O. D. H. BENTLEY.

ELASTIC FLUID TURBINE.

APPLICATION FILED JUNE 24, 1912.

1,042,871. Patented Oct. 29, 1912.

Fig. 1.

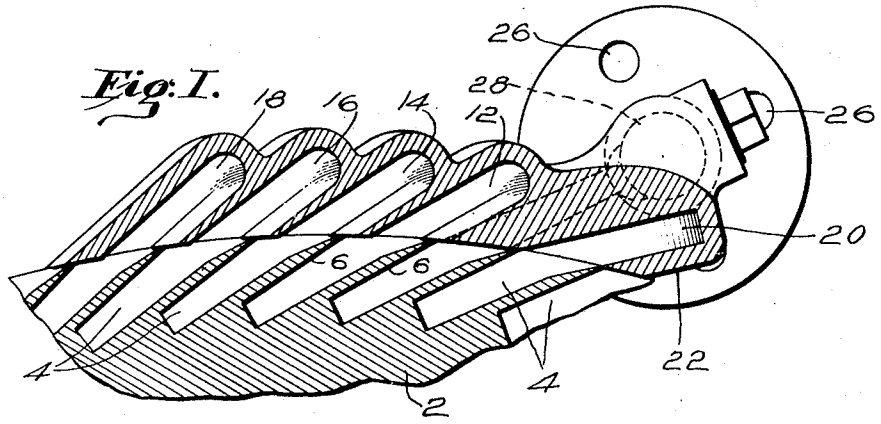
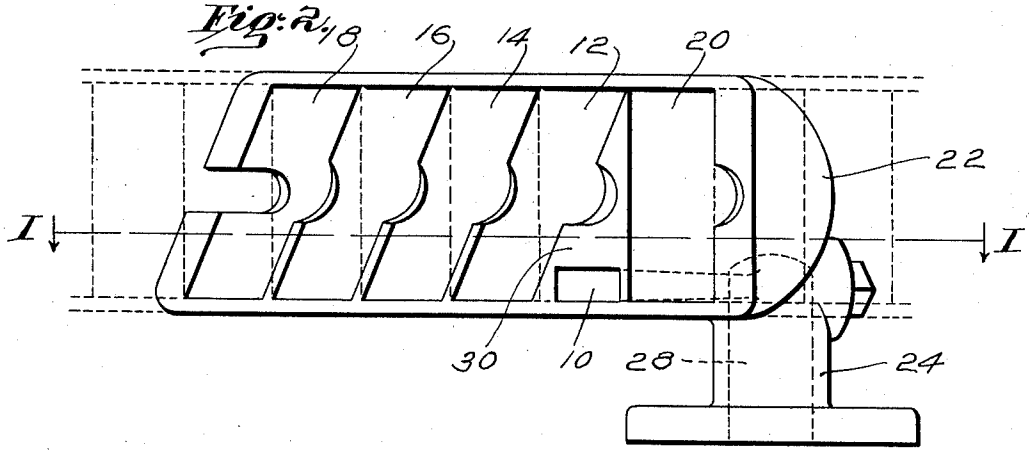


Fig. 2.



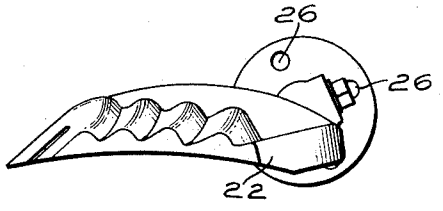


Fig. 3.

Witnesses:
Roswell F. Hatch.
George C. Stubbins.

Inventor:
Oliver D. H. Bentley
by his Attorneys
Phillips Van Orman Fish

UNITED STATES PATENT OFFICE.

OLIVER D. H. BENTLEY, OF HYDE PARK, BOSTON, MASSACHUSETTS, ASSIGNOR TO B. F. STURTEVANT COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ELASTIC-FLUID TURBINE.

1,042,871. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed June 24, 1912. Serial No. 705,356.

To all whom it may concern:

Be it known that I, OLIVER D. H. BENTLEY, a citizen of the United States, residing at Hyde Park, Boston, in the State of Massachusetts, have invented certain new and useful Improvements in Elastic-Fluid Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to elastic-fluid turbines, and more particularly that type of elastic-fluid turbine, commonly known as the Stumpf type of turbine, in which the elastic fluid is delivered at high velocity into the rotor buckets from which it is discharged into stationary reversing chambers which re-direct the steam into the same set of rotor buckets.

The object of the present invention is to reorganize and improve the construction and arrangement of the stationary reversing chambers, and the present invention is intended more particularly as an improvement upon the arrangement of stationary reversing chambers disclosed in my prior Patent No. 994,838, dated December 28, 1909.

With the above object in view, the present invention consists in the improvements in elastic-fluid turbines hereinafter described and particularly pointed out in the claims.

In the accompanying drawings which illustrate the preferred embodiment of the present invention, Figure 1 is a view taken in section on the line 1—1 of Fig. 2; Fig. 2 is a view of the reversing chamber and nozzle segment looking into the open mouths of the reversing chambers, the outlines of the rotor buckets being indicated in dotted lines; and Fig. 3 is a perspective view of the reversing chamber and nozzle segment.

