2 Sheets—Sheet 1.

J. CAMPBELL.

WATER WHEEL.

No. 105,301. Patented July 12, 1870.

Fig. 1.

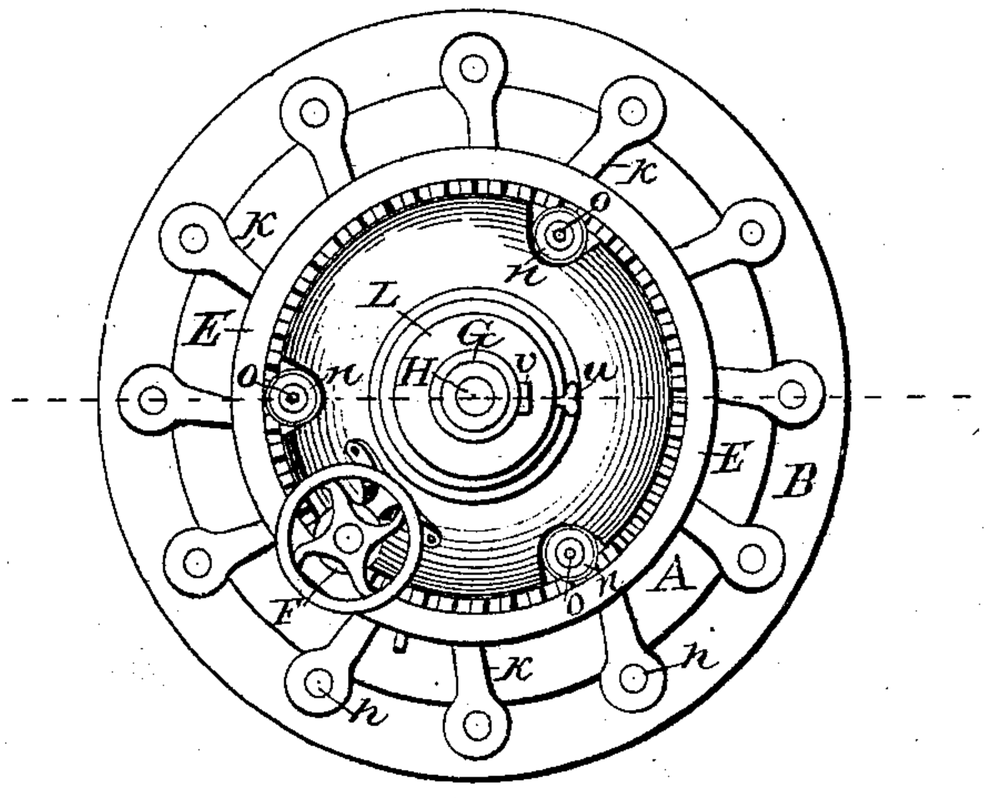
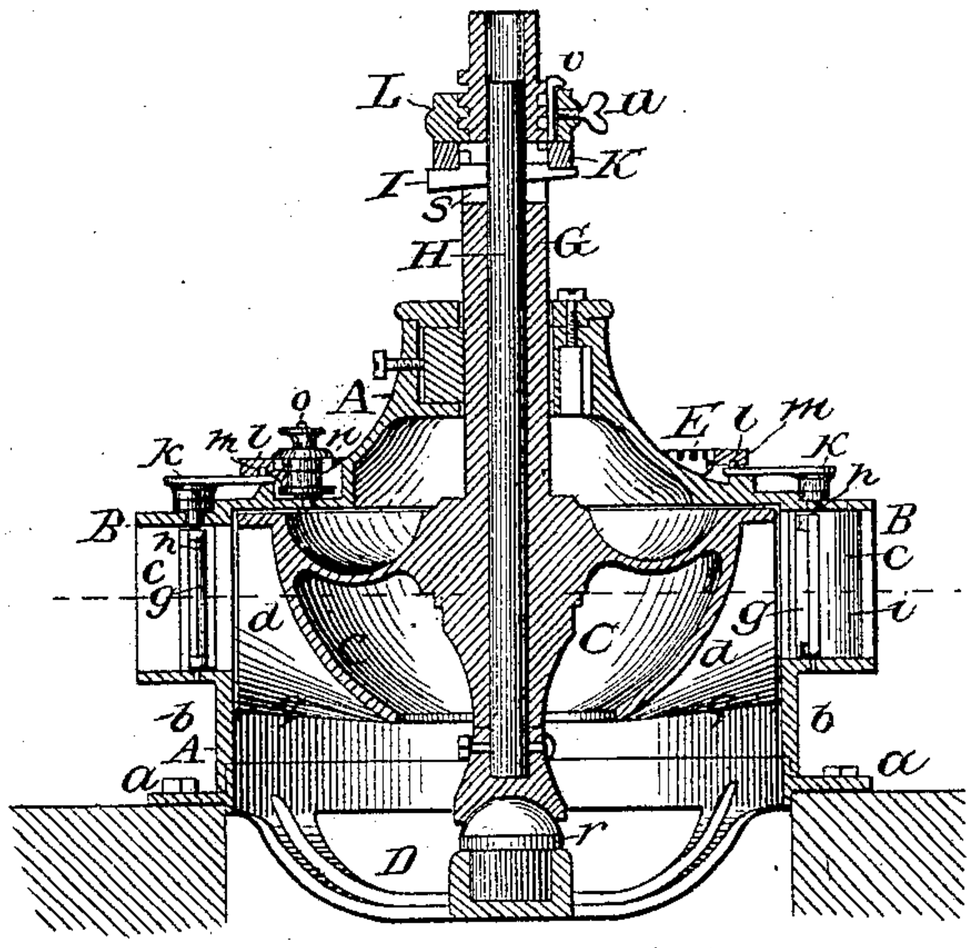


