E. H. SHERBONDY.

NOZZLE RING.

APPLICATION FILED APR. 8, 1918.

1,310,676.

Patented July 22, 1919.

FIG. 3.

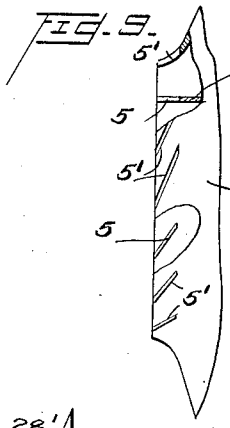


FIG. 1.

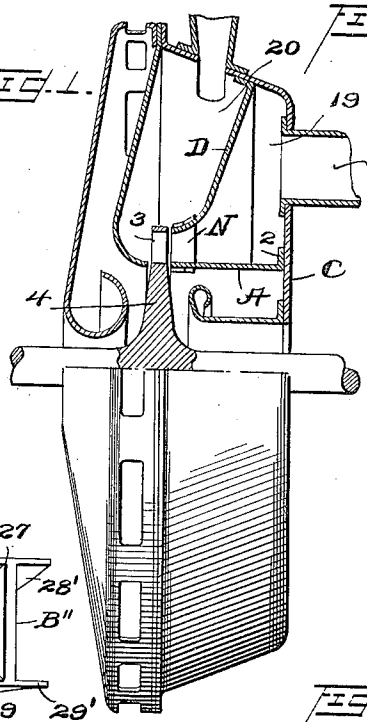


FIG. 5.

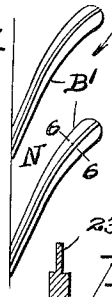


FIG. 6.



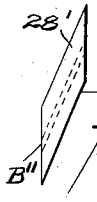
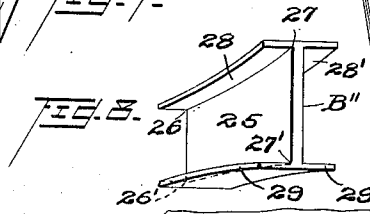


FIG. 7.

FIG. 8.



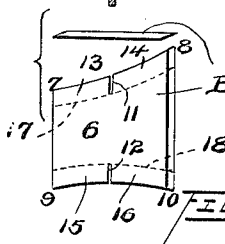


FIG. 4.

FIG. 2.

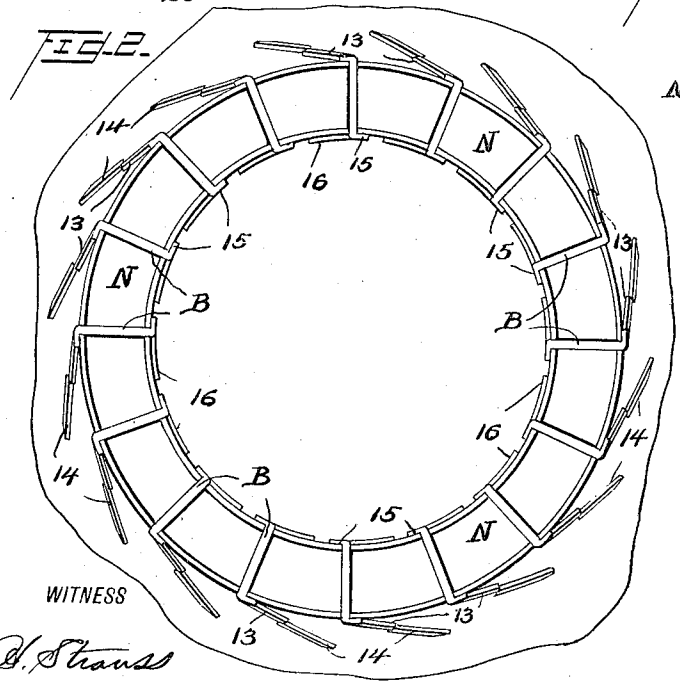
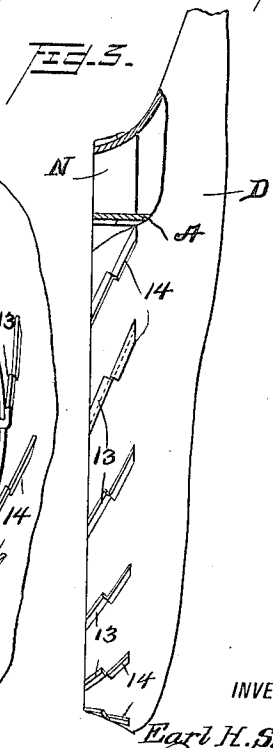


