Sheet 1. 2 Sheets.

G. M. Conner.

Water-Wheel.

No. 72169 Patented Dec. 17, 1867.

Fig: 1.

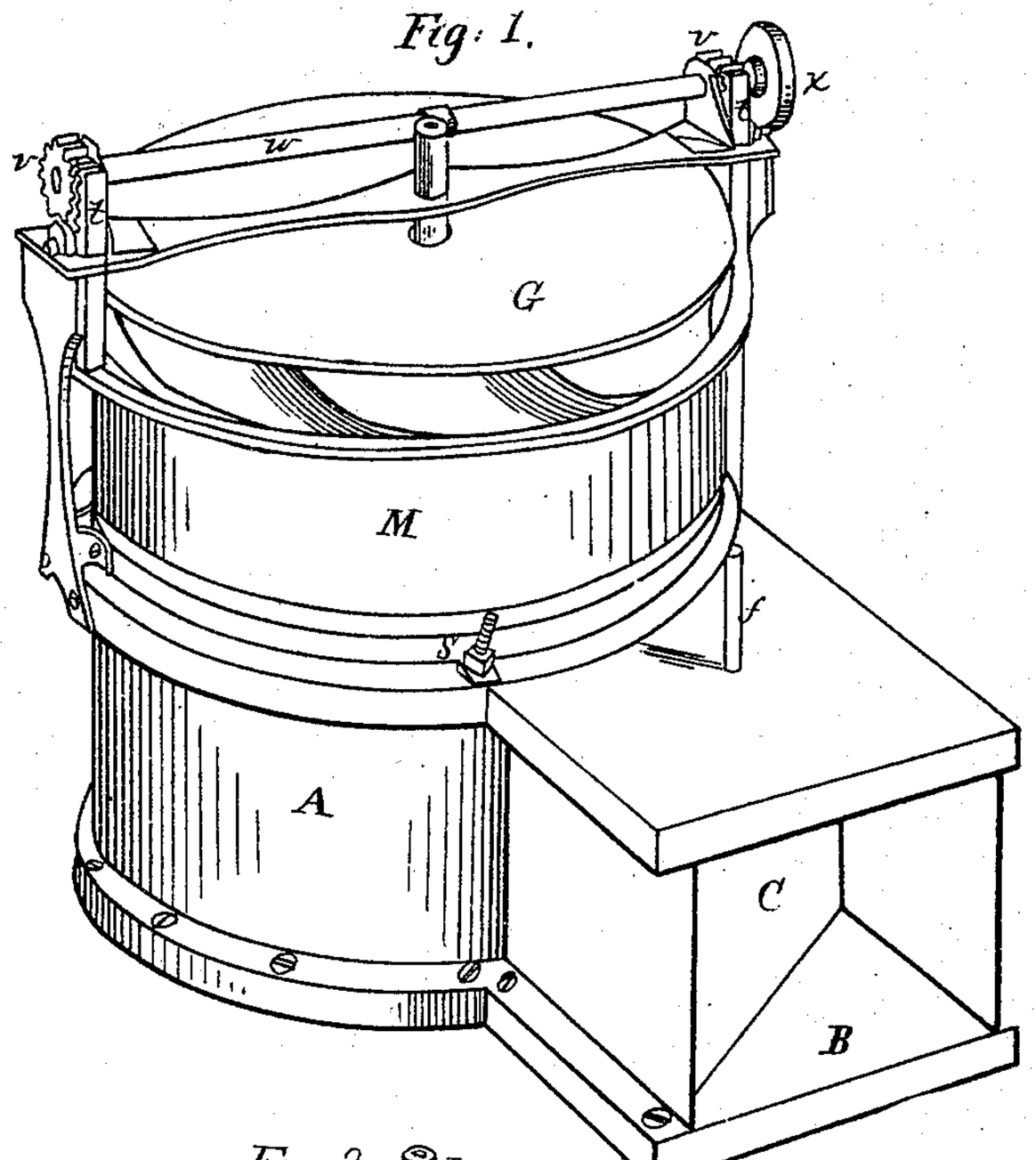
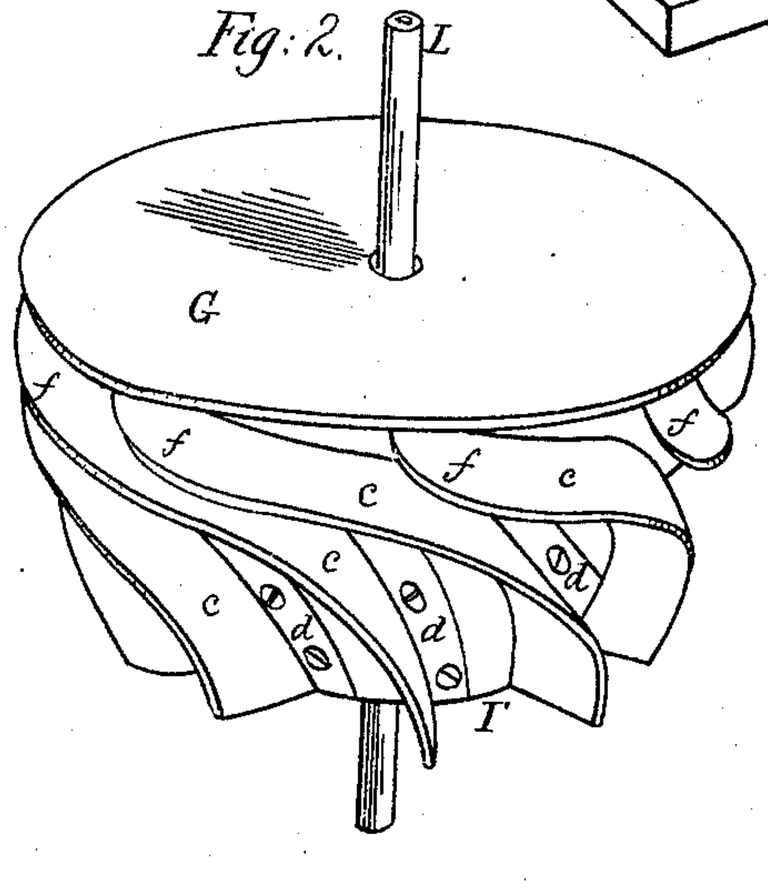


