# J. E. Stevenson.

## Water Wheel.

No. 88,422. Patented Mar. 30, 1869.

Fig. 1.

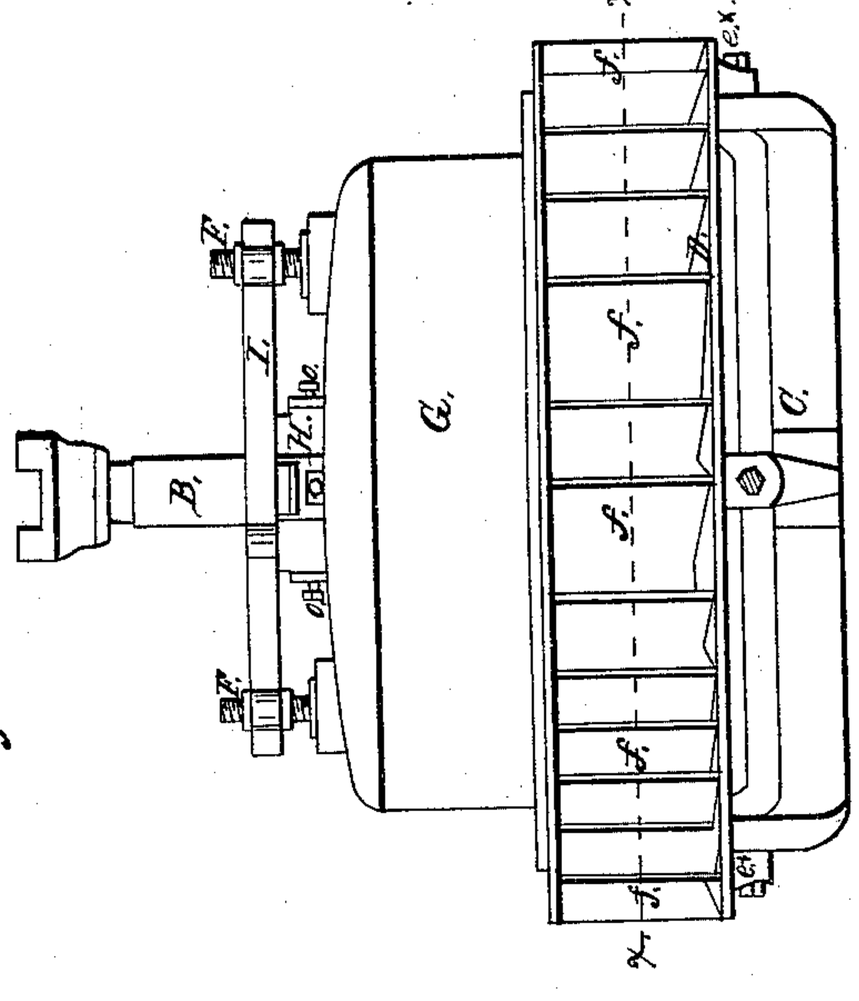


Fig. 2.

