

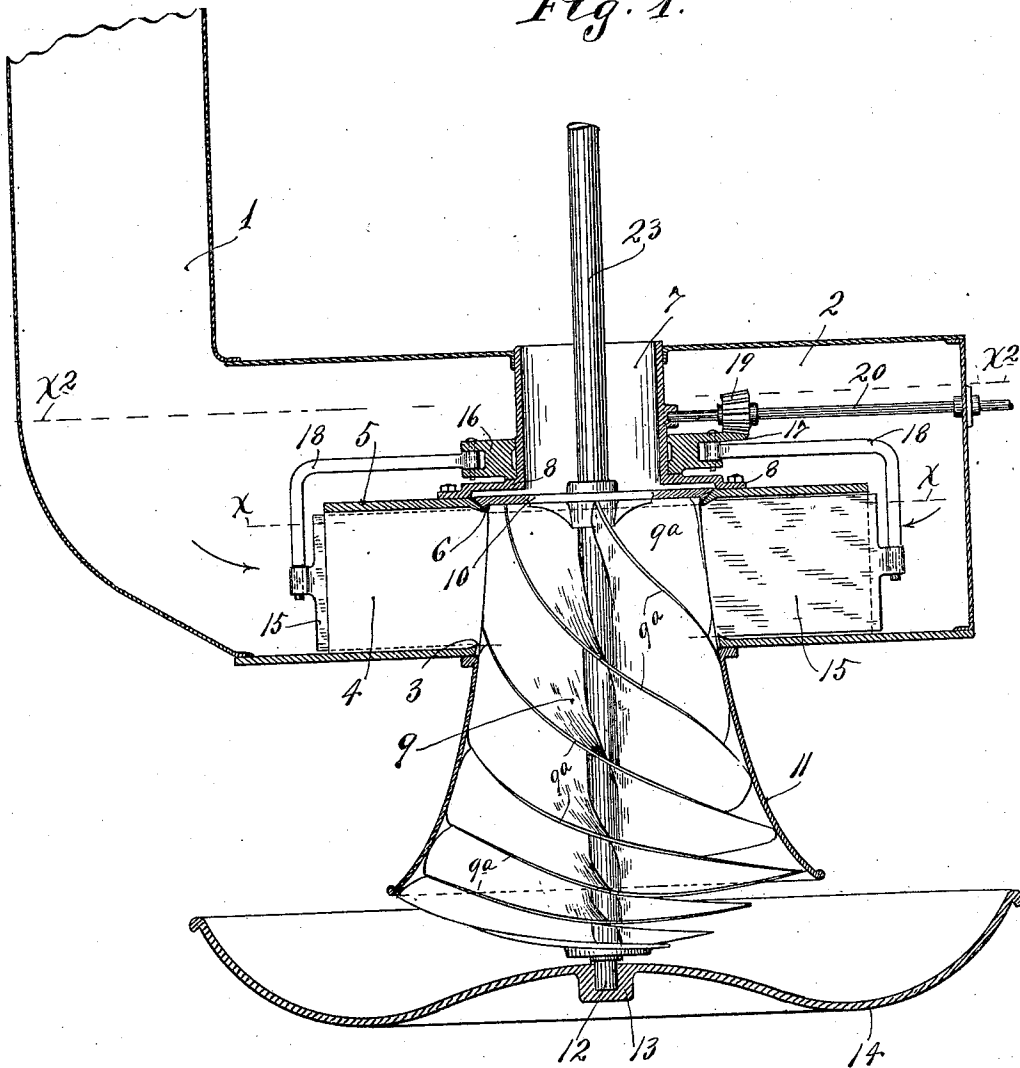
No. 860,988.

PATENTED JULY 23, 1907.

