2 Sheets—Sheet 1.

S. M. SMITH.
Water-Wheel.

No. 223,179. Patented Dec. 30, 1879.

Fig. 1

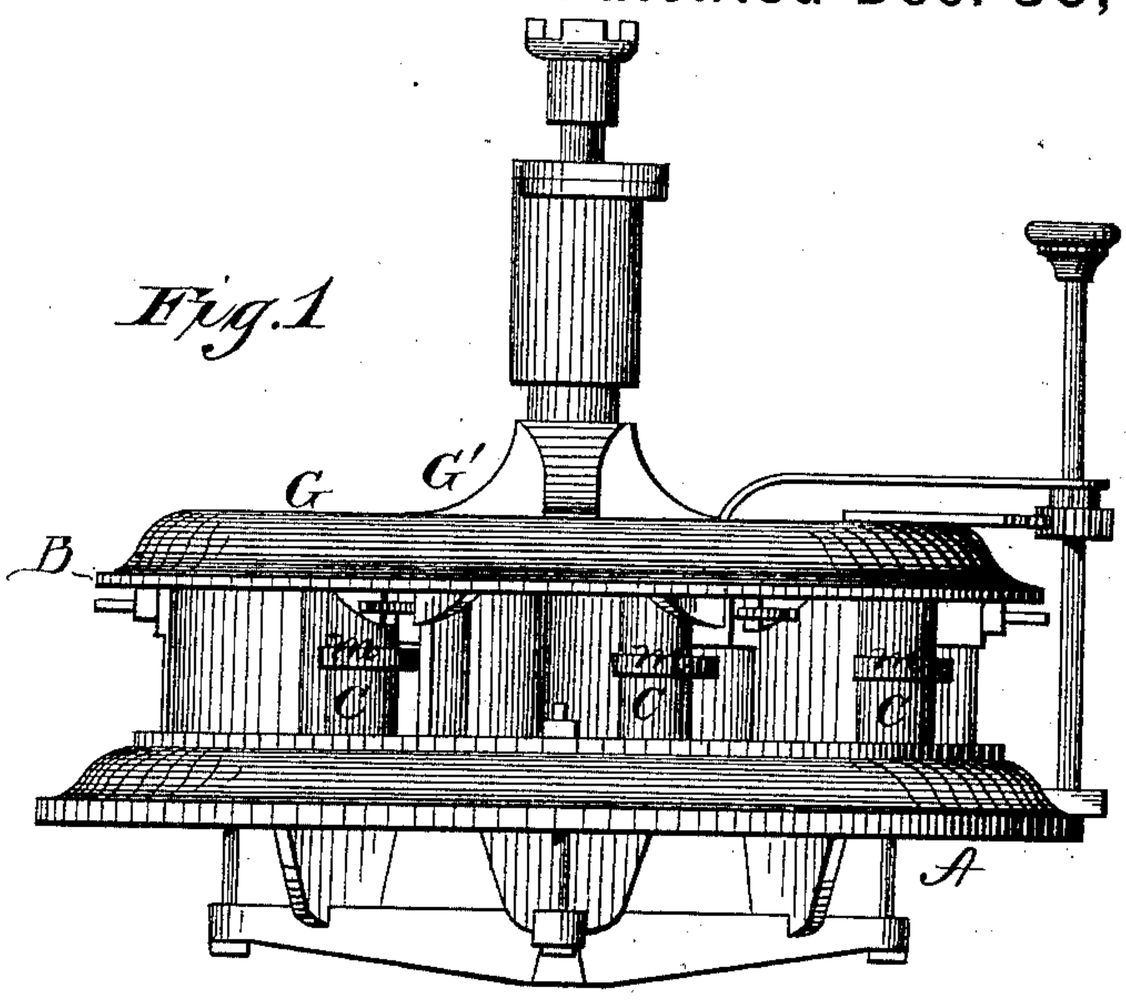

Fig. 4.

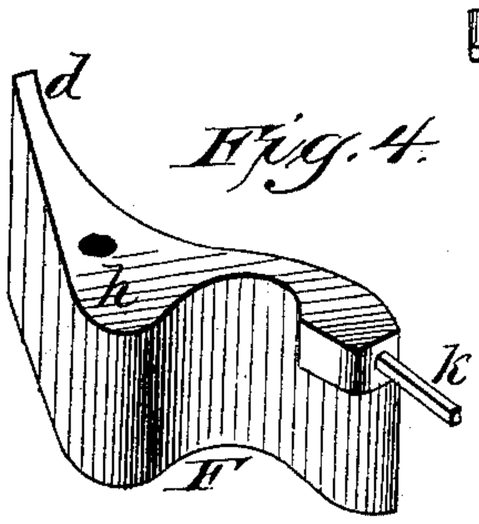

Fig. 5.

