No. 840,310. PATENTED JAN. 1, 1907.

R. H. GOLDSBOROUGH.

TURBINE.

APPLICATION FILED MAY 14, 1906.

Fig. 2.

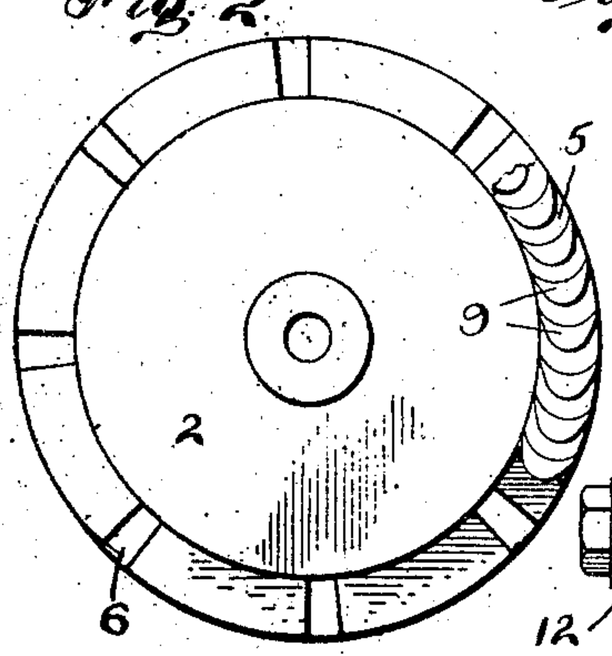


Fig. 1

