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PATENTED MAR. 13, 1906.

A. C. E. RATEAU & G. SAUTTER.
METHOD OF MAKING TURBINE BLADES.

APPLICATION FILED JUNE 3, 1904.

FIG. 1.

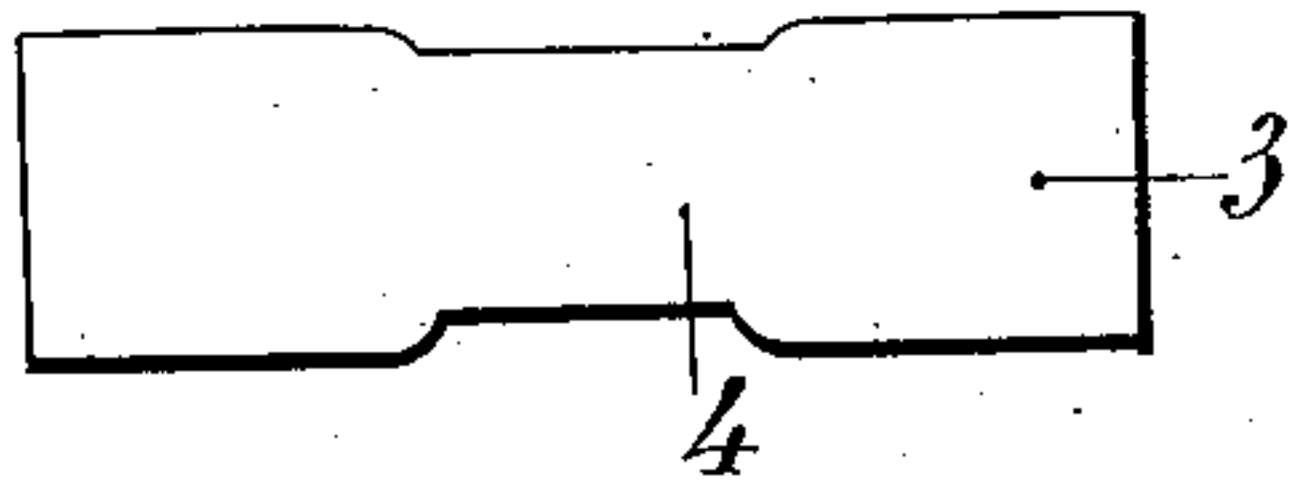


FIG. 2.

