Dec. 8, 1931. O. A. WIBERG 1,835,361

STEAM TURBINE

Filed July 16, 1926

Fig. 1.

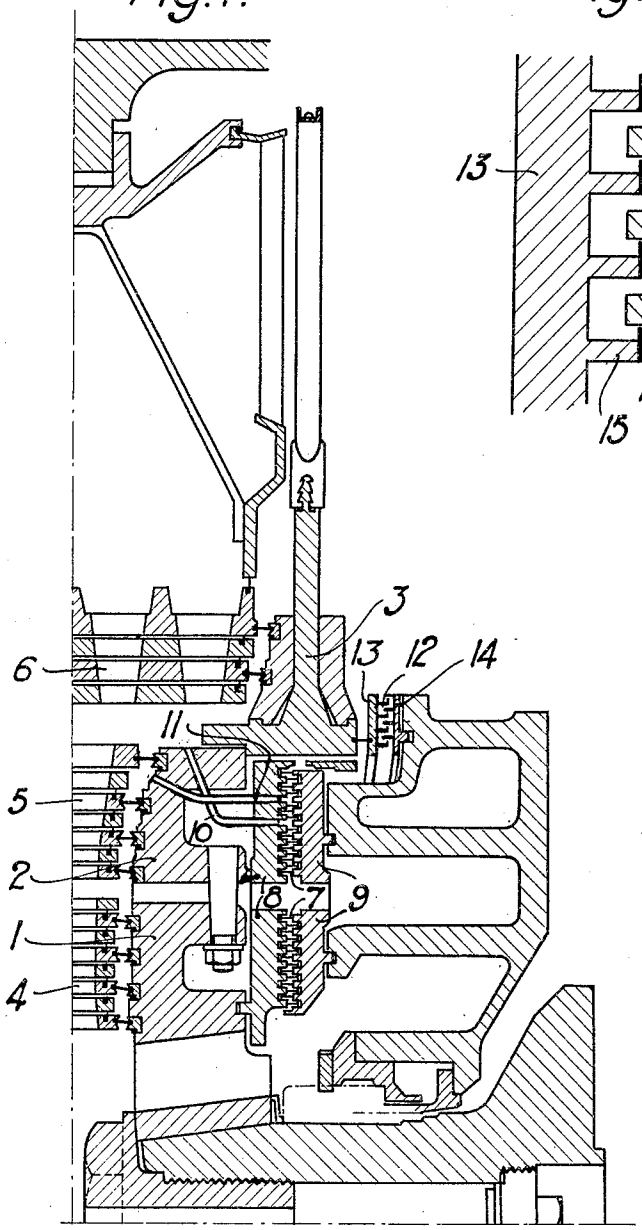


Fig. 2.

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STEAM TURBINE

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This invention relates to steam turbines, and particularly to steam turbines having a labyrinth packing associated with the turbine disk or each turbine disk.

The steam passing through such a labyrinth packing will be heated so as to reach a temperature considerably higher than that of the steam which while doing work has passed the blade system of the turbine down to the same pressure as that of the steam passing through the packing. The steam that has passed through the labyrinth packing is, therefore, more valuable than the steam which has passed the blade system to the same final pressure.

The present invention has for its object to utilize the heat generated due to the throttling or wire drawing of the steam during its passage through the labyrinth packing. To this end the steam that has passed the labyrinth packing wholly or partially is supplied to the blade system. Such steam will then mix with the steam of said system to raise the heat value at the mixing point and, as a result, the wet region will be displaced to a point situated at a greater distance from the center of the system thereby reducing the wear on the blades. In order to replace the steam thus removed from the labyrinth packing steam of a lower pressure is taken from the blade system and supplied to the labyrinth packing whereby a cooling effect on the packing will at the same time be produced.

In the drawings means are shown to enable such a transmission of steam in connection with a radial flow turbine. Fig. 1 is an axial section of part of the blade system and labyrinth packing of the turbine. Fig. 2 is a detail section on a larger scale of an additional labyrinth packing to be used in certain cases.

It is to be noted, that Fig. 1 shows a quarter of the turbine only and that the turbine is symmetric with respect to the dotted lines.

The radial flow turbine shown includes a turbine disk comprising three concentric annular members 1, 2, 3 each of said turbine disk members carrying in well-known way a section of the blade system 4, 5, 6, respectively. Provided outside the turbine disk is a labyrinth packing 7 comprising supporting rings 8 secured to the elements 1, 2 and stationary supporting rings 9.

The interior of the labyrinth packing is connected by a set of pipes 10 or channels (one of which is shown) to a section of the blade system (in the drawing that situated between the sections 5 and 6 of the blade system) where the steam pressure is lower than at the point where the pipes 10 are connected to the labyrinth packing. Through said pipes or channels 10 hot steam will flow from the labyrinth packing into the blade system to raise the temperature therein thereby securing the advantages already mentioned.

In order to supply steam to the labyrinth packing to replace the steam thus removed a set of pipes or channels 11 is arranged between points of the blade system where the pressure is higher than that existing in the labyrinth packing (that is, in front of the outlet from the labyrinth packing). The steam thus entering the packing will cool the packing and will thus act to preserve the same.

The design of the packing 12 will be more clear from Fig. 2. It comprises a thicker rotary ring 13 secured to the element 3 to rotate therewith and a thinner stationary ring 14 attached to the turbine frame. The packing ribs 15 of the disk 13 are thinner than the packing ribs 16 of the disk 14. Only the ribs 15 are formed with packing edges 17.

The labyrinth packing described operates as follows: Should for any reason the packing edges 17 come into contact with the corresponding surfaces of the ribs 16 the heat produced will be transmitted in part from the packing edges 17 through the ribs 15 to the rotary disk 13 and, in part, through the ribs 16 to the stationary labyrinth disk 14. Due to the fact that the ribs 16 are heavier than the ribs 15 and the ring 14 is lighter than the ring 13 the result of the said heat production in the labyrinth packing will be that the disk 14 will have its diameter increased more rapidly than the disk 13 thereby reducing the tendency for the packing edges 17 to cut into the ribs 16.

While the invention has been described above in connection with a radial flow tur-

bine, it is to be noted that it may equally well be adapted to other turbine types without departing from the principle or scope of the invention.

What I claim is:

1. In a radial flow turbine, the combination with the rotary blading and its supporting disc, of a labyrinth packing for said disc, means to pass leakage steam from an inner point of said packing to a stage of low pressure of said blading, and means to pass steam from a stage of the blading of higher pressure than that of said first mentioned stage to a point of the packing situated nearer the periphery of the packing than said first mentioned point.

2. In a radial flow turbine, the combination with the rotary blading and its supporting disc, of a labyrinth packing for said disc, a connection between an inner point of said packing to a stage of low pressure of said blading, and another connection between a point of the packing situated nearer the periphery of the packing than said first mentioned point and a stage of the blading of a higher pressure than that of the said first mentioned stage.

3. In a radial flow turbine, the combination with the rotary blading and its supporting disc, of a stationary housing, a radially extending labyrinth packing between said disc and said housing, a conduit extending through said disc between a point of said packing situated at a short distance from the axis of the packing and a stage of low pressure of said blading, and another conduit extending through said disc between a point of the packing situated at a greater distance from the axis of the packing than said first mentioned point and a stage of the blading of a higher pressure than that of first mentioned stage.

In testimony whereof I have signed my name.

OSCAR ANTON WIBERG.