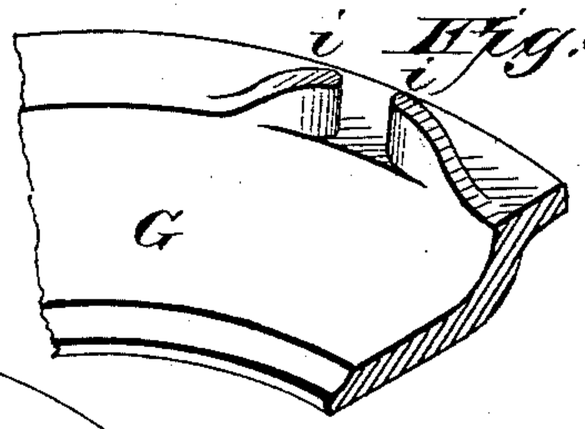

Fig. 2.

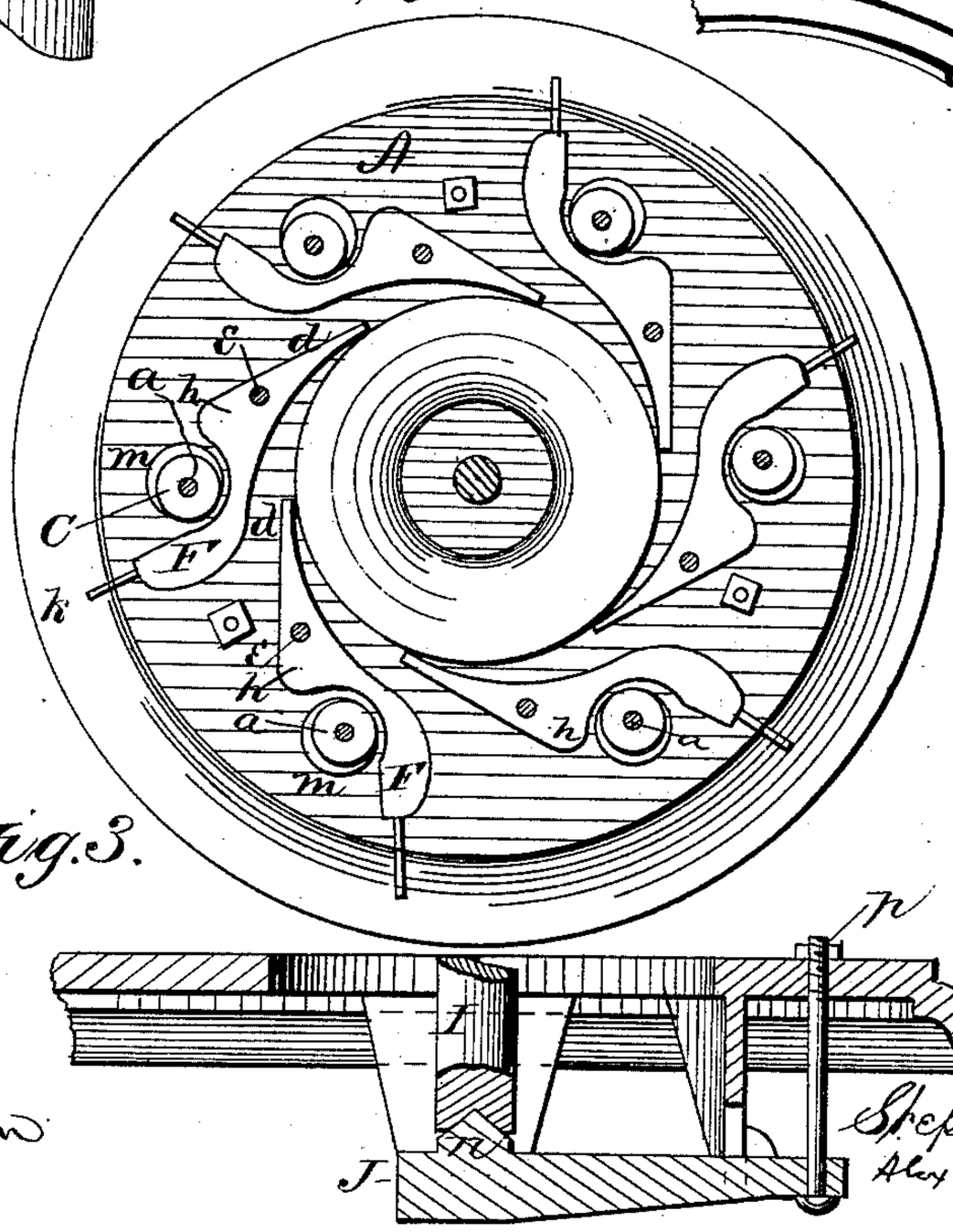

Fig. 3.