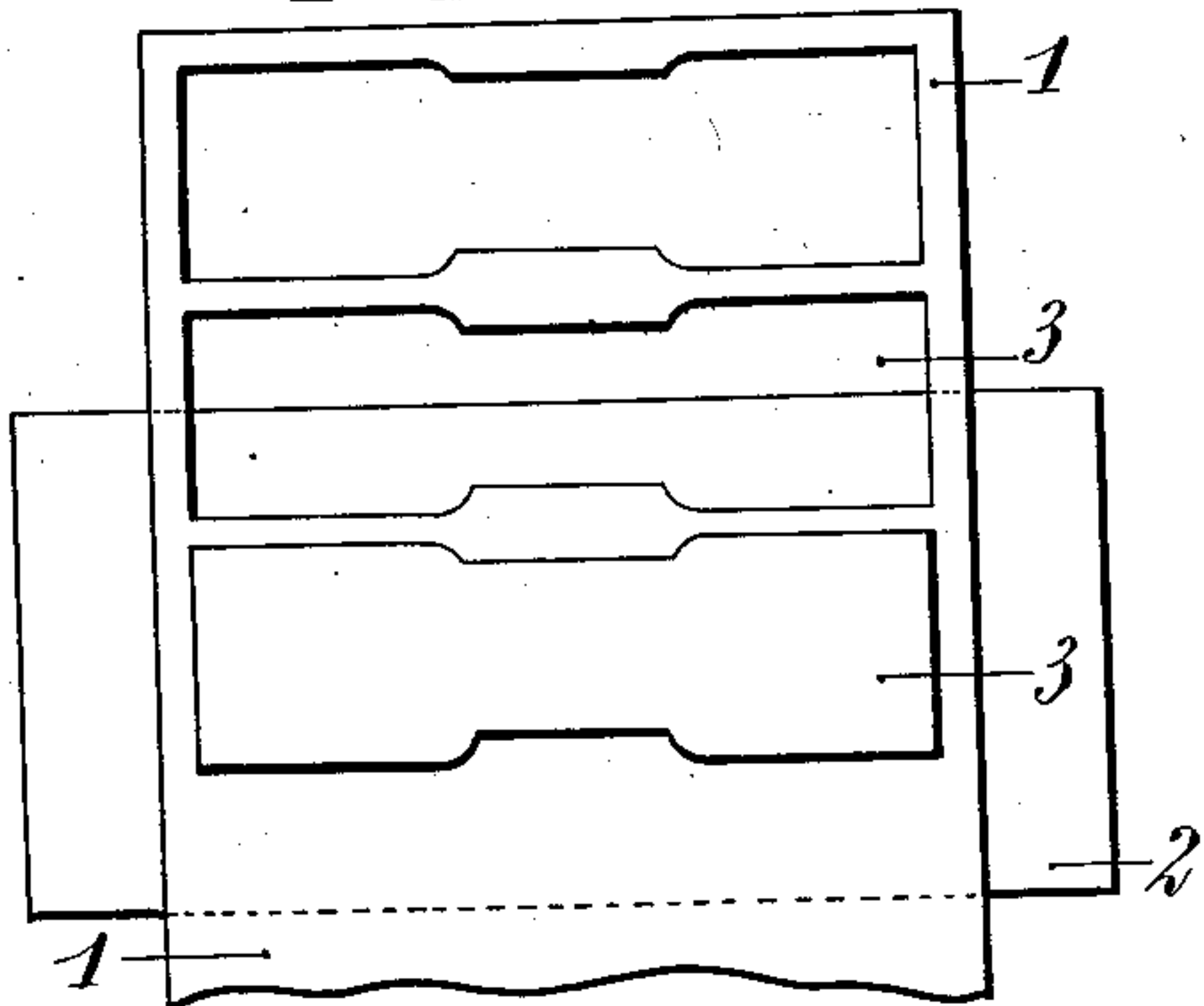


FIG. 3.

