No. 848,587. PATENTED MAR. 26, 1907.

C. W. DAKE.

ELASTIC FLUID TURBINE.

APPLICATION FILED MAR. 22, 1906.

Fig. 1.

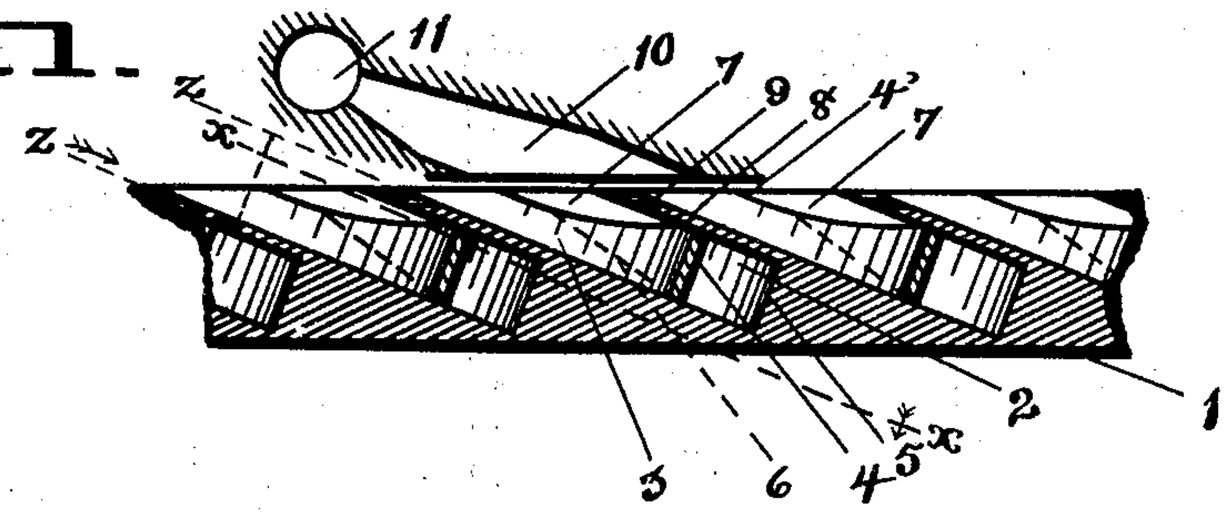


Fig. 2.

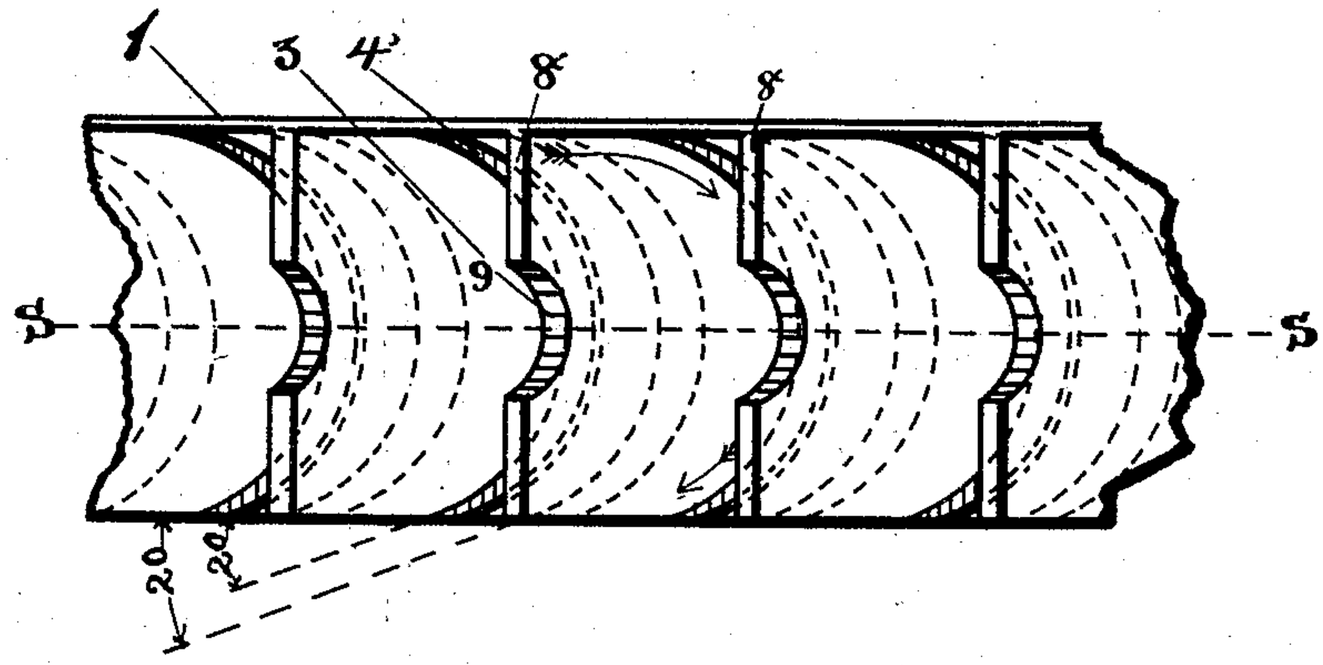


Fig. 3.

