

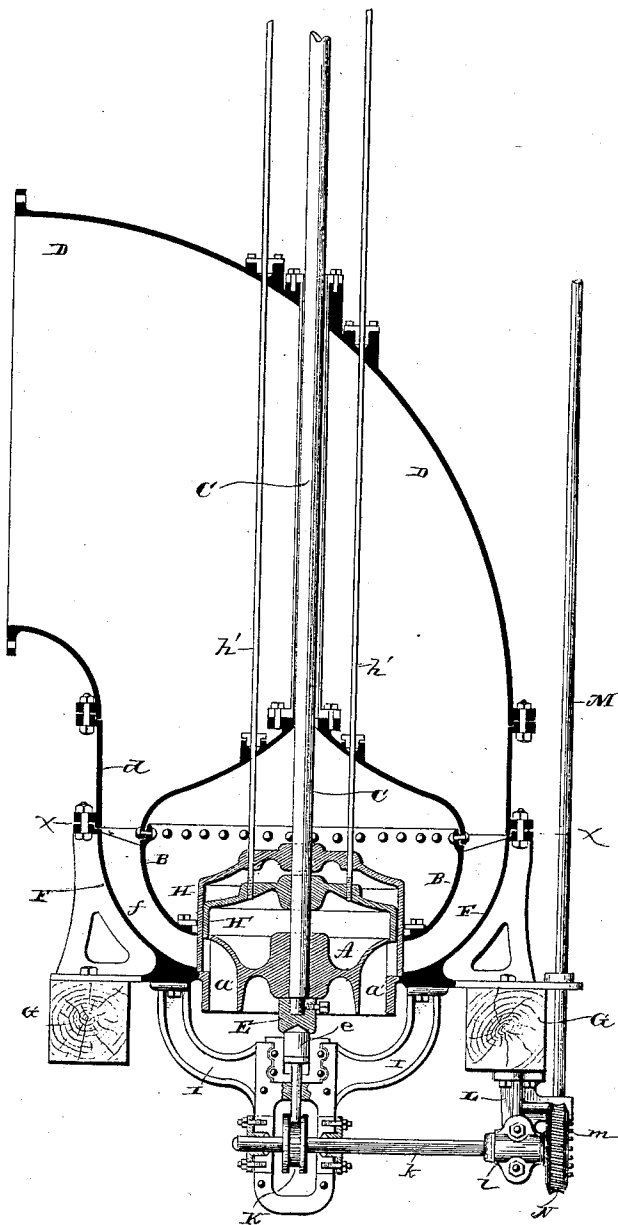
(No Model.)

3 Sheets—Sheet 1.

P. H. HOLMES.
TURBINE WATER WHEEL.

No. 341,577.

Patented May 11, 1886.