Fig: 2.

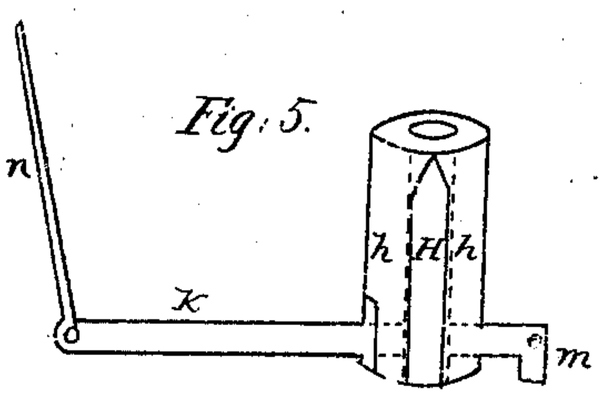


Witnesses:

S. W. Sovereign.

W. Geare

Fig: 5.



Inventor:

Gilbert M. Conner

Sheet 2. 2 Sheets.

G. M. Conner.

Water-Wheel.

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Fig. 3.

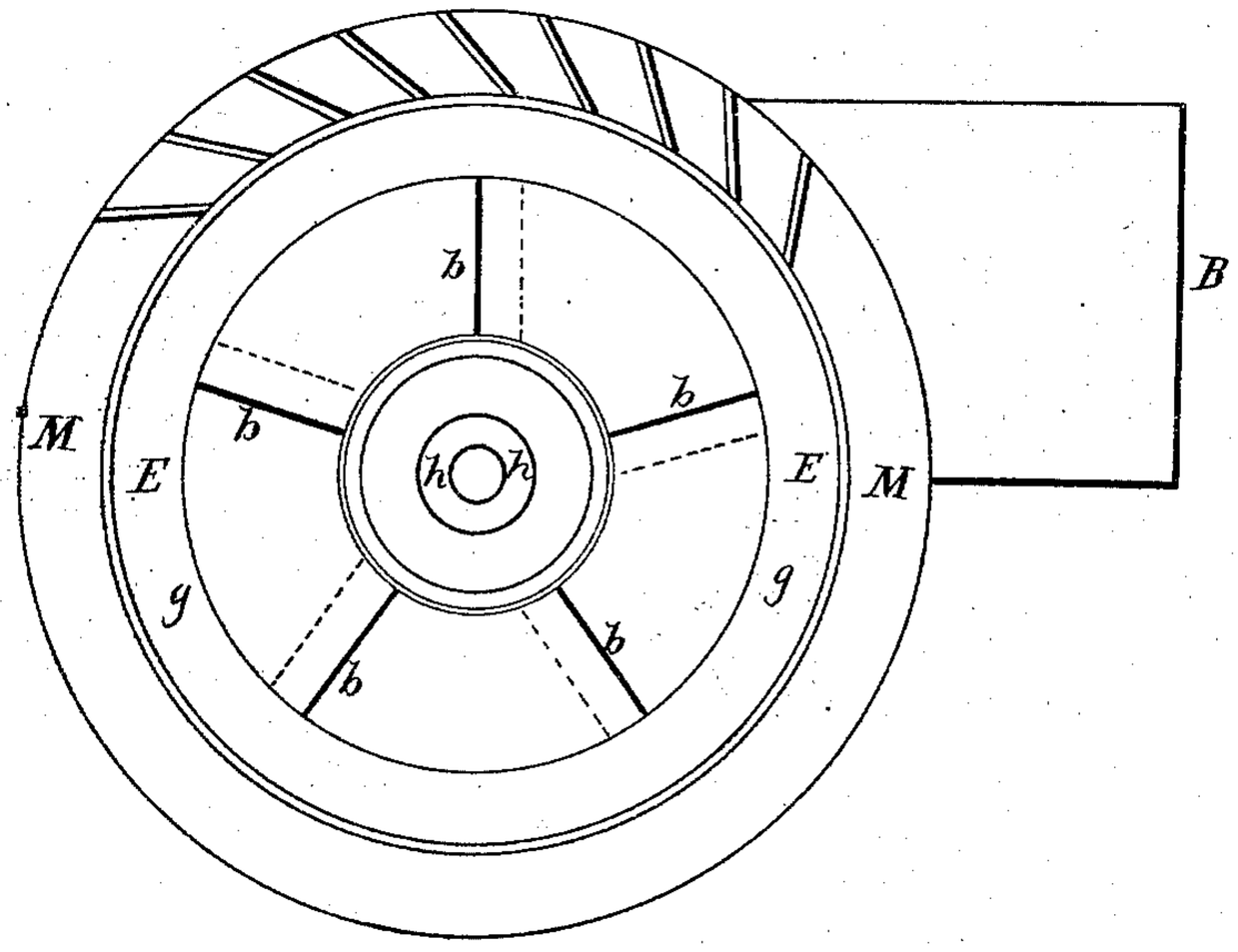
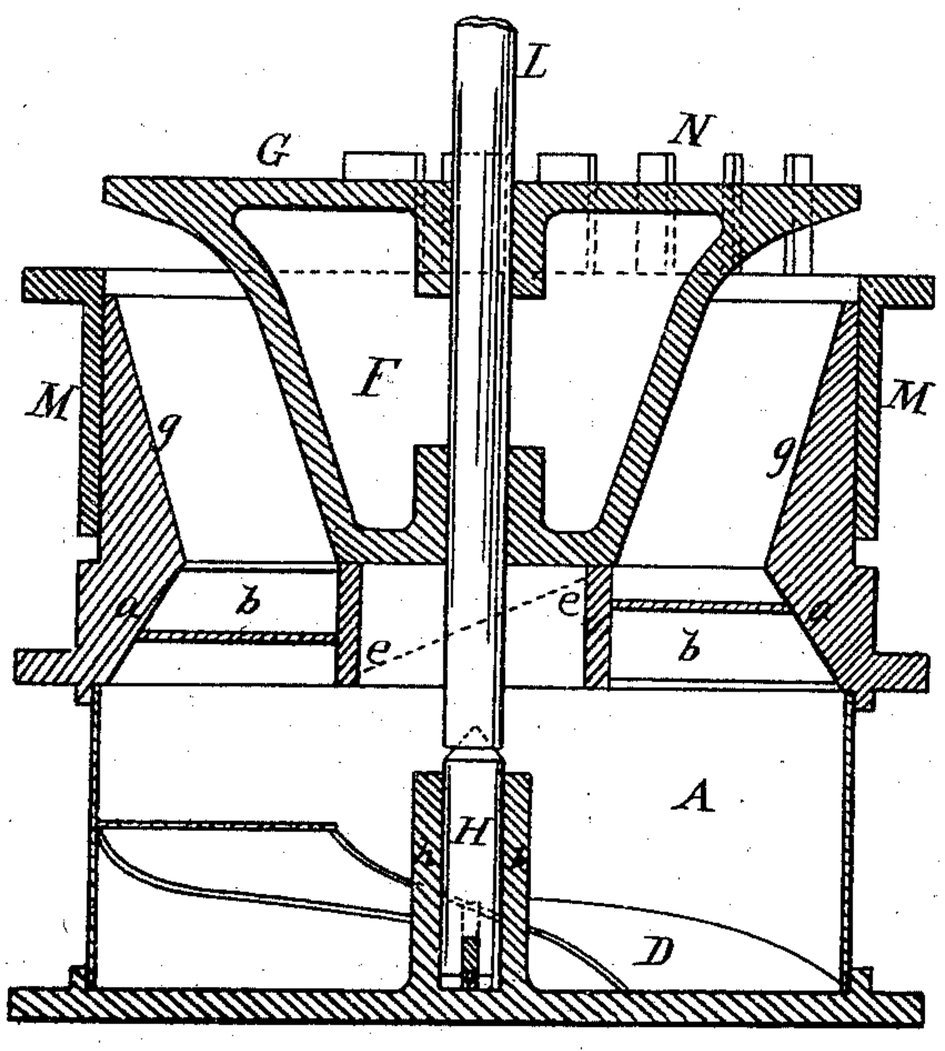