Fig. 2.



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2 Sheets—Sheet 2.

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WATER WHEEL.

No. 105,301. Patented Julv 12. 1870.

Fig. 3.

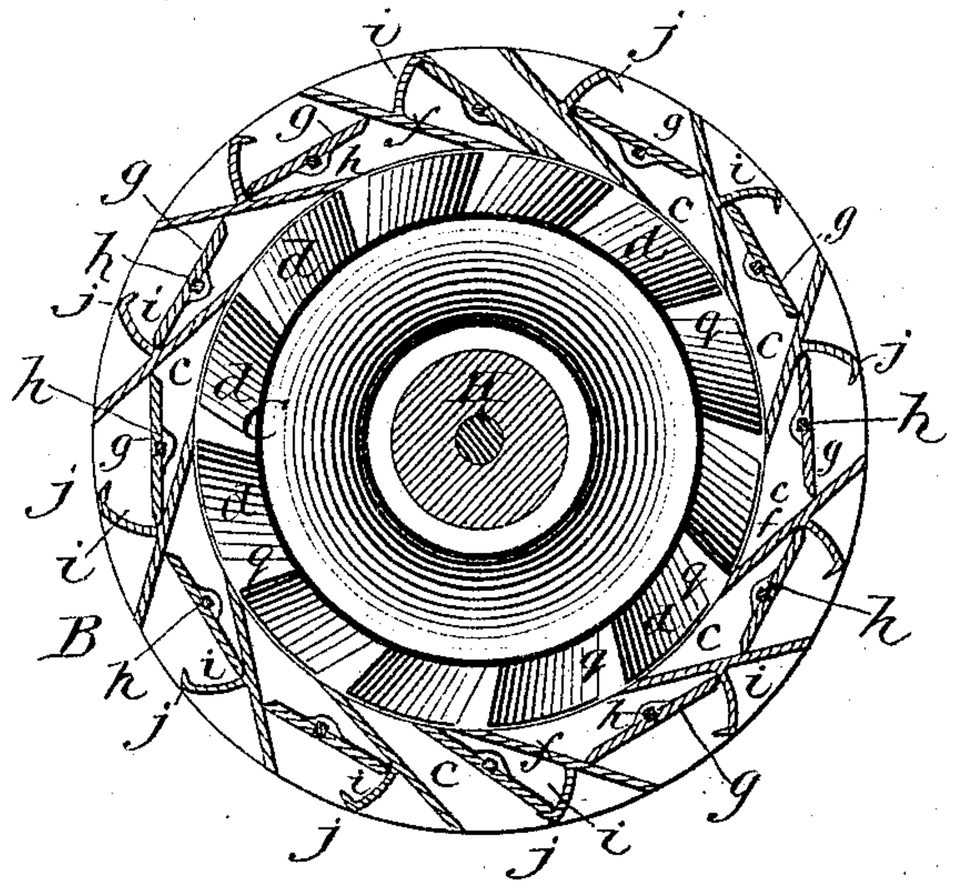
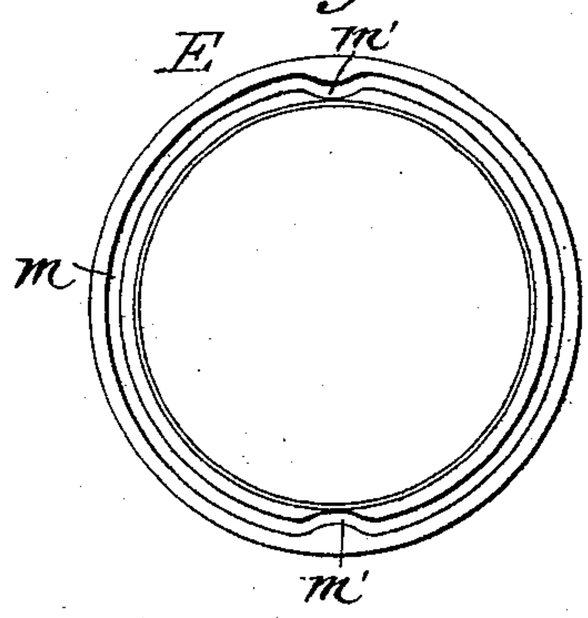