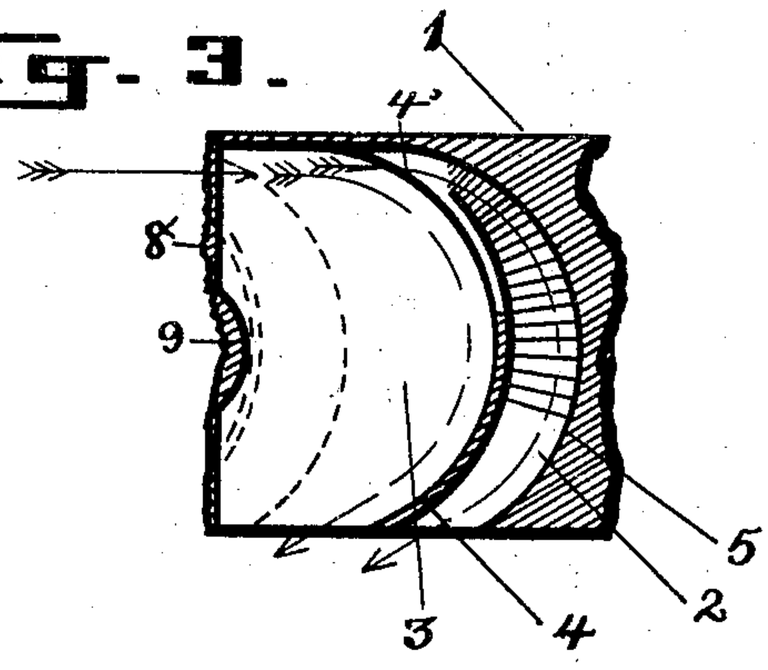
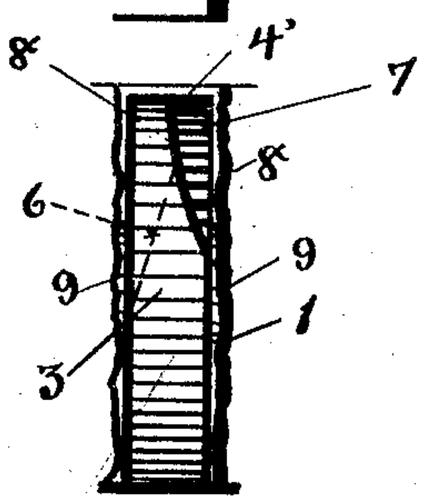


Fig. 4.



WITNESSES:

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ELASTIC-FLUID TURBINE.

No. 848,587. Specification of Letters Patent. Patented March 26, 1907.

Application filed March 22, 1906. Serial No. 307,456.

To all whom it may concern:

Be it known that I, CHARLES W. DAKE, a citizen of the United States, residing at Grand Rapids, in the county of Kent, State of Michigan, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to improvements in elastic-fluid turbine-engines; and it relates more particularly to improvements in the conformation of buckets.

The objects of the invention are, first, to increase the bucket capacity within a specified area, and, second, to provide an improved construction and arrangement of buckets for elastic-fluid turbines in which the energy of the jets is utilized to the fullest degree in actuating the turbine with the minimum loss on account of friction of fluid in the passages and parts.

Further objects and objects relating to the details of construction will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

The invention is clearly defined, and pointed out in the claims.

Portions of an elastic-fluid turbine illustrating the features of my invention are clearly illustrated in the accompanying drawing, forming a part of this specification, in which—

Figure 1 is a detailed sectional view through a nozzle and row of buckets embodying the features of my invention, taken on a line corresponding to line S S of Fig. 2. Fig. 2 is a plan view looking at the faces of said series of buckets, the nozzle being omitted. Fig. 3 is a detail sectional view of one of the composite buckets, taken on line *x x* of Fig. 1; and Fig. 4 is a detailed view of a single bucket as embraced between the lines Z and Z of Fig. 1 looking directly into the mouth of the bucket, as indicated by the little arrow on the said Fig. 1.

In the drawings similar numerals of reference refer to similar parts throughout the several views.

