No. 824,521. PATENTED JUNE 26, 1906.

K. AHLQUIST.

BUCKET FOR ELASTIC FLUID TURBINES.

APPLICATION FILED NOV. 28, 1905.

Fig. 1.

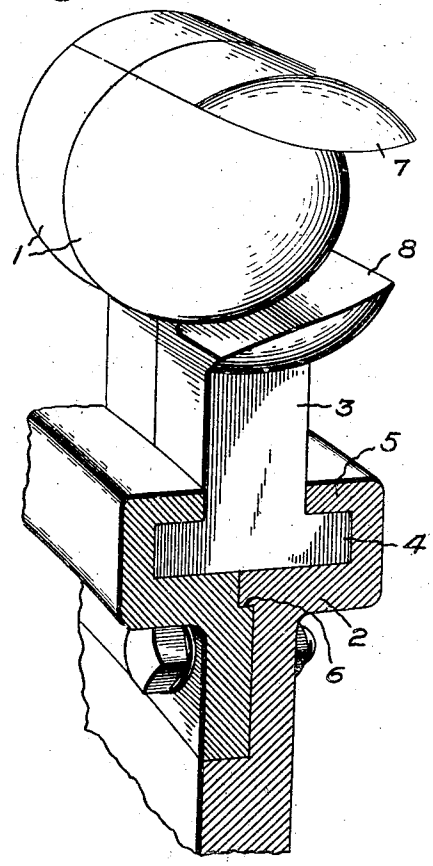


Fig. 2.

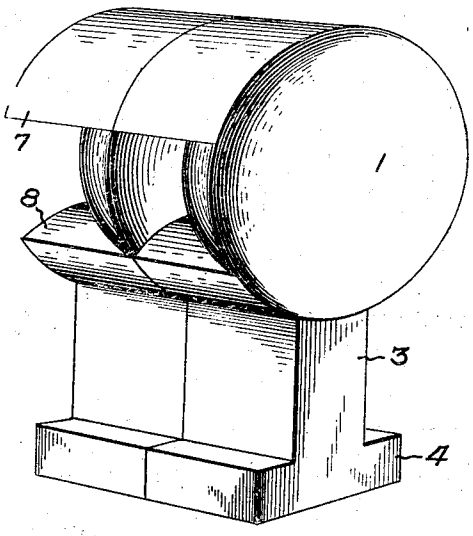


Fig. 4.

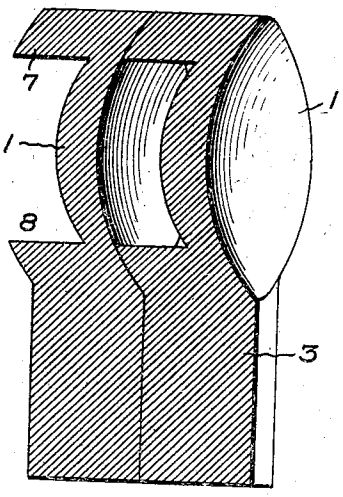


Fig. 3.

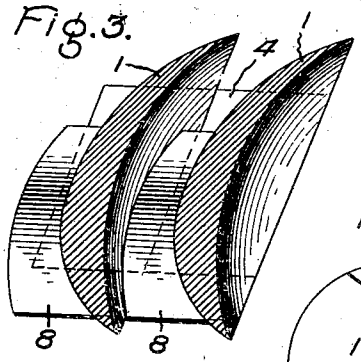
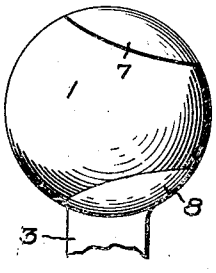


Fig. 5.



Witnesses:

Benjamin B. Hines.

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Atty

UNITED STATES PATENT OFFICE.

KARL AHLQUIST, OF RUGBY, ENGLAND, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

BUCKET FOR ELASTIC-FLUID TURBINES.

No. 824,521. Specification of Letters Patent. Patented June 26, 1906.

Application filed November 28, 1905. Serial No. 289,452.

To all whom it may concern:

Be it known that I, KARL AHLQUIST, a subject of the King of Sweden, residing at Sunnyside, Clifton Road, Rugby, England, have invented certain new and useful Improvements in Buckets for Elastic-Fluid Turbines, of which the following is a specification.

The present invention relates to the construction of buckets for elastic-fluid turbines, more especially those of the axial and radial flow types, and has for its object to provide an improved form of bucket whereby such turbines may be operated with greater efficiency than heretofore.