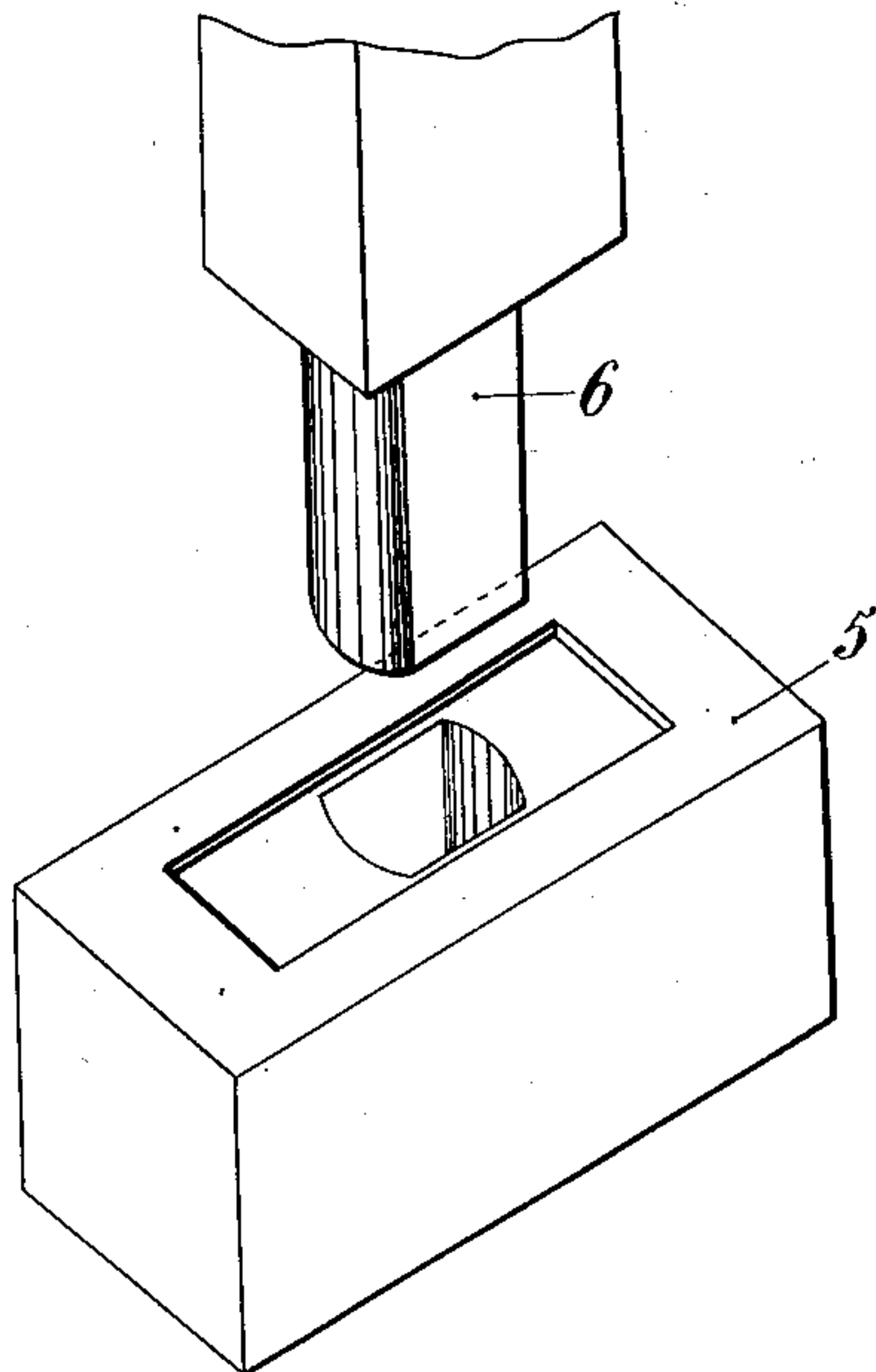


FIG. 4.

