2 Sheets—Sheet 1.

E. R. STILWELL.

TURBINE WATER-WHEELS.

No. 195,855. Patented Oct. 2, 1877.

Fig. 1

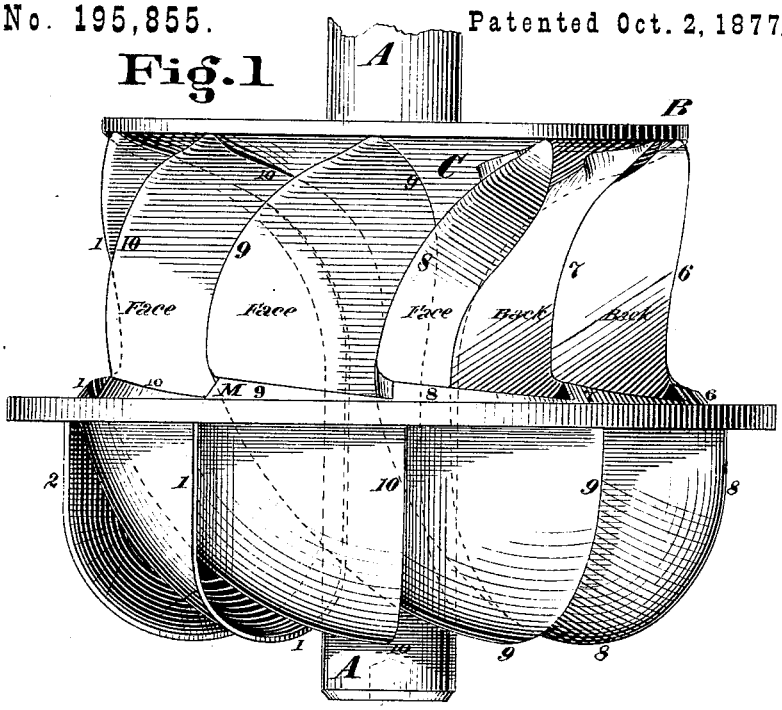
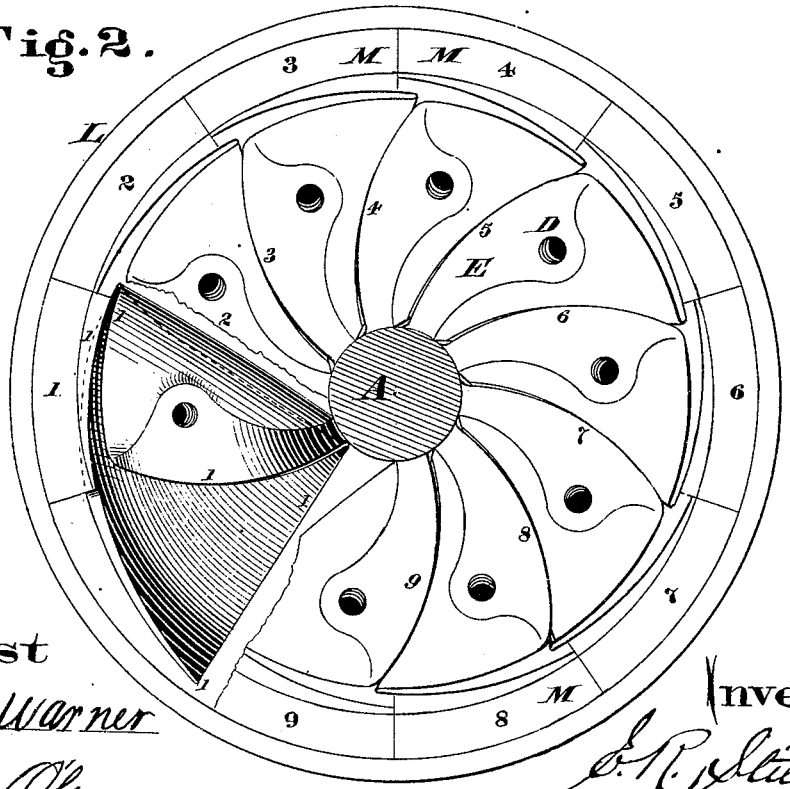


Fig. 2.



