No. 782,132. PATENTED FEB. 7, 1905.

F. HODGKINSON.

ELASTIC FLUID TURBINE.

APPLICATION FILED JUNE 9, 1904.

Fig. 1.

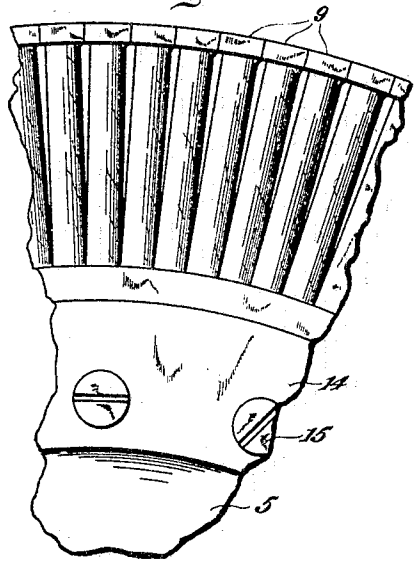



Fig. 2.

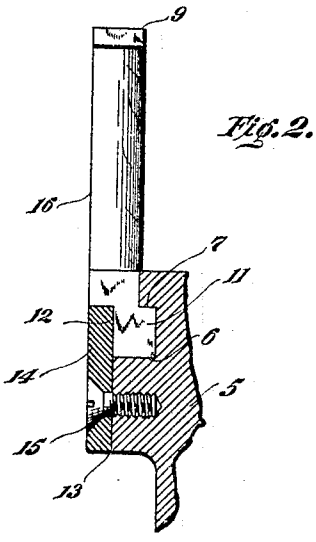
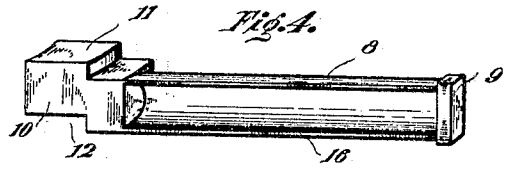



Fig. 3.




Fig. 4.




Witnesses
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No. 782,132. Patented February 7, 1905.

# UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

## ELASTIC-FLUID TURBINE.

SPECIFICATION forming part of Letters Patent No. 782,132, dated February 7, 1905.

Application filed June 9, 1904. Serial No. 211,881.

*To all whom it may concern:*

Be it known that I, FRANCIS HODGKINSON, a subject of the King of Great Britain and Ireland, residing at Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to elastic-fluid turbines, and more particularly to the rotatable members of such turbines.

The object of this invention is to provide a rotatable turbine member having blades or buckets disposed in one or more radial sets, with simple, inexpensive, and efficient means for so locating and supporting the blades or buckets or those pertaining to either or both of the end sets, if there be more than one, that the outer edges shall be in substantially the same plane as the end of the wheel or drum. These and other objects are attained by means illustrated in the accompanying drawings, throughout which corresponding elements are denoted by like characters.

Figure 1 is a fragmentary view, in end elevation, of a bucket wheel or drum embodying this invention. Fig. 2 is a sectional view of a fragment of a wheel or drum, showing a bucket in side elevation. Fig. 3 is a cross-sectional view of a plurality of buckets as they appear assembled, and Fig. 4 is a perspective view of one of the buckets.

One end or each end of the wheel or drum 5 is cut away or otherwise formed to provide a main cylindrical supporting-surface 6 and an annular flange 7, that overhangs said main supporting-surface.

The blades or buckets 8, which may be of any desired contour in cross-section, are preferably provided with shrouds 9, of rectangular cross-section, formed integral with the buckets. A base 10, that may also be formed integral with the buckets, is provided with a face adapted to make contact with and rest upon main supporting-surface 6 and with an offset portion 11, adapted to fit into the space beneath the overhanging portion 7. The side of the base portion of the bucket that is opposite the offset 11 is cut under or rabbeted, as shown at 12, to the plane of the end face 13 of the bucket wheel or drum. After the buckets have been assembled in the wheel or drum, with their shrouds abutting one against the other, an annular plate 14, formed for that purpose, is secured against the end face 13 of the wheel and against the faces 12 of the bases 10, preferably by means of screws 15, threaded into the end face of the wheel. The edges 16 of the assembled buckets lie in the plane of the end face of the wheel or drum, formed by the annular plate 14, and it will therefore be seen that these edges may be brought into close proximity to the stationary vanes or nozzles which may be utilized in the turbine. It will be seen that these buckets, with their shrouds and bases, may be stamped out or drop-forged, as may be found desirable, and that the construction here illustrated and described forms a comparatively simple and relatively inexpensive method of forming the buckets and accomplishing the objects sought in a most efficient manner.

It will be understood that this invention is not limited to the exact construction and form of bucket here illustrated, since almost any form desired may be utilized.

As I have already stated, the improvements herein set forth for locating and supporting the blades and buckets may be utilized at either the receiving end or discharging end, or at both ends, of the turbine wheel or drum, as may be desired.

Having thus described my invention, I claim—

1. In an elastic-fluid turbine, a wheel or drum having a cylindrical blade-supporting surface, an annular portion overhanging said surface, a series of buckets or blades formed with abutting shrouds at their outer ends and with base portions resting on said supporting-surface and projecting beneath said overhanging portion, and an annular confining member secured to said drum or wheel to anchor said buckets thereto.

2. In an elastic-fluid turbine, a wheel or drum having a cylindrical blade-supporting surface, an annular portion overhanging said surface, a series of buckets or blades formed with

abutting shrouds at their outer ends and with base portions resting on said supporting-surface and projecting beneath said overhanging portion, and an annular confining-plate secured to said wheel to anchor said buckets or blades thereto.

3. In an elastic-fluid turbine, an element having a blade-supporting portion formed with a cylindrical supporting-surface, an annular portion overhanging said surface, a series of buckets or blades formed with base portions resting on said supporting-surface and projecting beneath said overhanging portion, and an annular confining member secured to said element to anchor said buckets or blades thereto.

4. In an elastic-fluid turbine, a wheel or drum having a cylindrical blade-supporting surface, and an annular portion overhanging said surface, a series of buckets or blades formed with abutting shrouds at their outer ends and with base portions resting on said supporting-surface and projecting beneath said overhanging portion; said base portion overhanging the end face of said wheel or drum, and an annular plate secured to said end face whereby said buckets or blades are anchored to said wheel or drum.

5. In an elastic-fluid turbine, a rotatable element having a blade-supporting portion and an annular portion overhanging said blade-supporting portion, a series of buckets or blades formed with abutting shrouds at their outer ends and with base portions resting on said blade-supporting portion and projecting beneath said overhanging portion; the outer faces of said base portions being undercut or rabbeted, and an annulus secured to the end face of said element and engaging the undercut faces of said base portions to anchor said buckets or blades to said element.

6. In an elastic-fluid turbine, a wheel or drum having a cylindrical surface of relatively small diameter at one end and an annular flange overhanging said surface, a set of blades or buckets having faces that project between said surface and said flange and have rabbeted outer faces and an annular plate that is fastened to the end of the wheel or drum and projects over the rabbeted portions of said bases.

In testimony whereof I have hereunto subscribed my name this 20th day of May, 1904.

FRANCIS HODGKINSON.

Witnesses:
JNO. S. GREEN,
BIRNEY HINES.