WITNESSES

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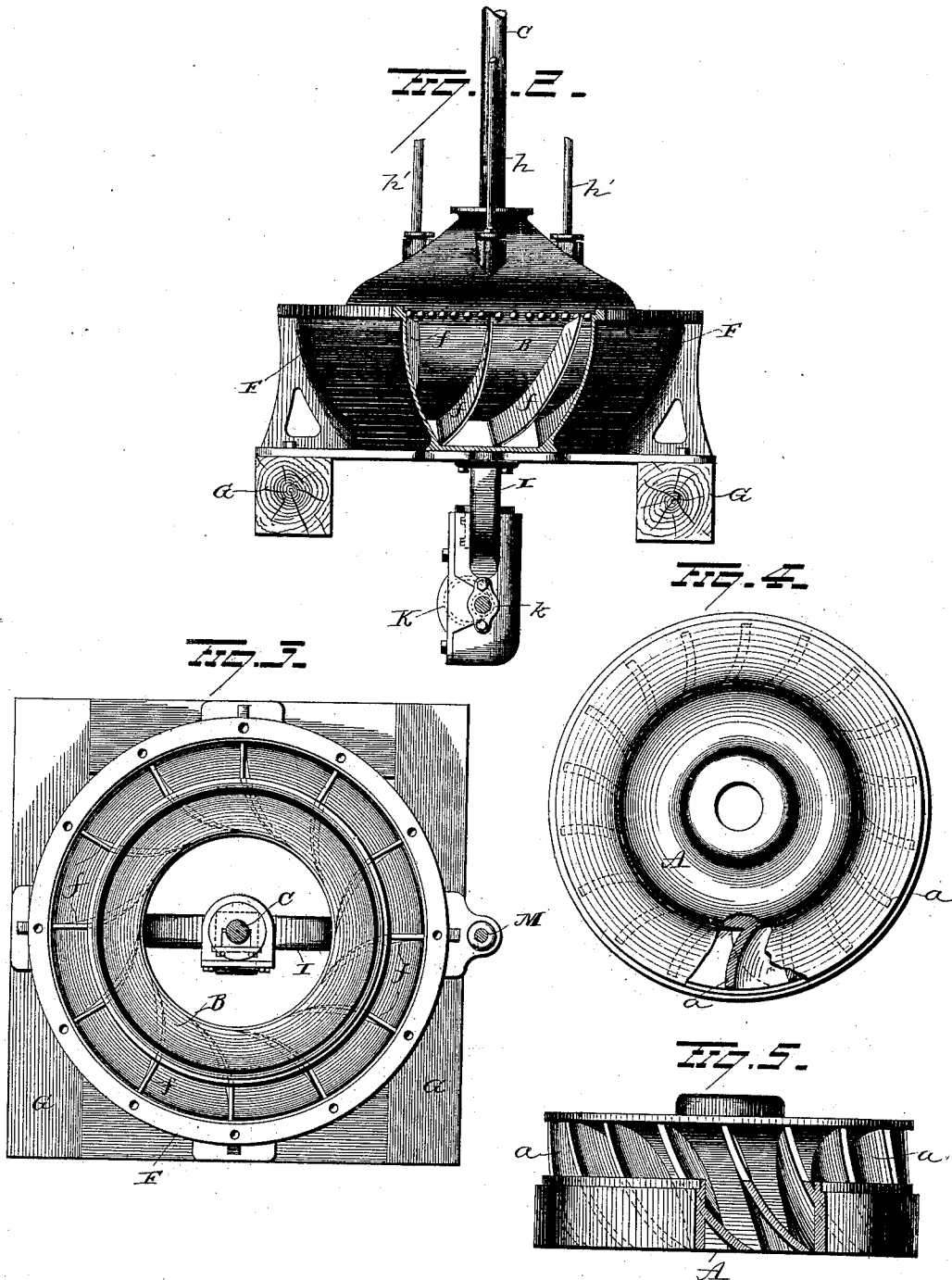
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TURBINE WATER WHEEL.

