

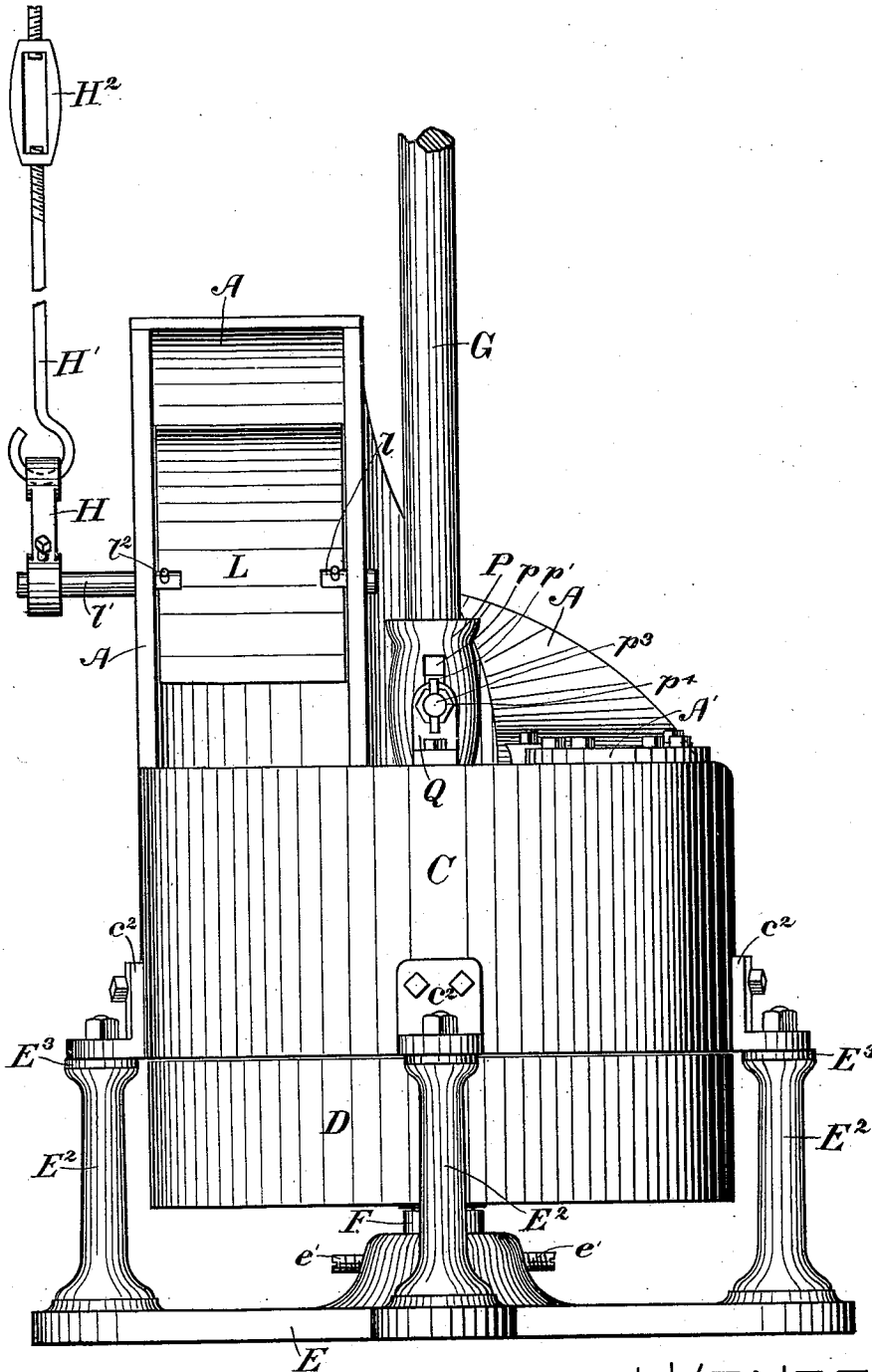
(No Model.)

3 Sheets—Sheet 1.

T. J. TOLMAN.
TURBINE.

No. 465,503.

