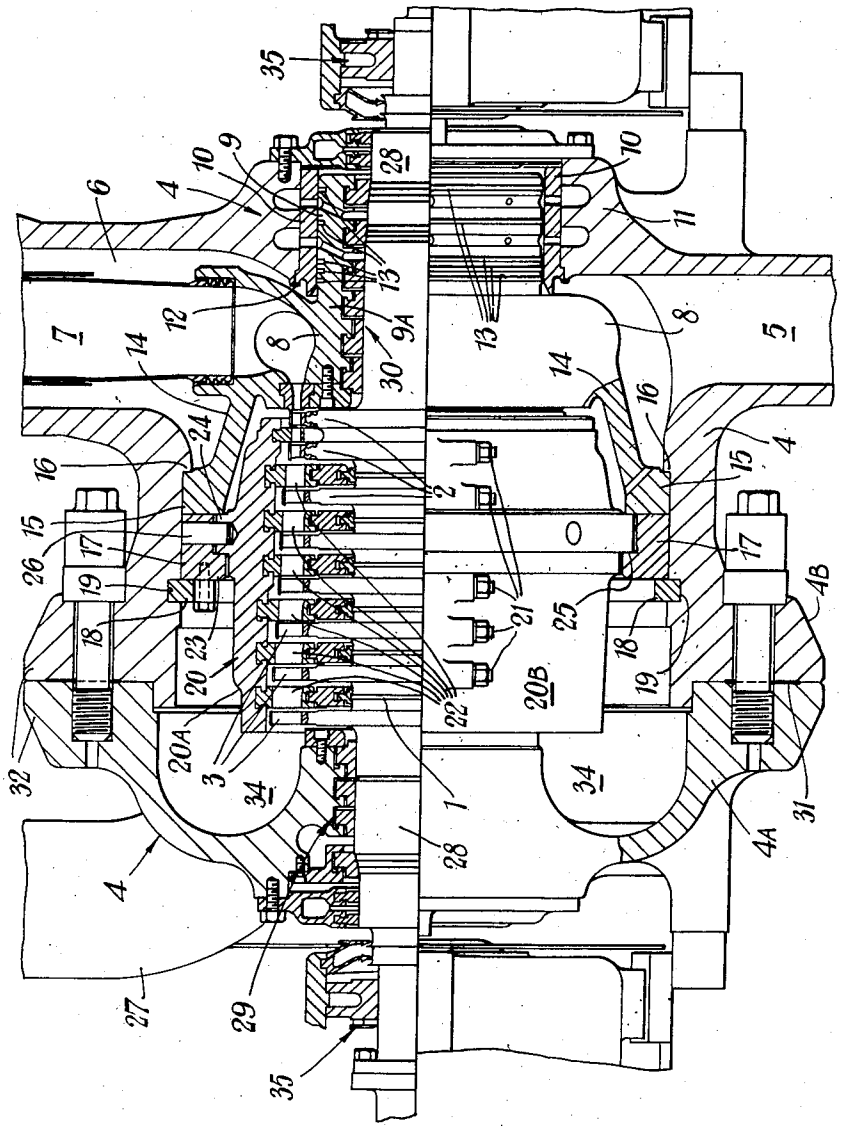
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TURBINES

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TURBINES

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This invention relates to turbines.

According to the present invention there is provided an axial flow turbine having a rotor, an inner casing around the rotor, a nozzle box at the high pressure end of the rotor, and an outer casing around and supporting both the inner casing and the nozzle box, the rotor having a shaft that is passed through glands at the high pressure and low pressure ends of the outer casing, wherein the nozzle box has a sleeve that is integral therewith and which is passed through the high pressure end of the outer casing and carries the gland at this end of the casing, the high pressure end of the outer casing having an inlet and outlet for fluid that serves to pressurise the nozzle box, there being also an inlet for delivering working fluid to the nozzle box, and wherein the nozzle box has a wall integral therewith which extends from the nozzle box to the outer casing to which the wall is sealed, the wall separating that part of the outer casing through which pressurising fluid flows from the part of the outer casing that contains the inner casing.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawing in which the single figure is a longitudinal sectional elevation of a steam turbine.

The turbine is of the axial flow type and has a rotor 1 that carries eight rings 2 of blades 3 and is located within a pressure casing 4. The casing 4 has an inlet 5 and an outlet 6 at the high pressure end of the casing 4. The inlet 5 is for connection to the main boiler (not shown) of the steam turbine installation and the outlet 6 leads to a superheater (not shown) of the installation. An inlet 7 for highly superheated steam delivered by the superheater passes concentrically through the outlet 6 to a nozzle box 8 disposed around the high pressure end of the rotor 1. The nozzle box 8 has a sleeve 9 that is integral therewith and extends through a bush 10 mounted in a boss 11 at the high pressure end of the casing 4. It will be understood that the sleeve 9, bush 10 and boss 11 are formed concentrically with the shaft 28 of the rotor 1. The bush 10 is sealed to the boss 11 by welding 12 and the seal between the sleeve and the bush is formed by Ramsbottom rings 13.