WITNESSES

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Fig. 6.

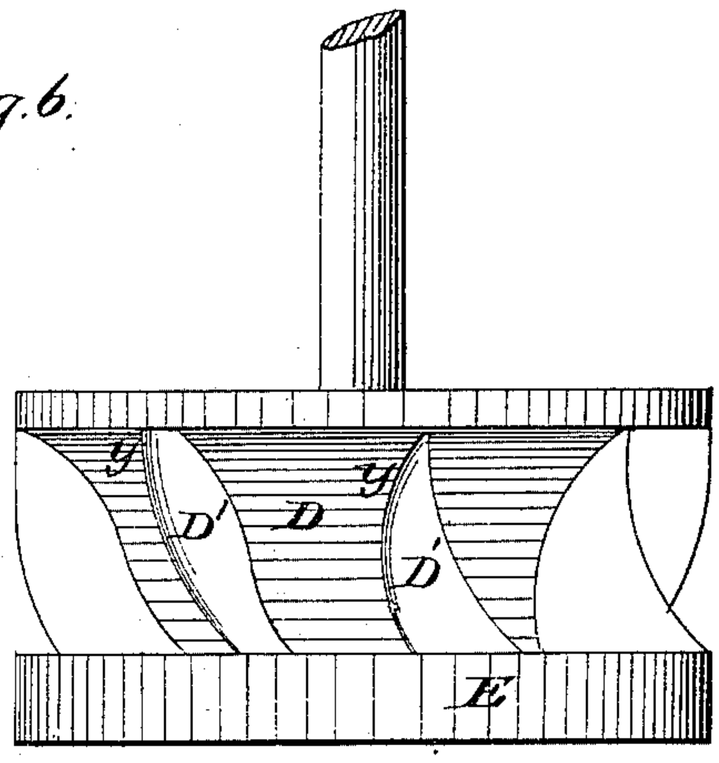


Fig. 7.

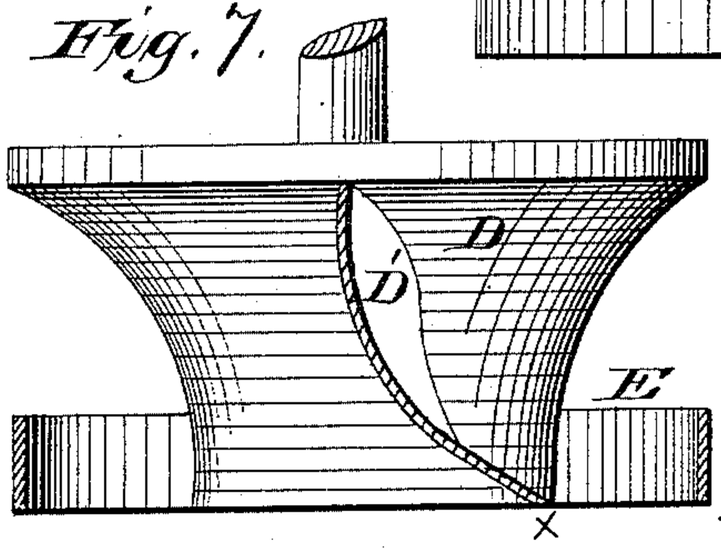


Fig. 8.