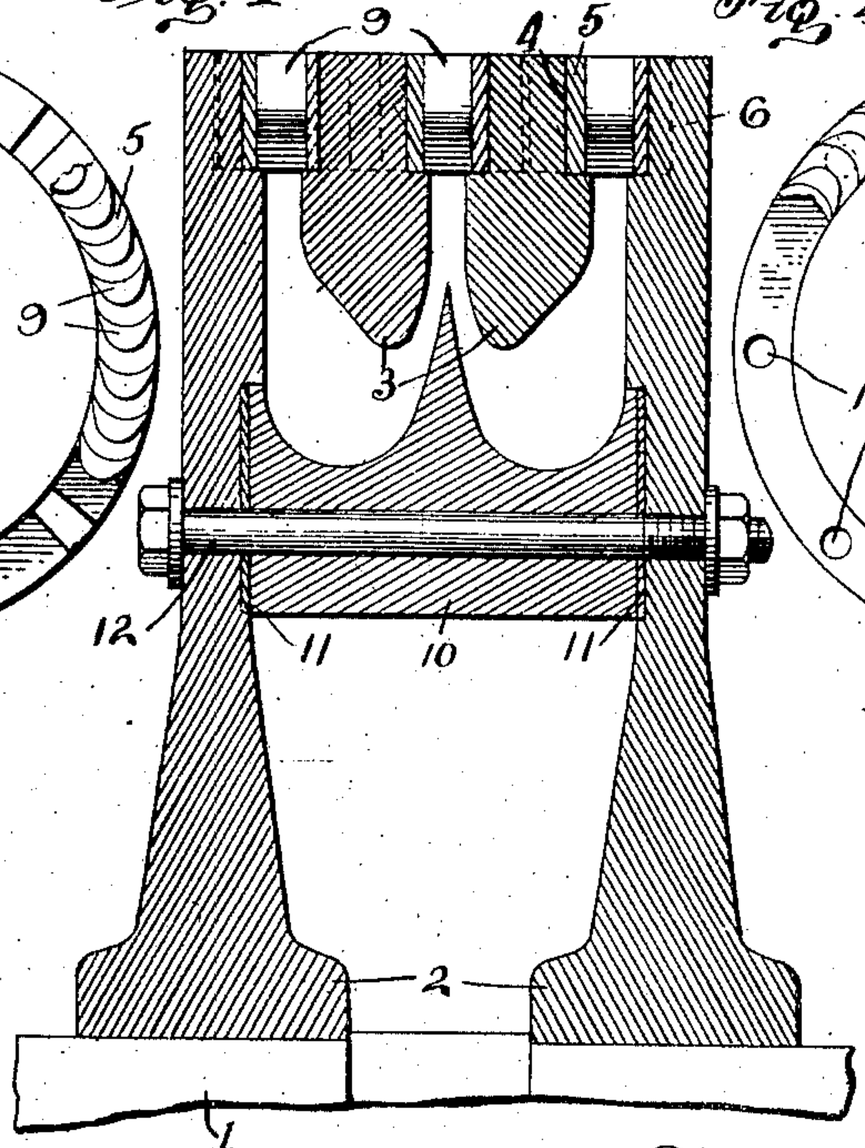


Fig. 4

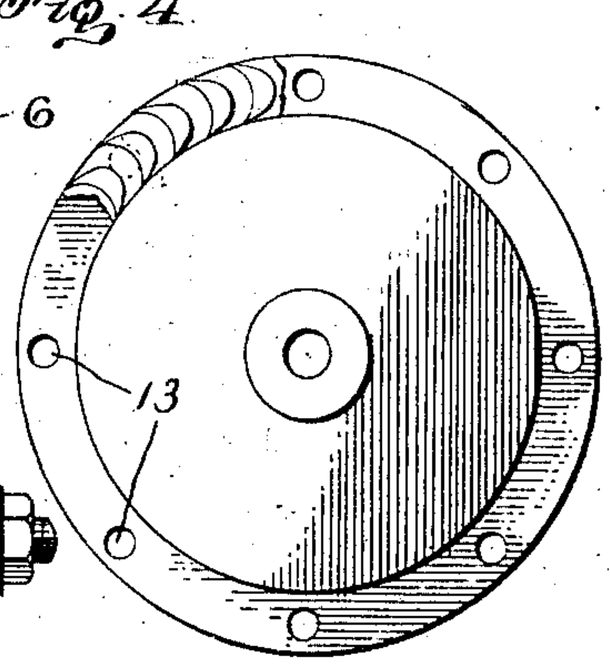


Fig. 3.

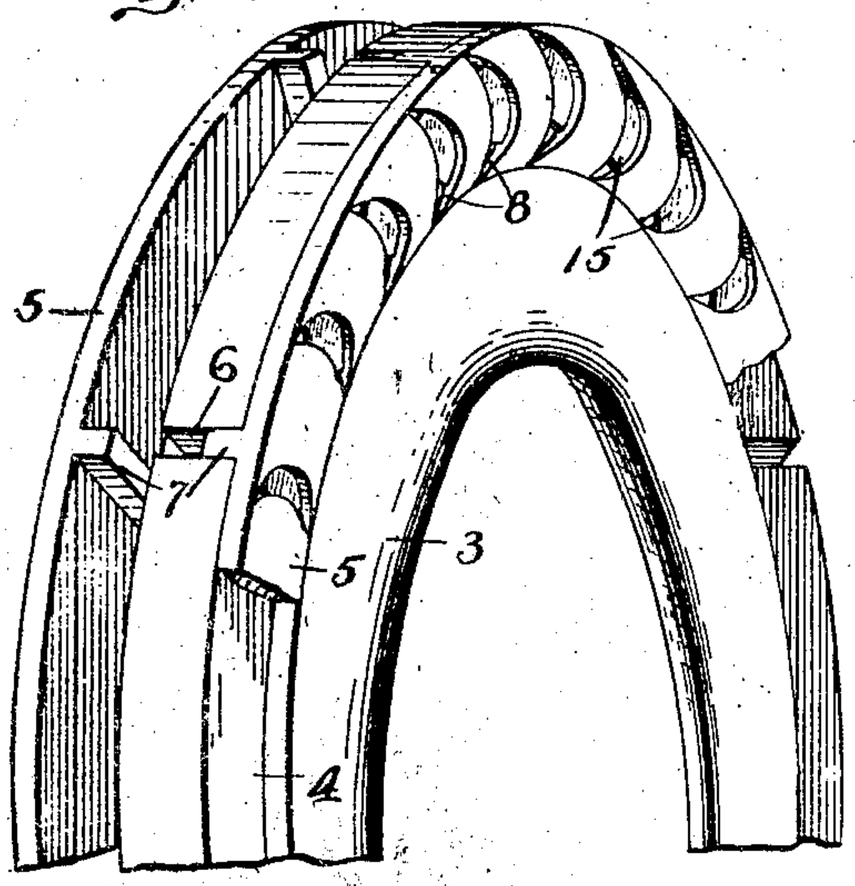
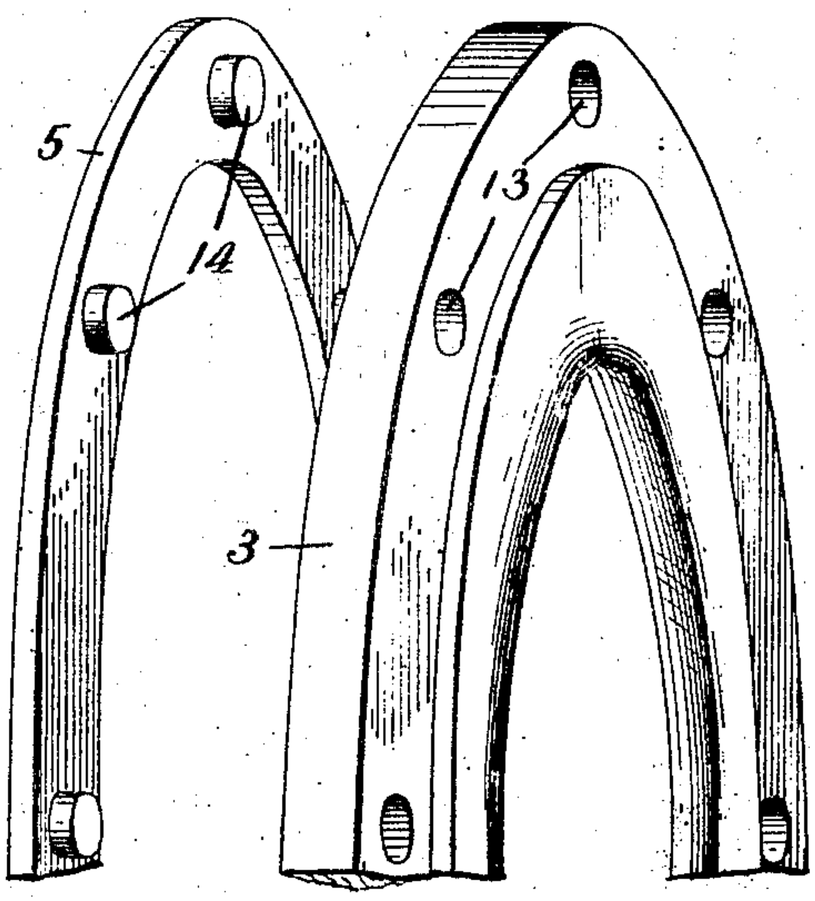


