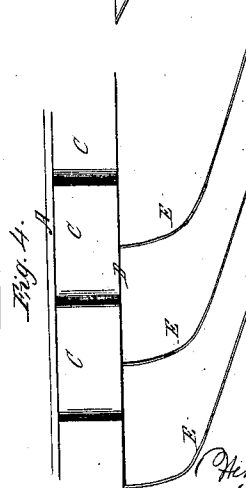
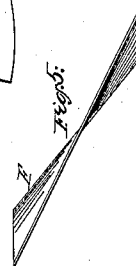
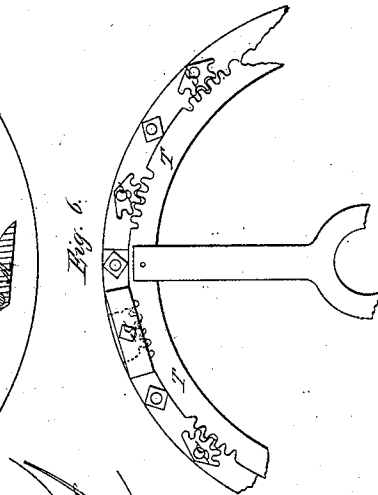
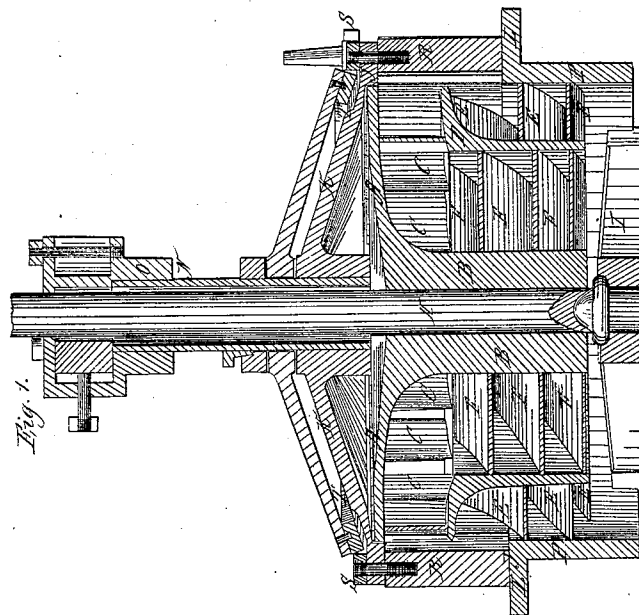
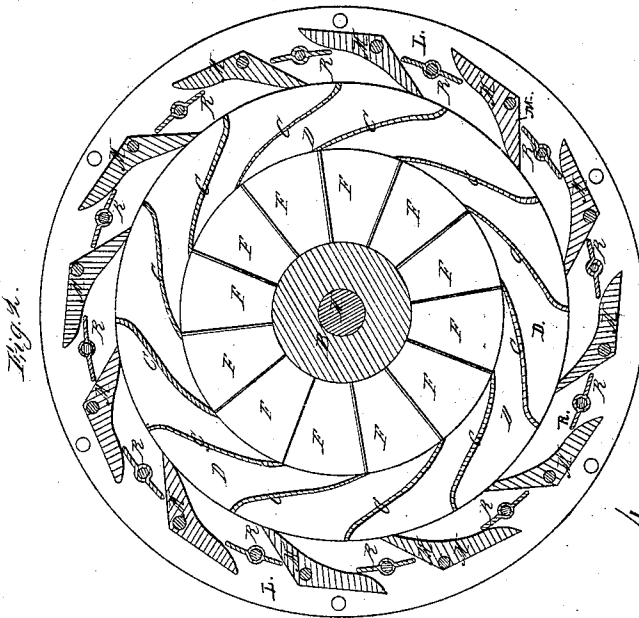


H. P. Bradbury,

Water Wheel,

N^o 60,854.

Patented Jan. 1, 1867.



Witnesses.
Thos. Connelley
James T. Parker.

Inventor.

Henry P. Bradbury
By his Attys Geo. W. Smith

United States Patent Office.

HENRY P. BRADBURY, OF SPRINGFIELD, OHIO.

Letters Patent No. 60,854, dated January 1, 1867.

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, HENRY P. BRADBURY, of Springfield, in the county of Clark, and State of Ohio, have invented a new and useful Improvement in Water-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical cross-section of my wheel and its case.

Figure 2 is a horizontal section of the same.

Figure 3 is a diagram of the upper set of buckets.

Figure 4 is a diagram of the lower set of buckets.

Figure 5 is a diagram of the inner set of buckets.

Figure 6, a plan of top of case, showing the mechanism for opening and closing the gates.

My invention relates to that class of water-wheels known as "Turbine," and it consists, first, in the manner of constructing and arranging the buckets or floats of the wheel so as to secure a much larger per cent. of power from the water passing through the wheel than has hitherto been attained; second, in the manner of constructing the case and gates by which the water is admitted and directed to the wheel; third, in the manner of operating the said gates.

That others may understand the construction and operation of my improved wheel, I will particularly describe it.