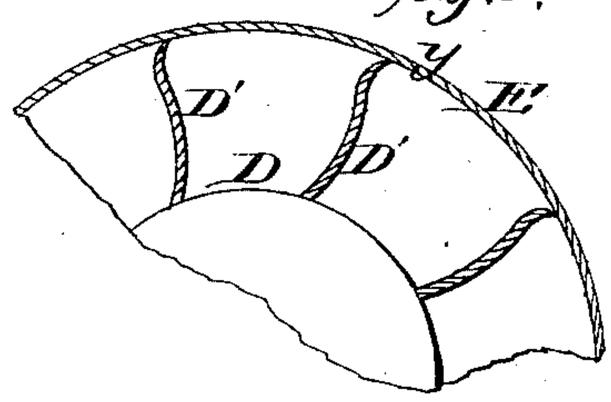
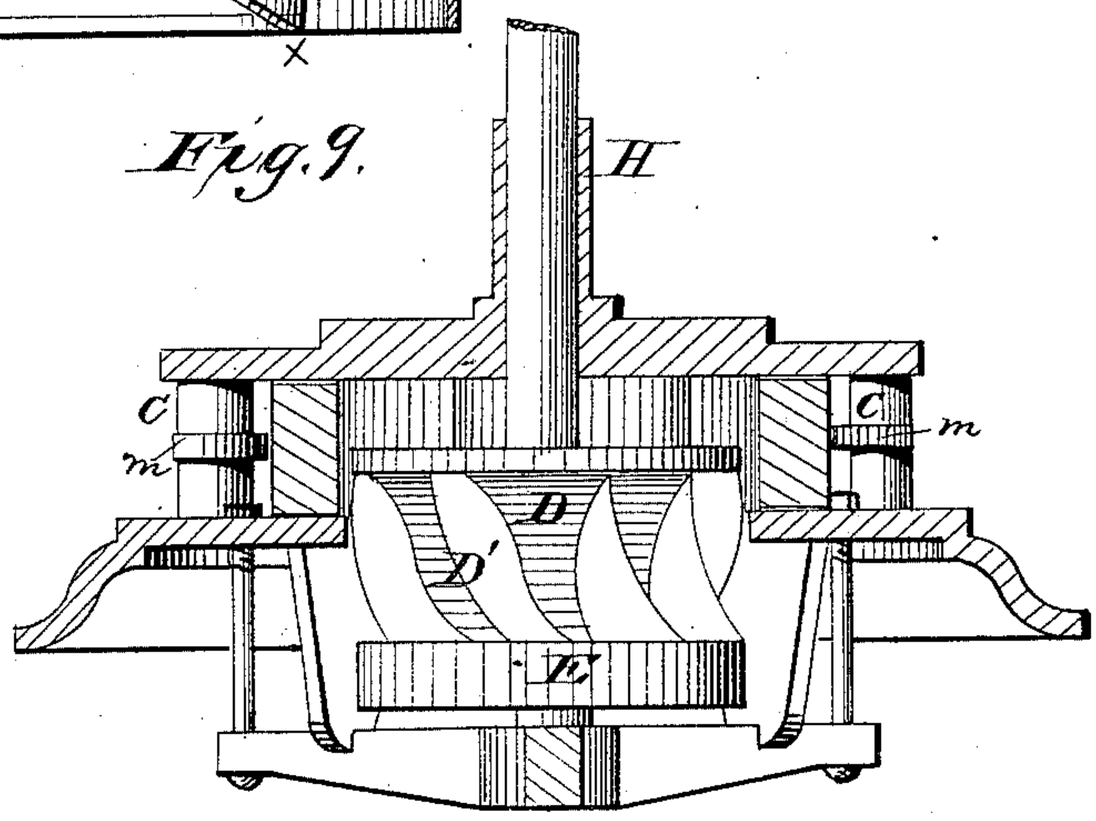


Fig. 9.



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IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. **223,179**, dated December 30, 1879; application filed September 13, 1879.

To all whom it may concern:

Be it known that I, STEPHEN M. SMITH, of York, in the county of York, and in the State of Pennsylvania, have invented certain new and useful Improvements in Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to certain improvements in water-wheels, as will be hereinafter more fully set forth, and pointed out in the claims.

In the annexed drawings, Figure 1 is a side elevation of a water-wheel embodying my invention. Fig. 2 is a horizontal section of the same. Fig. 3 is a detail of the bottom step and bridge-tree. Fig. 4 is a perspective view of one of the gates. Fig. 5 is a section of the device or mechanism for operating the gates. Fig. 6 is a side view of the wheel proper. Figs. 7 and 8 are detailed views of the same. Fig. 9 is a vertical section of the wheel and casing.

A represents the bottom plate, and B the top plate, of the casing for the water-wheel, said plates being of any suitable dimensions, and connected by means of bolts *a a*, which pass through hollow posts C C interposed between the two plates, as shown. The wheel, which is placed in the center formed by said plates, is composed of a hub, D, which is made conical and concave, as shown in Fig. 7, and has a series of buckets, D′, secured thereto. These buckets are arranged spirally, and are inclined forwardly in the direction of the water. Their lower edges are sharpened, as seen at *x* in Fig. 7, and their outer edges, *y*, are also sharpened.

By the sharpening of the lower edges of the buckets I prevent the vacuum which always occurs by the revolution of the wheel, and hence increase the speed and power of the wheel.