Fig. 5.



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UNITED STATES PATENT OFFICE.

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TURBINE.

No. 840,310. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed May 14, 1906. Serial No. 316,734.

To all whom it may concern:

Be it known that I, RICHARD H. GOLDSBOROUGH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Turbines, of which the following is a specification.

My invention relates to turbines; and it consists in the constructions, combinations, and arrangements herein described and claimed.

An object of my invention is to provide a simple and inexpensive means for accurately adjusting the several vanes of an annular series and for securely clamping said series in position.

A further object of my invention is to provide an improved means for assembling and clamping an annular series of turbine-vanes whereby the several vanes of the series can be expediently adjusted in their proper relative positions by any ordinary mechanic.

A further object of my invention is to provide improved means for assembling and securing annular series of vanes in turbines by which a large part of the expensive machining necessary in existing constructions is obviated and which can be conveniently set up by any mechanic without the necessity of sending a skilled turbine man from the shops.

Referring to the accompanying drawings, forming a part of this application, and in which similar reference-numerals indicate corresponding parts in the several views, Figure 1 is a detail longitudinal sectional view through the upper half of a turbine-rotor provided with one embodiment of my invention. Fig. 2 is an elevation, on a smaller scale, showing a face of one of the rotor-disks with a portion of an annular series of vanes and their securing-ring in position. Fig. 3 is a detail perspective view clearly illustrating the manner of connecting the annular series of vanes to one of the annular members of the turbine-rotor. Fig. 4 is a view similar to Fig. 2, illustrating a modified construction; and Fig. 5 is a detail perspective view showing the manner of connecting the vanes to one of the annular members of the rotor in the construction illustrated in Fig. 4.

Referring especially to Figs. 1, 2, and 3 of the drawings, 1 indicates a turbine-shaft carrying axially-arranged rotor members consisting of two disks 2 and annular members 3.

The opposed radial walls of the rotor members are provided with recesses 4 for receiving securing-rings 5 and with apertures 6, extending from the bottoms of said recesses for receiving studs 7, formed on the rear faces of said rings. The apertures 6 are shown extending entirely through the annular members 3; but obviously such construction is not essential, although it constitutes a convenient construction for machining said apertures. The two rings of each pair are provided with series of registering recesses 8 for receiving the ends of the several vanes 9, interposed between the front faces thereof. The recesses are formed of a contour corresponding to transverse sections of the vanes, and thereby act to securely lock the inserted vanes against any possibility of shifting. These recesses are formed in the rings by a simple and inexpensive method claimed in an application filed by me simultaneously with this application, and they obviate the tedious and expensive machining and assembling necessary in previous constructions.

As shown especially in Fig. 3, gaskets 15, of copper or other suitable material, are preferably positioned in the several recesses 8 for avoiding unequal clamping-pressure on the several vanes of the series through imperfect machining of the parts. Further, the gaskets 15 extend over only the wider portions of the bottoms of the recesses, leaving the narrow ends of said recesses free, thereby limiting the clamping-pressure to the thicker portions of the vanes and eliminating any tendency to crush or distort the thin edges thereof.

