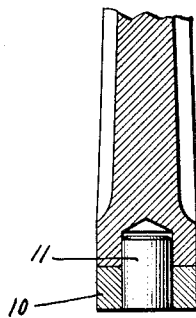
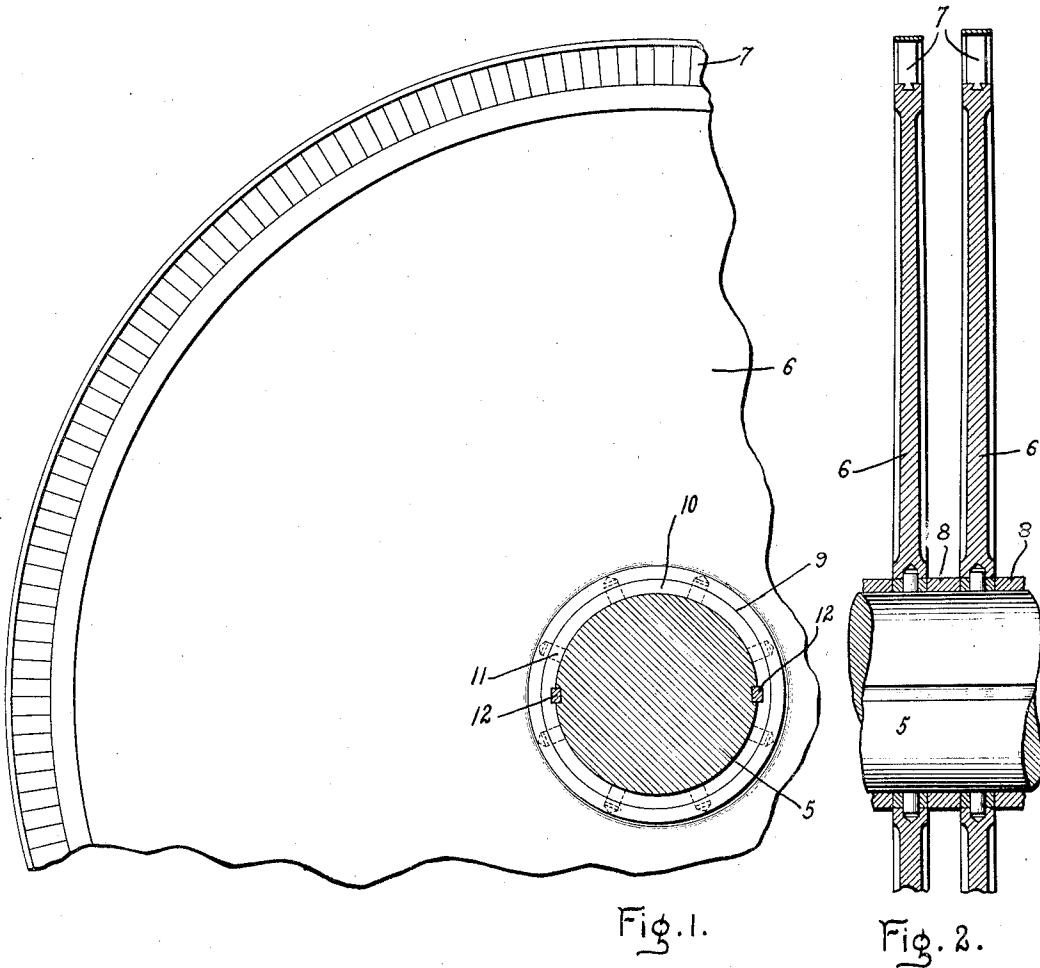


O. JUNGREN.
ELASTIC FLUID TURBINE.
APPLICATION FILED MAY 14, 1919.

1,326,871.

Patented Dec. 30, 1919.



Inventor:
Oscar Junggren,
by *Albert H. Davis*
His Attorney.

UNITED STATES PATENT OFFICE.

OSCAR JUNGREN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELASTIC-FLUID TURBINE.

1,326,871.

Specification of Letters Patent.

Patented Dec. 30, 1919.

Application filed May 14, 1919. Serial No. 297,127.

