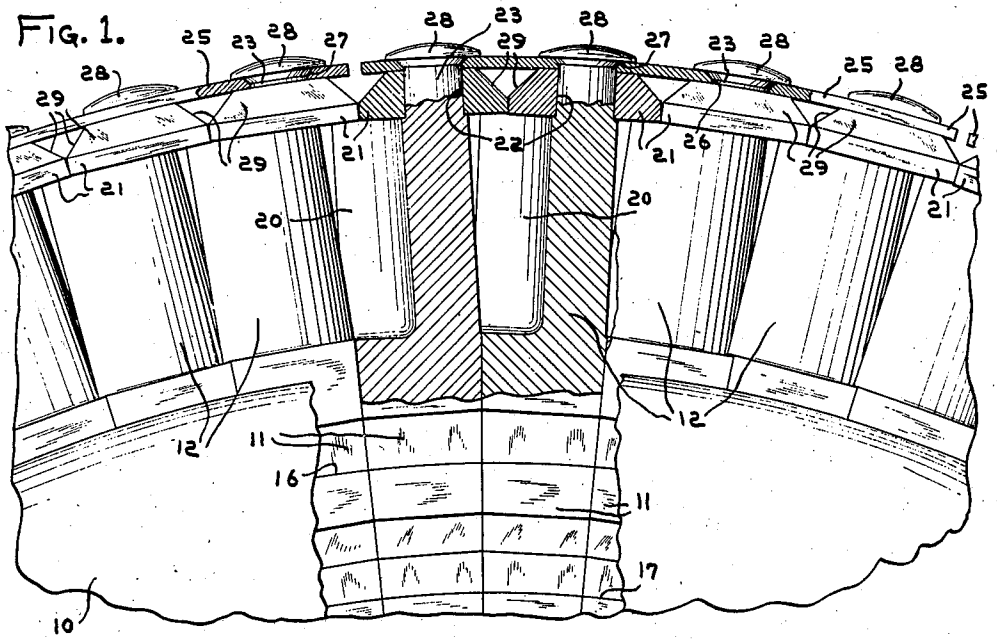
Dec. 14, 1943. F. P. GOOCH 2,336,859

TURBINE BLADE APPARATUS

Filed Aug. 19, 1942

FIG. 1.



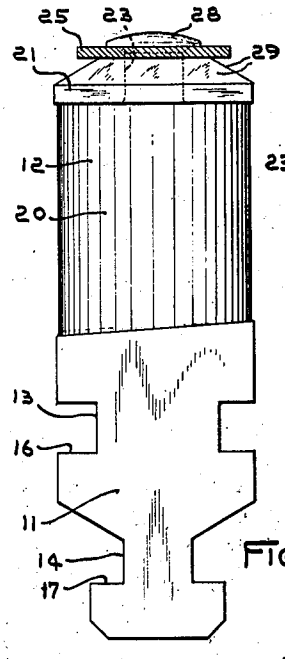


FIG. 3.

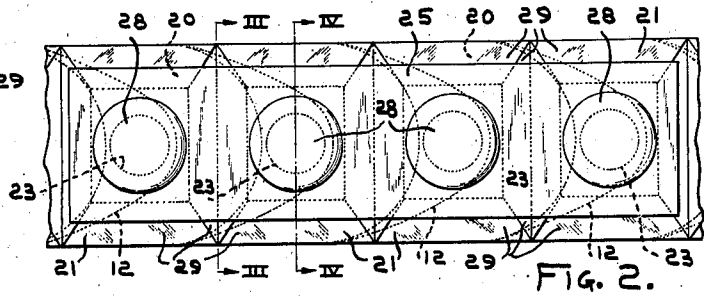


FIG. 2.

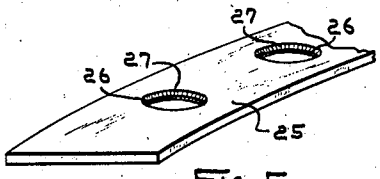


FIG. 5.

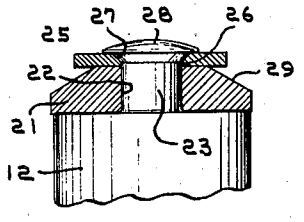


FIG. 4.

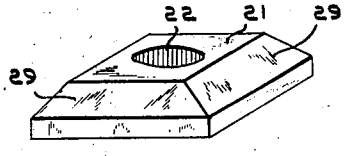


FIG. 6.

WITNESSES:

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Patented Dec. 14, 1943

2,336,859

UNITED STATES PATENT OFFICE

2,336,859

TURBINE BLADE APPARATUS

Fred P. Gooch, Swarthmore, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 19, 1942, Serial No. 455,310

3 Claims. (Cl. 253—77)

This invention relates to blading for elastic fluid turbines, more particularly to shrouding therefor, and it has for an object to provide improved construction of this character.

