

J. M. Cook,

Water Wheel.

No. 107,007.

Patented Sept. 6. 1870.

Fig. 1.

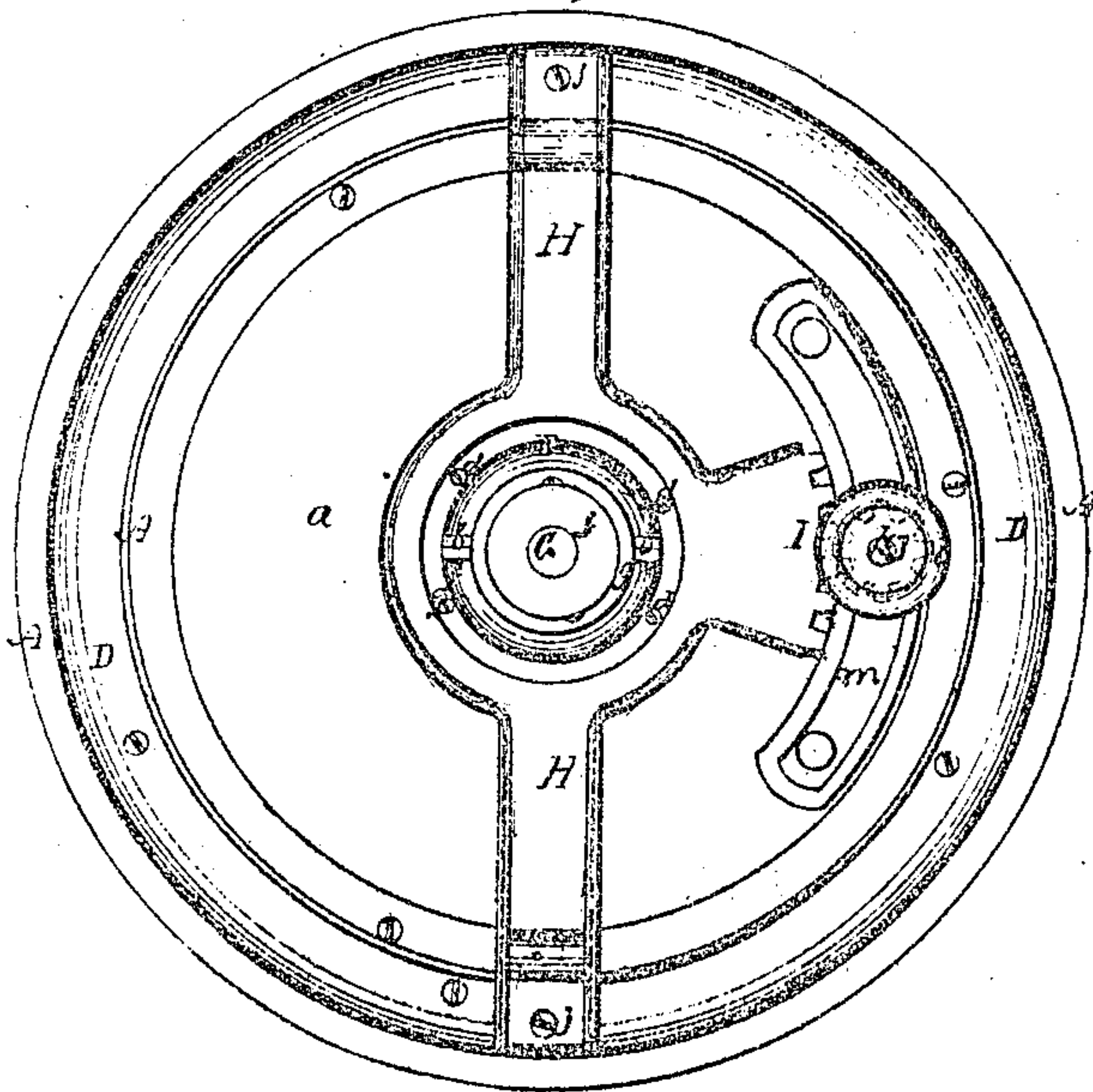
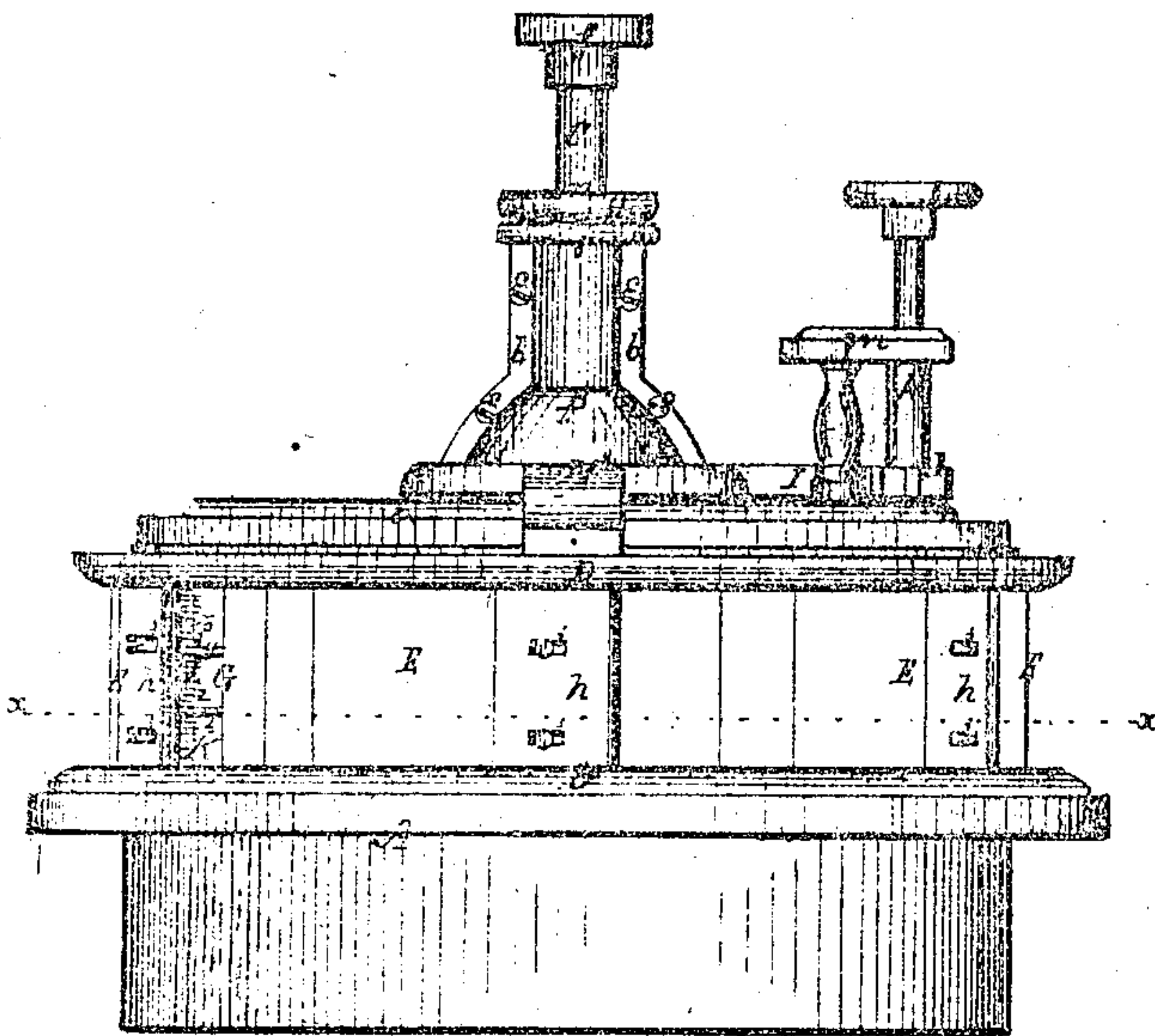