Fig. 4.



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JAMES CAMPBELL, OF ROCHESTER, NEW YORK

Letters Patent No. 105,301, *dated July* 12, 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, JAMES CAMPBELL, of the city of Rochester, county of Monroe and State of New York, have invented a certain new and useful Improvement in Water-Wheels; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawing, in which—

Figure 1 is a plan;

Figure 2, a central vertical section;

Figure 3, a horizontal section in the plane of the chutes.

Figure 4, a view of the bottom of the ring for opening and closing the chute-gates.

Like letters of reference indicate corresponding parts in all the figures.

My invention consists in the arrangement of the gates in the chutes, and the apparatus for operating the same; also, in the method of adjusting the wheel proper higher or lower upon the spindle; and, furthermore, in the construction of the casing, as hereinafter described.

In the drawing—

A represents the casing or curb;

B, the chute-chamber in the casing;

C, the water-wheel proper; and

D, the bridge-tree or bearing upon which the water-wheel rests.

The bridge-tree is provided with a flange, *a*, which rests upon the platform, and the base of the casing projects down to meet it, leaving, thereby, the chute-chamber elevated at some distance above the platform and projecting horizontally, as clearly shown in fig. 2, thus forming a dead space, *b*, beneath the chute-chamber.

I claim an advantage in this arrangement, inasmuch as the chutes are thereby elevated above the floor, so that stones, sticks, and other impediments, may strike into the dead space *b*, and be thereby prevented from passing into the chutes and choking the wheel. The working parts are also elevated, so that they may not become obstructed by mud and sediment that gradually gathers, and, also, so that they may be reached to repair or clear out without removing the wheel from place.

The chute-chamber is formed into a series of chutes, *c c c*, which direct the water in angularly upon the buckets *d d* of the wheel. One side, *f*, of the chutes is solid and fixed, but the other side is formed by gates or valves, *g*, turning upon axes, *h*, which open or close the gates as they are turned in one direction or the other.

At the rear of the gates are formed curved seats, *i*, in the wall, made concentric with the axes of the gates, so that the rear ends of the gates will always keep the water closed out, and thereby cause it to pass forward to the wheel.

This arrangement of the concentric seats in the wall, in connection with independent gates situated in the chutes, so as to open or close at any one point independently of the others, I believe to be new. The concentric seats make a perfect packing at the rear end, while the gates themselves form one side of the chutes, and are capable of any desired degree of adjustment to open or close the passage to the wheel. At the bottom and top, in fig. 3, the gates are shown open, while at the sides they are closed.

At their extremities, the seats *i* have angular lips or flanges, *j j*, which turn inward, overlapping the edges of the gates when shut against them. By thus covering the rear of the gates, the preponderance in the pressure of the water is upon the inner end of said gates when open, and upon the outer end when closed. Therefore, the tendency is to retain the gate stationary in either position, open or closed.