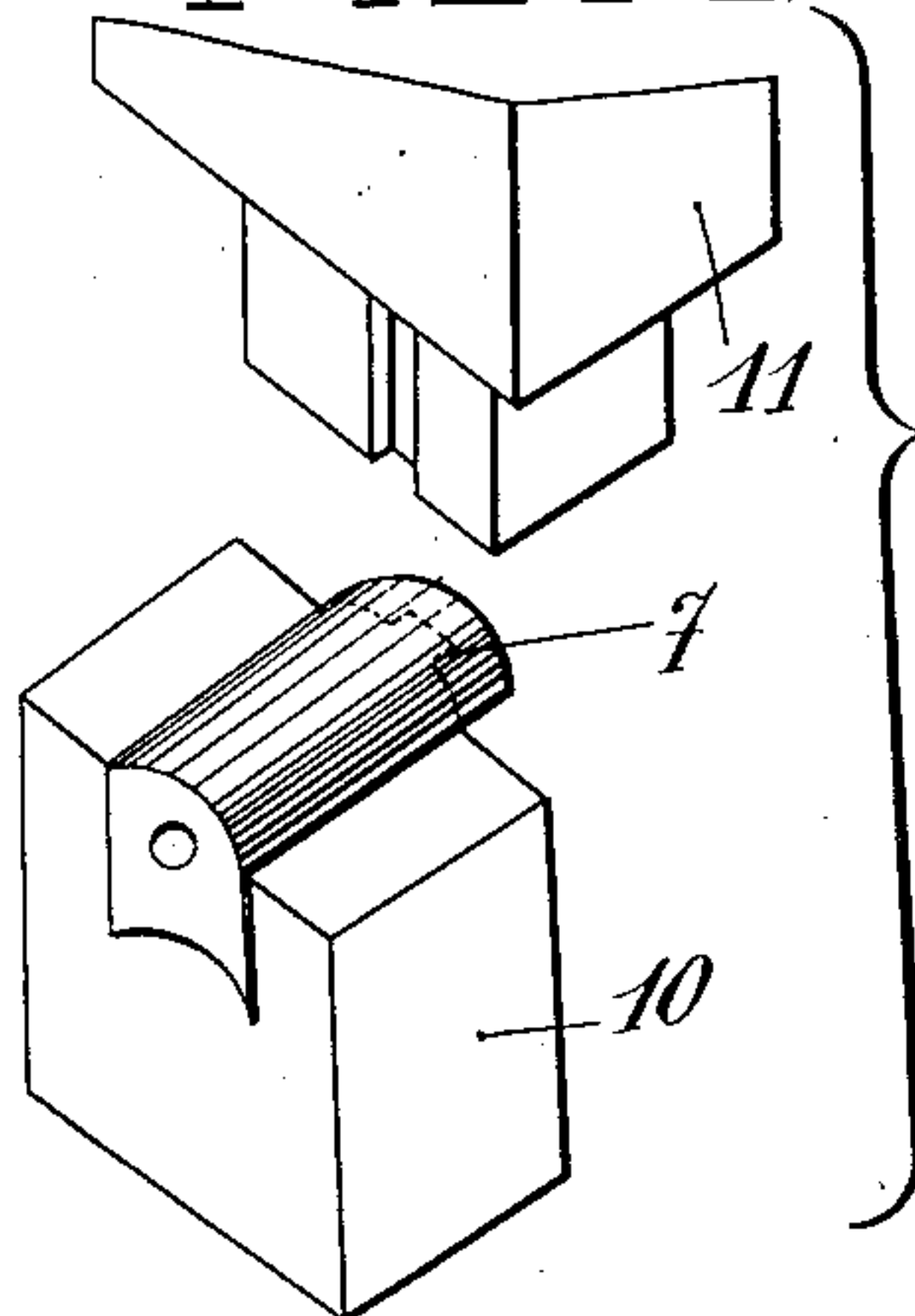


FIG. 8.