A. NELSON.  
WATER TURBINE.  
APPLICATION FILED OCT. 19, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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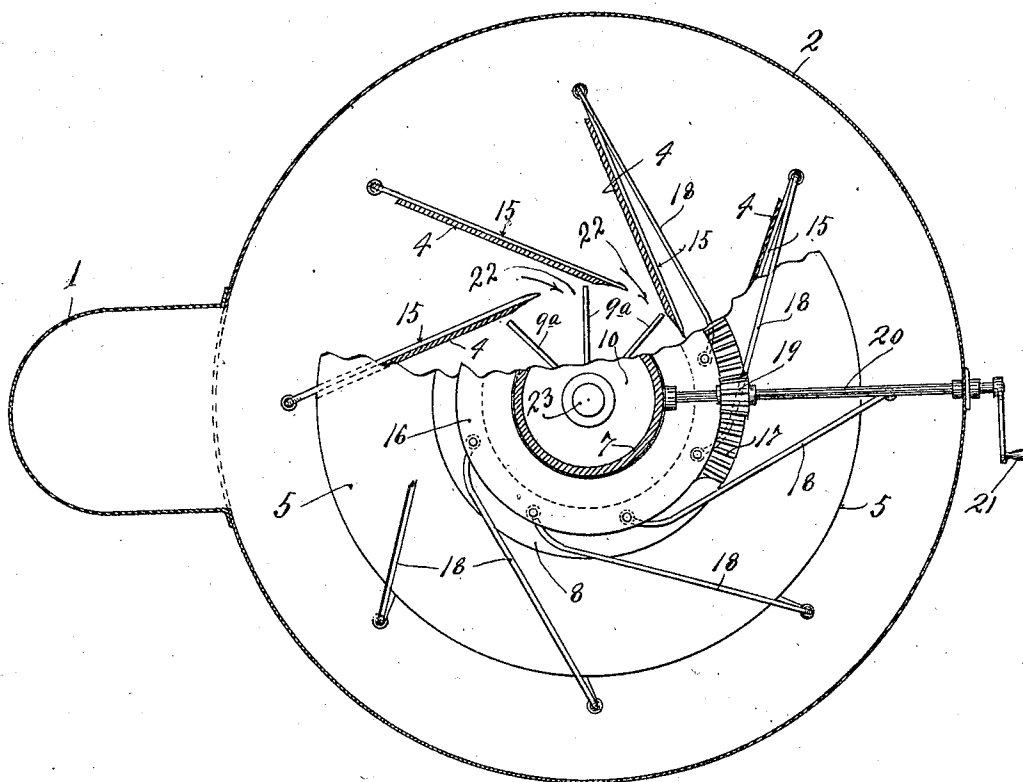
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2 SHEETS—SHEET 2.

*Fig. 2.*



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# UNITED STATES PATENT OFFICE.

ANDREW NELSON, OF SOUTH STILLWATER, MINNESOTA.

## WATER-TURBINE.

No. 860,988.

Specification of Letters Patent.

Patented July 23, 1907.

Application filed October 19, 1905. Serial No. 283,360.

*To all whom it may concern:*

Be it known that I, ANDREW NELSON, a subject of the King of Sweden, residing at South Stillwater, in the county of Washington and State of Minnesota, have invented certain new and useful Improvements in Water-Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to water-wheels of the turbine type, and has for its object to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate my invention, like characters indicate like parts throughout the several views.

Figure 1 is a view in vertical section, taken centrally through the improved turbine, some parts being left in full; and Fig. 2 is a horizontal section, taken in part on the line  $x^2 x^2$  of Fig. 1, and in part on the line  $x-x$  of Fig. 1, some parts being broken away.

The numeral 1 indicates the vertical shaft or water-conduit, which terminates at its lower end in a laterally extended circular case section 2. In its lower plates, the case-section 2 is provided with a large round opening 3.

