2 Sheets—Sheet 1.

J. W. BOOKWALTER.
Turbine Water-Wheel.

No. 209,219. Patented Oct. 22, 1878.

Fig. 1.

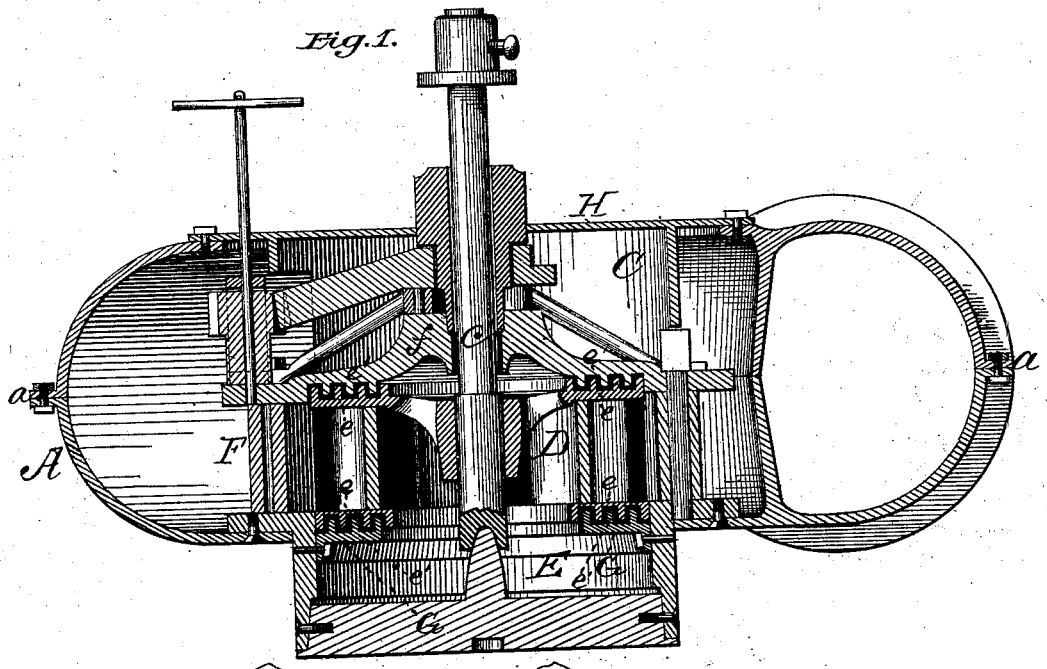
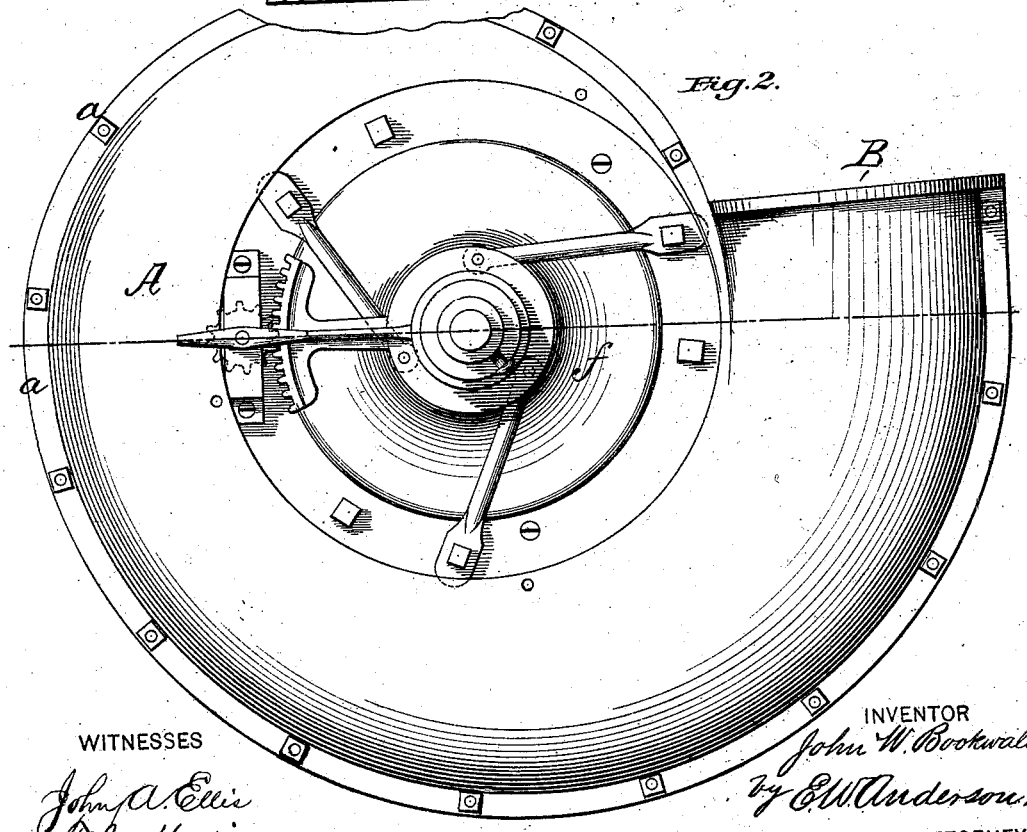