Patented Dec. 22, 1891.



WITNESSES.
E. W. Gilman
B. S. Woodley

FIG. 1.

INVENTOR.
Thomas J. Tolman
by Albert E. Leach
his atty.

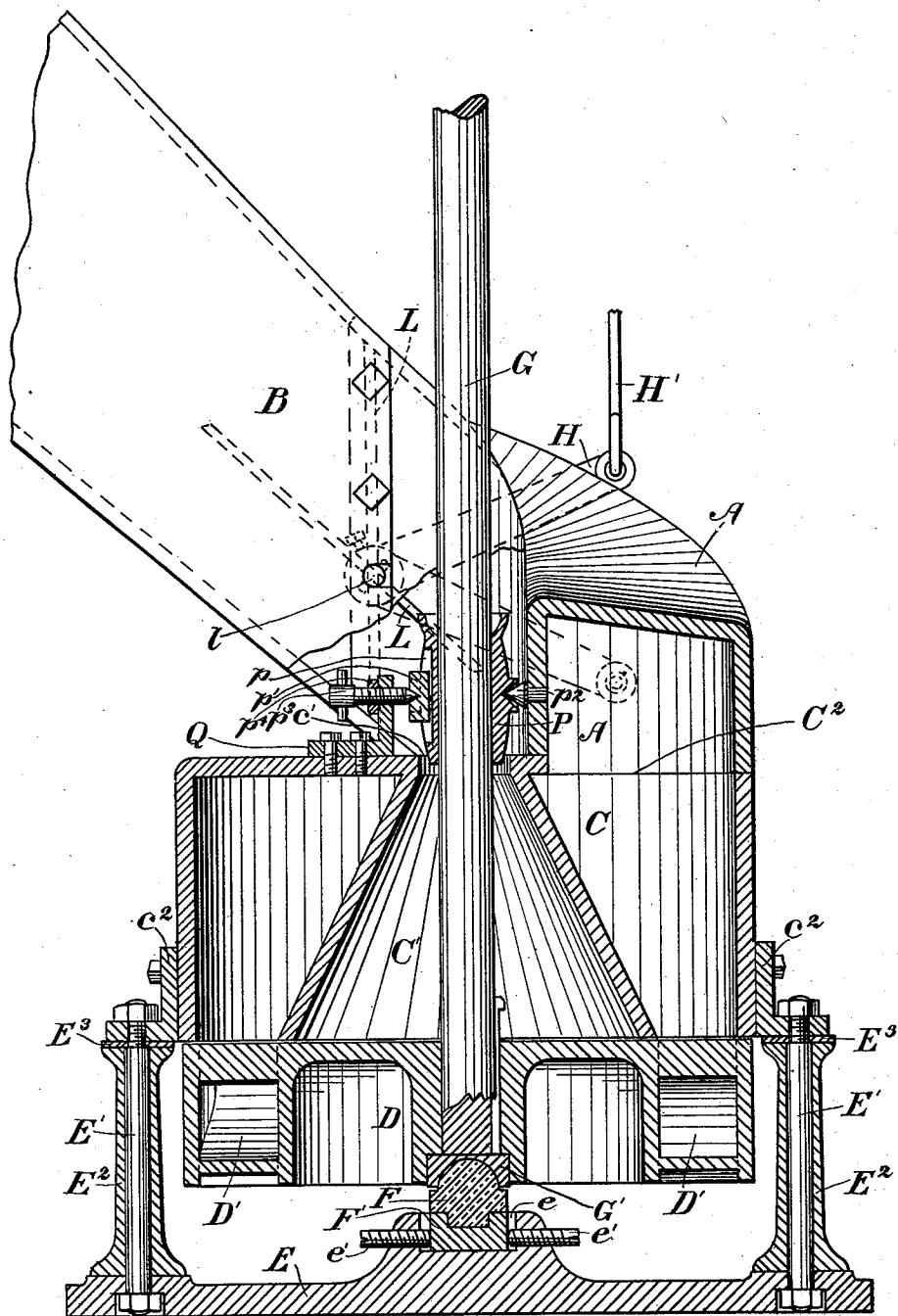
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FIG. 2. INVENTOR