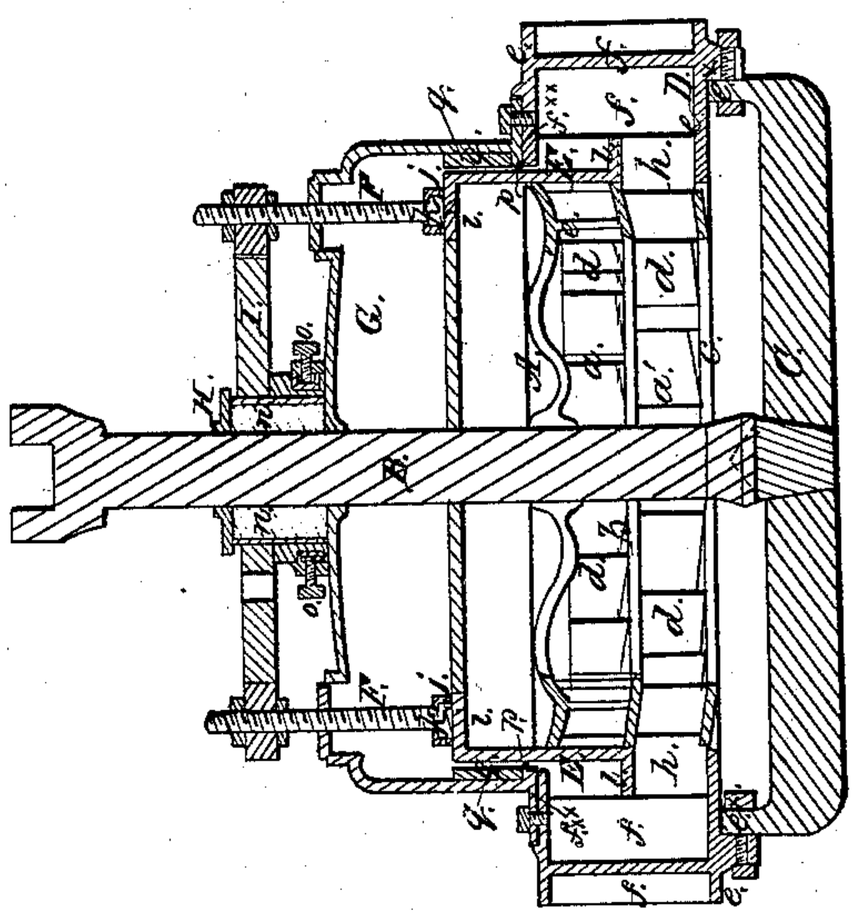


Fig. 3.

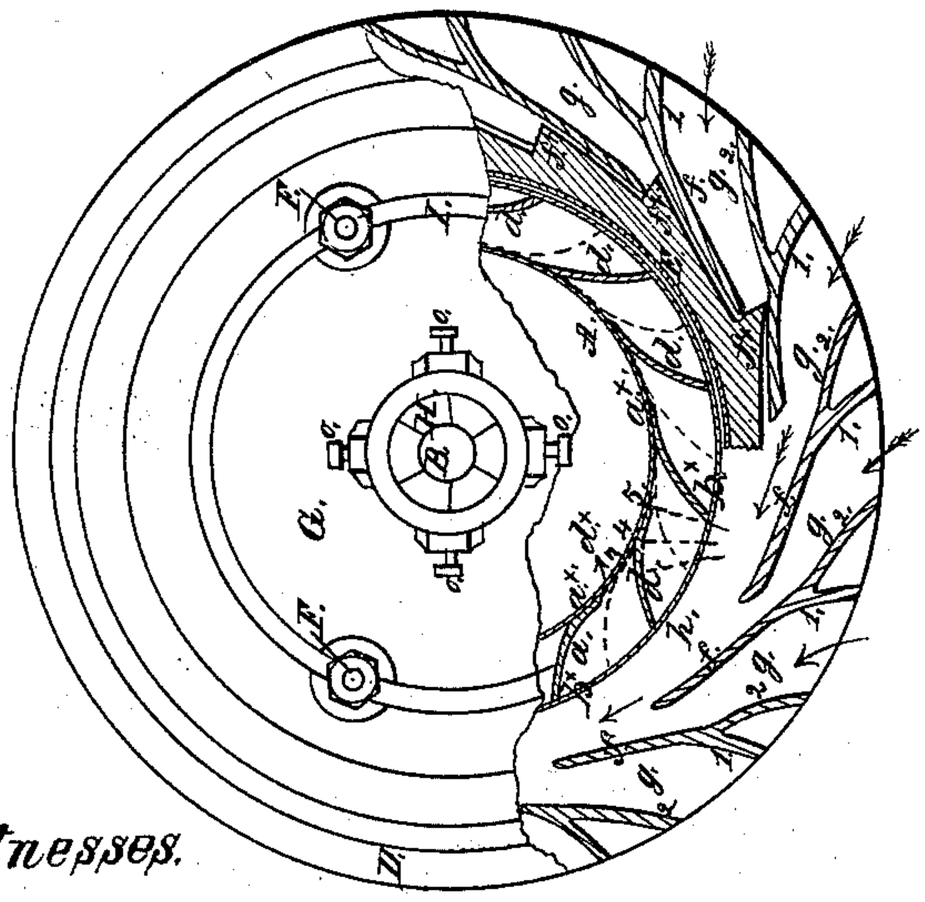


Fig. 4.

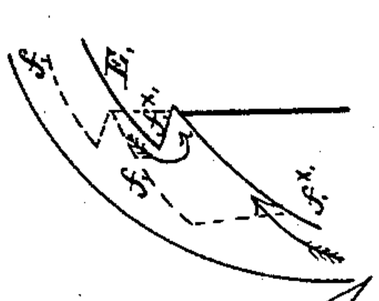
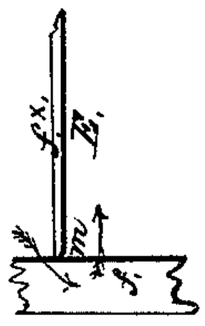


Fig. 5.



Witnesses.

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JAMES E. STEVENSON, OF NEW YORK, N. Y.

*Letters Patent No.* 88,422, *dated March* 30, 1869.

## IMPROVED WATER-WHEEL.

The Schedule referred to in these Letters Patent and making part of the same.