A is the crown plate of the wheel; on its under side it is nearly flat at the outer edge, but inclines downward slightly, and gradually curves downward more and more until it assumes a perpendicular outline as it reaches the central hub B. The buckets C, lying directly below, and attached to the outer part of the crown plate A, are known as ogee in form, (see fig. 3.) They stand vertical, and extend from the outer edge of the wheel inward about half the distance from the outer edge to the surface of the hub B. The lower edges of the buckets C rest upon the partition plate D, which, commencing at the outer edge of the wheel, extends inward, curving downward, until it assumes a perpendicular position about midway between the outer edge of the wheel and the surface of the hub B. The forms of the crown plate A and partition D, in section, upon a vertical plane, cutting through the centre of the wheel, are clearly shown in fig. 1. Beneath the horizontal portion of the partition D, and outside of its vertical portion, are the buckets E, the form of which is clearly shown in fig. 4. The outer edges of the bucket E are perpendicular to the outer edge of the partition D. Situated between the vertical portion of partition D and the hub B, are the buckets F. They are nearly straight on the face, and are curved slightly at each end, as shown in fig. 5.

Thus, it will be perceived, there are three distinct and separate sets of buckets to my wheel, each having its own office, but each adding its quota to the power of the whole. At the first impact the water is divided by the partition D, and a portion of it passes horizontally into the wheel, while another portion is immediately deflected downward, and acts vertically upon the buckets, escaping at the bottom of the wheel. That portion which passes in horizontally, and acts in that direction upon the ogee buckets C, soon reaches the central chamber or space G, without being exhausted, because its head has not been reduced by its passage through the buckets C. It has still as far to descend, before escaping finally from the wheel, as when it passed through the gates. It follows, then, that having still some power left, a greater or less portion may be utilized by permitting the water in the space or chamber G to act upon the inclined surfaces of the buckets F. These buckets are set with a more gradual inclination than the buckets E, because the water which is to act upon them has lost some of its velocity in passing through the buckets C, and therefore requires a longer time in which to act during the remainder of its passage through the wheel. As the water enters the chamber G, the direction of its motion is to be changed from horizontal to vertical. Its specific gravity would accomplish this alone, were there space and time, but here it requires aid. The crown plate A curves downward to form the hub B, and deflects the stream in the proper manner. It is of great importance that this deflection should take place within a chamber, because the direction of a rapidly moving stream of water cannot be so changed without violent commotion and reaction, and if the buckets C were simply extended and curved so as to meet the buckets F, the streams of water would then be forced to change their course while confined in narrow spaces, the reaction and friction due to the resistance to deflections would be received upon the surfaces of the buckets, and would tend to neutralize,

to some extent, the direct action of the water upon other parts of the wheel. When this deflection is accomplished in the annular chamber, G, these reactions and the consequent friction are received upon the atoms of the water itself, and have no other effect than possibly to absorb a portion of the velocity of the water, leaving the motion of the wheel uninfluenced. The wheel is set upon the shaft H, and is stepped upon the centre of the bridge I in any suitable manner. The ends of the bridge arms I are secured to the lower part of the wheel case in any suitable manner. The wheel case J is composed of a cover, K, a bottom rim L, and the posts, M, which also serve as shoots to direct the water upon the wheel. At the centre of the cover K is the stiff stand pipe N, having the bushed box O at its upper end. The shaft H passes upward through the stand pipe and has a bearing at O, so that the wheel is, at all times, dependent upon its case for the truth of its position, and will be unaffected by any variation of the flume or other bearings of the shaft. The rim or flange, L, has dependent from it a cylindrical band, P, to which the bridge I is attached. The posts M, which connect the cover K and rim L, occupy about the space of the distance between two contiguous buckets, and the space left between them is about the same. The horizontal section of one of the posts, M, presents a lozenge figure, the longer side being slightly convex on one side and concave on the other, so as to conform to the curve of the outer edge of the wheel. The inclined sides or edges of the posts M form permanent shoots to direct the water upon the wheel in the most advantageous manner, a feature which could not exist if the balance gates were employed to direct the water, because the direction would then constantly vary with the extent to which the gates are opened, and the water would be thrown upon one portion of the bucket or another, according to the amount to be admitted. This would be a defect manifestly, because there must be one certain angle of incidence which will be most advantageous. The balanced gates, R, are placed upon vertical axes, in the spaces between the posts M. When they open water is admitted at each edge and passes along the inclined edge of the shoot or post, M, upon the buckets of the wheel, and the direction of the motion of the water is not affected by the position of the gate. The upper end of the axis of the gate passes upward through the cover K, and is provided there with a segment gear, S. The ring, T, has cogs cut in its outer edge which gear with the segments S. To open or close the gate a lever is applied, in any convenient way, to any one of the segment gears, S, and through that and the ring T, all the other gates are equally influenced. My wheel may be placed anywhere between the top and bottom of the flume, equally good effects being obtained in one case as the other.

Its operation having been fully described, with the description of its construction, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the three sets of buckets, C, E, F, substantially as and for the purpose set forth.
2. The horizontal buckets C, in combination with the vertical buckets F, and the annular chamber G, substantially as and for the purpose set forth.
3. In combination with a wheel receiving its water horizontally, the post M, and balanced gates R, operated by the segment S, and geared ring T, substantially as and for the purpose set forth.

HENRY P. BRADBURY.

Witnesses:

H. S. SHOWERS,
GEO. MOWER.