R. H. RICE.

ELASTIC FLUID TURBINE.

APPLICATION FILED JUNE 12, 1918.

1,298,564. Patented Mar. 25, 1919.

Fig. 1.

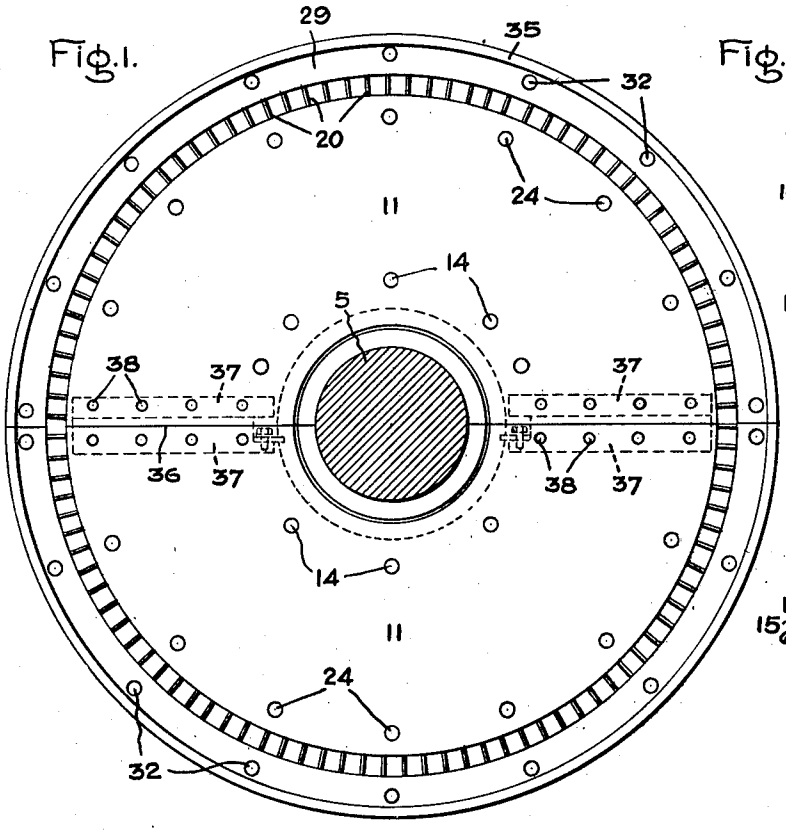


Fig. 2.

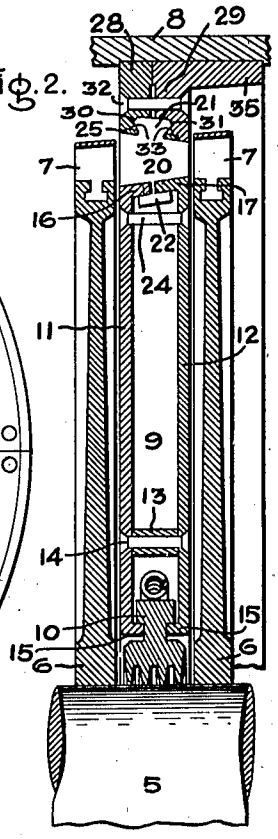
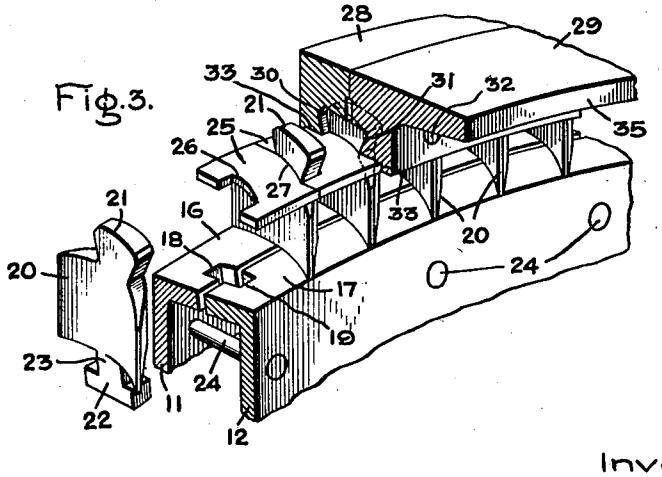


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

1,298,564. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed June 12, 1918. Serial No. 239,640.

To all whom it may concern:

Be it known that I, RICHARD H. RICE, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, 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 nozzle diaphragms for such machines.

The object of the invention is to provide an improved nozzle diaphragm which is simple and cheap to construct, and which is light in weight, but at the same time strong and rugged.

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

In the drawing Figure 1 is a side elevation of a nozzle diaphragm embodying my invention; Fig. 2 is a radial sectional view of a portion of a turbine, and Fig. 3 is a perspective view of a portion of the diaphragm.

As is well understood nozzle diaphragms are used in connection with elastic fluid turbines to divide the casing into stages and in Fig. 2, 5 indicates the shaft of an elastic fluid turbine upon which are mounted wheels 6, carrying bucket rings 7 at their peripheries. 8 indicates a turbine casing, and located in the casing between the wheels are diaphragms 9 which engage the casing at their peripheries and are provided adjacent the shaft with suitable packing means 10 which serves to prevent leakage between the shaft and the diaphragms. In Fig. 2 of the drawing only one diaphragm and the adjacent wheels are shown, but it will of course be understood that this is only a portion of a turbine and that in general a number of diaphragms are utilized.