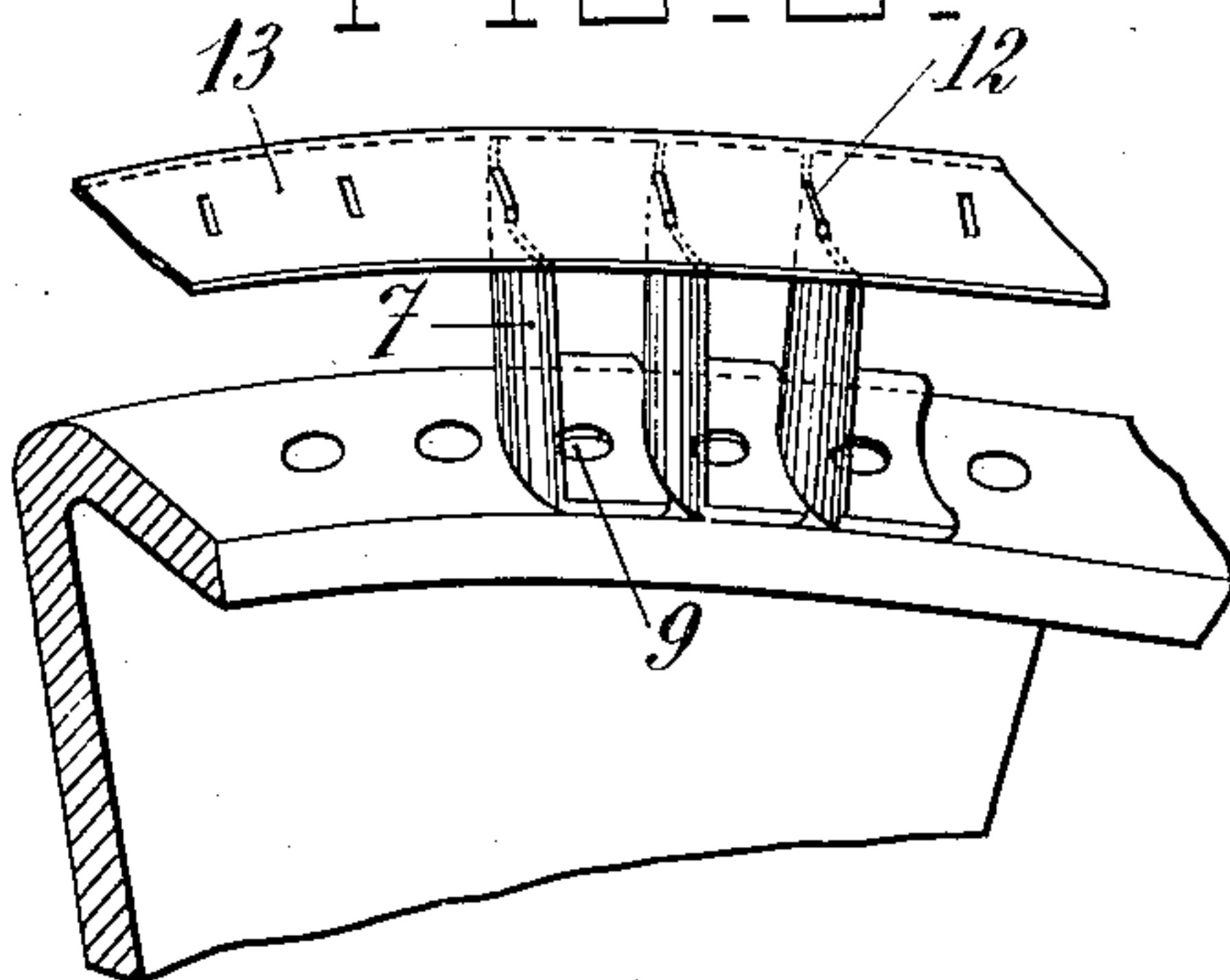


FIG. 5.

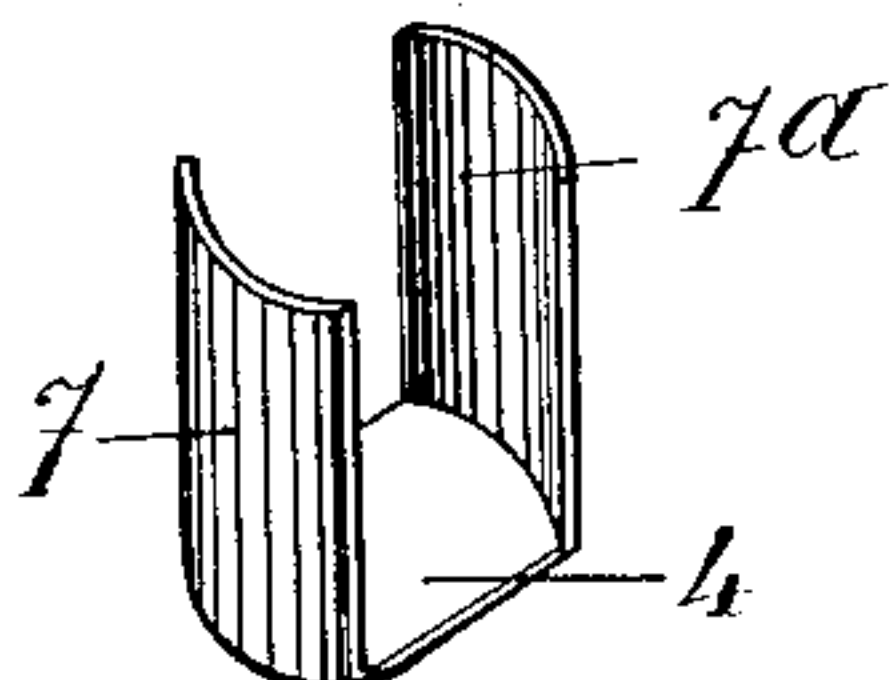