Fig. 2.



Witnesses

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3. Sheets, Sheet. 2

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Fig. 3.

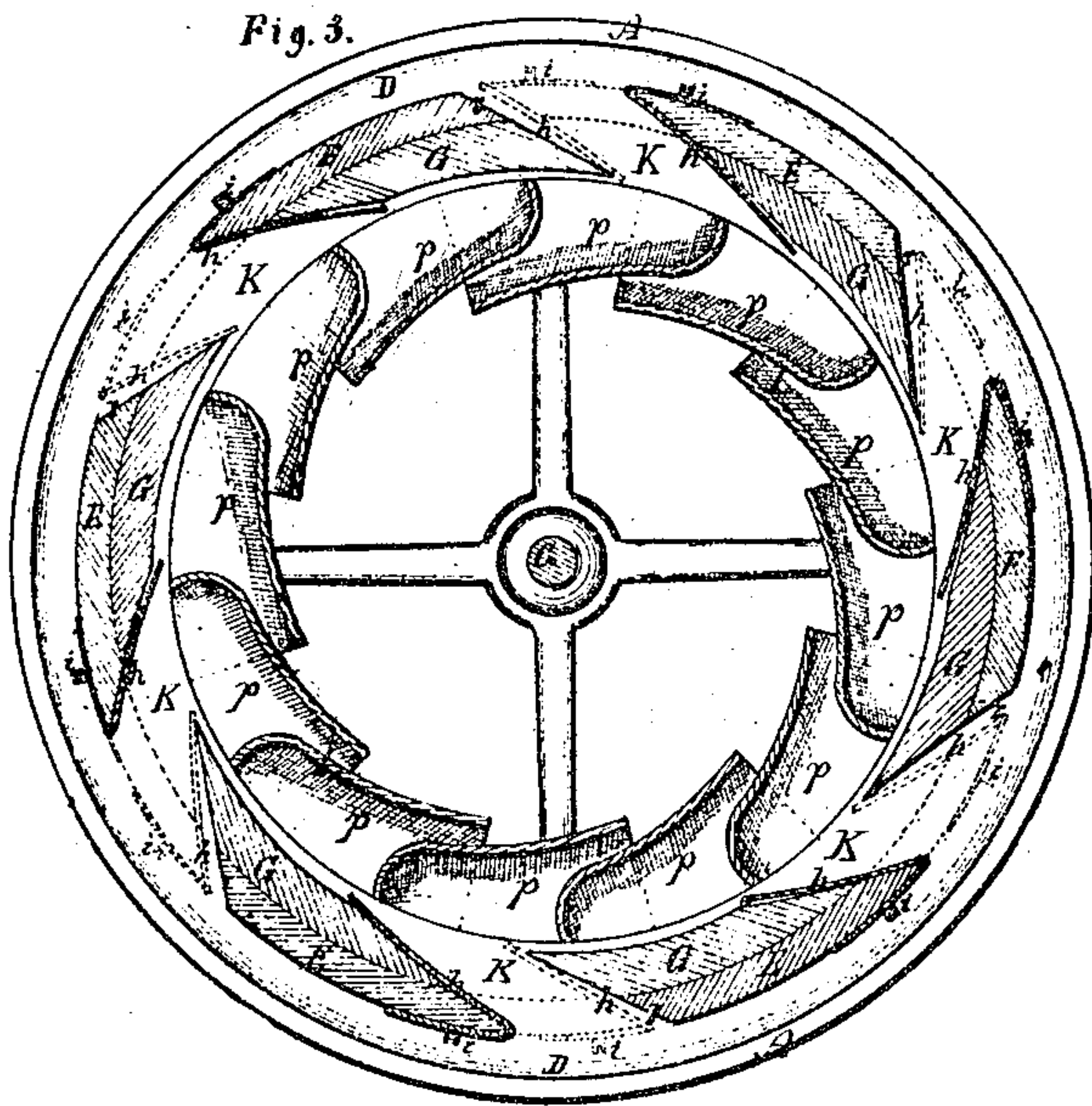
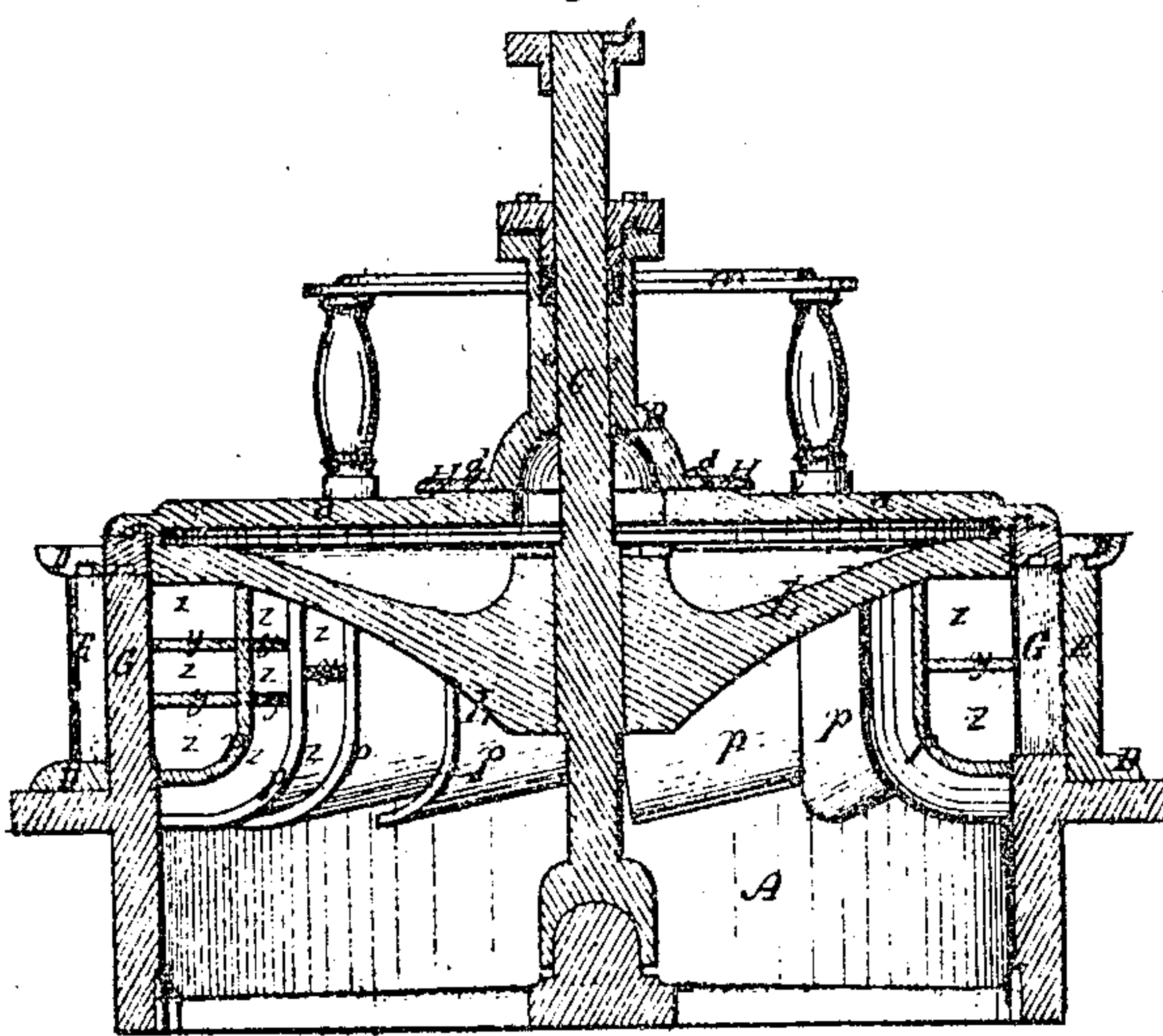