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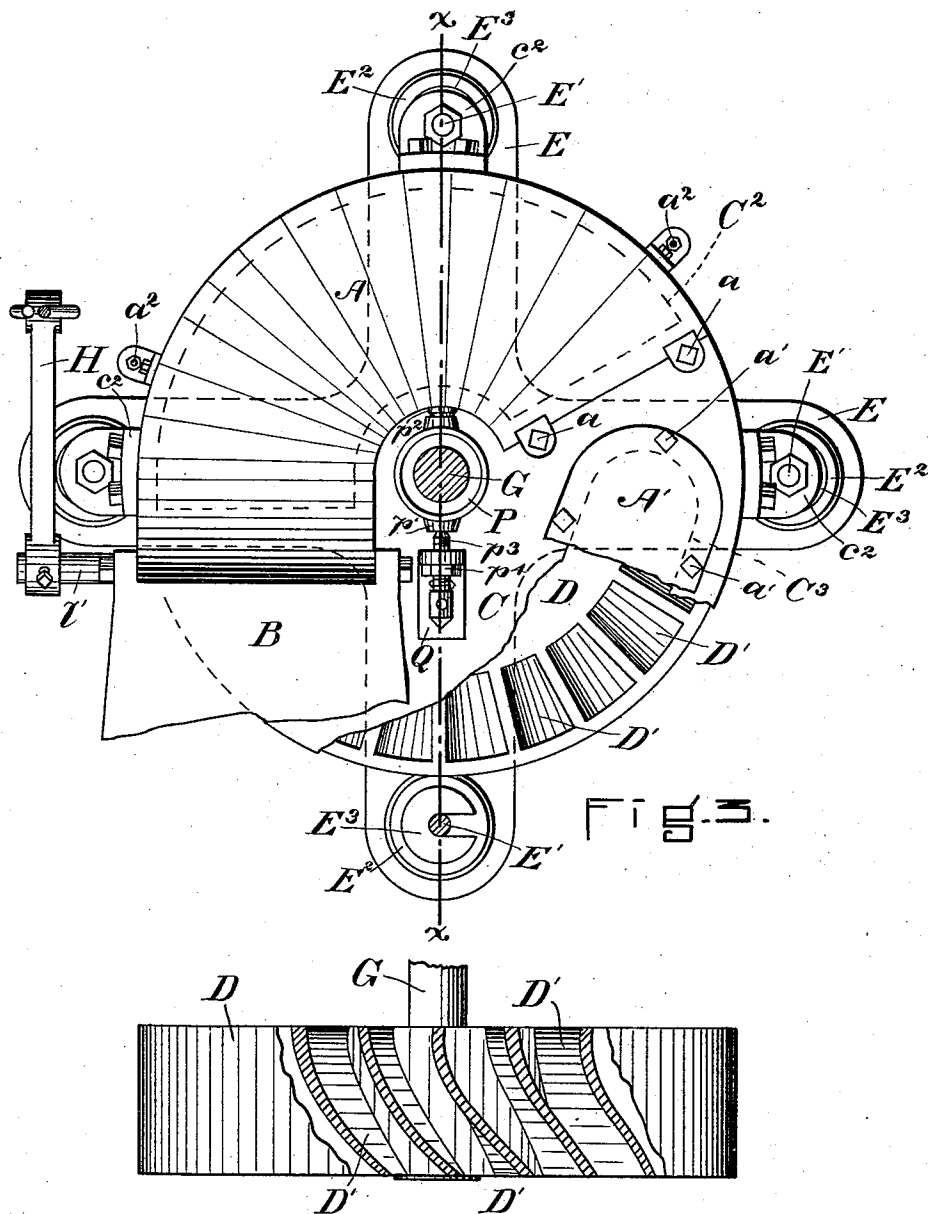
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WITNESSES.

C. H. Gilman

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Fig-4-

INVENTOR.

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UNITED STATES PATENT OFFICE.

