

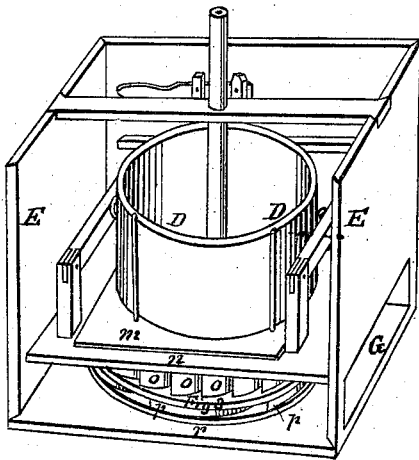
*S. B. Howd,*

*Water Wheel,*

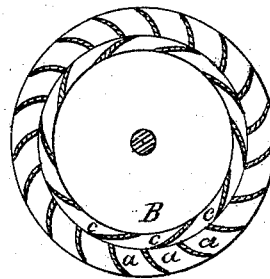
*N<sup>o</sup> 2,599.*

*Patented Apr. 30, 1842.*

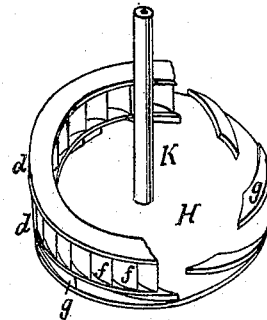
*Fig. 1*



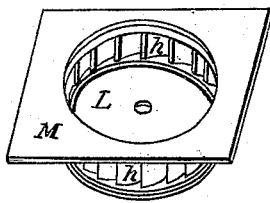
*Fig. 2.*



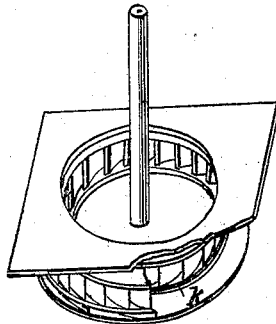
*Fig. 5.*



*Fig. 4.*



*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



*Fig. 9.*



*Witnesses*

*Geo. H. Middleton  
Theodore Partridge*

*Inventor*

*Samuel B. Howd*

# UNITED STATES PATENT OFFICE.

SAMUEL B. HOWD, OF ARCADIA, NEW YORK.

## IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 2,599, dated April 30, 1842.

*To all whom it may concern:*

Be it known that I, SAMUEL B. HOWD, of the town of Arcadia, county of Wayne, and State of New York, have invented a new and Improved Mode of Constructing a Water-Wheel, commonly called a "Reaction-Wheel;" and I do hereby declare that the following is a full and exact description thereof.

My said wheel is constructed in the following manner: Between two flat rims of cast-iron or other fit material are inserted curved buckets bounded on their inward and outward sides by arcs of perfect circles, as is hereinafter shown by reference to the drawings hereunto annexed. These buckets have their outward points directed backward contrary to the motion of the wheel, and the water is received from the inner side of the wheel around its whole periphery and is discharged outwardly nearly in the direction of a tangent of the circle coinciding with the outer points of the buckets. The said lower rim is supported by risers constructed of wood or iron or other fit material of a curved form as wide at the widest part thereof as the lower rim and as thick as the aggregate of the thickness of the bottom of the cistern and the space between it and the disk, which have their outward points directed in the same manner as the buckets, backward contrary to the motion of the wheel, and which rest upon the disk attached to the shaft. Said risers are placed between the disk of the wheel and the lower rim, first, for the purpose of elevating the upper surface of the lower rim to a level with the upper surface of the bottom of the cistern within the wheel, which they do in consequence of their being just equal in height to the aggregate of the thickness of the bottom of the cistern and the space between the cistern and the disk of the wheel, and, secondly, for the purpose of affording a channel of escape for the waste water rushing between the wheel and the cistern, which they do by means of the apertures between them. These risers should be of such a distance apart as to render the aggregate capacity of the discharging-apertures between the lower rim and the disk of the wheel much larger than the aggregate capacity of the apertures through which the waste water rushes in passing from the cistern above into the space between the bot-

