L. S. Warren,

Water Wheel.

No. 113,823. Patented Apr. 18. 1871.

Fig. 1

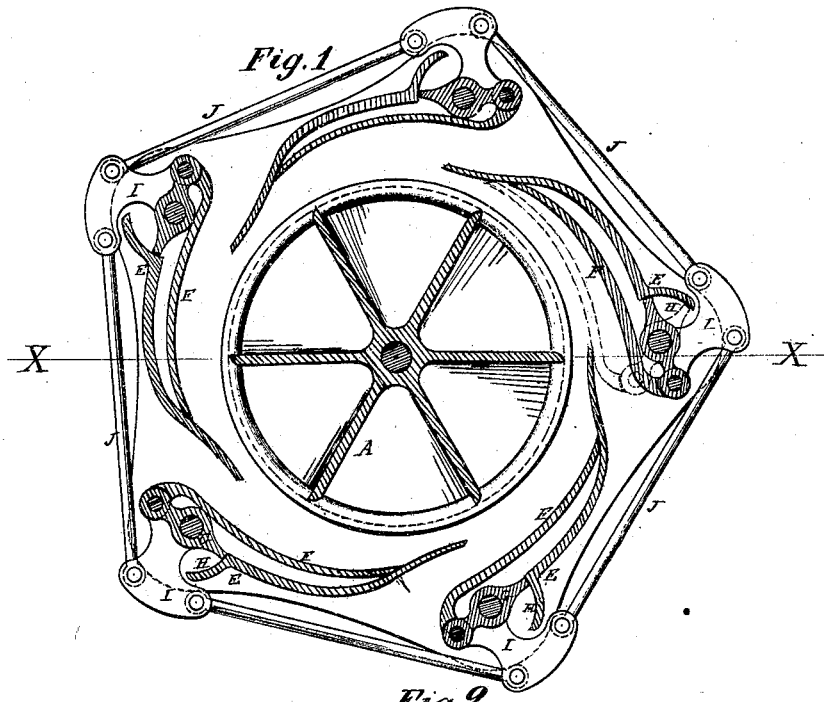

Fig. 2

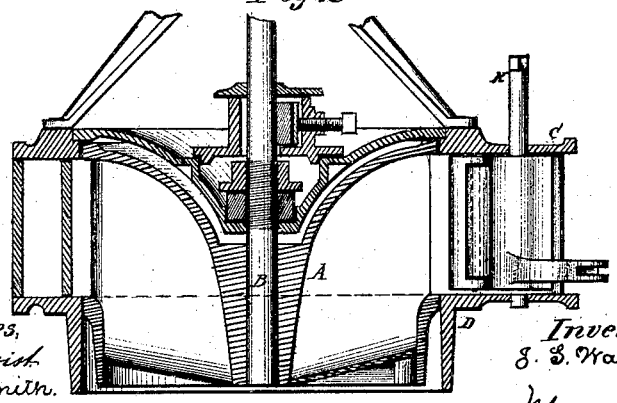

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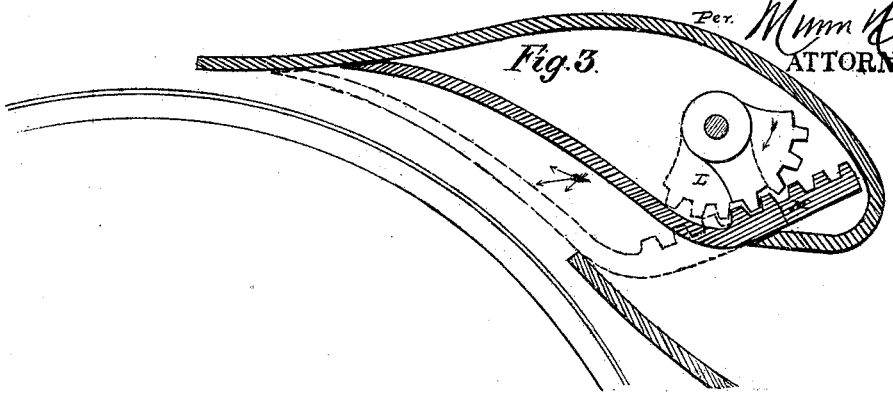
Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN S. WARREN, OF FISHKILL-ON-THE-HUDSON, NEW YORK.

IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. **113,823**, dated April 18, 1871.

To all whom it may concern:

Be it known that I, JOHN S. WARREN, of Fishkill-on-the-Hudson, in the county of Dutchess and State of New York, have invented a new and useful Improvement in Operating Water-Wheel Chutes; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification.

This invention relates to a new and useful improvement in mode of operating the chutes of water-wheels, whereby a very great objection to the ordinary mode is obviated, and whereby an increase of power from a given quantity of water is obtained; and it consists in sliding the chute forward and backward, and at the same time moving it toward the wheel, so as to preserve the proper relation or line of contact of the water with the wheel-bucket, whether more or less water is discharged, as will be hereinafter more fully described and specified.

In the accompanying drawing, Figure 1 represents a top view of the whole apparatus with the upper or cap plate of the wheel removed. Fig. 2 is a vertical cross-section of Fig. 1, taken on the line *x x*. Fig. 3 represents a modification, showing a different mode of moving the chute.

Similar letters of reference indicate corresponding parts.

My improvement applies to wheels attached to vertical shafts operating as direct-action or as reaction wheels, or the two combined, and is especially adapted to all wheels operating upon the turbine principle.

The chutes which conduct the water to the buckets of such wheels have heretofore been pivoted or hinged so as to swing upon their inner ends, by which movement the apertures for the water are opened and closed. Such a movement unavoidably varies the line of contact or the proper direction of the water, so that it strikes the bucket sometimes at one angle and sometimes at another, thus materially affecting and lessening the effect due to the quantity of water used.

A is the water-wheel. B is the water-wheel shaft. C is the upper or cap plate, and D the lower or flanged plate, between which the chutes are operated. E represents stationary curved plates, which are confined (on edge) between the upper and lower plates, C D. F represents the chutes, which are made to work in contact with the stationary plates E. G are upright hub-pieces, which turn on pivots passing through or into the upper and lower plates, C D. In length these hub-pieces correspond with the width of the chutes and plates E. The chutes F are hinged to one edge of these pieces. The other edge is designed to form a water-tight joint with the curve in the outer ends of the plate E, as seen at the points H, Fig. 1.

I is a lug projecting from the back sides of the pieces G, by means of which these pieces G are connected together so as to be operated simultaneously. J represents the connecting-rods. K is a prolongation of one of the pivots of one of the hub-pieces, to which power is applied for turning all the hub-pieces and operating the chutes.

Now, by turning the hub-pieces simultaneously, it will be seen that all the chutes will be given two distinct motions: They will move endwise or slide forward in contact with the stationary plates E, and will be thrown bodily toward the wheel at the same time, thus reducing the thickness or breadth of the water-apertures, while preserving the true curve or line of contact of the water with the buckets of the wheel.

The pressure of the water will always keep the ends of the chutes in contact with the stationary plates E. By this double motion the water is made to strike the buckets at a uniform angle, whether there be a full or a partial opening. The currents of water will not be clogged or broken, and the result is a very important increase of power from a given amount of water.

I do not, of course, confine myself to the particular arrangement of mechanism above described for producing the desired movement of the chutes. It may be done (and perhaps better done) by means of a sector cogged pinion, L, and a rack, M, arranged substantially

as seen in the modification in Fig. 3. There may be other modes of arriving at the desired result.

I design to adopt or use any mechanism or arrangement whereby I may be enabled to move the chutes endwise and preserve the true line or direction of the water to the wheel while reducing its volume. This movement necessarily reduces the length of the jet, thereby preserving a proper relation or proportion between the thickness and length of the sheet of water thus guided to the bucket.

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

The chutes of a water-wheel moving endwise while reducing the breadth or area of the water-aperture and the length of the jet, substantially as and for the purposes herein shown and described.

JOHN S. WARREN.

Witnesses:

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