N. F. Hodges,

Water Wheel,

No. 2,173. Patented July 16, 1841.

Fig. 1.

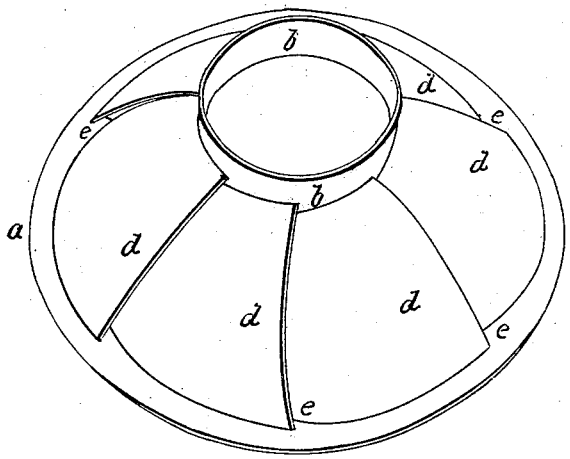
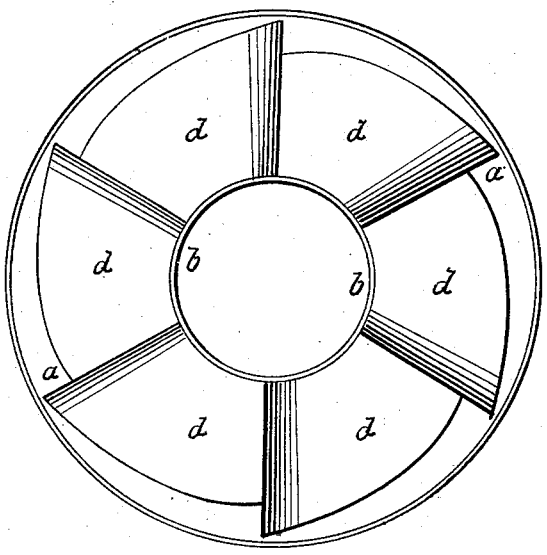


Fig. 2.



UNITED STATES PATENT OFFICE.

NATHANIEL F. HODGES, OF CORNING, NEW YORK.

IMPROVEMENT IN THE MANNER OF CONSTRUCTING REACTING WATER-WHEELS.

Specification forming part of Letters Patent No. **2,173**, dated July 16, 1841.

To all whom it may concern:

Be it known that I, NATHANIEL F. HODGES, of Corning, in the county of Steuben and State of New York, have made a new and useful Improvement in the Manner of Constructing that Kind of Water-Wheel which is Usually Denominated the Reaction Wheel; and I do hereby declare that the following is a full and exact description thereof.

The distinguishing features of my wheel are, first, that its general form is that of a segment of a hollow sphere, each of the individual buckets which by their combination give to it this form being also segments of hollow spheres, and, secondly, in causing the openings between these buckets through which the discharge of water takes place to extend from the periphery of the wheel to the eye or opening through which the shaft passes. There is not, therefore, on the face of my wheel any back or bottom plate or imperforated portion upon which the water presses without having a tendency to turn the wheel.

In Figure 1 in the accompanying drawings, *a a* is the rim or outer edge of my wheel. *b b* is the inner rim, which constitutes the eye through which the shaft is to pass. *d d d* are the buckets, each of which is a segment of a hollow sphere extending from the exterior rim *a a* to the interior rim *b b*, leaving apertures for the discharge of water at *e e e*, where one overlaps the other to a distance of three or four inches, or to such an extent as may be deemed necessary to give a tangential direction to the discharged water. Fig. 2 is a direct view of the inner or concave side of the wheel, showing the form which the rim *a a* will assume from the overlapping of the buckets.

I cast the rims and buckets of this wheel in one entire piece, as it is thus rendered more strong and perfect in all respects, as well as being afforded cheaper than if made in parts and put together. This wheel is put upon a shaft of wood, which fills the eye, and to cause it to run as nearly water-tight as possible I turn the outer rim *a a* true in the lathe, and I also affix a corresponding ring of cast-iron onto the penstock, which is also turned true, thus securing a more perfect water-tight joint than can possibly be obtained by running the wheel against an aperture of wood. I make the shaft cylindrical throughout that portion of it which is surrounded by the water in the penstock, thus avoiding all pressure upon it endwise, which would have an effect similar to that exerted upon the back or bottom plate or other imperforated part of a reaction-wheel.

In constructing this wheel it will be found advantageous in situations where the head of water is low and its quantity abundant to make the wheel of smaller diameter than when the head is high to make the discharge apertures or openings larger, and also to decrease the diameter of the eye, so as to carry the openings between the buckets nearer to the axis of the wheel. The shaft will in this case be diminished in size and the action of the water upon the wheel increased. In high heads, on the contrary, the diameter of the wheel should be increased, as also should that of the shaft, while the size of the apertures should be lessened. In doing this the judgment of the millwright must be the only guide, as the quantity of water which can be rendered available must always be taken into account in calculating the size of the wheel and that of the discharge-openings between the buckets. Such wheels may be used either singly or in pairs, according to circumstances. When used in pairs, the wheels should be placed on a horizontal shaft. When used singly, the shaft may be placed vertically, the arrangement in this respect being the same as with other reaction-wheels.

Having thus fully described the nature of my reaction water-wheel and shown the construction and operation of the same, what I claim therein, and desire to secure by Letters Patent, is—

The so constructing the wheel as that each of its buckets shall constitute a segment of a hollow sphere, and that these shall be so arranged and combined with each other as that the openings for the discharge of water shall extend from the outer rim to the eye or shaft, and the wheel itself thus constructed and combined shall constitute a segment of a hollow sphere, as herein fully set forth.

N. F. HODGES.

Witnesses:
T. A. JOHNSON,
H. H. HULL.