A portion of the turbine-disk 1 is illustrated with the U-shaped recurved buckets 2, machined into the side thereof by suitable milling-tools. So far as this invention is concerned, however, it is immaterial how these buckets are formed. A secondary bucket 3 is formed by the dividing-wall 4, which is arranged within the bucket 2, corresponding in contour to the bottom thereof, and it is separated from the curved bottom wall 5 of the said bucket 2 in about the proportion illustrated in Fig. 1.

A portion of wall 4 is cut away, as at 4′, to permit the passage of steam or other expansive fluid past the said wall 4 into the bottom of the bucket 2. A passage 7 is thus formed at the intake side of the bucket 2, where the fluid passes behind the curved wall 4 of said bucket 3. The intake-passage is somewhat contracted; but the side of the bucket is formed at an angle, as indicated by the dotted line 6, (see Figs. 1 and 4,) so that the fluid can expand to the full width of the bucket by the time it reaches the bottom thereof, and thus secure the best effect of the impact. It will thus be seen that the buckets 2 and 3 really constitute a composite single bucket provided with two bottom walls for increasing the efficiency of the jet of steam or elastic fluid and increasing the surfaces on which it reacts in driving the turbine-disk within the space usually occupied by a single bucket. These composite buckets are separated from each other by the dividing-walls 8, the walls 8 having circular notches at their center which accommodate the shaft or shank of the milling-tool used in forming the same, that being, so far as I am able to discover, the best method of forming the main parts of these buckets, although they might be formed otherwise so long as the contours I have described are preserved. I have shown a nozzle-bowl 11 and nozzle 10 in a conventional way, as my invention does not pertain to the nozzle construction. I have shown my composite buckets as provided with two curved walls; but it is perfectly clear that that number could be increased to suit different circumstances.

In the drawings the long curved arrows show the direction of the fluid through the buckets. The same is delivered at a point corresponding to the upper side of Fig. 3 in the direction of the long straight arrow appearing there, and as the jet of fluid passes into the buckets it is divided, one part reacting against the wall 5 of the main bucket 2 and another part reacting against the wall 4 of the inner bucket 3. The steam or elastic fluid is thus provided with an abundance of surface for reaction, and its full force is utilized in close proximity to the mouth of the nozzle. The machine discharges outwardly,

as indicated in the said Fig. 3. The bucket, it will be observed, can be formed either on the periphery or on the side of a turbine-disk, and the advantages of my invention can be substantially secured. I prefer the face of the wheel.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an elastic-fluid turbine, the combination of a turbine disk or wheel 1, with a series of composite buckets arranged therein, each bucket consisting of a main bucket 2, with a curved wall 5, and an auxiliary bucket 3 within the same, formed by the curved wall or partition 4, the said wall 4 being cut away at 4′ to form a passage for fluid against the wall 5 of the main bucket 2, the passage expanding at 6; and a nozzle arranged to deliver elastic fluid under pressure to impact and react on both of said walls 4 and 5, as specified.

2. In an elastic-fluid turbine, the combination of a turbine disk or wheel with a series of composite buckets arranged therein, each bucket consisting of a main curved wall and an auxiliary substantially parallel curved wall within the same, corresponding in contour to the said main wall, with passages formed through the said auxiliary wall; and a nozzle arranged to deliver fluid into the said composite buckets successively, whereby the fluid will be divided and impact and react upon the series of walls of said composite buckets, as specified.

3. In an elastic-fluid turbine, the combination of a turbine disk or wheel; a bucket with a recurved wall, arranged therein, with an annular auxiliary bucket arranged within the said main bucket and having its inlet within the walls of the main bucket, with passages formed to deliver into both the main and auxiliary buckets from substantially the same point; and a nozzle arranged to deliver elastic fluid under pressure to secure its impact and reaction on the curved walls of said buckets, as specified.

4. In an elastic-fluid turbine, a bucket of the recurved type, with a plurality of similar walls, with inlet-passages thereto connecting within the wall of the main bucket; and a nozzle arranged to deliver elastic fluid to impact and react on the said walls, as specified.

5. In an elastic-fluid turbine, a bucket of the recurved type, with a plurality of similar walls, with inlet-passages thereto connecting within the wall of the main bucket, the same being arranged to receive a jet of elastic fluid, coacting as specified.

6. In an elastic-fluid turbine, the combination of a turbine-disk with main buckets of the recurved type with an annular auxiliary bucket within each of the said main buckets, the said auxiliary buckets having their inlets within the walls of the said main buckets with a passage or passages to deliver the fluid to both the main and the auxiliary buckets from substantially the same point, to secure its impact and reaction on the curved walls thereof, as specified.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

CHARLES W. DAKE. [L. S.]

Witnesses:
FRED L. CHAPPELL,
CLARA A. SABIN.