April 21, 1925. 1,534,415

H. F. SCHMIDT

TURBINE BLADE

Filed July 7, 1924

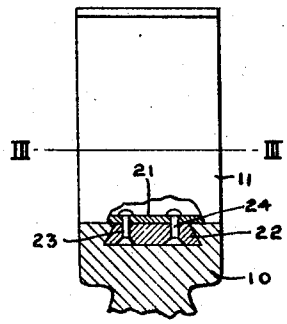


Fig. 1.

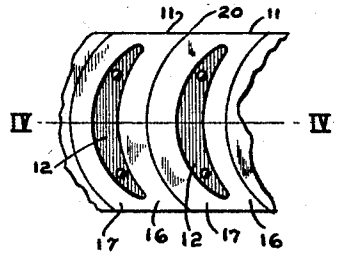


Fig. 2.

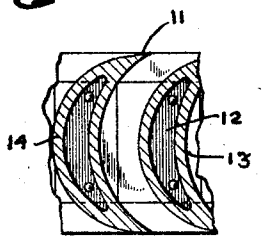


Fig. 3.

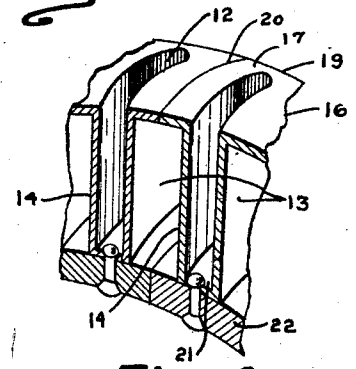


Fig. 4.

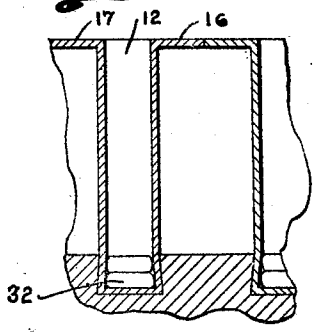


Fig. 5.

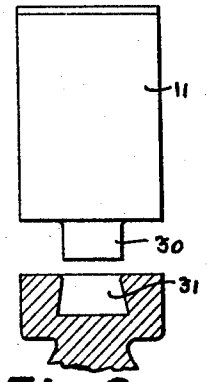


Fig. 6.

WITNESSES:

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Patented Apr. 21, 1925. 1,534,415

UNITED STATES PATENT OFFICE.

HENRY F. SCHMIDT, OF LANSDOWNE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

TURBINE BLADE.

Application filed July 7, 1924. Serial No. 724,562.

To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Lansdowne, in the county of Delaware 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 elastic fluid turbines, more particularly to the blades thereof, and has for its object the provision of a turbine blade which shall be efficient, of requisite strength, and which shall be simple and inexpensive to manufacture.

More specifically the object of my invention is to provide a hollow turbine blade formed from one piece of metal drawn or pressed to the required shape, having an integral flange portion forming, in cooperation with an adjacent blade, a shroud, and having readily accessible means for securing the blade to a blade-holding element.

Apparatus made in accordance with my invention is illustrated in the accompanying drawing forming a part of this application in which Fig. 1 is a sectional view through a turbine blade-holding element, or rotor disc, showing, in sectional elevation, my improved blade applied thereto; Fig. 2 is a plan view across the top of a row of blades; Fig. 3 is a sectional plane view of a blade row taken along the line III—III of Fig. 1; Fig. 4 is a perspective view showing a vertical section through the plane IV—IV of Fig. 2; Fig. 5 is a vertical sectional view through the same plane as Fig. 4 but showing a modified form of the invention; and Fig. 6 is a view similar to Fig. 1, showing the modified blade illustrated in Fig. 5 removed from the blade-holding element.