FIG. 5.



WITNESS

E. Straus

INVENTOR

Earl H. Sherbondy

BY Albert Hopping

Captain, A.S. Sig. R.C.

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EARL H. SHERBONDY, OF CLEVELAND, OHIO.

NOZZLE-RING.

1,310,676. Specification of Letters Patent. Patented July 22, 1919.

Application filed April 8, 1918. Serial No. 227,334.

To all whom it may concern:

Be it known that I, EARL H. SHERBONDY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Nozzle-Rings, of which the following is a specification.

This invention relates to a nozzle ring for a gas operated turbine, the object of the invention being to provide a nozzle ring, parts of which may be readily stamped out of sheet metal and easily assembled, whereby the expense of manufacture is reduced and the speed of production increased.

The nozzle ring is intended to be positioned in a turbine casing of the general type shown in my co-pending case, Serial Number 224892, filed March 26, 1918.

Other objects and advantages will appear as the description proceeds.

Referring now to the drawings, Figure 1 is a view, partly in section, of the nozzle ring in position in the turbine casing; Fig. 2 is a view looking into the discharge end of the nozzle ring; Fig. 3 is a side view, partly in section, of the same; Fig. 4 is a detached view of one of the nozzle blades before being inserted in position in the nozzle ring; Fig. 5 is a plan view of blades of a modified form; Fig. 6 is a section on line 6—6 of Fig. 5; Figs. 7 and 8 are plan and perspective views respectively of another modified form of blade; and Fig. 9 is a view of the slots in the nozzle ring before the blades are inserted in position.

The nozzle ring comprises an annular element A, which is flanged at one end as at 2, for attachment to the turbine casing C. The other end of said annular element A, terminates just short of the buckets 3 of the turbine 4. At the discharge end of the nozzle ring, that is, at the end adjacent to the buckets 3, there is cut, in the element A, a series of slots 5, which slots are helical with respect to the longitudinal axis of the element A, that is to say, said slots wind around the element A in a helical direction.

Positioned in these slots 5, is a series of blades B, which blades are provided with suitable means for fastening them in position in said slots 5.

Referring to Fig. 4, one type of blade is shown, comprising a substantially flat body 6. The upper edge of said blade is profiled, as indicated by the curved line 7—8. The lower edge of said blade is curved, as indicated by the line 9—10, into a helical curve, so that it will exactly fit the helical slots 5. The just described curving of the edges of the blade evidently provides a blade, one end of which is considerably higher than the other, the high end gradually tapering off to the low end.

The upper and lower edges of said blade may be slotted inwardly a short distance as indicated at 11—12, to provide tangs 13, 14, 15 and 16. The dotted lines 17—18 define the base of each tang.

The blades B are now inserted in the slots 5, the tangs 15 and 16 passing through said slots and after being positioned, are bent on the line 18, in opposite directions, to anchor the blades in position.

The blades, it will be evident, inasmuch as they are positioned in the helical slots, will themselves extend helically with respect to the axis of the element A. The discharge edges of said blades will extend substantially radially, as shown in Fig. 2.

These blades, thus positioned, define nozzles N, which are also evidently helically arranged with respect to the axis of the element A.