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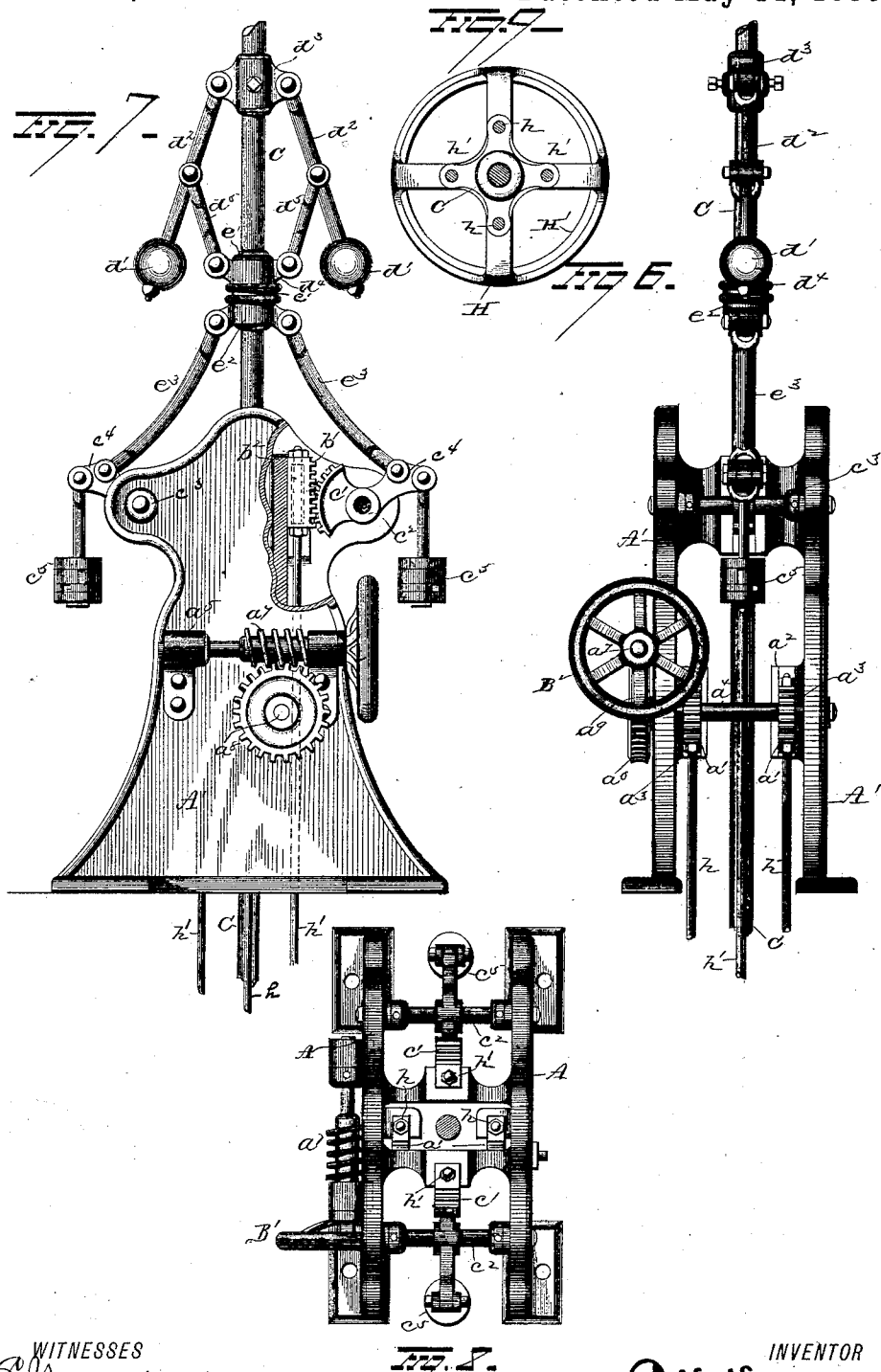
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3 Sheets—Sheet 3.

P. H. HOLMES.
TURBINE WATER WHEEL.

No. 341,577.

Patented May 11, 1886.



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UNITED STATES PATENT OFFICE.

PHILIP HENRY HOLMES, OF GARDINER, MAINE.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 341,577, dated May 11, 1886.

Application filed July 7, 1885. Serial No. 170,897. (No model.)

To all whom it may concern:

Be it known that I, PHILIP HENRY HOLMES, of Gardiner, in the county of Kennebec and State of Maine, have invented certain new and useful Improvements in Turbine Water-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in turbine water-wheels, the object of the same being to provide improved means for introducing the water upon the wheel, whereby the water is made to strike the floats at right angles, is given a maximum momentum as it strikes the float, and is caused to act a second time on the wheel before it finally passes into the tail-race, a further object being to provide an improved arrangement of gates for admitting the water onto the wheel and mechanism for automatically regulating the amount of water admitted, a further object being to provide means for taking up wear on the pivotal bearing, which supports the wheel; and with these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of the wheel in vertical section in position for use. Fig. 2 is a side view, a portion of the flume-wall and water-guide being removed, showing the partitions for dividing and changing the course of the water just before it strikes the wheel. Fig. 3 is a top plan view through line *x x* of Fig. 1 with wheel and upper portion of curb removed. Fig. 4 is a plan view of the wheel. Fig. 5 is a view of the same in side elevation. Fig. 6 is a view of the governor in end elevation. Fig. 7 is a view of the same in side elevation, partly in section. Fig. 8 is a plan view of the governor, and Fig. 9 is a similar view of the gates.

