A turbine blade or vane provided at one end with a reduced mounting shank and a reinforcing fillet extending from said shank longitudinally of said blade.

8. A turbine blade or vane provided at one end with a cylindrical mounting shank and a reinforcing fillet extending from said shank longitudinally of the blade.

9. In combination in a turbine, a blade or vane holding element, a slot provided in said element, a perforated base strip adapted to be secured into said slot, blades or vanes provided with mounting shanks adapted to be secured into the perforations of said strip by being riveted or expanded, and means for securing said strip to the blade or vane carrying element.

10. In combination in a turbine, a blade or vane carrying element provided with a slot, a blade or vane base strip located within and extending longitudinally of said slot, alined holes provided in said strip, and blades or vanes having reduced shanks which extend through said holes and are secured to said strip by being riveted or upset.

In testimony whereof, I have hereunto subscribed my name this 5th day of March, 1906.

JNO. S. GREEN.

Witnesses:
CHARLES W. MCGHEE,
E. W. MCCALLISTER.