Fig. 4.



Witnesses:-

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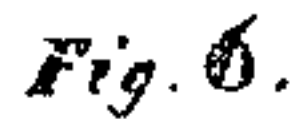
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United States Patent Office.

JACOB M. COOK, OF LAKE VILLAGE, NEW HAMPSHIRE, ASSIGNOR OF
ONE-HALF HIS RIGHT TO BENJAMIN J. COLE, OF SAME PLACE.

Letters Patent No. 107,007, dated September 6, 1870.

IMPROVEMENT IN WATER-WHEELS.

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, JACOB M. COOK, of Lake Village, in the county of Belknap and State of New Hampshire, have invented an Improved Water-Wheel; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing making part of this specification—

Figure 1 being a top view of the improved water-wheel.

Figure 2, a side view thereof.

Figure 3, a horizontal section of the same in a plane indicated by the line *x x*, fig. 2.

Figure 4, a central vertical section of the same.

Figure 5, a side view, showing a modified construction of the gates of the water-wheel.

Figure 6, a side view of the wheel itself, detached.

Like letters designate corresponding parts in all of the figures.

The first feature of my improvement consists in the construction of the top, *a*, of the case, *A*, with a central opening therein large enough to allow the top to come off over the shaft, *c*, of the wheel, without removing the coupling therefrom, or any pulley or gear-wheel, if used thereon, and in covering this opening with a removable cap or dome, *B*, made in two parts, so that it also can be removed from the shaft *C* without removing the coupling therefrom.

This cap or dome forms the upper bearing of the shaft, is provided with a soft metal bush, and has a stuffing-box in it, so as to be water-tight around the shaft.

The two parts of the cap or dome *B*, which covers the central aperture in the top *a*, have respectively flanges, *b b*, on their contiguous edges, by which they are secured together with screws, *c c*, so that the cap can be taken apart and removed from the wheel-shaft *C* whenever desired, without disturbing the coupling or connecting gear of the shaft above it. The cap also has a flange on its lower edge, by which it is secured to the top *a* with screws *d d*, so that, on removing, the cap can be removed from the wheel-shaft without hindrance.

The bearing in the cap is lined with a soft metal bush, *e*, and has a stuffing-box, *g*, in its upper end, so as to prevent all leaking from the wheel-case, around the shaft *B*. The outer edge of the top *a* is secured by bolts or screws to the stationary guides *G G*, which project upward from the main case *A*, and between which the water is admitted to the wheel. The top is raised a little inside, above the guides, in order to give free room for the wheel to turn beneath, and not interfere with the projecting bolt-heads or screws on the top wheel-plate, by which the wheel-buckets are secured to the said plate.

The next feature of my improvement consists in the construction and combined arrangement of the gates *E E*, mounted in a ring, and connected together, and of the stationary guides *G G*, also situated in a ring, the ring of gates having adjustable valve-plates, of peculiar form and arrangement, and the guides, having peculiar positions, with chutes between them, of peculiar form, in relation to the wheel *L* within, substantially as I shall describe.

First, the gates *E E* are arranged at uniform distances apart, in a ring, their inner surfaces being accurately formed and situated in the circumference of a single circle, concentric with the wheel *L*, and the guides *G G* are similarly arranged, at uniform and corresponding distances apart, their outer surfaces being accurately formed and situated in the circumference of a single circle, concentric with the wheel, and coinciding with the circumference of the circle described by the said inner surfaces of the gates, so that the gates fit closely around the guides, but may turn on their center, outside of the guides, without impediment.

Second, the inner surfaces of the guides *G G* do not reach quite into the periphery of the wheel, or the outer edges of its buckets *p p*, but leave a narrow annular space between, through which a small quantity of water may flow, for the purpose of obviating friction and obstruction between the guides and buckets.

Third, the edges of the guides *G G*, forming the outlines of the chutes *K K*, through which the water is admitted to the wheel *L*, on all sides are in planes tangential to the outer periphery of the wheel, so that the water is directed to the buckets in a course to produce the best effect, and, when the gates are moved to open the chutes to the water, as shown in fig. 3, their rear inclined surfaces, *r r*, are in line with the adjacent edges of the guides, so that the water is directed in unbroken sheets upon the wheel.