Fig. 4.



Witnesses:

S. W. Sovereign.

H. R. Grant.

Inventor:

Gilbert M. Conner

United States Patent Office.

GILBERT M. CONNER, OF COHOES, NEW YORK

Letters Patent No. 72,169, *dated December* 17, 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, GILBERT M. CONNER, of Cohoes, in the county of Albany, and State of New York, have invented certain new and useful Improvements in the Construction and Mode of Operating Turbine Water-Wheels; and I do hereby declare the that following is a full and exact description thereof, reference being had to the accompanying drawings, and to the figures and letters marked thereon, and in which—

Figure 1 is a perspective view of the improved water-wheel, with its casings and apparatus.

Figure 2, a perspective view of the wheel, as seen detached from the case.

Figure 3, a top view of the wheel-case, and the radial chutes in its lower part.

Figure 4, a vertical section of the hub or body of the wheel and its enclosing case.

Figure 5, the step of the water-wheel shaft and its adjusting lever.

The same parts are designated by the same letters in all the figures.

The nature of my invention consists in giving to the water, upon entering the apparatus, an upward and rotary movement, and then, by means of radial chutes, a direct action against the buckets of the wheel upon all sides; also, in giving such form to the buckets and to the hub or body of the wheel and the enclosing case, in which the wheel works, as will cause a continued deflection of the water as it passes along the buckets; and in so controlling the discharge of the water from the machine as to vary the power of the wheel, as may be required.

To enable others skilled in the art to make and use my improved turbine water-wheel, I shall now particularly describe its construction and mode of operation.

I make a circular chamber, A, figs. 1 and 4, of sheet iron, or other suitable material, with a bottom floor of cast iron or timber. Into this chamber the water from the forebay is introduced by means of the trunk B, figs. 1 and 3, and is let on or shut off by the balanced gate or throttle C, which is mounted on the spindle *f* passing through its centre, which spindle may be carried up to any suitable place for the convenience of the attendant. In this lower chamber is placed a helix, D, which may be made of sheet iron or other suitable material, and may be a full circle or only a portion of a circle, but in either case it should rise to the full height, or nearly so, of the chamber A, and be so formed as to turn the water upward; the object being to give the water an upward motion in addition to the rotary motion it receives from passing around the inner surface of the circular chamber A. Upon this chamber A, I place the wheel-case E, figs. 1 and 4, which I prefer to make of cast iron. In the lower part, *a a*, of this case I make a number of radial chutes, *b b b b b*, figs. 3 and 4. The water from the lower chamber, having to pass through these chutes, is directed by them squarely against the lower portion of the wheel-buckets *c c c c*, fig. 2. The hub or body F of this wheel, which is shown in perspective at fig. 2, and in vertical section in fig. 4, is of a peculiar form; about two-thirds of its lower part is the inverted frustum of a cone, the inclination of its side to the axis being about twenty-one degrees. It then curves upwards and outwards to a flare of about seventy-two degrees with the axis, as shown in fig. 4, and thus forming a top plate or disk, G, of a diameter equal to that of the wheel-case E, as shown in figs. 1, 2, and 4. The profile of this wheel-body or hub, instead of being made of straight and curved lines, as described, may be of a parabolic or curvilinear form, if preferred, and of such inclination to the axis as may be considered best. Upon this conical or flaring hub I place a number of buckets or floats, *c c c c*, fig. 2, which may be more or less numerous, according to the head of water; that is, the greater the velocity of the water passing through the machine, the more numerous may be the buckets upon the wheel. These buckets are of peculiar form, and have about the same angle of rake upon the hub which the surface of such hub has with its axis. Thus for some two-thirds of the height the angle of the buckets to the horizontal would be about sixty-nine degrees. They then curve over more rapidly till they terminate under the flare or disk G, at an angle of about eighteen degrees with the horizontal. The buckets are attached to the body of the wheel or hub by means of flanges *d d d d*, fig. 2, and are so twisted as to make them stand perpendicularly to the hub at all points of attachment, thus causing the upper portion of the bucket to droop or incline downwards, as shown at *f f f*, fig. 2, where, also, the corners are rounded off, so that no part of the buckets shall project beyond the periphery of the disk or top plate G. The outer edges of the buckets are then trued up in a lathe till they fit the inner conical surface *g g* of the wheel-case E, which should also be trued out in a lathe, it being important to the economical operation of the machine that the buckets should run as close as possible to the wheel-case without touching it, and to prevent the possibility