*To all whom it may concern:*

Be it known that I, JAMES E. STEVENSON, of the city, county, and State of New York, have invented a new and improved Turbine Water-Wheel; and that the following description, taken in connection with the accompanying drawings, hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvement, by which my invention may be distinguished from all others of a similar class, together with such parts as I claim, and desire to have secured to me by Letters Patent.

This invention relates to a new and improved turbine water-wheel, and has for its object the constructing of the wheel and its concomitant parts, in such a manner that the greatest useful effect of the water may be obtained with either a partially or fully-opened gate, the wheel being made or formed in sections, and the gate devised in such a manner that one or more sections of the wheel may be used independently of the others, at any time when a division of the power of the wheel may be necessary, so as to suit, or be commensurate with the flow and height of water in variable streams, through the different seasons of the year, and thereby utilize the water in a manner best suited to the conditions of quantity, flow, and height of fall, or backwater, as changes occur.

In the accompanying sheets of drawings—

Figure 1, Sheet No. 1, is an elevation of my invention.

Figure 2, a vertical central section of the same.

Figure 3, Sheet No. 2, a sectional plan, taken in the line *x x*, fig. 1.

Figure 4, a detached perspective view of a portion of the same.

Figure 5, a diagram of a portion of the same.

Similar letters of reference indicate corresponding parts.

A represents the wheel, and B, the shaft thereof, the water being taken at the periphery of the wheel, and discharged at its centre.

The wheel, in this instance, is represented with two sections, or parts *a a'*, one being above the other, with a central dividing-rim, *b*, between, as shown clearly in fig. 2.

The upper and lower rims *c c*, as well as the central rim *b*, have a slight inclination downward from their outer to their inner edges, the object of which is chiefly to admit of the free passage or discharge of water from the wheel, and relieve, in a measure, the step of the wheel-shaft of the weight of the wheel.

The buckets in both parts of the wheel are precisely of the same shape, or form, those in one part being directly over the centres of the spaces between those of the other part.

The buckets, which are designated by *d*, are of curved form, as shown in fig. 3, so as to discharge the water tangentially to the inner edges of the rim of the wheel.

The inner parts of these buckets, it will be seen, are in line with and follow for a short distance the curvature of the inner edges of the rims *b c c*, as shown at $a^{\times}$, and then curve outward to the outer edges of said rims, as shown at $b^{\times}$.

A correct idea of the shape of the buckets will be obtained by referring to fig. 3.

The issues are designated by $d^{\times}$, and, it will be seen, admit of a free escape of the water, on account of the curvature of the buckets.

The shaft B is stepped in a cross-tree, or strap, C, to which the casing D of the wheel is bolted, as shown at $e^{\times}$.

This casing consists of two rims *e e*, one being above the other, and in planes coinciding with the peripheries of the rims *b c c* of the wheel.

Between these rims *e e*, there are secured guides *f*, of peculiar form, shown plainly in fig. 3.

These guides are curved, and extend within the casing, so that their inner parts will have a tangential position relatively with the periphery of the wheel.

The guides *f* do not extend inward to the inner edges of the rims *e e* of the casing, a free, or open space, or chamber *h*, being allowed between the inner ends of the guides, and the periphery of the wheel, as shown in figs. 2 and 3.

The outer parts of the guides *f* are forked, or so made as to have a double curvature, as shown clearly in fig. 3, in order to give the proper shape, or curve to the spaces, or chutes *g*, between the guides, and cause the water to be directed into the annular space, or chamber *h*, tangentially with the moving body of water therein, and without causing or producing any reaction or counter-current of the water in an opposite direction; for instance, the curve designated by 1, must bear a certain relation to that shown at 2, as indicated in the drawing, in order to obtain the desired effect.

The flow of the water through the chutes, into the chamber *h*, is indicated by the arrows.

By this arrangement, it will be seen that the water does not pass directly from the chutes *g* into the wheel, but passes from the chutes into chamber *h*, and thence into the wheel. A very important result is thereby obtained, for the water acts upon the wheel in a smooth, unbroken current, and from a chamber in which, the water moves in the same direction as the wheel.

If the guides *f* extended to the inner edges of the rims *e e* of the casing, the current of water would be broken, and consequently far less efficacious in its action upon the wheel.

This feature of the invention requires to be particularly observed, as it is the principal characteristic in the admission of water to the wheel.

E represents the gate, which is of cylindrical form, and works over the wheel A, rising and falling, (opening and closing,) within the chamber *h*.

This gate is composed of a single thickness. and is provided at its upper edge with a horizontal inwardly-

projecting flange, *i*, to which the gate-rods F are attached, said flange having sockets *j* upon it, and the lower ends of the rods being provided with heads *k*, to slip laterally into the sockets.

