Oct. 8, 1929. K. RÖDER 1,730,746

STEAM OR GAS TURBINE

Filed Dec. 29, 1927

Fig. 1

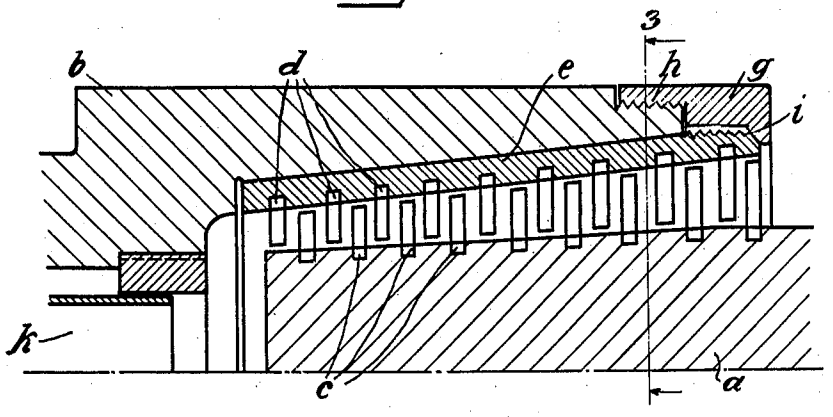
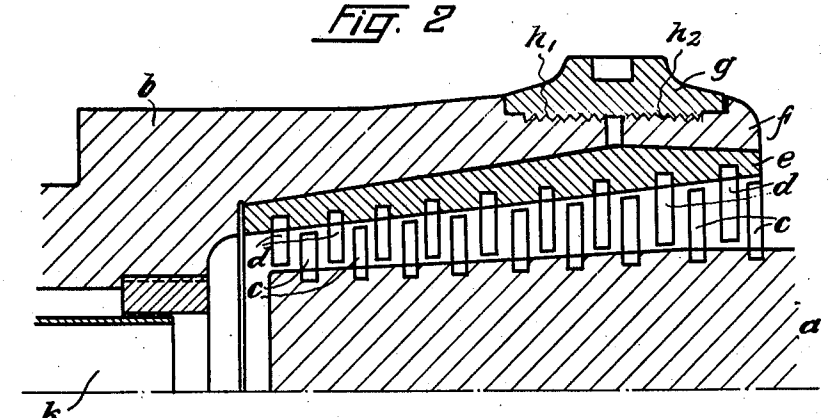


Fig. 2



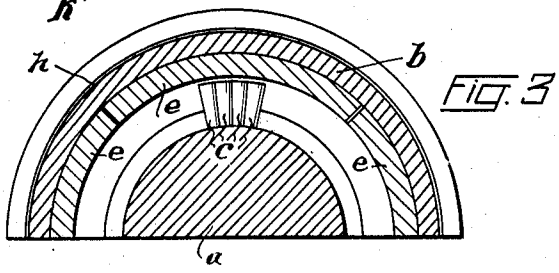


Fig. 3

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UNITED STATES PATENT OFFICE

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STEAM OR GAS TURBINE

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My invention relates to an improvement in steam or gas turbines.

It is already known to provide steam or gas turbines having preponderating axial admission with two rotors rotating in opposite directions. The blade rims rotating in opposite directions are then mounted within the space formed between the outer and the inner rotor, both rotors overhanging their bearings.

The mounting of the rows of blades in the outer rotor of this turbine presents considerable difficulties, if it is desired to obtain a substantial construction, in which a loosening of the blades by forces set up by mechanical causes is effectively eliminated. A further requirement of such a turbine is that it should be possible to take it apart as quickly as possible when the machine has been stopped, in order to render the blades freely accessible.

I attain this result by fitting a bushing tapered at the outside and split in an axial plane, or in a number of planes, into the correspondingly bored outer rotor and clamping it in position by a locking ring, said bushing carrying the rows of blades of the outer rotor. In a modification I employ a double-taper, the shorter portion then being located in an additional ring, while a locking ring provided with right-hand and left-hand thread effects the connection with the shaft end. By tightening the locking ring the split bushing is rigidly connected with the hollow shaft. The force holding the parts together is not diminished in service, since centrifugal forces as well as stresses set up by the heating progressing from the inside towards the outside have not the tendency to loosen the connection, but rather to tighten it.

In the drawing affixed hereto and forming part of my specification two embodiments of my invention are illustrated by way of example.

