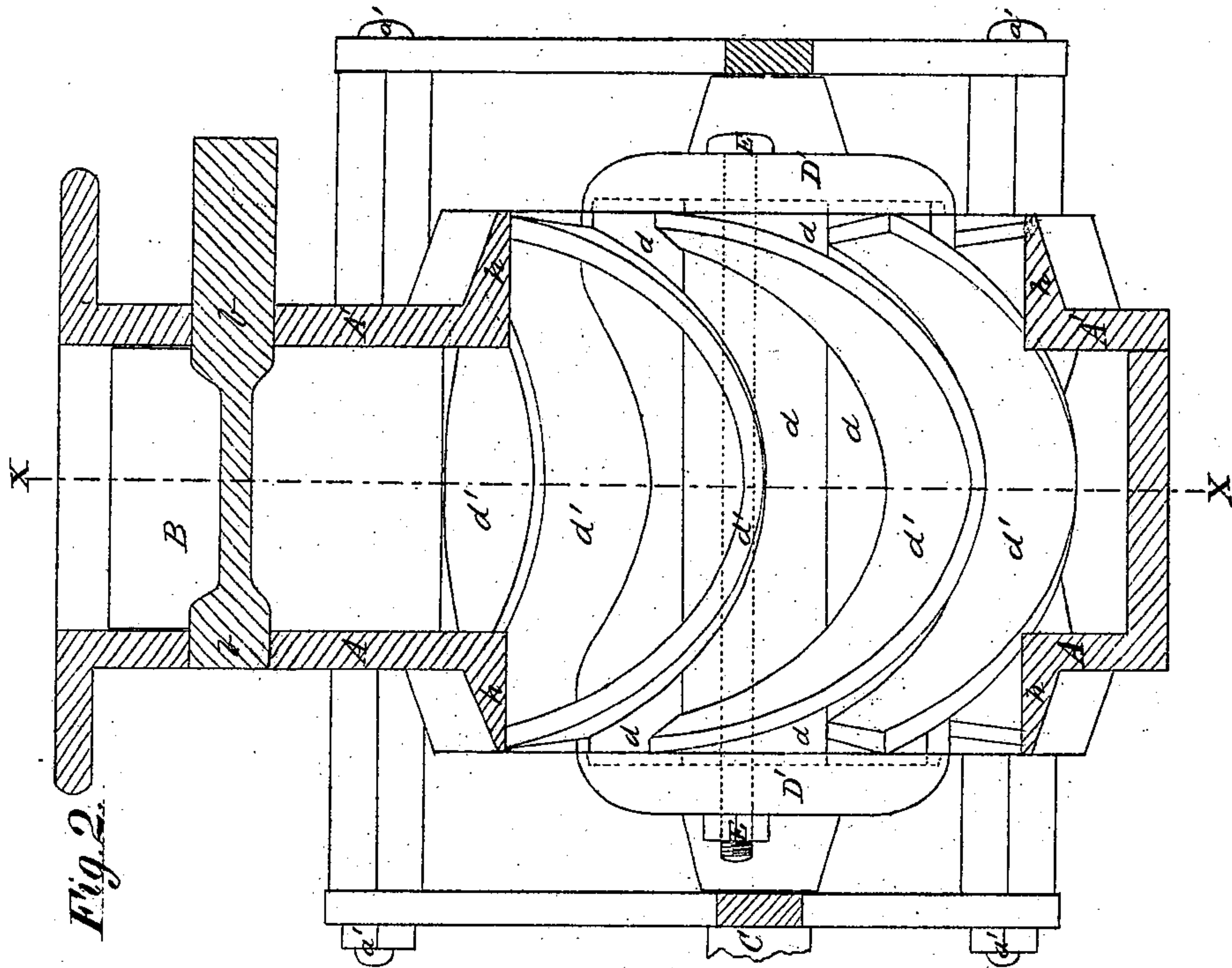


*E. F. Cooper,*

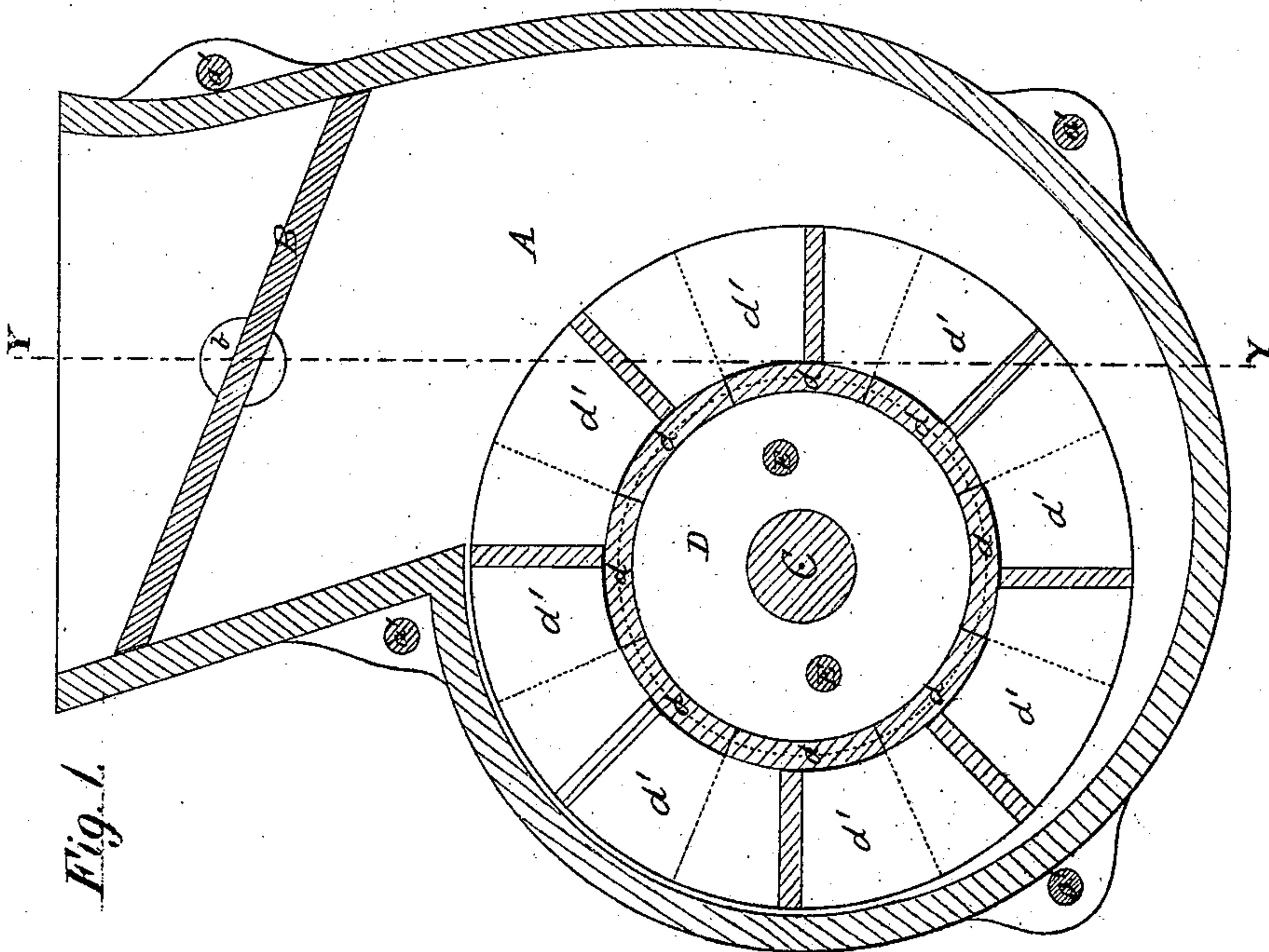
*Water Wheel.*

*No. 98,150.*

*Patented Dec. 21, 1869.*



*Fig. 2.*



*Fig. 1.*

*Witnesses*  
*E. W. Anderson,*  
*D. D. Kane*

*Inventor.*  
*E. F. Cooper.*  
*Chapman, Hooper & Co.*  
*Attorneys.*

# United States Patent Office.

E. F. COOPER. OF MOUNT GILEAD, OHIO.

Letters Patent No. 98,150, dated December 21, 1869.

## IMPROVEMENT IN TURBINE 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, E. F. COOPER, of Mount Gilead, in the county of Morrow, and State of Ohio, have invented a new and valuable Improvement in Turbine Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1, of the drawings, is a section of my invention through the line X X.

Figure 2 is a section of my invention taken through the line Y Y.

My invention relates to turbine wheels, and consists, mainly, in the construction and novel arrangement of devices, whereby efficient and economical purposes are subserved.

The letter A, of the drawings, represents the casing, cast in two parts, A and A', which are secured together by bolts and nuts, at *a' a'*.

B is the regulating-gate, placed in the mouth of the casing, and turning on journals *b b*.

C represents the shaft of the wheel, to which the cylinder-heads D' D' are firmly secured.

D represents the wheel thus constructed.

Cylinder-heads D' D' are formed with circular grooves in their inner surfaces, to receive the lips formed at each end of the iron staves *d d*.

Each bucket *d'* is curved, so as to present its concave surface to the force of the water. Each bucket is cast on a separate stave, so that when the staves are joined, to form the body of the wheel, the buckets fall into their proper places.

