

R. WARRINER.  
TURBINE WHEEL.  
APPLICATION FILED AUG. 27, 1917.

1,279,800.

Patented Sept. 24, 1918.

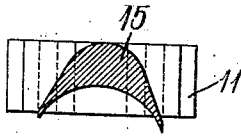


FIG. 3.

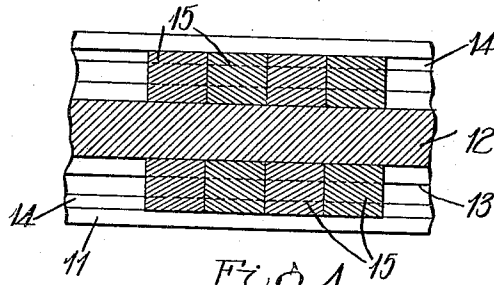


FIG. 4.

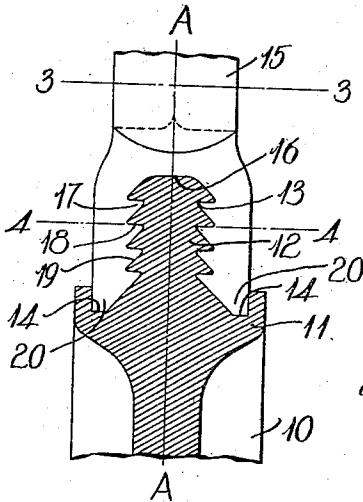


FIG. 2.

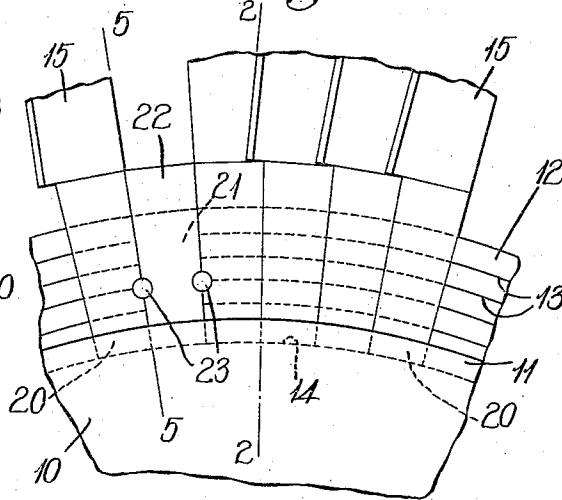


FIG. 1.

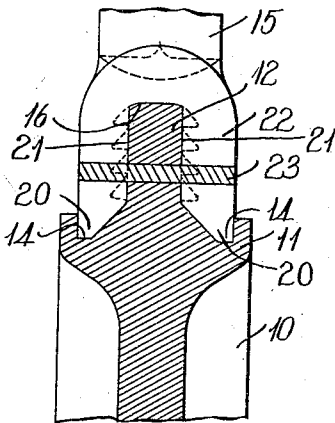


FIG. 5.

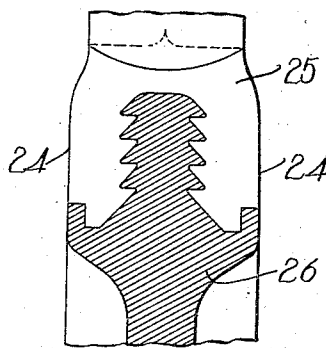


FIG. 6.

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# UNITED STATES PATENT OFFICE.

ROBERT WARRINER, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO BETHLEHEM SHIPBUILDING CORPORATION, OF QUINCY, MASSACHUSETTS, A CORPORATION OF DELAWARE.

TURBINE-WHEEL.

1,279,800.

Specification of Letters Patent. Patented Sept. 24, 1918.

Application filed August 27, 1917. Serial No. 188,366.

*To all whom it may concern:*

Be it known that I, ROBERT WARRINER, a citizen of the United States, residing at Quincy, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Turbine-Wheels, of which the following is a specification.