Attest

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2 Sheets—Sheet 2.

E. R. STILWELL.

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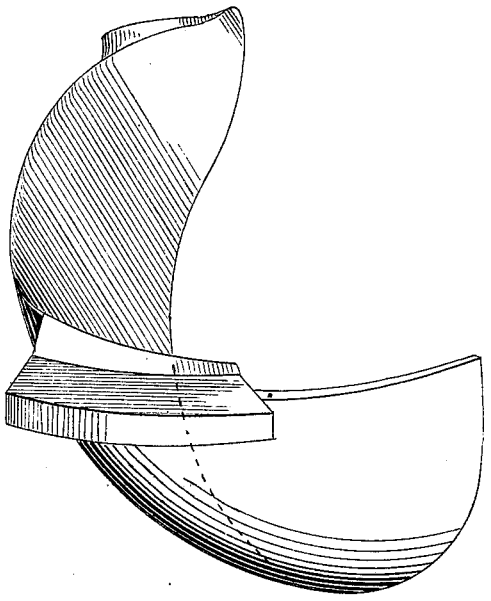
Fig. 3.



Attest.
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Attorneys

UNITED STATES PATENT OFFICE.

EDWIN R. STILWELL, OF DAYTON, OHIO.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **195,855**, dated October 2, 1877; application filed January 9, 1877.

To all whom it may concern:

Be it known that I, EDWIN R. STILWELL, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Turbine Water-Wheels, of which the following is a specification:

My invention relates to an improved method of constructing water-wheels, the first object of which is to occupy the entire area of the wheel from the shaft outward with buckets, so as to employ a column of water approximating in area the net area of the wheel.

The second object of my invention is to increase the useful effect of the water employed on the wheel.

There are three important features of my invention, the first of which relates to the inclination to a vertical line of that part of the bucket-face opposite the chutes, and with the curve of the bucket arranged to shorten the line of travel of water striking the upper line of the bucket. The second feature consists in an outward or downward and rearward extension of the buckets below the chute, thereby increasing the discharge-area of the buckets, in the manner hereinafter explained. The third feature is in combining with the Jonval the Fourneyron or outward system of discharging the water from the wheel, all of which will be fully explained in the following specifications and drawings, making a part of the same.

Referring to the drawing, Figure 1 is an elevation of my invention. Fig. 2 is a plan view of the same. Fig. 3 is a perspective view of one of the buckets.

A represents the wheel-shaft; B, a crown-plate of the preferred form, having a conical or curved hub, C. The figures from 1 to 10 represent the buckets, which are preferably cast in individual pieces, attached to the wheel by bolts, D representing a place for a screw-bolt on the top of the bucket, projecting downward through the crown-plate. E represents a face, which conforms and fits in exterior to the shape of the crown-plate from the exterior inward to the shaft.

L represents an annular ring surrounding the buckets, and M represents a flange cast upon the upper and outer edge of that part of the bucket lying below the bucket-faces. The flanges M of the several buckets are segmental arcs of a circle, and form, when put together, an annular flange, and are hooped or banded together by means of the ring L, the buckets also being supported at the crown-plate and abutting the shaft A, as shown in Fig. 2. They are firmly secured and held in position by the hoop or band L, which may be shrunk on or applied in any other way. The dotted lines in Fig. 1 show the rearward inclination and relative position of the buckets, each of which is inclined to overlap portions of two buckets next in rear. In Fig. 2, bucket 1 is shown in plan, bucket 10 being broken away and portions of bucket 9, thereby showing their relative relations. The remaining buckets are shown in plan above the hoop L.

This wheel is designed to be used in any well-known case common to turbine water-wheels. That portion of the buckets marked "Face" lies within the chute-area to receive the impinging column of the water. In Fig. 2 the circumference of the face is indicated by the interior segmental arc-lines next to the face of the buckets. The bevel N, flange M, and hoop L project out under the chute-case, which case may or may not inclose the lower portion of the buckets, as desired; but a large annulus or space must be provided adjacent to the discharging-bucket orifices to allow a free outward discharge of the water, which leaves the orifices tangentially in the direction due to the shape of the orifice.