THOMAS J. TOLMAN, OF HANOVER, MASSACHUSETTS.

TURBINE.

SPECIFICATION forming part of Letters Patent No. 465,503, dated December 22, 1891.

Application filed June 19, 1891. Serial No. 396,832. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. TOLMAN, a citizen of the United States, residing at Hanover, in the county of Plymouth and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Turbines, of which the following is a full specification.

My invention consists of an improved outward and downward flow turbine constructed in the manner hereinafter described in detail, and illustrated in the accompanying drawings.

Figure 1 shows my improved apparatus in elevation. Fig. 2 is a vertical section taken in the plane of xx , Fig. 3, showing some of the parts broken away. Fig. 3 is a top plan view of the apparatus, and Fig. 4 shows in elevation the wheel with its outer casing broken away to show the floats.

E is the base, which is preferably cruciform and which supports the working parts of the apparatus. Near the four extremities of the cross-shaped base are mounted the bolts E' , which are of considerable length and are surrounded by the sleeves E^2 . These sleeves are enlarged at top and bottom and rest either directly upon the top surface of the base E or upon suitable seats formed thereon. The central portion of the base E is raised and contains a central depression e , in which rests the support or seat F' for the lower bearing of the wheel-shaft. The lower bearing F is preferably of lignum-vitæ, being spherically curved at the top to fit a correspondingly-curved hollow in the piece G' at the bottom of the wheel-shaft G. The bearing F fits into a socket in the metal support or seat F' , which is somewhat smaller in diameter than the cavity e , so as to have some play therein. A number of screws e' , preferably four, serve to center the wheel-shaft at the bottom.

D is the wheel, the hub of which is bored out to accurately fit the shaft G, being keyed or otherwise made fast to said shaft to turn therewith. G' is an enlarged foot or bearing piece, which is tightly fitted to the wheel-hub against the bottom of the shaft G. This piece G' is hollowed out, as aforesaid, to fit over the bearing F. The wheel has the curved floats D' around the outer portion thereof, the construction and arrangement of the wheel and floats, which are preferably integral, being best shown in Figs. 3 and 4.

C is the water-chamber, which conducts the water directly to the wheel. This is made of cast metal, the inner wall of the chamber, which is circular, being practically an upward continuation of the inner wall of the outer shell of the wheel when the said chamber is in position. The water-chamber C has the central cone C' cast therewith of small diameter at the top, but spread out at the bottom to form an opening around the chamber of a width equal to that of the floats in the wheel, and when the wheel is set up directly above said floats. The chamber C has bolted thereto at equal distances around its outer surface the lugs or angle-irons c^2 , through which pass the upright bolts E' , washers E^3 being preferably interposed between the bottom of the lugs and the top of the sleeves E^2 , which surround said bolts. Nuts at the top of the bolts secure the water-chamber firmly in place.

A is a spiral chute which leads from the flume B to the water-chamber C. This chute is made of cast metal and is bolted, as at $a a^2$, or otherwise firmly secured to the top of the chamber C over a curved opening C^2 , through which the water flows from the chute into the chamber. The outside of the chute conforms to the shape of the water-chamber C and passes almost half-way around it, as shown in Figs. 1 and 3. Over the front opening or mouth of the chute is bolted or otherwise attached the flume B, which may be made either of wood or of metal, as desired, the bottom of the flume terminating in a flange which enters the chute with a slope practically conforming to that of the top of said chute, as shown in Fig. 2. The mouth of the chute is guarded by the gate L, which is pivoted below its center on the spindle-pieces $l l'$, passing through and having bearings in each side of the chute, and, as herein shown, secured to the gate by pins l^2 or in any convenient manner. The spindle l' has keyed thereon the arm H, to which is loosely connected the upright rod H' . By means of a buckle-joint H^2 or any equivalent device the rod H' may be adjusted up and down in position and the gate L opened or closed or held at any angle.