By this mode of connection, the gate-rods may be very readily applied to and detached from the gate, which is a great convenience in putting the wheel together and taking it apart. This mode of connecting the gate-rods is fully exhibited in fig. 2.

The lower edge of the gate E is provided with an outwardly-projecting flange, *l*, which is notched so as to conform to the inner parts of the guides, as shown clearly in fig. 3.

By this arrangement, it will be seen that the outer ends of the projections $f^{\times}$, which are formed by the notches, extend, each one outward past one guide *f*, and abut against the inner end of the succeeding guide.

The outer ends of these projections are rounded at their under sides, as shown at *m* in fig. 5. The object of this will be presently stated.

G is the cap, or cover, which is provided with a flange, $f^{\times\times}$, at its lower end, through which bolts pass into the top rim *e* of the casing D.

On the top of this cap, or cover, is the bearing H, containing boxes *n*, to support the wheel-shaft, said boxes being adjustable by set-screws *o*.

The gate-rods F pass up through the top of the cap, or cover G, and are connected at their upper ends to a ring, I, to which any suitable mechanism may be applied for the purpose of raising and lowering the gate.

The flange $f^{\times\times}$ extends inward a trifle beyond the side of the cap, or cover, and is grooved all around at its inner edge, to receive a packing, *p*, which prevents leakage of water upward between the gate and the cap, or cover. (See fig. 2.)

The inner surface of the cap, or cover G, is provided with vertical ribs *q*, which extend upward from the flange $f^{\times\times}$ a suitable distance. These ribs serve as guides, and retain the gate in proper position.

From the above description, it will be seen that water may be let upon one or both parts of the wheel, as occasion may require, or upon one part and a fraction or portion of the other part, according to the power required for the wheel to give out.

The space above the flange *l* in the chamber *h*, and below the packing *p* in the flange $f^{\times\times}$ of the cap, or cover, is filled with stagnant water. This, of course, does not affect the running of the wheel in the least.

It will be seen that the water in passing through the chutes *g*, will press against the water in chamber *h*, and this pressure will cause the water above *l* to pass down over and under the edges of the projections $f^{\times}$, as indicated by the arrows in figs. 4 and 5; hence, no eddy, or back, or reacting currents will be formed, to break the smooth flow of the water through the casing into the chamber, or deflect said water out of its true course, in its passage through the chutes *g*, into said chamber, and from thence into the wheel.

This will be fully understood by referring to fig. 3, in which the action of the water upon the buckets, if the projections $f^{\times}$ were not employed, is shown by the dotted lines 3, 4, 5, under different heights, or opening of the gate; the lower the gate, or the less it is raised, the greater the tendency of water to pass radially into the wheels.

This is an important feature, and must not be disregarded in the construction of the wheel.

I am aware that water-wheels, discharging the water centrally, have been made in sections, or with a plurality of rows of buckets, but so far as I am aware, such wheels have invariably been set in scroll-cases, into which the water is admitted by a single gate, or sluice-valve, or by a series of gates surrounding the wheel. I am also aware that cylindrical gates have been used with wheels having a central discharge, and stationary guides in a casing, but the guides have extended to the inner edge of the casing, there being no water-chamber allowed between the wheel and the guides, as in my improvement, and the water consequently is discharged directly from the chutes into the wheel in broken columns,-which greatly detract from its effective force. I am further aware that curved buckets have been employed, similar to mine, and I do not claim broadly such form, irrespective of the general construction of the wheel and its arrangement with the gate.

I claim, therefore, as new, and desire to secure by Letters Patent—

1. The annular or cylindrical gate E, provided with a horizontal flange, *l*, at its lower end, notched to form projections $f^{\times}$ to extend into the chutes *g*, in combination with the guides *f*, placed or arranged tangentially in the casing D, enclosing a turbine or horizontal water-wheel A, all constructed and arranged to operate substantially as set forth.

2. The arrangement of the annular water-chamber *h*, guides *f* in the casing D, centrally-discharging wheel A, and the annular or cylindrical gate E, provided with the projections $f^{\times}$ at its lower flange *l*, with the outer ends or edges of said projections rounded, or bevelled, substantially as and for the purpose set forth.

3. The packing *p* in the inner edge of the flange $f^{\times\times}$ of the cap, or cover G, and the guides, or ribs *q*, on the inner surface of the cap, or cover, all arranged substantially as and for the purpose specified.

4. The casing D, cap, or cover G, gate E, and wheel A, all constructed and arranged substantially as shown and described.

J. E. STEVENSON.

Witnesses:

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