of actual contact, while at the same time permitting the buckets to run close to the wheel-case, I use the adjusting-stop H, fig. 5, which is turned to fit the bored-out central socket *h h*, attached to or cast upon the bottom plate of the lower chamber A, which stop has a notch in its lower end to fit the lever *k*, the fulcrum *m* of which lever is secured to the bottom plate also, while the long arm is held up by the rod *n*, which passes out to the top of the lower case at *s*, fig. 1, where it is secured by a nut passed down a screw formed upon the rod *n*, and by this nut and screw the lever *k* raises and lowers the stop H, as required. This stop has a conical point at top, which enters a corresponding recess or cavity formed in the lower end of the wheel-shaft L, as shown in fig. 4. The stop H may be of metal or hard wood, such as lignum-vitæ, which latter material is generally preferred for this purpose. To give this wheel a variable power, so as to economize the water when less than its full power is required, or to run at full speed with a diminished supply, I use a controlling-rim, M M, figs. 1, 3, and 4, which encloses the wheel-case E E, and slides up and down upon it by means of the racks *t t*, which are attached to the rim of the controller, and the pinions *v v* and shaft *w*, mounted on supports attached to the lower case A, as shown in fig. 1, and may be operated by means of an endless screw gearing into the periphery of the wheel *x* on the shaft *w*, in which case the spindle of the screw might pass up to a convenient place within reach of the attendant. When the wheel is running at full power, the top edge of the controlling-rim is at or below the level of the top edge of the wheel-case, but when it is necessary to economize the water or to reduce the power of the wheel, without reducing its speed, the controlling-rim is elevated, and thereby contracts the cylindrical space between the top edge of the controlling-rim M and the under edge of the wheel-disk or top plate G, thus reducing the outflow from the wheel, while the speed of the wheel is retained at its maximum, for the head of water being preserved in the forebay, the full mechanical effect due to the quantity expended can be obtained from the wheel under all variations from the full supply, which is a matter of great importance where the supply of water is variable, as the turbine-wheel will not work to advantage when the water is below the full head. As a means of obtaining additional force from the water while issuing from the wheel, I sometimes place a number of deflecting floats around the upper edge of the controlling-rim M, placing them obliquely to the outward direction of the effluent water, and facing the way the wheel runs, as shown at N, figs. 3 and 4. The water passing off from the wheel in an outward direction, strikes against the oblique plates or floats, above described, with the force due to its velocity, which force, reacting upon the wheel, increases its power, as I have experimentally ascertained; for having applied these deflecting-plates to a water-wheel, while it was making two hundred revolutions per minute, the speed was immediately increased to two hundred and fifty revolutions per minute. In this case the deflecting-plates were so constructed as to be applied or removed at pleasure, and upon their removal the speed fell from two hundred and fifty to two hundred revolutions per minute. The application of the deflecting-plates in this case gave an increase of twenty per cent. in useful effect. But the value of this effect depends upon the velocity of the effluent water, and this I find is directly as the load upon the wheel, from which it follows that the greater the load upon the wheel the greater the benefit obtained from the use of the deflecting-plates. To obtain the full effect due to the head of water under which this wheel is to be operated, the whole machine should be submerged to the level of the top plate or disk of the wheel.

Having thus described the nature, construction, and mode of operation of my improved turbine water-wheel, what I claim therein as my own invention, and desire to secure by Letters Patent, is—

1. The combination of the circular receiving-chamber and the helical floor, or its equivalent, with the radial guide-chutes, substantially as described.

2. The combination of the central hub and its inclined and twisted buckets, with the conical wheel-case, all constructed and operating substantially as described.

3. The combination of the deflecting-floats, with the controlling-rim, for the purpose specified, arranged and operating substantially as described.

GILBERT M. CONNER.

Witnesses:

S. W. LOVEJOY,

H. R. GRANT.