The drawings represent in

Fig. 1, a longitudinal central section through a part of my improved turbine, in which the bushing is secured within the outer hollow rotor by means of a single locking ring,

Fig. 2, a similar section in which a double-taper bushing is secured within the outer rotor by means of two locking rings and in

Figure 3 a transverse section through Figure 1 on the line 3—3 in that figure, ring g being removed, and only a few of the turbine blades or buckets being shown.

Like parts are indicated by like letters of reference in the figures of the drawing.

Referring to Fig. 1 of the drawing, a is the inner rotor, the blades c of which are mounted directly in slots of the rotor body. The driving medium is admitted into the turbine by the central bore k of the outer rotor b. The blades d of this rotor are carried by a bushing e. This bushing is split in at least one central axial plane, so that it comprises two or more component parts as may be seen from Figure 3. The portions of the bushing e are fixed within the tapering bore of the outer rotor b by means of an external taper. The assembly takes place in such a manner that the parts of the bushing provided with the blades are first placed around the bladed inner rotor a. The end of the rotor shaft b is then pushed over the taper of the portions of the bushing in an axial direction. The drum-shaped rotor b then envelops the tapering bushing. The assembly is now completed by screwing the locking ring g on to the end of the outer rotor b by means of the thread h. This locking ring g also serves for transmitting the axial thrust of the steam on the blades to the rotor b. The locking ring g surrounds the peripheral portions of the ends of the bushing elements e with a certain amount of clearance. The ends of the bushing elements are themselves provided with thread i upon which after the removal of the lock ring g a correspondingly threaded tool may be placed by means of which the parts of the bushing e may be withdrawn from the shaft b when the turbine is to be dismantled.

Referring to Fig. 2 of the drawing, it will be seen that the embodiment illustrated here differs from that shown in Fig. 1 only in so far as the bushing elements e are provided also on their peripheral portions, which protrude beyond rotor b, with a taper, on which latter is disposed a tapered ring f. The as-

sembly is effected in the same manner as described with reference to Fig. 1. The locking ring g is in this case provided with an internal left-hand thread h^1, h^2 by which the correspondingly threaded ends of rotor b and ring f are drawn together, so that thereby the split bushing b is forced into the rotor. By turning the ring g in the opposite direction and by a few light blows with a mallet the connection may easily be loosened and the bushing e be withdrawn to make the blading accessible.

Various modifications and changes may be made without departing from the spirit and the scope of the invention, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:—

1. In a steam turbine, in combination, an inner rotor having a plurality of axially spaced circumferential rows of blades on its outer periphery, an outer hollow rotor having similarly spaced rows of blades on its inner periphery, both of said rotors overhanging their bearings, said outer rotor having an inwardly tapering bore enveloping said inner rotor along its bladed portion, an externally tapered axially split bushing fitting said bore and carrying said outer rotor blades on its inner periphery, and means adapted to hold said bushing attached to said outer rotor.

2. In a steam turbine, in combination, an inner rotor having a plurality of axially spaced circumferential rows of blades on its outer periphery, an outer hollow rotor having similarly spaced rows of blades on its inner periphery, both of said rotors overhanging their bearings, said outer rotor having an inwardly tapering bore enveloping said inner rotor along its bladed portion, an externally tapered axially split bushing fitting said bore, and carrying said outer rotor blades on its inner periphery, and a locking ring adapted to secure said tapering bushing within the bore of said outer rotor.

3. In a steam turbine, in combination, an inner rotor having a plurality of axially spaced circumferential rows of blades on its outer periphery, an outer hollow rotor having similarly spaced rows of blades on its inner periphery, both of said rotors overhanging their bearings, said outer rotor having an inwardly tapering bore enveloping said inner rotor along its bladed portion, an externally double-tapered axially split bushing fitting said bore and carrying said outer rotor blades on its inner periphery, a holding ring having a bore fitting the outer taper of said bushing, and a locking ring disposed between said hollow rotor and said holding ring and having an internal right-hand and left-hand thread adapted to join the correspondingly threaded ends of said outer rotor and said holding ring to draw the bushing into said hollow rotor.

4. A steam turbine composed of an integral outer element and an inner element, carrying a plurality of axially spaced circumferential rows of blades on its outer periphery, said outer element containing a cone shaped bushing carrying a plurality of axially spaced circumferential blade rows on its inner periphery, the blades of said rows being shaped to cooperate with the blades of the inner element, said bushing being divided into a plurality of segments to permit the assembling and dismounting of the turbine, and means for holding said cone shaped bushing in said outer element.

In testimony whereof I affix my signature.

KARL RÖDER.