In order to enable the maximum amount of energy to be abstracted from the fluid in elastic-fluid turbines, it is necessary that the bucket-angles on the discharge side shall be small. In turbines as usually constructed this condition cannot be fulfilled on account of the difficulty in providing sufficient outlet area for the fluid. It has therefore been found necessary to employ buckets having a relatively large angle of delivery.

According to my invention the above-mentioned difficulty is obviated by providing a bucket in which the steam or other elastic fluid is caused to leave it with as small an absolute velocity as possible, and for this purpose I form the bucket of such a shape that the fluid stream admitted to the bucket leaves everywhere approximately at the same angle to the axis, this angle being very small. For example, this result may be obtained by making each bucket in a row of a spherical or cup shape.

For a fuller and detailed description of my invention attention is directed to the description and claims appended thereto.

In the accompanying drawings, representing one embodiment of the invention, Figure 1 is a rear perspective view of two adjacent turbine-buckets, together with a support therefor. Fig. 2 is a front perspective view of the same buckets. Fig. 3 is a cross-section through the center of the buckets. Fig. 4 is a longitudinal section through the buckets, and Fig. 5 is a partial rear elevation of one of the buckets.

I construct the vane or bucket spaces by providing a number of cup-shaped buckets 1, which are nested or arranged one within the other at a suitable distance apart around the turbine-wheel or other support 2. Each bucket is provided with a shank 3, having outwardly-extending shoulders 4 formed thereon. One of these shoulders engages with an annular flange 5, formed integral with the support, and the other engages with a removable annular flange bolted or otherwise secured to the support. Between the removable annular flange and the support is a shoulder 6, which takes the centrifugal strains off of the securing devices.

In order to form a fluid-space between the buckets, the back of each bucket is provided with upper and lower distance pieces or separators 7 and 8, formed integral therewith, the former being integral with the back or convex portion of the bucket, and the latter with the shank. The ends of these separators are convex, so as to make a good fit with the concave or working face of the adjacent bucket. In addition to acting as separators, the opposed faces of these distance-pieces are divergent, and so shaped as to form, with the bucket-walls, an expanding passage from the inlet to the exit. In order to provide a lesser exit than entrance-angle for the fluid, assuming that each bucket has its interior and exterior surfaces of the form of two concentric hemispheres, it is turned or twisted somewhat with respect to its shank, so that a plane at right angles to the axis of the wheel or support containing the centers of the hemispheres instead of dividing the buckets symmetrically will divide them unsymmetrically, and radial planes containing the circular edge of each bucket instead of passing through the axis of the wheel will cut the said axis at an angle. Instead, however, of the back or convex surface of each bucket being hemispherical it may be given a paraboloidal form, the portion of the curve on the exit side of the axis of the paraboloid being longer than on the inlet side.

The type of bucket shown is intended primarily for use in a multistage machine having a single row of wheel-buckets per stage. When applied to a multistage machine having more than a single row of wheel-buckets per stage, it would generally be used only on the low-pressure end, since it is with these buckets that the greatest difficulty is experienced in extracting the proper amount of energy from the steam.

In accordance with the provisions of the patent statutes I have described the princi-

ple 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 a turbine, the combination of a support, individual cup-shaped buckets carried thereby, and diverging distance-pieces between the buckets which are so shaped and positioned as to form with the buckets a gradually-expanding fluid-passage.

2. In a turbine, the combination of a support, a plurality of independent cup-shaped buckets carried thereby, and distance-pieces formed integral with the buckets, which are provided with convex end surfaces arranged to fit the concave surface of the adjacent bucket.

3. In a turbine, the combination of a support, a plurality of independent cup-shaped buckets, a shank for each bucket that is secured to the support, a distance-piece carried by the back of each bucket and arranged to fit the concave surface of the adjacent bucket, and a second distance-piece carried by the shank of each bucket that also fits the concave surface of the adjacent bucket.

4. In a turbine, the combination of a support, a plurality of independent cup-shaped buckets, a shank for each bucket, so positioned with respect to the body of the bucket that the entrance-angle of the bucket is greater than the exit-angle, and pieces between the buckets which serve to space the buckets apart and are so shaped as to form a part of the expanding passage for the fluid.

5. In a turbine, the combination of a support, a plurality of cup-shaped buckets carried thereby, shanks for the buckets, a shoulder between the support and the shanks for securing the buckets in place, and diverging distance-pieces carried by each bucket, and arranged to fit the concave surface of the adjacent bucket.

In witness whereof I have hereunto set my hand this 15th day of November, 1905.

KARL AHLQUIST.

Witnesses:
ERNEST HARKER,
SIDNEY GEO. WEBB