W. L. R. EMMET.

ELASTIC FLUID TURBINE.

APPLICATION FILED APR. 4, 1910.

1,006,637. Patented Oct. 24, 1911.

Fig. 1.

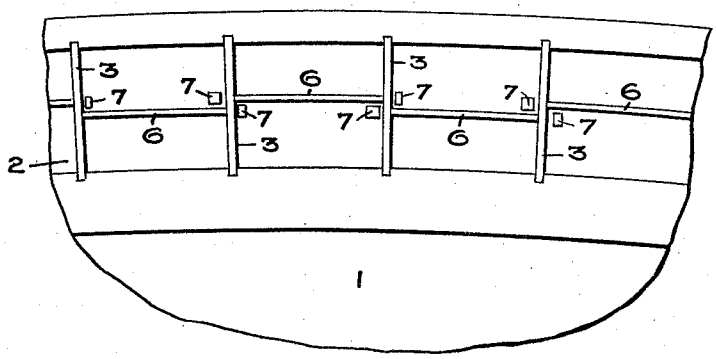


Fig. 2.

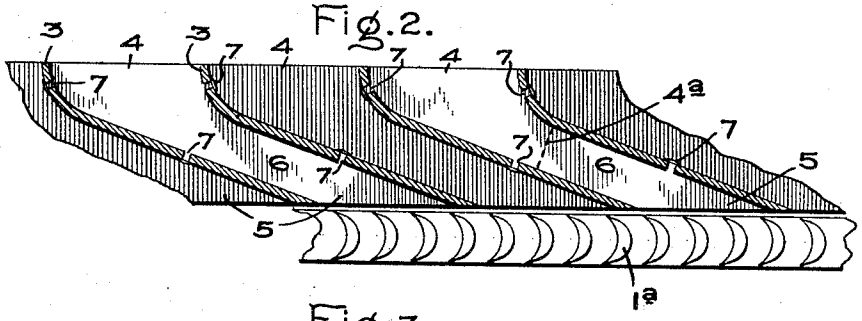


Fig. 3.

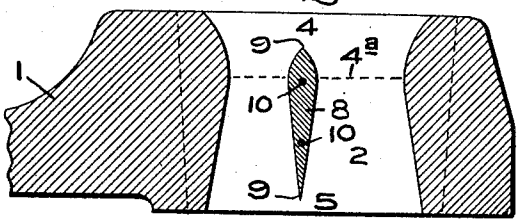
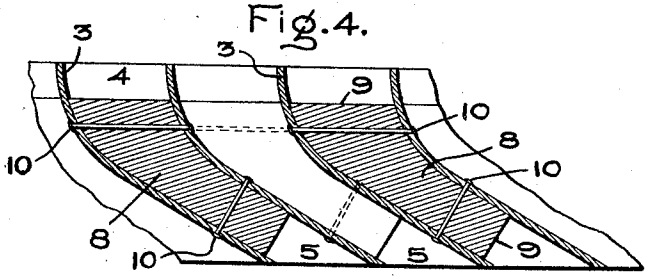


Fig. 4.



Witnesses:

Marcus L. Byng.

J. Ellis Glen.

Inventor:

William L. R. Emmet,

by Albert G. Davis

His Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM L. R. EMMET, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELASTIC-FLUID TURBINE.

1,006,637. Specification of Letters Patent. **Patented Oct. 24, 1911.**

Application filed April 4, 1910. Serial No. 553,182.

To all whom it may concern:

Be it known that I, WILLIAM L. R. EMMET, a citizen of the United States, residing at Schenectady, 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.

This invention relates to elastic fluid turbines, and has especial reference to the nozzles for conveying steam from one stage to the next in a multistage machine. In the low pressure stages of large turbines, and also in most or all of the stages of a low pressure turbine operating on the exhaust from a reciprocating engine, it often becomes desirable to use very high buckets, which necessitates nozzles of great radial depth. In making such nozzles it is desirable to use a small angle of inclination to the plane of rotation, also to pass large amounts of steam and consequently it is preferable to use thin division plates between the separate nozzles. But if the radial depth of the nozzles is considerable, these thin division plates may be a source of danger from breakage or loosening, and if this danger is overcome by thickening said plates there will be a loss of efficiency incident to such thickening, and also a loss of discharge area which may necessitate further increase of radial depth. To overcome this difficulty I put between the successive division plates one or more spacing partitions, running substantially the entire length of the nozzle, so that each nozzle is divided into two or more sections. These partitions not only serve to stiffen the division plates and hold them in place, thus preserving the proper shape of the nozzles, but they also assist in directing the steam in its passage through the nozzles, preventing the formation of objectionable eddies and cross currents. In many nozzles a certain degree of divergence is desirable from throat to discharge end, and in such cases the partitions can be used to obtain the desired effect, at the same time being so shaped that they will not interrupt the continuity of the stream at the point where it strikes the buckets.