A represents a circular wheel provided on its periphery with a series of curved floats, *a*. The floats *a* are so curved that the centrifugal force of the wheel in motion will throw the water which strikes them at right angles, or a great portion of it, outwardly, which, when it falls, acts upon the lower portions of the floats, and by its weight forces them forward. The

wheel-box B, or, more properly, the inner water-guide, consists of a hollow casting oval or urn shaped in vertical section, and provided with a circular opening at its base, the diameter of which is a little more than the diameter of the wheel. The said box or guide B serves to protect the wheel from the pressure of the water in the flume. The shaft C, on which the wheel A is secured, passes upwardly through the apex of the box B, thence through the flume D to a point where it is found convenient to attach a drive-wheel. The said shaft is boxed where it passes through the flume and suitably packed. The lower end of the shaft C rests on a vertically-adjustable step, E, the construction and operation of which will be hereinafter described.

From a circular line about midway between the upper and lower edges of the wheel A, and in close proximity thereto, the curb F extends outwardly and upwardly, conforming nearly to the curve of the box or inner guide, B, but not quite, it (the curb) gradually increasing the distance between itself and the inner guide, B, until it reaches a point where the inner guide, B, begins to contract. At this point the curb is attached to the flume-wall *d*, which leads to the general water-supply. The curb F is supported upon sleepers G or upon a foundation-wall of any approved material.

Between the curb F and the inner guide, B, a series of curved partitions, *f*, are placed. The curve of the partitions is such that the direction of the water is gradually changed to a course at right angles to the upper portions of the floats at the point where it engages therewith.

It will be noticed that the water-channels formed by the partitions *f*, the curb F, and the inner guide, B, are gradually contracted as they near the floats, and the water as it leaves the said channels issues with force, as from the nozzle attached to a hose. The construction is moreover such that there is no abrupt shoulder to interfere with the forward motion of the water through the channels, and the effect is a very appreciable increase of power from a given head of water.

The water is admitted to the wheel by means of an outer gate, H, which consists of a circular ring of sufficient depth to shut the channels formed between the curb and inner guide

entirely off from the wheel, and is operated by means of vertical rods h , which pass upwardly through the flume.

An inner gate, H' , conforming to the shape of the outer gate, H , and lying in close proximity thereto, is operated by means of vertical rods h' , which also extend upwardly through the flume and are connected with the governor as follows: A' represents the main frame of the governor, which, in the present instance, is located about the main shaft C , but which may be located to one side in any approved position, as found most convenient. The gates H H' are free to slide on the shaft C . The operating rods h , attached to the gate H , are provided at their upper ends with racks a' , which slide in the guides a^2 , attached to the frame A' . Gearing into the racks are the spur-pinions a^3 , secured to the horizontal shaft a^4 , running in the boxes a^5 . To this pinion-shaft is fastened the worm-gear a^6 , actuated by the worm a^7 , secured to the shaft a^8 , supported by the boxes a^9 , and operated by the hand-wheel B' .

The operating-rods h' , attached to the governor-gate H' , pass through the arms of the gate H and are provided on their upper ends with racks b' , sliding in guides b^2 , which are attached to the frame A' . The racks b' engage with segment-gears c' , secured to the shaft c^2 , journaled in bearings c^3 . The segment-gears c' are provided with outwardly-extending arms c^4 , to which are attached weights c^5 , to counterbalance the weight of the governor-gate H' .

The governor-balls d' are attached to the wheel shaft C by means of arms d^2 , hinged to a collar, d^3 . The arms d^2 are connected with a sleeve, d^4 , by links d^5 . The sleeve d^4 is free to rotate on a bushing, e' , the latter being free to slide on the shaft C . The bushing e' is secured at its lower end to the sleeve e^2 , which is connected with the arms c^4 on the segment-gears c' by links e^3 .