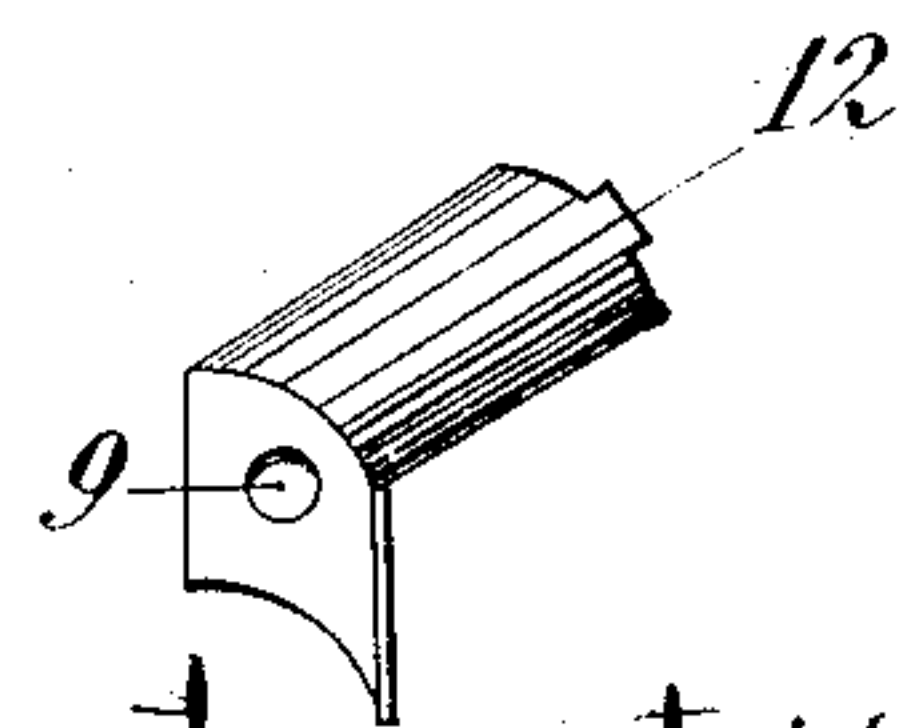
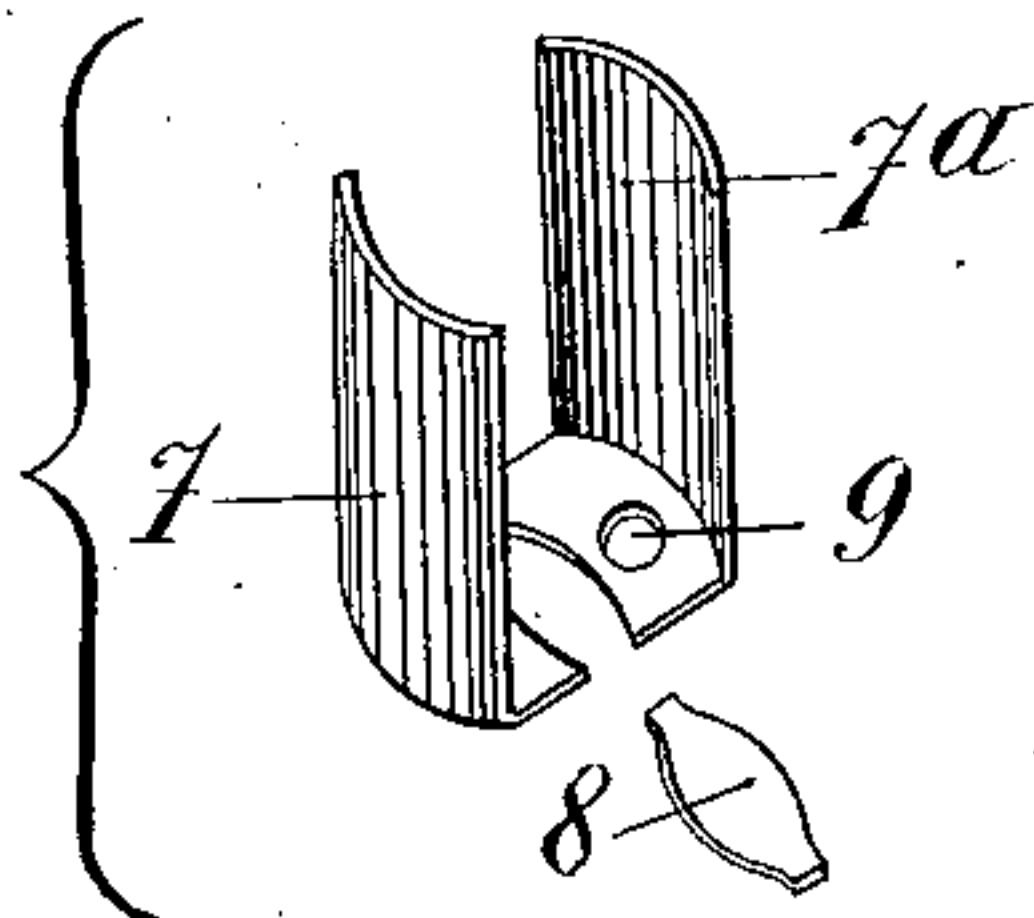