Referring now particularly to the diaphragm structure, it comprises two inner disks or plates 11 and 12 which form the web portion of the diaphragm. The disks or plates 11 and 12 are spaced apart at their central portion by spacing blocks 13 through which pass fastening rivets 14 and they have inturned flanges 15 which serve to support the packing means 10.

At their peripheries the disks or plates 11 and 12 are provided with flanges 16 and 17 respectively in which are spaced complementary notches 18 and 19. The nozzle partitions comprise suitably shaped curved brackets 20 provided with heads 21 having undercut sides and bases 22 connected to the buckets 20 by shanks 23. The shanks 23 are located in notches 18 and 19, and the bases 22 project under flanges 16 and 17. This serves to space the inner ends of the nozzle partitions apart and to firmly anchor them to the peripheries of the disks 11 and 12. Disks 11 and 12 are fastened together at their peripheries by rivets 24. The outer ends of the nozzle partitions are spaced apart by spacing strips 25 which rest on the tops of the buckets 20 and are provided at one end with notches 26 to receive heads 21 and at the other end with rounded portions 27 which conform to the curvature of the faces of buckets 20. The heads 21 are held by an outer ring comprising two annular members 28 and 29 provided with undercut grooves 30 and 31 respectively, which together form an undercut slot to receive heads 21, and they are fastened together by rivets 32. The spacing strips 25 are comparatively thin and are of less width than the buckets 20 while the outer ring comprising members 28 and 29 is of substantially the same width as the buckets. In their inner faces the members 28 and 29 are provided with grooves 33 in which the spacing strips 25 are located. By this means the spacing strips 25 are firmly held in place between buckets 20 and members 28 and 29 as is obvious. The bottoms of the diaphragm passages are formed by the outer surfaces of flanges 16 and 17 and the tops of such passages are formed by the spacing strips 25 and the adjacent portion of members 28 and 29. The grooves 33 are sufficiently deep so that the surfaces of strips 25 and members 28 and 29 are flush so as to present a smooth surface for the passage of elastic fluid.

In the present instance the annular ring member 29 has a flange 35 formed integral with it which engages the shell of the turbine and serves as a spacer to space apart adjacent diaphragms. It will be understood however that a separate spacing ring may be used instead of the integral flange shown, if found desirable; or other suitable arrangement may be used.

With the above described diaphragm structure, it will be seen that a number of

parts can be stamped from sheet material and that all the surfaces requiring finishing can be finished prior to assembling. This latter is of particular importance in connection with the nozzle passages for after the diaphragm is assembled they are difficult to get at and hence the labor cost in such cases is high. Also the diaphragm can be readily assembled by ordinary labor, the assembling being principally riveting operations. Furthermore, the diaphragm is comparatively thin which results in a less over all length of the machine while at the same time owing to its box-like structure it is very stiff and rigid.

The diaphragm is shown in Fig. 1 as being formed in halves, being split in a horizontal plane as indicated at 36. This is a customary arrangement to facilitate assembling. The edges of the two diaphragm halves are reinforced and held in spaced relation by blocks 37 to which the disks 11 and 12 are fastened by rivets 38.

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 can be carried out by other means.

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

1. A diaphragm for elastic fluid turbines comprising two annular disks, nozzle partitions having their inner ends held between the peripheries of said disks, spacing strips for the outer ends of said partitions, and means for holding said spacing strips in position.

2. A diaphragm for elastic fluid turbines comprising two annular disks having inturned peripheral flanges, nozzle partitions having their inner ends held by said flanges, and a ring comprising two annular members fastened together for holding the outer ends of said nozzle partitions.

3. A diaphragm for elastic fluid turbines comprising two annular disks having inturned flanges at their central portions and at their peripheries, a packing means supported by said central flanges, nozzle partitions having their inner ends held by said outer flanges, said nozzle partitions having heads on their outer ends, spacing strips supported on said nozzle partitions and surrounding said heads, and a holding ring connected to said heads which serves to support the other ends of the nozzle partitions and hold the spacing strips in position.

4. A diaphragm for elastic fluid turbines, comprising two annular disks, nozzle partitions having their inner ends held between the peripheries of said disks, the outer ends of said partitions being provided with projecting heads, spacing strips of less width than said partitions which are supported on them between the heads, and a holding ring which embraces said heads and strips and serves to hold the strips in position and to support the outer ends of the nozzle partitions.

5. A diaphragm for elastic fluid turbines comprising two annular disks, nozzle partitions having their inner ends held between the peripheries of said disks, the outer ends of said partitions being provided with projecting heads having undercut sides, spacing strips of less width than said partitions which are supported on them between the heads, and a holding ring comprising two annular members which embrace between them the heads and spacing strips.

6. A diaphragm for elastic fluid turbines, comprising two annular disks, nozzle partitions having their inner ends held between the peripheries of said disks, the outer ends of said partitions being provided with projecting heads having undercut sides, spacing strips of less width than said partitions which are supported on them between the heads, and a holding ring comprising two annular members which embrace between them the heads and spacing strips, said members being formed with grooves which receive the spacing strips.

In witness whereof, I have hereunto set my hand this tenth day of June, 1918.

RICHARD H. RICE.