The numeral 4 indicates a series of vertical partitions that are rigidly secured to the bottom plate of the case-section 2, extend tangentially to the opening 3, and terminate at their outer ends a very considerable distance inward from the outer portion of the case-section 2. These partitions 4 rigidly support a horizontally disposed circular plate 5, provided with a central passage 6 that directly overlies the lower opening 3. As shown, a large sleeve 7 extends downward through the upper plate of the case-section 2, and is provided with an expanded base flange 8 that is rigidly secured with a tight joint to the circular plate 5.

The numeral 9 indicates the water-wheel proper which, at its upper end is provided with a head 10 that closes the central perforation of the plate 5, and forms a tight joint therewith. The blades 9<sup>a</sup> of the wheel 9 are spiral, and are given a gradually decreasing advance or pitch toward the bottom of the wheel. Otherwise stated, at their extreme upper portions, the blades 9<sup>a</sup> closely approach a vertical direction, and at the bottom of the wheel, their pitch is changed until they extend very nearly in a horizontal direction. This arrangement of the blades permits the water to ac-

quire high momentum at the head of the wheel, and is caused to act with gradually increasing pressure on the blades toward the bottom of the wheel. The outer edges of the several spiral blades 9<sup>a</sup>, below the bottom of the case-section 2, are rigidly secured to the inner surface of a bell or downwardly flaring shell 11. This construction gives increased bearing surface to the spiral blades toward the lower end of the wheel, and the flaring shell or bell 11 gives a water-conduit of increasing cross-section toward the bottom of the wheel. Furthermore, as the wheel and the bell 11 revolve together, there is no friction between these parts. At its lower end, the wheel 9 is provided with a foot or trunnion 12 that rests in a bearing 13, shown as forming part of a fixed basin 14, which basin, in practice, may be rigidly supported in any suitable way and by any suitable means.

Mounted to slide on the face of each partition 4, and fitting between the bottom of the case 2 and the overlying circular plate 5, is a series of slides or cut-off blades 15. Loosely mounted on the sleeve 7, and on the flange 8 thereof, is an adjusting ring 16 which carries a segmental bevel gear 17. L-shaped links 18 pivotally connect the outer ends of the slides 15 to the adjusting ring 16. Meshing with the segmental gear 17 is a bevel pinion 19 that is carried by a shaft 20 journaled in the sleeve 7, and in the side of the case 2, and provided at its outer end with a crank 21 by means of which it may be turned. By rotary movements of the shaft 20 and pinion 19, the ring 16 may be oscillated, and by oscillations of said ring, the cut-off blades 15 may be moved either inward or outward, at will. When the said cut-off blades are moved inward to their extreme positions, they are thrown together, and then completely cut off the flow of the water from the case 2 to the water-wheel. When the said blades are moved outward, they are separated and then leave openings, marked 22 on Fig. 2, through which the water may flow to the water-wheel. As is evident, by varying the size of the openings 22 the supply of water to the wheel may be regulated so as to thereby vary the speed and power under which the said wheel will be driven. Power from the wheel may be conveyed therefrom through an upwardly extended shaft 23 of the said wheel, and through other driving mechanism, not shown. The higher the head of water, the longer the turbine wheel should be and the deeper the basin 14 should be.

What I claim and desire to secure by Letters Patent of the United States is as follows:

The combination with a water-conduit terminating in a case-section 2 having in its bottom water out passage 3

and having within the vertical partitions 4 and centrally perforated overlying plate 5, of the cut-off blades 15 slidable on said partitions 4, a ring 16 mounted to oscillate above said plate 5, links 18 connecting said ring 16 to said cut-off blades 15, means for oscillating said ring 16, and a water-wheel 9 having spiral blades 9<sup>a</sup>, and upper end head 10 and a surrounding bell 11, which blades 9<sup>a</sup> extend upward through said water-outlet passage 3, which head 10 closes the perforation in said plate 5, and which bell

11 is secured to the blades of said wheel below the bottom plate of the case-section 2, substantially as described. 10

In testimony whereof I affix my signature in presence of two witnesses.

ANDREW NELSON.

Witnesses:

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A. H. OPSAHL.