It is well understood that if the lower edge of the bucket presents a square edge to the water there will, of necessity, be a vacuum at the end of each bucket, which will cause friction or suction and retard the motion of the wheel; but by sharpening the edges of the buckets, as above described, the water is cut or divided without any vacuum being formed, and hence without retarding the motion of the wheel.

The lower edges of the buckets are surrounded by a band or rim, E, which projects below the bottom plate, A, of the casing, as shown in Fig. 9, whereby the buckets may be extended below the casing to increase the power of the wheel without increasing the height of the casing, the band or rim E around the lower ends of the buckets acting to confine the water in the wheel below the casing until its full force is expended.

In my water-wheel I have no stationary chutes or water-ways, the gates being constructed to form the water-ways.

F F are the gates, constructed as shown in Figs. 2 and 4. Each gate is pivoted at a point, *e*, and has its inner end, *d*, projecting inward to form the chute. From the pivot-point *e* the gate has a heel, *h*, running outward straight, or nearly straight, to about the circular line in which the columns or posts C C are located.

It will be understood that in a working wheel there are twelve gates and twelve chutes, and therefore the distance from the pivot or pin that pivots the gate to the inner end is but about half as long as it is or would be if only six gates are used. Hence to turn the gate or make the heel of the gate extend only to the pivot gives a very short chute, and too short to give the greatest amount of power possible. By extending the heel of the gate about as far beyond the pivot as from the pivot to the inner end I get a chute that spouts the water much more strongly, and thus the percentage of the wheel is increased very considerably. Again, by running straight back on the heel side of the gate and extending the heel to the column-line, I get a great increase in the thickness and strength of the gate, not so liable to break, and there is more wearing-surface next to the bottom and base-plate, upon which it slides in opening and closing. This increased thickness also prevents the gate from twisting over and binding as it is opened or closed.

Without extending out with a heel, as described, the column-post in a wheel-case with twelve chutes stands very much in the current of the water as it flows to the chute and gates around it. Therefore pieces of floating grass, leaves, and other rubbish will catch on

said posts and obstruct the flow of the water to the wheel. By extending the heel of the gate back as far from the pivot as from the pivot to the inner end I form a body of metal, behind which, as it were, I set my column-posts, so that they are to one side of the current of water, and not in the current, as they are in the old chutes. Again, extending the heel back and keeping a straight line on the heel side, I get such a thickness of metal as allows me to core a large cavity or opening of the gate in the rear of the pivot, which I fill with waste and oil or tallow, thereby preventing the pivot from rusting, and also causing the gates to operate with greater ease. This cored-out cavity may be filled with brass or some non-corrosive metal which will not rust away, as cast or wrought iron would, and therefore the gates will keep in proper position longer, and thus obviate the leakage.

In the outer end of each gate is fastened a pin, *k*, which pin is made of malleable metal or any material capable of being bent to fit the device for operating the gate, and yet retain sufficient rigidity, so as not to be bent by said gate-operating mechanism.

The pins *k k* of the gates project beyond the top plate, B, of the casing, and each pin is fitted between two lugs, *i i*, on the under side of a plate or ring, G, which is placed on top of the top plate, B, of the casing. These lugs are such distances apart that the plate or ring G may move a certain limited distance without operating the gates, which admits of any number of gates being closed, even if any obstruction should get in between one or more of them, and these latter be thereby prevented from closing.

The plate or ring G is connected to a center hub, G′, which is placed on and turns around a hollow shaft, H, projecting from the top plate of the casing, and said gate-plate G is operated by means of an ordinary rack and pinion.

Each post C is provided or formed with an eccentric, *m*, to form a stop for the gate in opening the same. In putting the wheel together these eccentrics should be set so as to regulate the distance the gates shall open, and hence regulate the size of the chutes or waterways.

I is the shaft on which the wheel is secured, the lower end of said shaft resting on a step, *n*, upon a spider, J, which is adjustable up and down by means of bolts *p*, substantially as shown in Fig. 3.

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

1. The gate F, pivoted at *e*, and having the heel *h* running beyond said pivot to a point on the circular line in which the casing-columns C are located, substantially as set forth.

2. The pins *k*, made of a material capable of bending, and fastened in the ends of the gates F, in combination with the plate or ring G having projecting lugs *i* to take hold of said pins beyond the top plate of the casing, substantially as herein set forth.

3. The eccentrics *m* on the posts C, in combination with the gates F, for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 30th day of August, 1879.

STEPHEN M. SMITH.

Witnesses:

J. J. McCARTHY,

H. J. ENNIS.