Referring to the drawings, Figs. 1 to 4, I show a blade-holding element 10 having my improved blades 11 attached thereto. Each of the blades 11 comprises a hollow portion 12, a concave front portion 13 and a convex back portion 14. The concave portion terminates at the tip of the blade in a rearwardly projecting flange 16, and the convex portion terminates at the tip in a forwardly projecting flange 17. The blade is formed from one piece of sheet metal by drawing, pressing, or other suitable means forming the metal to the required shape. In forming the metal to the required shape, the hollow portion 12 is left in the center of the top of the blade looking downwardly. The front flange portion 16 and the rear flange portion 17 are so cut that the front flange portion cooperates with the rear flange portion of an adjacent blade in the same row to form a shroud, contacting across the entire width of the blade along the line 20.

It will be seen that, while forming the blade, the central part of the blade at the base has the front portions and rear portions spaced apart so as to form a base portion 21 by means of which the blades are attached to the blade-holding element. The base portion 21, as shown, is readily accessible from the top of the blade through the hollow portion 12. In accordance with the modification shown in Figs. 1 to 4, I attach the blades to a holding strip 22 which fits within a groove 23 formed in the holding element 10. The blades 11 are attached to the holding strip 22 by means of rivets 24, any desired number of blades being so attached as to form a segment of a ring of blades and are subsequently inserted in the blade holding element in a manner well known in the art. In attaching the blades 11 to the holding strip 22 the rivets 24 are readily accessible through the hollow portion 12, making it a simple operation to attach the blades.

The blades illustrated in Figs. 5 and 6 are similar to those shown in Figs. 1 to 4, inclusive, except in the manner of attaching the blade to the blade-holding element. In accordance with this modification a small cup-like extension 30 is pressed outwardly from the base of the blade through the hollow portion 12 and inserted in a hole 31 drilled in the face of the blade holding element. After insertion, a wedge element 32, preferably of soft metal, is driven into the cup 30 expanding it into the hole 31 in the blade element.

From the foregoing, it will be apparent that I have invented an improved one-piece turbine blade, simple of construction and comparatively inexpensive to manufacture. While I have shown my invention in but two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, 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. A one-piece turbine blade comprising a hollow blade portion and an integral flange portion thereon forming a shroud.

2. A one-piece turbine blade comprising a hollow blade portion and an integral flange portion thereon forming a shroud, said blade being formed by drawing or pressing.

3. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a hollow body portion terminating at the tip in a double flange.

4. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a hollow body portion terminating at the tip in a double flange and open for at least a part way across the top.

5. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a hollow body portion terminating at the tip in a double flange, open for at least a part way across the top, and having means for attaching said blade to a holding element.

6. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a hollow body portion terminating at the tip in a double flange, open for at least a part way across the top, and having means for attaching said blade to a holding element, said means being accessible through the hollow portion of the blade.

7. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a hollow body portion terminating at the tip in a double flange, open for at least a part way across the top, and having means at the base of the hollow portion for attaching said blade to a holding element.

8. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a concave front portion terminating in a flange, a base portion, a convex back portion terminating in a flange, said front and back portions being spaced apart for forming a hollow body portion.

9. A turbine blade formed from one pie e of metal drawn or pressed to the required shape, said blade comprising a concave front portion terminating in a flange, a base portion, a convex back portion terminating in a flange, said front and back portions co-operating to form a hollow body portion, and means accessible through the hollow body portion for attaching the base portion to a blade-holding element.

10. A turbine blade formed from one piece of metal drawn or pressed to the required shape, said blade comprising a concave front portion terminating in a flange, a base portion, a convex back portion terminating in a flange, said front and back portions cooperating to form a hollow body portion, said front flange portion coacting with the rear flange portion of the next adjacent blade in a row for forming a shroud.

11. In a turbine, a row of hollow blades, each formed from one piece of metal drawn or pressed to the required shape and each having double flanged tip portions cooperating with the tip portions of adjacent blades in a row for forming a shroud.

In testimony whereof, I have hereunto subscribed my name this 24th day of June, 1924.

HENRY F. SCHMIDT.