Another object of the invention is to provide shrouded turbine blading of economical construction and which may be easily manufactured and assembled.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in accordance with the accompanying drawing, forming a part of this application, in which:

In the drawing, Fig. 1 is a side elevational view, partially in section, of a row of turbine blading embodying the present invention;

Fig. 2 is a fragmentary plan view of the structure shown in Fig. 1;

Fig. 3 is a sectional view taken along the line III—III of Fig. 2, looking in the direction of the arrows, with the turbine rotor omitted for the sake of clearness;

Fig. 4 is a fragmentary sectional view taken along the line IV—IV of Fig. 2 looking in the direction of the arrows;

Fig. 5 is a fragmentary perspective view of a flexible shroud strip embodied in the construction shown in Fig. 1; and,

Fig. 6 is a perspective view of one of the cover pieces.

Referring now to the drawing more in detail, there is shown a turbine rotor 10 having a circumferential groove adapted to receive the root structures 11 of a plurality of turbine blades 12. In the embodiment herein shown, the root is of the double T type having side recesses or notches 13 and 14 providing upwardly facing shoulders 16 and 17, respectively, adapted to engage with mating downwardly-directed faces formed in the side walls of the turbine rotor groove (not shown).

Each blade includes a passage-forming portion 20 for flow of steam axially of the rotor, the space being closed at the bottom by the root structure 11 and at the top by separate or individual cover pieces 21, each cover piece having an opening 22 therethrough for reception of a tenon 23 formed integral with the outer or free end of each blade.

Overlying the cover pieces 21 are segments 25 of a flexible shroud strip, each segment having a plurality of openings 26 therethrough for reception of the tenons 23. Preferably, the openings 26 are chamfered at their upper edges, as at 27, and the outer ends of the tenons 23 are deformed as by spinning, peening, or similar operations, to provide a bend 28 filling the space provided by the chamfer 27 and preferably overflowing onto the upper surface of the flexible shroud 25.

The cover pieces 21 are preferably of such size as to approximately engage one another, thereby substantially completely bridging the steam flow space therebelow, the cover pieces being of relatively heavy construction to withstand the sudden and high steam pressures applied thereto. Therefore, as the shroud is relieved of stresses due to such pressures, it may be made of thin material and in segments providing for flexibility to insure of only small bending moments being applied to the tenons and for connection of the blades in groups to restrict vibration of the blades to the groups.

To obtain maximum flexibility of the shroud segments 25, and to reduce the weight of the covers, the upper surface of each cover piece 21 is chamfered, as at 29, in the vicinity of adjacent edges thereof, with the result that the shroud strip 25 is unconfined at points midway of adjacent tenons, whereby maximum flexibility of the shroud is obtained.

While in the embodiment herein illustrated the cover pieces are shown as chamfered, at 29, at all four edges, it will be apparent that such chamfering may be confined to only those edges which are adjacent other edges in the assembled construction.

It will be apparent to those skilled in the art that the arrangement herein illustrated and disclosed is composed of elements which are relatively simple to manufacture and which may be easily assembled without the necessity for a high degree of precision.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What is claimed is:

1. In an elastic fluid turbine, a blade-mounting member; a row of blades mounted on said member; a separate cover piece at the free end of each blade, adjacent cover pieces having meeting edges and closing the space between adjacent blades and each cover piece being thicker at its center than at its meeting edges; a flexible shroud strip overlying the cover pieces in engagement with the thickened central portions thereof and

spaced from the thinner edges thereof; and means at the thickened portions uniting the shroud strip and cover pieces to each blade.

2. In an elastic fluid turbine, a blade-mounting member; a row of blades mounted on said member; tenons integral with and projecting radially from the free ends of the blades; a segmental flexible shroud strip associated with the free ends of said blades, said shroud strip having openings therethrough for reception of the tenons; and a separate cover piece for each blade positioned between the free end of the blade and the flexible shroud strip, each cover piece having an opening therethrough receiving a blade tenon, and the cover pieces and shroud strip being in firm engagement in the vicinity of the tenons and being spaced apart at points midway of adjacent tenons.

3. An elastic fluid turbine having a blade-carrying member; a row of blades mounted on said member; an individual cover piece at the free end of each blade for substantially bridging the space between the free ends of adjacent blades; a flexible shroud strip overlying a plurality of said cover pieces, said cover pieces having their surfaces adjacent the shroud strip chamfered in the vicinity of adjacent edges; and the cover pieces and shroud strip having aligned openings therethrough; and tenons integral with the free ends of the blades extending through said openings and securing the shroud strip and cover pieces to the blades.

FRED P. GOOCH.