The lips at each end of the staves fit into the circular grooves in the cylinder-heads; which are drawn tightly together, by means of bolts and nuts E E, making the wheel secure and firm.

The casing is so constructed that it allows the concussion of the water to act on about one-half of the surface of the buckets, one-quarter being covered above by a flanch, *h*, constructed in the upper casing, and one-quarter covered below by a similar flanch, *h*, in the lower casing.

The reactionary force of the water is allowed to act on the whole concave surface of each bucket. After use, the water passes freely out at both ends of the buckets.

It is apparent, from the construction of this wheel, that it is very easily packed and transported.

It is a reversible wheel, being capable of either a right-hand or left-hand movement. The journals of the gate may be reversed in their bearings, and the ends of the buckets may be changed to the opposite cylinder-heads, when, by turning the casing upside down, what was a right-hand movement, will become a left-hand movement, and *vice versa*.

The cylindrical body of the wheel is made up with from six to fourteen separate staves, each having cast on its outer surface a bucket.

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

The reversible turbine wheel, herein described, having reversible casings A A', with flanches *h h* and gate B, and wheel D, having grooved cylinder-heads D' D' and separate reversible buckets *d' d'*, cast on separate iron staves *d d*, all constructed and arranged to operate substantially as specified.

In testimony that I claim the above, I have hereunto subscribed my name, in the presence of two witnesses.

E. F. COOPER.

Witnesses:

S. R. MERRILL,  
G. D. CROSS.