The upper bearing-box P of the shaft G is movable, so as to allow of some motion of the shaft.

p^2 is a pin mounted in the side of the spiral chute A and having a conical end fitting a conical depression in the side of the box P. The box P on the side opposite to this conical depression is provided with a vertical slot p , in which is fitted the block p' , movable vertically therein, not loosely, but with considerable resistance. This block has a conical depression, in which rests the tapered end of the screw p^3 , mounted in the lug or angle-piece Q, which is bolted to the top of the water-chamber C. The bearing-box P is thus hung between the pin p^2 and screw p^3 in such a manner as to allow considerable motion of the shaft G in all directions, the bottom bearing being capable of adjustment in the manner already described.

p^4 is a check-nut on the screw p^3 .

The shaft passes down through the center of the cone C' above the inner opening c' , at the top of which cone the box P is hung, the said opening c' being considerably larger than the box. The top of the bearing-box P is hollowed out to form an oil-cup for ready lubrication of the bearing. The flume B is so inclined as to conduct the water into the spiral chute at practically the same angle as the top slope of said chute. If the gate L is open, the water rushes down and around the spiral chute A into the water-chamber C with a whirling motion acquired by reason of the peculiar spiral or scroll shape of the chute. In descending the water is forced outward over the flaring slope of the cone c' , which directs the force of the descending volume of water immediately upon the floats D' of the wheel D, which floats slope toward the direction from which the water flows. The wheel is thus given a rapid motion as the swirling water passes downward through the curved compartments between the floats thereof. Motion is transmitted in any desired manner from the shaft G, which revolves with the wheel. By being hung or pivoted below its center the gate L has a tendency to be closed by the rushing water, so that ordinarily if the upward pull on the rod H' be slackened the force of the water of itself closes the gate. As the lower bearing of the shaft G becomes worn by continued use the wheel D descends, opening in time a wide space between the top of the wheel and the bottom of the chamber C, thus causing leakage.

I preferably make the washers E³ in the shape shown in Fig. 3, with an opening to the center, whereby they may be removed without taking off the water-chamber or interfering with the use of the wheel during the operation by simply loosening the nuts on the bolts E' and sliding out the washers E³, when

the chamber C drops down the thickness of the washers, so that the lugs c^2 rest directly on the top of the sleeves E². If desired, a number of washers E³ may thus be interposed on top of each sleeve, between it and the lug c^2 , so that the wear may be taken up a large number of times by simply removing from time to time one layer of washers.

It will be observed that the construction of the turbine herein shown and described is extremely simple, the three main parts thereof—viz., the spiral chute, the conducting-chamber, and the wheel proper—being each made in one piece. The inner cone C' is cast integral with the chamber C and the floats D' integral with the wheel D. The lugs c^2 may, moreover, if desired, be cast integral with the chamber C.

The method of securing the parts together is also an important feature, whereby great rigidity and firmness is attained in the stationary parts of the apparatus.

At the top of the chamber A, I preferably provide a hand-hole C³, closed normally by a plate or cover A', bolted, as at a' , to the top, whereby access to the interior of the apparatus may easily be had at any time for the purpose of removing any obstructions, &c., and for repairs.

One great advantage of this particular construction of turbine lies in the fact that the water area of the gate is larger than the water area of the wheel, thus keeping the wheel well supplied with water, utilizing to the greatest extent the force of the water in imparting a swift motion to the wheel in much the same manner as a hose-nozzle at the end of a hose acts in making a spray.

I claim—

In a turbine, the combination, with a base E, provided with a lower adjustable bearing for the wheel-shaft, of a conducting-chamber suitably supported by said base and secured thereto, said chamber having a central opening for the wheel-shaft, a wheel interposed between said base and said conducting-chamber, a shaft secured to said wheel and suitably seated in said lower bearing, and an upper bearing for the shaft, consisting of the box P, having a slot p , a block p' , movable in said slot, said box and block being provided with diametrically-opposite conical depressions, in which fit the suitably-mounted pin p^2 and screw p^3 , whereby the bearing-box containing the shaft is hung over the central opening in the chamber, substantially as and for the purposes described.

In witness whereof I have hereunto set my hand.

THOMAS J. TOLMAN.

Witnesses:

ALBERT E. LEACH,
E. H. GILMAN.