June 24, 1924. 1,499,103

W. B. FLANDERS

TURBINE BLADE

Filed April 18, 1922

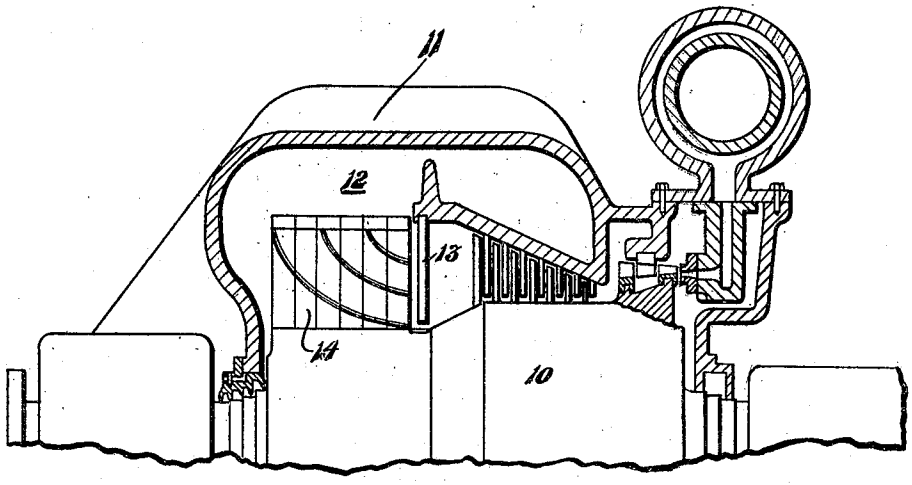


Fig. 1.

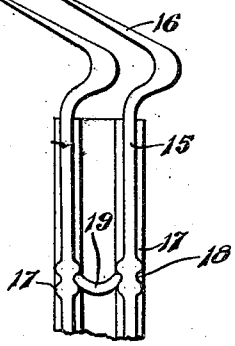


Fig. 2.

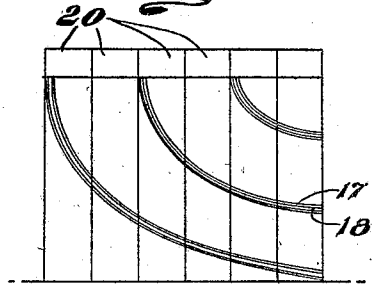


Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

WARREN B. FLANDERS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

TURBINE BLADE.

Application filed April 18, 1922. Serial No. 554,563.

To all whom it may concern:

Be it known that I, WARREN B. FLANDERS, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Turbine Blades, of which the following is a specification.

My invention relates to turbine blading, and more particularly to exhaust blading of the wide type adapted to receive motive fluid flowing in an axial direction and to discharge it peripherally or radially, and it has for its object to provide, in connection with apparatus of the character designated, deflector or guide means arranged between the blades which shall assist in changing the direction of flow of the motive fluid, which shall serve to brace the blading structure, and which shall allow for differential expansion of the blades.

Apparatus embodying features of my invention is illustrated in the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a longitudinal sectional view of a turbine showing my improved blading structure applied thereto;

Fig. 2 is a detail view of the upper portion of two of the wide blades showing one of my improved deflector elements interposed therebetween; and

Fig. 3 is a detail view showing one of the wide blades drawn to a larger scale.

My invention relates to the type of turbine blades disclosed and claimed in the applications of H. F. Schmidt, Serial No. 482,678, filed July 6, 1921, and Alexander T. Kasley, Serial No. 521,872, filed December 12, 1921, both of which are assigned to the Westinghouse Electric and Manufacturing Company, and in which the motive fluid is received laterally and discharged peripherally.

The particular object of my present invention is to provide an improved deflector structure for blading of this type which shall assist both in bracing the blading structure and in changing direction of flow of the steam.

Referring now to the drawings for a more detailed description of my invention; in Fig. 1, I show a turbine comprising a rotor 10 and a casing 11 carrying energy-abstracting elements of any suitable type followed by a low-pressure or exhaust stage at 12 which consists of a row of guide blades 13 carried by the casing and of a row of relatively wide blades 14 carried by the rotor 10. The wide blades are adapted to receive motive fluid laterally from the guide blades 13 and to change the direction of flow thereof for discharge radially or peripherally.

Each of the wide blades 14 preferably comprises an inner radial portion 15 and an outer curved or spoon-outline portion 16, the spoon-outline portions cooperating, when the blades are assembled, to define peripheral-expansion passages. The inner radial portions 15 of the blades are provided with pairs of curved ribs 17 which define grooves 18 to receive inwardly bowed deflector members 19.

The deflector wall elements 19 are bowed or curved inwardly and transversely so that, when they are forced in place, they may react to brace the blades 14, and, owing to the deflector members being bowed inwardly, centrifugal force assists in such bracing. If the blades 14 should expand, the deflector wall elements 19 will permit of differential expansion and will also be maintained tightly in the grooves 18, owing both to the initial deflection thereof as well as to the effect of centrifugal force tending to straighten out the bowed portions.

The deflector wall elements 19 may be made as single pieces and inserted between the blades after the latter are assembled as by being forced or sprung into place in the grooves 18. However, if the wide blades 14 are made in sections 20, as indicated in Fig. 3, the deflector wall elements may be made in sections corresponding thereto or they may be made in single pieces as already referred to.

From the foregoing, it will be apparent that I have provided, in connection with the wide blades of the exhaust type which are adapted to receive motive fluid flowing in an axial direction or to discharge it peripherally or radially, deflector wall elements which serve not only to assist in the change of the direction of flow of motive fluid between the blades but also to strengthen the blade structure and to permit of expansion thereof.

While I have shown my invention 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 other changes and modi-

fications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. In a turbine, the combination of a row of blades and bracing means bowed inwardly and secured between the blades.

2. In a turbine, the combination of a row of blades each of which is provided with guide and holding means and deflector members fitting the guide and holding means and bowed inwardly.

3. In a turbine, a row of blades having inner plane portions and outer curved energy-abstracting portions, curved grooved portions carried by the plane portions, and inwardly-bowed wall members fitting in the grooved portions.

4. In a turbine, a row of blades adapted to receive steam at one side and to discharge it peripherally, and deflector wall members arranged between the blades and curved so as to assist in the deflection of steam from a lateral to a peripheral direction and bowed inwardly and transversely so as to constitute, at all times, bracing means for the blades.

5. In a turbine, a row of blades adapted to receive steam axially and to discharge it peripherally and curved deflector wall members arranged between the blades for assisting in changing the direction of flow of the steam and bowed inwardly and transversely, whereby centrifugal force may act thereupon to cause the deflector wall members to expand to fit against the blades tightly at all times in order to brace the blades.

6. In a turbine, a row of blades adapted to receive steam axially and to discharge it peripherally and having inner plane portions and outer curved, energy-abstracting portions, grooved portions carried by the plane portions of said blades and curved from an axial toward a radial direction, and inwardly-bowed wall members fitted in the grooves for deflecting steam and bracing the blade structure.

In testimony whereof, I have hereunto subscribed my name this 17th day of April, 1922.

WARREN B. FLANDERS.