Fourth, the front edges of the gates *E E* are covered with valve-plates, *h h*, made of elastic metal, and thin enough to bend and yield to pressure, their inner edges reaching inward through the chutes, just in front of the edges of the gates. This part of the plates forms planes tangential to the wheel, or is slightly curved, but lies in the same general direction, as shown, so that they will shut tightly against the rear edges of the guides *G G* when the chutes are closed by the gates, and the chutes will always retain a wedge-shaped form, whether wholly or only partially opened thereby, and will direct the water in straight unbroken sheets to the wheel. The outer ends or flanges of the valve-plates bend around the outer surfaces of the gates, to which they are attached, by set-screws *i i* passing through horizontal slots in the plates, for the purpose of adjusting the positions of the plates accu-

ately, that they may close all the chutes simultaneously and tightly. The valve-plates close against the guides, at the rear inner edges thereof, while, further outward, they need not entirely close the passage. Their angular positions may be varied, so as to change the direction of the water to a certain extent, if desired.

The number of gates, guides, and chutes is from six to twenty-four each, according to the size of the wheel, and the number of buckets on the wheel is greater, generally from ten to thirty-six, according to the corresponding sizes of wheels.

The gates *E E* are mounted between two ring flanges, *D D*, to which they are fastened. To the upper flange *D* a cross-bar, *H*, is secured, and extends across the top of the case. It has a central opening, which fits around the bottom flange of the cap or dome *B*, and turns thereon as a pivot-guide. A segment rack, *I*, projects from one side of the cross-bar, and gears into a pinion, *J*, on a short vertical shaft, *k*, which is mounted on the case-top *a*, and in a frame, *m*, secured upon the said top, for bearings. The shaft *k* is turned by a hand-wheel or crank, *l*. By this device all the ring-gates *E E* are moved simultaneously on turning the said hand-wheel.

Another feature of my improvement consists in dividing the ring-gates *E E* into two or more sections, or in the employment of two or more rings of gates, one over the other, so as to let the water into the wheel, either in different quantities at the top and bottom, or all at the bottom, as may be desired.

This improvement is shown in fig. 5, which represents two rings or sets of gates, *E E* and *E' E'*, and the manner of operating them, so as to open the lower ring or set first, entirely or partially before the opening of the second or upper ring of gates commences, and the closing of those sets also will be one in advance of the other; the one which opens last closing first.

The means of producing this movement, as represented, is by extending the shaft *k* of the hand-wheel *l* down, outside of the water-wheel case, and placing thereon two pinions, *s s*, one opposite to the flange *D* of the upper gate *E E*, and the other opposite to the flange *D'* of the lower gates *E' E'*. On the upper flange *D* is a short rack, *t*, into which the upper pinion gears, and on the lower flange *D'* is a short rack, *u*, into which the lower pinion gears. These two racks

are not opposite to each other, one over the other, but one is a little to one side of the other, so that the pinion will take first into one, and move the gates as far as desired, before the other pinion takes into its rack. Then there is a cog or stop, *v*, on the lower edge of the upper ring, and a stop, *w*, on the upper edge of the lower ring, the two being so arranged as to have one strike the other, at the proper time, and thereby bring the rack of the other ring into gear with its pinion at the moment required, and *vice versa*, on the return movement. Similarly, if there are three or more rings or gates, one opens before another, in succession.

Another feature of my invention consists in dividing the buckets *p p* by a horizontal partition-plate, *y*, one in each, as shown at the right hand in fig. 6, or two, as seen at the left hand in the same figure, into two or three compartments, *z z*, each corresponding with the double or triple rings of gates above described. By means of these compartments only the lower, or two lower rings or sets of gates, may be opened, and yet the buckets will act with as much efficiency, and upward reaction, to relieve the weight of the wheel on its step, as if the whole wheel received the water. This is a valuable feature for small streams, or when the water is low.

What I claim as my invention, and desire to secure by Letters Patent, is—

The cover *a* of the water-wheel case, constructed with a large central aperture, covered by a divided removable cap or dome, *B*, substantially as and for the purpose herein specified.

Also, the ring-gates *E E*, with their adjustable valve-plates *h h*, the guides *G G*, and chutes *K K*, constructed, arranged, and combined substantially as and for the purpose herein set forth.

Also, the two or more sets of gates *E E* and *E' E'*, one above the other, to cover the same chutes *K K*, in combination with buckets *p p*, divided into compartments, substantially as and for the purpose herein specified.

Specification signed by me January 1, 1870.
J. M. COOK.

Witnesses:

H. B. QUINBY,
JOHN ALDRICH.