Fig. 2.



WITNESSES

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F. J. Masi.

INVENTOR

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Fig. 3.

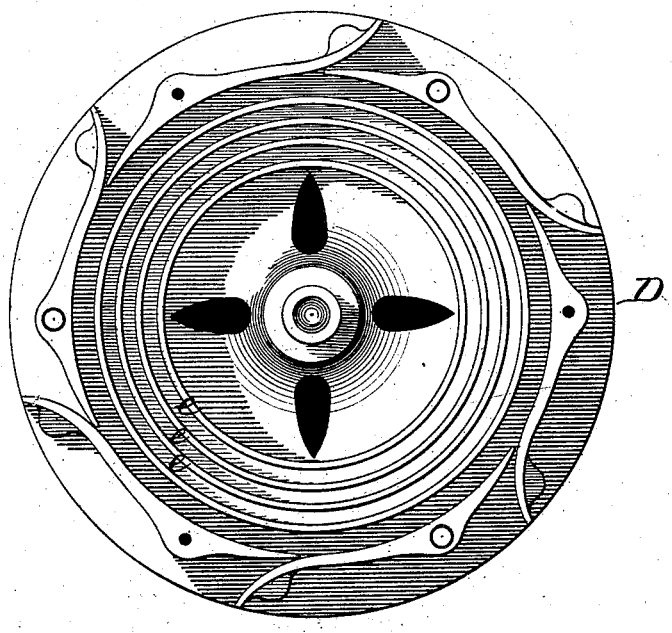
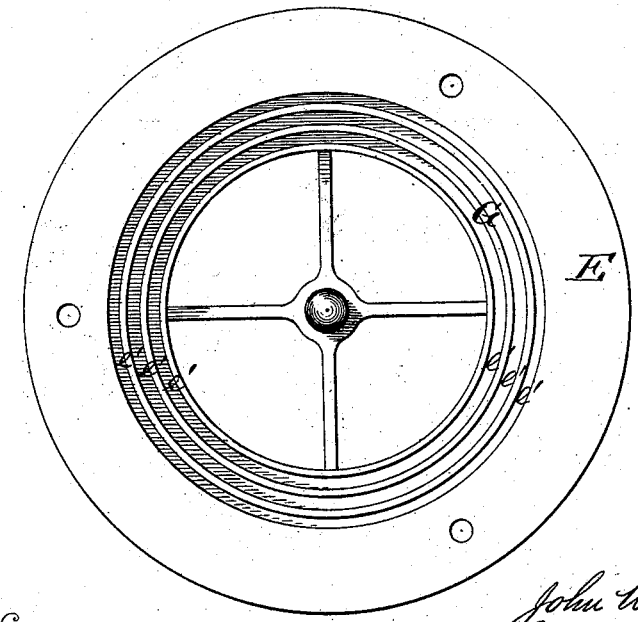


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN W. BOOKWALTER, OF SPRINGFIELD, OHIO.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **209,219**, dated October 22, 1878; application filed June 8, 1878.

To all whom it may concern:

Be it known that I, JOHN W. BOOKWALTER, of Springfield, in the county of Clarke and State of Ohio, have invented a new and valuable Improvement in Turbine Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a vertical central section of my improved water-wheel. Fig. 2 is a top view of the same with the head-plate. Fig. 3 is a bottom view of the wheel, showing the concentric baffle-grooves; and Fig. 4 is a top view of the discharge-cylinder, showing the correspondingly-grooved ledge-ring.

