

No. 853,334.

PATENTED MAY 14, 1907.

C. A. BACKSTROM.

TURBINE VANE.

APPLICATION FILED OCT. 24, 1904.

Fig. 1.

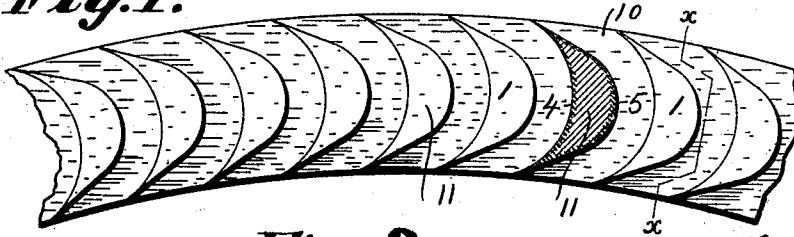


Fig. 2.



Fig. 3.

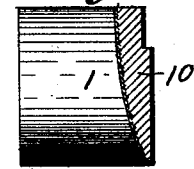


Fig. 9.

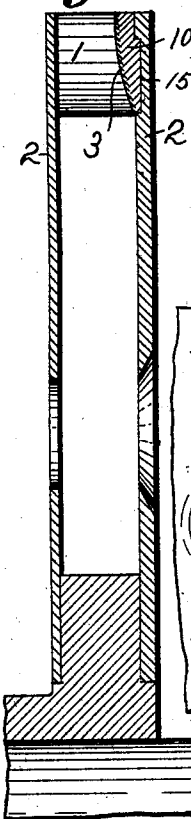


Fig. 4.

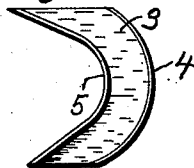


Fig. 5.

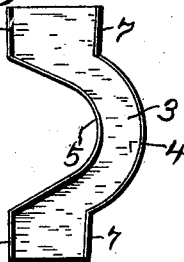


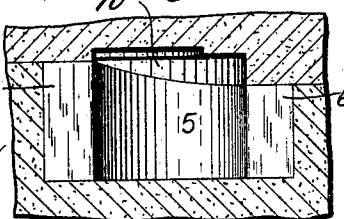
Fig. 6.



Fig. 7.



Fig. 8.



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TURBINE-VANE.

No. 853,334.

Specification of Letters Patent.

Patented May 14, 1907.

Application filed October 24, 1904. Serial No. 229,722.

To all whom it may concern:

Be it known that I, CHARLES A. BACKSTROM, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Turbine-Vanes, of which the following is a specification.

My invention relates to improvements in turbine vanes.

The objects of my invention are to secure absolute uniformity and accuracy in the contour of the vanes as well as in their position in the running wheel, and to avoid the necessity of finishing and shaping the surfaces of the vanes by machine tools. Also to provide for casting the vanes in a set or series of connected vanes which may be unitedly secured in position in the running wheel, thus avoiding the labor of assembling the vanes separately and dispensing with numerous rivets.

A further object of my invention is to provide the vanes with exterior shells of smoother and harder material than that ordinarily used for casting, the interior portion of the vane being composed of softer material which, however, is integrally united to the hard outer shell.

In the following description reference is had to the accompanying drawings in which

Figure 1 is a view of a series of vanes ready for insertion in a running wheel. Fig. 2 is a peripheral view of the same with two of the vanes partially broken away along the center line of the series. Fig. 3 is a transverse sectional view drawn on line X—X of Fig. 1. Fig. 4 is an end view of one of the shells showing the edges of the curved walls. Fig. 5 is a similar view showing a modified form of construction. Fig. 6 is a view of the concave side of a shell such as is shown in Fig. 5. Fig. 7 is a plan view of a portion of the mold, with the cope partially broken away to show the upper ends of shells similar to those shown in Figs. 5 and 6. Fig. 8 is a vertical sectional view of the mold, drawn transversely to a row of shells. Fig. 9 is a sectional view of a portion of a running wheel with the vanes in position.

Like parts are identified by the same reference characters throughout the several views.

The drawings are illustrations of the construction of vanes designed for use in im-

pulse turbine arranged for inward radial attack, and the vanes 1 are to be mounted between disks 2 which constitute the sides of a running wheel as shown in Fig. 8. In constructing these vanes, a series of shells are formed, preferably by stamping them from sheet metal, such as nickel-steel, and each shell, in the construction shown, is provided with an end wall 3 and two curved walls 4 and 5, the inner faces of which constitute finished concave and convex surfaces of the bucket cavities when the vanes are completed. The walls 4 and 5 may, if desired, be extended in the form of wings 6 and 7 on each side and the space between these wings, if used, and the walls 4 and 5, is filled with a core of molding sand or other suitable material. A mold is then prepared, having a curved channel in which the shells are placed in a row with the walls 4 of one shell abutting the walls 5 of the next at the side edges and with open cavities 11 between the divergent central portions of these walls. The space between the walls 4 and 5 of each shell constitutes a bucket cavity in the completed series of vanes and in the mold. This cavity is covered by the wall 3. The cope is then prepared with a channel 10, corresponding in position with the row of shells, and molten metal is then flowed into this channel to fill it, and the cavities 11 between the shells, under conditions of temperature to cause it to fuse with the shell surfaces with which it contacts. On removing the casting with the shells thus integrally connected, the vanes are completed by merely trimming off the edges, or the wings 6 and 7 if such wings are employed. The walls 4 and 5 of each shell form the concave wall of one vane and the convex wall of the next succeeding vane.

The object of the wings 6 and 7 is to keep the molten metal from entering the bucket cavities where the cores are imperfect, but if the molds and cores are carefully prepared, the wings may be dispensed with and the work of trimming the edges of the vanes largely if not entirely avoided.

All the vanes thus produced in a single casting operation are integrally connected and held in position by the bar of cast metal which filled the channel 10 in the mold, and

this bar may be formed to fit a channel 15 in one of the disks 2 of the running wheel, thus accurately determining the position of the vanes and facilitating their attachment to the disks.

It will be understood that while I have shown and described the invention with reference to a special form of turbine, it may be adapted to the requirements of any style of turbine, and, if desired, the connecting bars may be formed at both ends of the vanes, or the vanes may be separately formed, or connected in series, having any desired number. By stamping the surface walls of the vanes from sheet metal, absolute uniformity and accuracy is insured in any case, and the vanes are provided with smooth hard surfaces which require no finishing.

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

1. A turbine vane having a stamped exterior surface of relatively hard material and a filling of cast metal between the surface walls.

2. A cast metal turbine vane provided

with a surface of stamped metal fused to the cast metal interior.

3. A series of turbine vanes integrally united by a cast metal bar, and a smooth metallic covering for each vane of different character than the interior portion, but integrally united therewith by fusion.

4. A series of turbine vanes integrally united with each other by a metallic connecting bar, each vane being surfaced with metal of a different character from that composing the bar, and connected with the bar through projections on the latter extending between the surface walls.

5. A series of turbine vanes having body portions of cast metal formed integrally with a curved metallic connecting bar and having surfaces of different material from that composing the body portions.

In testimony whereof I affix my signature in the presence of two witnesses.

CHARLES A. BACKSTROM.

Witnesses:

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