The nozzle ring is completed by intimately associating the outer edges of the several blades B with a diaphragm D, positioned in the turbine casing C, as shown in Fig. 1. This diaphragm D defines inlet and exhaust chambers 19 and 20 within the casing C, as more particularly described in said co-pending case Serial No. 224,892.

The diaphragm D is annular, and at its inner end, is provided with a series of slots 5′, which are so cut as to substantially overlie the slots 5 in the element A. The tangs 13 and 14 pass through these slots 5′, the tangs then being bent oppositely to firmly anchor the diaphragm and blades together. The curve of the blade B along the line 17, which is substantially parallel to the line 7—8, is such that the diaphragm D fits the edge 17 of the blade B with a gas-tight joint. The outer annular element of the nozzle ring is here shown as formed by the diaphragm D, but it is apparent that this outer element could be made separately from the diaphragm D and attached thereto later, if desired, but the preferred form is as shown in the drawings.

The gases enter the inlet chamber 19 through the pipe 21, pass through the noz-

zle N onto the buckets 3, thence into the exhaust chamber 20 and thence out through a pipe.

It should be noted at this point, that the element A, diaphragm D and blades B may be all stamped out of sheet metal, a feature which obviously is conducive to ease and rapidity of production and assemblage.

Referring now to the modified form of blade shown in Figs. 5 and 6, the blade B′ has a body portion 22, which is made rather thick and is rounded to present a more or less streamline form, the purpose of the streamline form being to minimize shock as the gases enter the nozzles N. The course of the gases is shown by the arrows. the blade B′ is provided with upper and lower tangs 23 and 24. As in the case of the blade B, these are adapted to anchor the blade in position in the slots 5′ and 5. The upper edge of the blade B′, is profiled to fit the diaphragm D and the lower edge is helically curved to fit the helical slot 5, in very much the same way as in the case of the blade B.

Referring now to Figs. 7 and 8, there is shown a blade B″ of substantially I-beam cross section. The body of the blade, indicated at 25, is higher at one end than at the other, the high end gradually tapering to the lower end. At the upper edge, the curve along the line 26 and 27 is such as to conform with the edge of the slot 5′ in the diaphragm D. The tangs 28 and 28′, bent along the line 26 and 27 will accordingly fit tightly against the diaphragm D when the blade is in position.

The general curvature of the lower part of the blade B″, as indicated on the line 26′—27′, is helical and adapted to conform to the helical slots 5 in the element A. The tangs 29 and 29′ operate to anchor the blade in position on the element A, said tangs being, as in each of the other two blade forms, on the outside with respect to the nozzle spaces N. The blades shown in Figs. 5 and 8 are intended and adapted to be stamped out of sheet metal, which presents advantages already stated.

While I have illustrated certain embodiments of my invention, it should be understood that the invention may be carried out in other ways, as defined within the scope of the appended claims.

I claim:

1. A turbine nozzle ring, comprising two annular elements, blades of different height at opposite ends positioned between said annular elements, the edges of said blades throughout their length being seated against each of said annular elements.

2. The combination as claimed in claim 1, the parts being made of stamped out sheet metal.

3. A turbine nozzle ring, comprising two slotted annular elements, blades provided with tangs, seated in said slots and seated between said annular elements to define nozzles helical with respect to the axis of one of said annular elements, said tangs being bent to hold the blades in position.

4. A turbine nozzle ring, comprising two slotted annular elements, blades of different height at opposite ends, provided with tangs seated in said slots and seated between said annular elements to define nozzles helical with respect to the axis of one of said annular elements, said tangs being bent to hold the blades in position.

5. A turbine nozzle ring, comprising two slotted annular elements, and blades of substantially I-beam cross section, seated in the slots in said annular elements to define nozzles.

6. The combination as claimed in claim 5, the said blades varying in height at opposite ends.

In testimony whereof I affix my signature.

EARL H. SHERBONDY.

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