FIG. 6. FIG. 7.



Witnesses:
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UNITED STATES PATENT OFFICE.

AUGUSTE CAMILLE EDMOND RATEAU AND GASTON SAUTTER, OF PARIS, FRANCE, ASSIGNORS TO RATEAU TURBINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

METHOD OF MAKING TURBINE-BLADES.

No. 814,804.

Specification of Letters Patent.

Patented March 13, 1906.

Application filed June 3, 1904. Serial No. 211,037.

To all whom it may concern:

Be it known that we, AUGUSTE CAMILLE EDMOND RATEAU and GASTON SAUTTER, residing at Paris, France, have invented a new and useful Improvement in Methods of Making Turbine-Blades, which improvement is fully set forth in the following specification.

This invention relates to a method of constructing the blades or vanes for the moving wheels of turbine-engines; and its object is to manufacture these blades in quantities with the minimum expense for labor and material.

Preferably our improved method consists in forming an oblong blank from sheet metal, bending said blank into a U shape, curving the arms of the U laterally and oppositely with respect to each other, and finally dividing the blank by a transverse cut across the base of the U, whereby two separate similar blades are produced. These operations may conveniently be performed by means of stamping and punching machinery; but it will be evident that any suitable tools may be provided for the work, the invention being not dependent upon the function of any particular machine.

We will describe our invention more particularly by reference to the accompanying drawings, which illustrate the successive steps in our improved process and also illustrate the preferred mechanism by which the several operations may be accomplished.

Figure 1 shows one of the oblong blanks. Fig. 2 shows how a number of these blanks may be cut from a metal sheet. Fig. 3 shows a pair of dies by which the blank may be bent into the U shape and the required curve thereof imparted to the arms at the same time. Fig. 4 shows a punch or cutter for forming tangs at the ends of the blades, these tangs being for the purpose of riveting to a metal frame or tire. Fig. 5 shows the blank bent into the U shape, as by the dies illustrated in Fig. 3. Fig. 6 shows the two parts of the blank separated by having a doubly-curved strip punched out from the central portion of the base. Fig. 7 shows the completed blade, and Fig. 8 shows a portion of the moving wheel with several blades in position thereon adapted to be secured by rivets.

The first step in our method is to cut out

by punching or otherwise a sheet-metal blank of the form shown in Fig. 1, the end portions of the blank being preferably slightly wider than the central portion 4 thereof. The blank is then bent into the U shape shown in Fig. 5, the arms of the U being curved laterally and oppositely with respect to each other. These operations can conveniently be performed by the dies illustrated in Fig. 3, which are adapted to bend the blank into the U shape and impart the required curvature to the arms thereof in the same operation. When the ends of the blank are of greater width than the central portion thereof, said curvature of the arms brings the lateral edges of the U into alinement. This U-shaped blank is now ready to be formed into two turbine-blades by cutting it transversely across the base of the U. Preferably this transverse cut is formed by punching out an elliptical-shaped piece 8 from the central portion of the base 4. The turbine-blades thus formed will therefore have bases which are curved at the rear edges to fit the curvature of another turbine-blade placed directly behind, as shown in Fig. 8.

The turbine-blades are intended to be riveted to the periphery of the turbine-wheel, and the rivet-holes 9 9 may be punched out of the base portion 4 of the blank at the same time that said base portion is severed by the transverse cut. It is further intended that a metal rim or tire 13 shall encircle the turbine-wheel and be fastened in place by riveting to the blades. We therefore preferably form a tang 12 at the extremity of each blade by means of a cutter (shown in Fig. 4) or by any other suitable mechanism.

Having thus described our invention, we claim—

1. The herein-described method of making turbine-blades in pairs, which consists in forming an oblong blank from sheet metal, bending said blank into a U shape, curving the arms of the U laterally and oppositely with respect to each other, and dividing the blank by a transverse cut across the base of the U, whereby two separate similar blades are produced.

2. The herein-described method of making turbine-blades in pairs, which consists in forming an oblong blank into a U shape, imparting a similar but opposite lateral curva-

ture to the arms of the U, severing the U into two similar L-shaped parts, and imparting to the edge of the severed end of each blade a contour adapted to conform to the exterior curvature of the other blade.

3. The method of making turbine-blades, which consists in stamping out from a sheet of metal an oblong blank, bending said blank into a U shape and simultaneously therewith imparting concave inner and convex outer surfaces to the arms of the U, dividing the blank by a transverse cut across the base of the U into two similar blades and imparting a concave edge to the severed end of each blade, adapted to conform to the exterior curvature of the other blade.

4. The method of making turbine-blades, which consists in stamping out from a sheet of metal an oblong blank having a central portion of less width than the ends of the blank, bending the ends of the blank at an angle

with the central portion to form a U shape, and simultaneously therewith imparting concave inner and convex outer surfaces, to the arms thereby bringing the sides of the arms into alinement with the base of the U, and severing the U into two parts by punching out an elliptical piece from the central portion of the base; whereby two similar turbine-blades are produced, each blade having a base with an inwardly-curved rear edge adapted to conform to the exterior curvature of a similar blade.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

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Witnesses:

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