tom of the cistern and the disk of the wheel in order to afford such waste water free egress, and thereby to relieve the wheel from the pressure of the column of water in the flume, which it would otherwise necessarily have to sustain if the lower ends of the buckets were inserted directly into the disk, or if the aggregate capacity of the discharging-apertures was only equal to or was less than the aggregate capacity of the apertures through which the waste water passes into the space between the bottom of the cistern and the disk of the wheel. The disk upon which the risers directly rest by being laid thereon and upon which the wheel indirectly rests by being placed on the risers is constructed of wood or other fit material, the diameter thereof being equal to that of the wheel and the thickness thereof being such as to afford sufficient strength to support the weight of the risers and wheel resting upon it and to transmit the power of the wheel to the shaft. Its upper surface is a plane. It is attached to a vertical shaft and when in motion it revolves horizontally. A tub or cistern as large as will pass within the rims with a bottom fitted closely around the shaft is sunk or suspended within the wheel so deep as may be without touching the disk of the wheel and is supported and held in its place by means of a flange overlapping the floor of the common flume for the purpose of sustaining the weight of the water above and preventing its resting upon the disk of the wheel and for the purpose of receiving the discharging ends of the chutes and holding them in their place. Short chutes are placed within the cistern in the plane of the buckets with their discharging ends terminated at the periphery thereof and in such a position as to discharge the water outwardly at right angles to the point of impingement upon the face of the buckets.

Figure 1 in the accompanying drawings is a perspective view of the apparatus, one side of the flume being omitted to show the construction of the parts more perfectly. DD is a circular gate which stands upon the flange of the cistern for the purpose of admitting and shutting out the water. EE is the flume. G is the opening at which the water is discharged. *m* is the flange overlapping the flume-floor. *n* is the flume-floor. *ooo* are the buckets.

Fig. 3 is the lower rim of the wheel. *pp* are the risers. *r* is the disk of the wheel.

Fig. 2 is a top view of the wheel and the chutes, the flange which covers the chutes and the upper rim of the wheel being removed so as to exhibit the position and direction of the chutes and buckets. *B* is the bottom of the cistern, into which the lower ends of the chutes are inserted. *ccc* are the chutes. *aaa* are the buckets standing on the lower rim of the wheel.

Fig. 4 is a perspective view of the cistern attached to the flange. *L* is the bottom of the cistern. *M* is the flange. *hh* are the chutes standing between the bottom of the cistern and the flange.

Fig. 5 is a perspective view of a section of the wheel, representing the form and position of the risers, the manner in which the wheel is elevated by them, the disk of the wheel, and its attachment to the shaft. *H* represents the disk of the wheel as attached to the shaft *K*. *dd* are the rims of the wheel. *ff* are the buckets. *gg* are the risers.

Fig. 6 represents a portion of the wheel and also the cistern with a part of the flange omitted to show more perfectly the suspension of the cistern within the wheel and the space between the bottom of the cistern and the disk of the wheel. *k* is the space between the bottom of the cistern and the disk of the wheel.

Fig. 7 is a perspective view of a chute.

Fig. 8 is a perspective view of a bucket.

Fig. 9 is a perspective view of a riser.

The mode of supporting the cistern within the wheel may be varied, care, however, being taken that no part of it rests upon the wheel; but the above-described mode I have found to answer well in practice.

The relative dimensions of the several parts may be considerably varied without essentially affecting the power of the wheel; but I give the following proportions as having answered well in practical trials: Suppose the

wheel to be six feet in diameter. The width of the rims may be six inches and the space that the chutes occupy on the bottom of the cistern four inches. There may be twenty-four chutes and forty buckets. The length of the buckets or distance of the rims asunder may be four inches; but this part in particular may be much increased or diminished, according to the quantity of water at command and the consequent power of the wheel. The sum total of the areas of the cross-sections of all the chutes should be less—say one-half—than the sum total of all the areas of the cross-sections of the discharging-orifices between the buckets, so that the water may have free discharge. The space between the disk of the wheel and the bottom of the cistern may be one inch, and the bottom of the cistern, if of wood, may be four inches thick, and in such case the number of risers may be eight and their vertical thickness five inches.

My said improvement being above described as applicable to a horizontal wheel, I hereby declare that the same is not intended to be limited to that position, but is applicable to vertical and inclined wheels.

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

A mode of constructing a water-wheel, commonly called a "reaction-wheel," by elevating it upon risers placed between the disk of the wheel and the lower rim thereof for the purpose of raising the upper surface of the lower rim to a level with the upper surface of the bottom of the cistern within the wheel, and for the further purpose of affording a channel of escape for the waste water rushing between the wheel and cistern, in the manner and form set forth and described in the foregoing specification.

SAMUEL B. HOWD.

Witnesses:

STEPHEN CULVER,

THEODORE PARTRIDGE.