A spacing and deflecting member 10 is shown positioned between the disks 2, with gaskets 11 interposed between the abutting surfaces thereof. A series of bolts 12, extending through the disks 2, provides means for forcibly drawing said disks together, thereby providing a common means for clamping said disks together with the rotor members 3, rings 5, and vanes 9. This constitutes a very convenient and efficient means for securely clamping the several parts and tends to produce a uniform pressure between the rings and vanes of the several annular series.

Figs. 4 and 5 illustrate a modification in which the rotor members are provided with circular apertures 13 and the securing-rings 5 with cylindrical studs 14 for engagement therewith. This is a very advantageous construction, since it positively locks said rings from distortion under the action of centrifugal force, and it is capable of being very conveniently and cheaply machined.

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

1. In a turbine, the combination of a plurality of axially-arranged rotor members, a plurality of vanes, rings engaging the opposed radial walls of said members and provided with series of recesses corresponding in contour to transverse sections of said vanes, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

2. In a turbine, the combination of a plurality of axially-arranged rotor members provided with apertures in their opposed radial walls, a plurality of vanes, and rings provided with series of recesses corresponding in contour to transverse sections of said vanes and with studs engaging said apertures in the rotor members, substantially as described.

3. In a turbine, the combination of a plurality of axially-arranged rotor members provided with apertures in their opposed radial walls, a plurality of vanes, rings provided with series of recesses corresponding in contour to transverse sections of said vanes and with studs engaging said apertures in the rotor members, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

4. In a turbine, the combination of a plurality of axially-arranged rotor members, a plurality of vanes, rings engaging the opposed radial walls of said members and provided with series of recesses corresponding in contour to transverse sections of said vanes, and yielding seats positioned in said recesses for engagement by the ends of said vanes, substantially as described.

5. In a turbine, the combination of a plurality of axially-arranged rotor members, a plurality of vanes, rings engaging the opposed radial walls of said members and provided with series of recesses corresponding in contour to transverse sections of said vanes, yielding seats positioned in said recesses for engagement by the ends of said vanes, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

6. In a turbine, the combination of a plurality of axially-arranged rotor members provided with apertures in their opposed radial walls, a plurality of vanes, rings provided with series of recesses corresponding in contour to transverse sections of said vanes and with studs engaging said apertures in the rotor members, and yielding seats positioned in said recesses for engagement by the ends of said vanes, substantially as described.

7. In a turbine, the combination of a plurality of axially-arranged rotor members, a plurality of vanes, rings engaging the opposed radial walls of said members and provided with series of recesses corresponding in contour to transverse sections of said vanes, a gasket positioned in each of said recesses and constructed to extend over a portion only of the bottom thereof, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

8. In a turbine, the combination of a plurality of axially-arranged rotor members, a plurality of vanes, rings engaging the opposed radial walls of said members and provided with a series of recesses corresponding in contour to transverse sections of said vanes, said recesses extending to the outer peripheries of the respective rings, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

9. In a turbine, the combination of a plurality of axially-arranged rotor members provided with channels in their opposed radial walls and with apertures extending from the bottom of said channels, a plurality of vanes, and rings positioned in said channels and provided with studs engaging said apertures and with series of recesses corresponding in contour to transverse sections of said vanes, substantially as described.

10. In a turbine, the combination of a plurality of axially-arranged rotor members provided with channels in their opposed radial walls and with apertures extending from the bottom of said channels, a plurality of vanes, rings positioned in said channels and provided with studs engaging said apertures and with series of recesses corresponding in contour to transverse sections of said vanes, and a common means for securely clamping together said rotor members, rings and vanes, substantially as described.

11. In a turbine, the combination of a plurality of axially-arranged rotor members provided with channels in their opposed radial walls and with apertures extending from the bottom of said channels, a plurality of vanes, rings positioned in said channels and provided with studs engaging said apertures and with series of recesses corresponding in contour to transverse sections of said vanes, yielding seats positioned in said recesses for engagement by the ends of said vanes and a

common means for securely clamping together said rotor members, rings and vanes, substantially as described.

12. In a turbine, the combination of a plurality of axially-arranged rotor members provided with annular channels in their opposed radial walls and circular apertures extending from the bottoms of said channels, a plurality of vanes, and rings positioned in said channels and provided with cylindrical studs engaging said apertures and with series of recesses corresponding in contour to transverse sections of said vanes, substantially as described.

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

RICHARD H. GOLDSBOROUGH.

Witnesses:

ALEX. S. STEUART,

G. AYRES.