This invention has relation to turbines; and it consists in the construction and novel arrangement of the annular concentric grooves and ribs on the top and bottom plates of the wheel, and corresponding series of ribs and grooves on the crown-plate of the wheel-case, and on a ring in the cylinder of the outer case below the wheel, engaging the ribs and grooves of the wheel-plates.

It also consists in the construction and novel arrangement of the tangential scroll-case and the directing-cylinder, attached to the cap of the flume, and also to the top plate of the wheel-case, whereby undue leakage is prevented, and the initial motion or direction of the water is preserved and carried entirely around the wheel, so that there is but little loss, and the initial force of the water is almost wholly utilized, as hereinafter shown and described.

In the accompanying drawings, the letter A designates the outer or scroll case, made in halves, which are bolted together at the periphery, as shown at *a*. This case has its initial opening arranged on the side tangentially, as shown at B, whence the spiral contour of the scroll extends around the wheel and wheel-case and gradually approaches the same.

The scroll-case is made light, being supported from the wheel-case by the directing-cylinder C, which is attached to the crown-plate of the wheel-case, and, by means of a head-plate, H, to the marginal flange or edge of the scroll-opening.

D represents the wheel; *c*, its shaft, pivoted upon a suitable bearing in the discharge-cylinder E at the bottom of the case. The top and bottom plates of the wheel, near their outer edges, or above and below the series of buckets, are provided with annular concentric grooves, alternating with ribs, as shown at *e*. The crown-plate *f* of the wheel-case F is provided on its under side with a series of annular ribs and grooves, as shown at *e'*, corresponding to and designed to engage with the grooves and ribs of the upper plate of the wheel somewhat loosely, so that the wheel will have free motion, but forming an intercalating or baffle joint between the wheel and the crown-plate, which will so obstruct the water that little leakage will take place at this point.

In order to engage with the under grooves and ribs of the wheel and prevent leagage below a ledge-ring, G, having corresponding ribs and grooves, as shown at *e'*, is located within the discharge-cylinder E. By means of these intercalating ribs and grooves the water, in passing from the flume into the buckets of the wheel, is prevented from leaking out above or below the wheel, the joints serving to obstruct the passage of the water, not only on account of the changes in the direction of the motion and the distance around the ribs and grooves, but also because, when the wheel is revolved, the centrifugal force of the water in the grooves will tend to retard the passage of water through said grooves.

The movable top H of the scroll-case is provided, as above stated, with directing-cylinder C, which is fastened to the crown-plate of the wheel-case. This cylinder is usually cut away on one side to form an opening for the location of a part of the operating mechanism of chute-gates.

The removable head and cylinder above described supports the scroll-case from the wheel-case, bracing the former securely, so that it can be made of light metal. Into the scroll-case A the water is admitted in a direction tangent to the periphery of the case of the wheel; and by the directing-cylinder E, depending from the cap-plate H of the flume,

this initial motion or direction of the water is preserved or carried entirely around the wheel, so that whatever velocity the water may possess is still retained and carried into the wheel at all points of its circumference. In this manner very little of the initial force is lost, and the water is almost wholly utilized. As by this arrangement but little of the initial velocity is lost and no conflicting currents are produced, a smaller pipe and a flume of very much smaller diameter can be used.

Having described this invention, what I claim, and desire to secure by Letters Patent, is—

1. The wheel D, having its upper and lower plates externally and concentrically grooved and ribbed, substantially as specified.

2. The combination, with the wheel D, having its upper and lower plates grooved and ribbed, as shown at *e*, of the crown-plate *f* and ledge-ring G, respectively above and below said wheel, having corresponding annular ribs and grooves *e'*, to engage with the annular grooves and ribs of the wheel, forming baffle-joints, substantially as specified.

3. The combination, with the metallic scroll-case A and the wheel-case F, of the cap-plate H, attached to the scroll-case, and having the directing-cylinder C, extending downward therefrom and attached to the crown-plate of the wheel-case, substantially as specified.

4. A metallic scroll-case having within it and depending from its cap-plate a rigid directing-cylinder, C, toward which the spiral wall of the scroll constantly approaches, and below which are the chutes of the wheel-case, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

JOHN W. BOOKWALTER.

Witnesses:

WILLIAM JAYNE,

FRANZ OESTERREICH.