Referring to the drawings, 2 indicates a fragment of the rotor wheel, preferably formed of a single steel forging, in the periphery of which are milled semi-cylindrical or U-shaped buckets 4. The flat sides of the buckets 4 are inclined to intersecting radii of the rotor, but are parallel to the axis of the rotor. The partition walls 6 of the rotor buckets are beveled at their edges to offer a minimum resistance to the inflowing steam.

The steam is delivered at high velocity into one side of the rotor buckets by an expanding nozzle 10. Forward of the nozzle 10, in the direction of rotation of the rotor wheel, are four U-shaped reversing chambers 12, 14, 16, and 18. Back of the nozzle 10, relatively to the direction of rotation of the rotor wheel, is a supplemental U-shaped reversing chamber 20. The steam flowing at high velocity from the nozzle 10 into the semi-cylindrical reversing buckets 4 of the rotor is reversed in the direction of flow through an angle of 180 degrees and is delivered at a high, albeit a somewhat reduced, velocity into the receiving ends of the reversing chambers. The steam is reversed in the direction of flow through an angle of 180 degrees in the reversing chambers and is re-directed from the discharge ends of the reversing chambers into the rotor buckets, which again reverse the steam and deliver it to the stator chambers, from which it is again re-directed to the rotor. The steam in this manner is re-directed a plurality of times into the rotor buckets and its velocity is reduced in a plurality of velocity stages as it impels the moving rotor wheel, until it is finally discharged therefrom beyond the last reversing chamber 18 into the exhaust space surrounding the rotor wheel, as will be readily understood by one skilled in this art. The reversing chambers 12, 14, 16, 18 and 20 are all substantially semi-cylindrical, open mouthed chambers and are first milled and then shaped by hand in a one piece metal block 22, which, for convenience may be referred to as the reversing chamber and nozzle segment. The segment 22 has its inner face concave to fit over the rotor wheel and is supported by means of a flanged bracket 24 upon a steam chest at the side of the rotor wheel. The bolt holes 26 are provided for bolting the segment 22 in place. The bracket 24 is provided with a steam conducting passage 28 through which steam is supplied to the expanding nozzle 10.

The flat walls of all the reversing chambers 12, 14, 16, 18 and 20 are inclined to intersecting radii of the rotor wheel at approximately the same angles as the rotor buckets 4. The flat walls of the supplemental reversing chamber 20 like the rotor buckets 6 are parallel to the axis of the rotor. The flat walls of the reversing chambers 12, 14, 16 and 18 are, however, inclined

to the axis of the rotor so that these chambers, as shown in Fig. 2, are inclined to a line drawn longitudinally through the series of chambers. All of the reversing chambers have the same width, measured peripherally of the rotor wheel, as the rotor buckets 4. The reversing chambers 12, 14, 16 and 18 are inclined at such an angle to the axis of the rotor that when the receiving end of one of these reversing chambers registers with the discharge end of one of the rotor buckets, the discharge end of the reversing chamber will register with the receiving end of the next forward rotor bucket, as indicated by the dotted line in Fig. 2. The effect of the inclination of the buckets is to carry the steam forward along the periphery of the rotor and contributes to the efficient operation of the turbine. Since the supplemental reversing chamber 20 is inclined relatively to the other reversing chambers, a substantially triangular flat surface 30 is left on the face of the segment 22 between the chambers 12 and 20. The receiving ends of the reversing chambers 12 and 20 are in close proximity being separated only by the thin end of the triangle 30, while the discharge ends of these reversing chambers are separated by the base portion of the triangle 30, through which passes the expanding nozzle 10. It is to be noted that, whereas in the construction shown in my prior patent, referred to above, reversed steam is discharged by a small reversing chamber *g* adjacent the nozzle *f* in an inner layer concentric with the steam from the nozzle *f*, in the present construction the steam from the two reversing chambers 12 and 20, which are adjacent to the nozzle 10, is discharged at the edge of the segment either in front or back of the nozzle in the same radial plane as the nozzle, and thus the mixing of two streams of steam flowing in concentric layers of different velocities is avoided.

The present invention is not limited to the preferred embodiment illustrated and described, but may be embodied in other constructions within the scope of the invention as defined by the following claims.

I claim—

1. An elastic-fluid turbine having, in combination, a rotor having reversing buckets, and a stator comprising an expanding nozzle for delivering the elastic-fluid at high velocity to the rotor buckets, and two reversing chambers for receiving the fluid from the rotor buckets and re-directing it to the same set of rotor buckets, said reversing chambers having their receiving ends in proximity and their discharge ends separated and located forward and back of the nozzle respectively, substantially as described.

2. An elastic-fluid turbine having, in combination, a rotor having reversing buckets, and a stator comprising a plurality of reversing chambers for receiving the elastic-fluid from the rotor buckets and redirecting it to the same set of rotor buckets, and an expanding nozzle with its orifice located between the discharge ends of two adjacent reversing chambers, substantially as described.

3. An elastic-fluid turbine having, in combination, a rotor having reversing buckets, and a reversing chamber and nozzle segment comprising an expanding nozzle, a supplemental reversing chamber behind the nozzle opening, and a reversing chamber in advance of the nozzle opening, the receiving ends of said chambers lying next adjacent to each other and the discharge ends of said chambers located at the edge of the segment, the nozzle opening being located between the discharge ends of the chambers, substantially as described.

OLIVER D. H. BENTLEY.

Witnesses:

HORACE VAN EVEREN,

GEORGE E. STEBBINS.