My invention is illustrated in the accompanying drawing, in which—

Figure 1 is a top plan view of a portion of a diaphragm containing nozzles provided with my spacing partitions; Fig. 2 is a longitudinal section of the same, showing also a portion of the buckets to which the nozzles deliver the steam; Fig. 3 is a radial section of a nozzle showing a modified form of partition; and Fig. 4 is a longitudinal section of the same.

The diaphragm 1 is provided with a slot or opening 2 near its outer edge, running concentric with the turbine shaft. This opening is divided into nozzles by means of thin division plates 3 of sheet metal, which may be secured in place by having their edges embedded in the metal of the diaphragm at the time said diaphragm is cast. These plates are shaped, as usual, to give a bowl 4 at the receiving end, a throat 4^a, and a discharge end 5, delivering the steam to the buckets 1^a at a slight angle to the plane of revolution. In order to stiffen these plates I introduce one or more spacing partitions 6 between them, said partitions being of thin sheet metal and arranged preferably perpendicular to the division plates, as appears in Fig. 1. I prefer to secure these partitions in place by providing their edges with lugs 7 which are inserted through holes in the division plates and riveted down, as shown. This construction necessitates placing the partitions out of line with each other, so that they are alternately offset, as shown in Fig. 1. It is preferable, however, to locate them as near to the middle as possible, if only one set is used. If more than one set is desired, they can be arranged to divide the nozzles into as nearly equal sections as possible: though in some cases it may be found desirable to vary the relative sizes of said sections. In any event, these partitions, running the entire length of the nozzles, serve to support and stiffen the division plates and also to insure the direct flow of the steam to the buckets and its delivery in practically equal amounts along the entire length of the bucket.

In the modification shown in Figs. 3 and 4, the spacing partition 8 does not extend quite the entire length of the nozzle, but is somewhat thicker than those shown in Figs. 1 and 2, and is thinned off at its upper and lower ends to a sharp edge 9, so as to offer no obstruction to the inflowing steam, and also to deliver it in an unbroken stream to the buckets. This shape of the partition

also assists in giving the proper divergence to the nozzle, as plainly appears in Fig. 3. These thicker partitions can be readily fastened in place by through rivets 10, which are headed down on the division plates after passing through them and the partitions. With these partitions, as with the thin ones, it is necessary to stagger them, as shown in Fig. 1.

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. In an elastic fluid turbine, the combination with a nozzle, of inclined division plates and one or more individual longitudinal partition plates that are separately secured to two adjacent division plates.

2. In an elastic fluid turbine, the combination with a nozzle provided with thin division plates, of one or more partitions located between said plates and arranged in staggered relation.

3. In an elastic fluid turbine, the combination with a nozzle provided with thin division plates, of one or more partitions riveted to said plates, and staggered.

4. In an elastic fluid turbine, the combination with a nozzle provided with thin division plates, of one or more individual partitions located between adjacent plates and extending the greater part of the length of said plates, and independent securing means for each partition.

5. In an elastic fluid turbine, the combination with a nozzle provided with thin radially disposed division plates, of one or more individual circumferentially extending partitions secured to adjacent plates, and tapered to a thin edge at each end.

6. In a nozzle for an elastic fluid turbine, the combination of a support containing an orifice, radially disposed division plates mounted therein and having a small angle of inclination to the plane of rotation of the wheel receiving the fluid, partitions located between each two division plates and extending in a plane perpendicular to said plane of rotation, and means for securing the partitions in staggered relation one to the other.

In witness whereof, I have hereunto set my hand this first day of April, 1910.

WILLIAM L. R. EMMET.

Witnesses:
B. B. HULL,
HELEN ORFORD.