To all whom it may concern:

Be it known that I, OSCAR JUNGREN, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

The present invention relates to elastic fluid turbines and particularly to turbines of the type comprising a plurality of disks or wheels mounted on the shaft and carrying suitable buckets upon the periphery. With such turbines it is important that the disks or wheels be made as light as possible in order to reduce the weight of the machine thereby reducing its size. In addition, by making the disks or wheels as thin as possible, particularly at the hubs where the greatest stresses occur, the distance between the bearings may be reduced, or a large number of stages may be put in in the same distance. On the other hand, it is essential to obtain a rigid construction which will withstand not only the stresses set up due to centrifugal action but also those which occur due to the substantial temperature changes which are continuously going on in the turbine due to changes in load and variations in the vacuum. If the turbine wheel or disk is rigidly fastened to the shaft these latter strains, due to temperature changes are very large, particularly in the hubs, on account of the wheels or disks responding much more quickly to temperature changes than the heavy shaft, and with this arrangement, relatively heavy wheels, having strong hubs are required as otherwise the wheels, if made too thin and light will distort and possibly loosen on the shaft.

The primary object of the present invention is to provide an improved structure in which the wheel is so connected to the shaft that it is free to respond to temperature changes independently of the shaft. By this arrangement the strains due to temperature changes are practically eliminated and as a consequence the wheels or disks may be made much lighter and thinner than before.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying specification and the claims appended thereto.

In the drawing, Figure 1 is a side elevation of a portion of a turbine wheel or disk

embodying my invention; Fig. 2 is a radial sectional view of the structure shown in Fig. 1, and Fig. 3 is a detail view of certain parts, on a larger scale.

Referring to the drawing, 5 indicates a shaft and 6 wheels or disks mounted thereon and carrying the usual ring or rings of buckets 7. The wheels are spaced apart by rings 8 and it will be understood that between the wheels are the usual stationary nozzle diaphragms or intermediates for conveying elastic fluid from the buckets of one wheel to those of the next.

Now, according to my invention, I provide the wheel or disk 6 with a central opening 9 of greater diameter than the shaft, and in this opening is a ring 10 of an outside diameter to just fit opening 9. Ring 10 is fastened to wheel 6 by a number of radial dowel pins 11, eight being shown in the present instance. It will be understood, however, that any suitable number may be used. The wheel 6 with ring 10 attached thereto is shrunk on shaft 5 in the usual manner, the ring being keyed thereto by suitable keys as indicated at 12. With this arrangement it will be noted the ring 10 is firmly attached to shaft 5 while the wheel 6 is attached to ring 10 by means of the dowel pins 11. Also when the ring and wheel cool during the shrinking on process the ring in contracting on the shaft will be stressed and forced in a tight fit with the bore of wheel 6.

With the above described arrangement it will be seen that when temperature changes take place such as occur, for example, in starting up the machine, which changes cause wheels or disks 6 to heat up more quickly than heavy shaft 5, such wheels or disks may expand independently of the shaft, moving slightly away from the rings 10. The wheels will, however, be guided by the dowel pins 11 which will keep them centered and transmit the torque from them to the shaft. The rings 10 will stay tight on the shaft as there is nothing to disturb them. As soon as the shaft has come to the same temperature as the wheels or disks, then there will be the ordinary contact between rings 10 and wheels or disks 6. When the action is reversed, that is, when the machine is cooling down, the shaft stays hottest the longest and some stresses will then be set up between the wheels and the shaft. The arrangement will be such however, that

these stresses will not exceed the elastic limit of the material and hence will do no harm.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. In combination, a shaft, a ring, said ring being put on the shaft with a shrink fit, a wheel having a bore in which the ring is located, and dowel pins fastening the ring to the wheel.

2. In combination, a shaft, a wheel having a bore of greater diameter than the shaft, a ring which fits the bore of the wheel and is interposed between the wheel and the shaft, and dowel pins connecting the ring to the wheel, said ring and wheel being put on the shaft with a shrink fit.

3. In combination, a shaft, a wheel having a bore of greater diameter than the shaft, a ring which fits the bore of the wheel and is interposed between the wheel and the shaft and shrunk on the shaft, and dowel pins connecting the ring to the wheel.

4. In an elastic fluid turbine comprising a shaft and a wheel having buckets thereon, means for fastening the wheel to the shaft comprising a ring shrunk on the shaft and interposed between the wheel and the shaft, and radially extending pins which fasten the ring to the wheel.

5. In an elastic fluid turbine comprising a shaft and a wheel having buckets thereon, means for fastening the wheel to the shaft comprising a ring which fits on the shaft and has radially outwardly projecting parts, said wheel having openings into which said parts project, and said ring and wheel being shrunk on the shaft.

In witness whereof, I have hereunto set my hand this 13th day of May, 1919.

OSCAR JUNGREN.