This invention relates to an improved construction of turbine wheel and the blades therefor, whereby said blades may be readily attached to the body portion of the wheel and firmly held in position thereon.

The object of the invention is to provide a turbine wheel with detachable blades which may be easily manufactured and which gives a maximum amount of shear to the blades and to the wheel and a maximum amount of bearing surface to said blades, at the same time only slightly reducing the strength of the wheel and of the blades.

To these ends the invention consists in a turbine wheel and blades therefor constructed and attached in a manner hereinafter fully set forth in the specification, and particularly the invention consists in the form of blades and in the combination of said blades with the body portion of the wheel, all as hereinafter set forth in the specification and particularly as pointed out in the claim.

Referring to the drawings:

Figure 1 is a front elevation of a portion of a turbine wheel and blades therefor embodying my invention.

Fig. 2 is a sectional elevation taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional plan taken on line 3—3 of Fig. 2.

Fig. 4 is a detail sectional plan developed and taken on line 4—4 of Fig. 2.

Fig. 5 is a sectional elevation taken on line 5—5 of Fig. 1.

Fig. 6 is a sectional elevation similar to Fig. 2 showing a modified form of my invention.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, Figs. 1 to 5, inclusive, 10 is the body portion of the wheel, 11 is the rim thereof, 12 is an annular flange on said rim provided with oppositely disposed concentric grooves 13. The rim 11 is provided with a pair of annular grooves 14 in its periphery. 15 are turbine blades, each of

which is provided in its inner end with a slot 16 extending transversely thereof and in the opposite edges of said slot are provided oppositely disposed teeth 17 which fit into the concentric grooves 13 upon the flange 12. One face 18 of each tooth of a blade extends at right angles to the median axial line A—A and the other face 19 of the same tooth extends at an acute angle to the face 18. The inner ends 20 of each of the blades 15 project into the annular grooves 14.

For substantially the thickness of one turbine blade the grooves 13 are interrupted, a pair of oppositely disposed slots 21 extending transversely of the flange 12, and a locking member 22 is provided which is of substantially the same thickness as the turbine blades and fits into said slots 21. The locking member 22 is locked to the flange 12 by cross-pins 23.

The blades are attached to the wheel in the following manner: Assuming the locking member 22 to be disconnected from the wheel the blades are slipped onto the flange 12 at that portion thereof where the slots 21 are located until the teeth 17 come into alignment with the grooves 13. The blades are then moved circumferentially on the wheel upon the flange 12 and the teeth 17 enter the grooves 13. When all of the blades are attached to the wheel they will extend completely around the flange 12, with the exception of the space occupied by the slots 21, and this space will be filled up by slipping into said slots the locking member 22, which is then locked to the flange 12 and to the adjacent blades by means of the cross-pins 23.

In Fig. 6 a modified form of my invention is illustrated in which the outer edges 24 of the turbine blade 25 are flush with the opposite faces of the wheel 26. Otherwise the construction is substantially the same in the form of my invention illustrated in Fig. 6 as in the form hereinbefore described and illustrated in Figs. 1 to 5 inclusive.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

A turbine wheel, an annular flange extending around the periphery of said turbine wheel, said flange being provided with a plurality of oppositely disposed concentric grooves, said wheel also being provided with a pair of annular grooves in its periphery

and located at the base of said flange, a plurality of turbine blades, each of said blades having a slot extending transversely through the inner end thereof, and a plurality of  
5 oppositely disposed teeth on the opposite edges of said slot, said teeth projecting into said concentric grooves, the inner ends of said blades on opposite sides of each of their respective slots projecting into and fitting  
10 said annular grooves in the periphery of said

wheel, and means to lock said blades against circumferential movement upon said flange.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ROBERT WARRINER.

Witnesses:

ALICE M. LANE,

MARY E. MAHONEY.

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