The axes *h h* of the gates extend up through the top of the casing, and are provided with crank-arms, *k k*. On the ends of these arms are pins, *l l*, which rest in a groove, *m*, of a cog-ring, E, which is driven by a pinion operated by hand-wheel, F.

The groove is provided with two offsets, *m' m'*, fig. 4, situated opposite each other. As the ring revolves, these offsets respectively strike the pins *l* of one of the gates, and throw the crank-arm *k* around to such a degree as to fully open the gate, when the offset clears, still going onward, and leaves the gate fully open. The offset then strikes the next successive gate and opens it, and so on till all are opened one after another. The use of the two offsets opens two gates at once, exactly opposite, so that only a half revolution of the cog-ring is necessary to open all the gates. The number of offsets might be increased or lessened as desired. The reverse movement will close the gates in the same way.

This arrangement of the cog-ring with the cam groove provided with the offsets, and the crank-arms and pins, enables me to open any desired number of the gates in succession, whereby I am enabled to exactly gauge the amount of water admitted to the wheel, to the work which is to be done; and, furthermore, I open the gates just opposite each other, so that the wheel is perfectly balanced by the water entering upon opposing sides.

I am aware that a series of gates opening by a simultaneous movement has before been used, but such is not the equivalent of my invention. I claim nothing but the arrangement of parts for producing the above effect.

The cog-ring is kept in place by means of small caps or shoulders, *n n*, held down by nuts, *o o*. Small

rollers *p p* are also arranged on the same bearing inside the cog-rim, to give the latter a free turning action. The cog-ring can be easily removed by taking off the nuts.

The body of the wheel proper is made convex, as shown, the taper extending downward. The front edges of the buckets are slanted outward, as shown at *q*, and the outer corners turn upward, so as to give a downward tendency to the water to the inner angle, where it escapes with the least resistance, after having expended its full force upon the buckets.

The shaft G of the wheel proper is made hollow, and in this rests the solid spindle H, which turns upon the step *r* of the bridge-tree.

A key, I, rests crosswise in the top of the spindle, passing through a slot, *s*, in the hollow shaft.

This slot is made of such extent vertically as to allow a degree of adjustment, up and down, over the ends of the key.

On top of the key rests a collar, K, which slips loosely over the outer shaft, having notches for striking over the key to prevent turning.

The upper end of the outer shaft is provided with a screw-thread, *t*, on which screws a nut, L, that rests upon the collar K. By turning this nut down it will be seen that the effect will be to raise the outer shaft, and, consequently, the wheel C, since the nut acts as a lever pressing down upon the key as a fulcrum.

A small set-screw *u*, striking upon a key, *v*, of the nut fixes the latter in place to the outer shaft in any desired position.

The object of the above-described arrangement is, to elevate the wheel to compensate for the wear of the spindle upon the step. Were it not for some adjusting arrangement, the wheel would soon grind in its case. Heretofore this effect has usually been produced by a set-screw under the step, but such an arrangement, from its position, is difficult to operate. I can extend my spindle and outer hollow shaft to any height above the wheel, and produce the adjustment without difficulty. I do not claim, however, the position of the adjusting parts, but simply the arrangement of the parts for producing the adjustment, which I believe to be new.

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

1. The cog-ring E, provided with the groove *m*, and offsets *m' m'*, when combined with the crank-arms *k k*, in such a manner as to set the gates in succession, one after another, as herein described.

2. The rollers *p*, caps *n*, and nuts *o*, for retaining the cog-ring in place and allowing its removal, as described.

3. The seats *i*, in the wall of the chute-chamber, concentric to the axes of the gates, when combined with the independently acting gates *g*, situated in the chutes and forming one side thereof, as herein described.

4. The combination with the spindle H, and hollow shaft G of the key I, loose collar K, and screw-nut L, the whole so arranged as to produce a vertical adjustment of the wheel at the top of the spindle, as described.

5. The combination of the angular lips *j*, of the seats *i*, with the gates *g*, serving to produce a preponderance of water upon the front or rear end of the gates as open or closed, as described.

6. The chute-chamber B, located at a distance above the platform flange *a*, and projecting horizontally to form a dead space, *b*, beneath, as herein described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES CAMPBELL.

Witnesses:

R. F. OSGOOD,

GEO. W. MIATT.