The governor operates as follows: The gate H being raised by means of the hand-wheel B' , the worm a^7 , the worm-gear a^6 , the pinion-shaft a^4 , and operating-rods h , admits water to the wheel. The motion of the wheel is imparted to the governor-balls, causing them to separate to a greater or lesser extent, and this motion, being transmitted through the segment-gears and operating-rods h' , causes the governor-gate H' to drop or rise as the variable load requires a lesser or greater quantity of water.

The support for the step E consists of a depending bracket, I , bolted to the lower portion of the curb F . The step rests on a vertically-movable plunger, e , which in turn rests on the face of a cam-wheel, K , secured on a horizontal shaft, k . The shaft k is journaled in suitable bearings in the lower portion of the bracket I , and in a suitable bearing, l , in a bracket, L , secured to one of the sleepers G . The shaft k is operated, conveniently, by means of a vertical operating-rod, M , provided with

a worm, m , on its lower end, which meshes with a worm-gear, N , secured on the end of the shaft. Thus by providing a mark on the main shaft C and a pointer the wheel may be kept at the proper elevation as the bearing or step wears away by rotating the cam-wheel K more or less, as required.

The plunger e is encased within the bracket and protected from the water by suitable packing.

It is evident that many changes in the construction above described might be resorted to without departing from the spirit and scope of my invention, particularly in the mechanism for elevating the pivotal bearing of the main shaft; hence I do not wish to limit myself strictly to the construction herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a turbine wheel and two gates for wholly or partly cutting off the supply of water, of gradually-contracting water-conduits extending above the wheel and connected to the flume, and curved, substantially as shown, to conduct the water upon the wheel at right angles to its axis of rotation, substantially as set forth.

2. The combination, with a flume, a wheel, gates encircling the wheel, and a casing covering the wheel and gates, of the tapering and inwardly-curved water-guides, the outer guide being connected to the flume and the inner guide attached to the casing over the wheel and gates, substantially as set forth.

3. The combination, with turbine wheel and a gate suspended above and encircling the wheel, of a casing extending over the gate and wheel and serving to protect the gate and wheel from the weight of the column of water, and also serving as the inner wall of the conduit for supplying water to the wheel, and rods extending vertically through said casing and attached to the upper portion of the gate for operating the same, substantially as set forth.

4. The combination, with a turbine water-wheel, of two vertically-adjustable gates, one encircling the other, and independent devices for operating the gates.

5. The combination, with a turbine water-wheel, of an outer gate for admitting water to the wheel, and an inner gate situated within the outer gate and connected to a governor, for automatically regulating the supply of water admitted to the wheel, substantially as set forth.

6. The combination, with a turbine water-wheel, a ring-gate for opening and closing the water supply, and a second gate located within the first-named gate, for regulating the water supply, substantially as set forth.

7. The combination, with a turbine water-wheel, of inner and outer casings encircling the wheel and extending above the same, the

lower ends of said casings being located one above the other in the same horizontal plane as the wheel floats, while the upper end of the outer casing is connected with the flume and the upper end of the inner casing is attached to a casing located over the wheel and within the flume.

8. The combination, with a water-wheel, of two concentric gates for admitting water to the wheel, gearing for operating one of said gates by hand, and a governor for automatically operating the other gate.

9. The combination, with a horizontal wheel and an annular water-channel adapted to supply the water to the upper portions of the floats, a combined wheel-protection and water-guide box, a ring-gate adapted to slide vertically into said combined wheel-protection and water-guide box, operating-rods attached to the gate, and means for simultaneously elevating or depressing the rods, substantially as set forth.

10. The combination, with a turbine water-wheel, of inner and outer casings encircling the wheel and provided with guides or chutes arranged to give the water in its downward and inward motion a course in the direction of its action on the wheel-floats, the lower ends of said casings being located one above the other in the same horizontal plane with the wheel-floats, while the upper end of the outer casing is connected with the flume and the upper end of the inner casing is attached to a casing or dome located over the wheel and within the flume, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

PHILIP HENRY HOLMES.

Witnesses:

CHAS. H. MARR,
G. H. MARR.