A frusto-conical portion 14 integral with the nozzle box 8 diverges therefrom towards the low pressure end of the casing 4. The portion 14 has an outwardly directed flange 15 at the wider end thereof and the high pressure side of this flange 15 abuts against a circumferential shoulder 16 around the inside of the casing 4. A ring 17 keyed to the inside surface of the casing 4 abuts against the wider end of the frusto-conical portion 14. A split ring 18 that is secured in a circumferential recess 19 in the inner surface of the casing 4 locates the ring 17 against movement away from the frusto-conical portion 14. The ring 18 is bolted to the ring 17.

An inner casing 20 of cylindrical form and split longitudinally into two halves 20A, 20B is supported by the

ring 17. The two halves 20A, 20B of the inner casing 20 are held together by bolts 21 and this casing 20 carries seven rings of nozzles 22, each ring of nozzles 22 being located between two adjacent rings 2 of blades 3 on the rotor 1. The ring 17, at the low pressure side thereof, has an inwardly directed flange 23 and the inner casing 20 has an outwardly directed rib 24 that is located between the flange 23 on the ring 17 and the wider end of the frusto-conical portion 14. The seating between the rib 24 and the flange 23 on the ring 17 forms a seal 25. The rib 24 of the inner casing 20 is secured to the ring 17 by studs 26.

The low pressure end of the pressure or outer casing 4 has an exhaust 27 that leads to another turbine (not shown) of the installation or alternatively through a valve (not shown) to the condenser (not shown) of the installation.

The rotor shaft 28 passes through the low pressure end of the outer casing 4 and the latter carries a gland 29 for preventing leakage of steam along this part of the shaft 28. At the high pressure end of the turbine the shaft 28 passes through a gland 30 carried by the sleeve 9. The shaft 28 is supported at each end of the turbine by bearings 35.

The outer or pressure casing 4 is formed in two parts 4A, 4B, being split vertically (i. e. in a plane perpendicular to the axis of the rotor 1) to the low pressure side of the split ring 18. At the split 31 in the casing each part 4A, 4B is provided with a flange 32 and these two flanges 32 are bolted together.

In operation of the turbine described above high pressure steam which is slightly superheated passes in via the inlet 5 and pressurises the exterior of the nozzle box 8, the frusto-conical portion 14, and that part 9A of the sleeve 9 that is within the pressure casing 4. The pressurising steam then passes from the casing 4 via the outlet 6, is highly superheated in the superheater and is returned to the turbine via the inlet 7 and flows to the nozzle box 8. Steam flows from the nozzles 33 of the nozzle box 8 through the successive rings of blades 3 and nozzles 22, to the space 34 between the inner and outer casings 20 and 4 and thence to the exhaust 27.

That part of the inner casing 20, that is to the high pressure side of the rib 24 is, on the outside thereof, subjected to the pressure of the steam emerging from the nozzles 33 of the nozzle box 8, as also is the inside of the frusto-conical portion 14. That part of the inner casing 20, that is to the low pressure side of the rib 14 is, on the outside thereof, subjected to the pressure of the steam emerging from the last ring 3 of the blades 2 of the rotor 1, i. e., to the exhaust pressure of the turbine.

We claim:

1. An axial flow turbine having a rotor, an inner casing around the rotor, a nozzle box at the high pressure end of the rotor, an outer casing around and supporting both the inner casing and the nozzle box, a shaft upon which the rotor is mounted, first and second glands at the high pressure and low pressure ends respectively of the outer casing and through which glands the shaft is passed, a sleeve integral with the nozzle box, the sleeve being passed through the high pressure end of the outer casing and carrying the first gland, the high pressure end of the outer casing having an inlet and an outlet for fluid that serves to pressurise the nozzle box and there being also an inlet for delivering working fluid to the nozzle box, a conical-shaped wall integral with the nozzle box, the wall extending and diverging from the nozzle box to the outer casing to which the wall is sealed, the wall separating that part of the outer casing through which pressurising fluid flows from the part of the outer casing that contains the inner casing, a circumferential shoulder on the inside

of the outer casing, an outwardly directed flange on the wider end of the conical-shaped wall, the shoulder being on the high pressure side of said flange, a ring abutting against the low pressure side of said flange, and means connecting the outer peripheral surface of the ring to the outer casing and connecting the ring to the inner casing so that the latter is supported by the ring.

2. A turbine according to claim 1, wherein a groove is formed around the inside surface of the outer casing, the groove being adjacent the low pressure side of said ring, the connecting means including a split ring inserted in the groove and abutting against the first-mentioned ring to cause the latter to abut against said flange.

3. A turbine according to claim 1, wherein the inner

casing is of cylindrical form and includes between its ends an outwardly directed circumferential rib, said ring including on the low pressure side thereof an inwardly directed flange, the turbine further comprising means connecting the rib to the ring with the rib abutting against the high pressure side of said inwardly directed flange.

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