The outer edge of the bucket, below the chute, I prefer to have in a line parallel with the shaft; but these outer edges may be inclined, if desired—that is, the outer edges of the buckets may form what is called a "conical wheel" at the top.

It will be observed from Fig. 2 of the drawing that the angle of the buckets is much more nearly radial than the wheels in common use. This feature is important when the buckets extend inward to the shaft.

By making the buckets of the angle, inclination, and curve here shown, the line of travel of the path of the water entering from the chute, and acting upon the different faces of the buckets, will be nearly the same. Thus the top of the entering column of water will strike upon the upper portion of the face, and

will travel and be discharged inside of that portion which enters the lower portion of the chute; yet the path of travel will be nearly the same of each part of the column.

It will be observed that a portion of the buckets are made to extend outward beneath the chute, and that the discharge-orifice outside of the vertical line of the face of the bucket is nearly half of that within the line. This extended area of discharge-orifice allows the voiding of all of the water which can be made to pass through a circle equal to the net area of the smaller circle of the wheel.

Another important advantage is gained by this form of bucket and delivery-orifice: the centrifugal force tends to carry the water outward from the impinging-point on the face of the bucket, and the shape of the bucket and orifice is such as to receive the centrifugal force of the water upon the curved angle of the bucket, thereby materially increasing the percentage of power.

It is obvious that the form of the lower part of the wheel may be retained and the upper and outward face of the buckets could be made vertical, or nearly so, instead of inclined, and still retain those features of my invention corresponding to the second clause of my claim. Also, the upper portion of my wheel may be retained and the circumference of the lower part of the wheel reduced to the same diameter as the upper half of the wheel, and thus correspond to the third clause of my claim.

It is also obvious that the buckets, of substantially the same shape and angle, might be employed, except the central area now occupied by the shaft might be increased and the lower portion of the buckets extended radially, and embody all the features referred to in my fourth clause of claim. It is also true that a portion of the inner portion of the discharge-orifice of the buckets might be dispensed with, and the discharge nearly all be outward, instead of being vertical and outward, which modification will correspond to the fifth clause of the claim herein specified. So, also, the upper face of the buckets may be varied so as to be vertical, or nearly so, and still employ such features of my invention as are specified in the claims where the angle of the face of the bucket is not made a specific feature in the claim.

I claim—

1. A turbine water-wheel composed of buckets whose faces are inclined, and which extend centrally to the shaft, from thence downward, rearward, and outward, forming a combined vertical and centrifugal system for discharging of the water acting on the wheel, substantially as set forth.

2. A turbine water-wheel the buckets of which occupy the entire area of the wheel from the shaft outward, and which form the combined vertical and outwardly-discharging series of orifices, substantially as set forth.

3. A turbine water-wheel the buckets of which occupy the entire area of the wheel from the shaft outward, with the faces inclined to a vertical line, which receive the water centrally upon the outer faces, and which discharge the same downwardly therefrom, substantially as set forth.

4. A turbine water-wheel whose buckets occupy the entire area of the wheel from the shaft outward, and in which the lower portions of the buckets which are below the chutes are of larger circumference, and have between their faces orifices for discharging the water outwardly from the buckets, substantially as set forth.

5. A turbine water-wheel whose buckets occupy the entire area of the wheel from the shaft outward, which have inclined faces and project outwardly below the chute, and overlapping each other, so as to form an outwardly-discharging orifice beneath the chute, substantially as set forth.

6. A water-wheel the buckets of which have inclined faces, and which project outwardly and under the chute-case, and which are inclined rearwardly to overlap each two buckets next in rear, and forming a combined outward and downward discharge for the water, as herein set forth.

In testimony whereof I have hereunto set my hand this 4th day of January, 1877.

EDWIN R. STILWELL.

Witnesses:
O. M. GOTTSCHALL,
GEO. R. YOUNG.