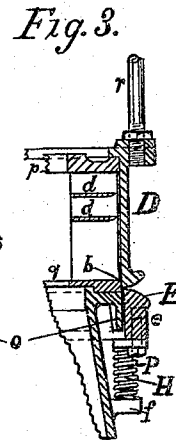
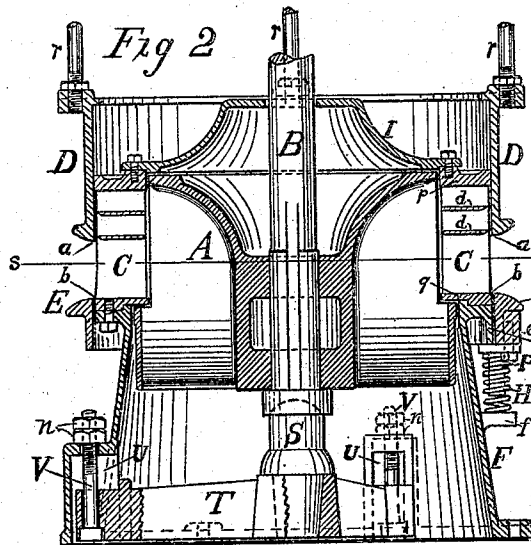
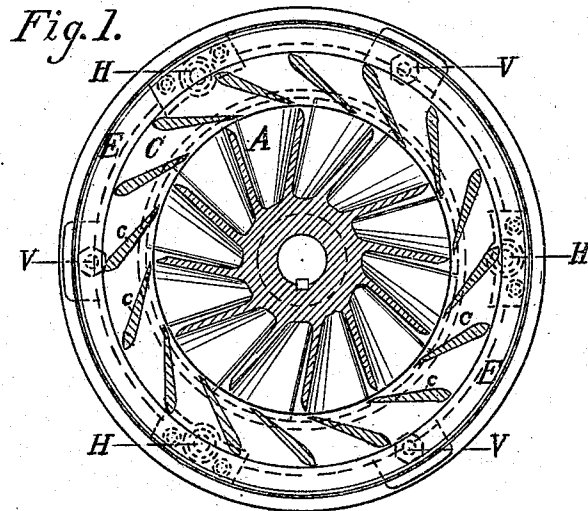


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TURBINE WATER WHEEL.
APPLICATION FILED APR. 29, 1908.

930,832.

Patented Aug. 10, 1909.



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TURBINE WATER-WHEEL.

No. 930,832.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed April 29, 1908. Serial No. 429,886.

To all whom it may concern:

Be it known that I, HENRY BROOMELL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Turbine Water-Wheels, of which the following is a specification.

My invention relates to the improvement of certain parts of turbine water wheels already in use in some form and also embraces one feature or device believed to be entirely new in machines of this class.

The object of the invention is to increase efficiency and to secure ease of adjustment of certain parts, thus facilitating construction, aiding in keeping the machine in proper working order and reducing frequency and cost of repairs.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a horizontal section on the line *s, s*, in Fig. 2, Fig. 2 is a vertical section through the center and Fig. 3 is a detail.

Similar letters refer to similar parts throughout the several views.

A is the wheel, proper, or runner, secured to the shaft B. The lower end of the shaft is cup shaped in the usual form and rests on the step S, which has a corresponding form. The step is held in a socket in the spider or bridgetree T, which consists of a hub with arms extending into pockets U, U, in the draft tube F. The bridgetree and with it the step, shaft and wheel is supported by the bolts V, V, V. These bolts have long threads, so that, by turning the nuts *n, n*, on them ample vertical adjustment of the step is secured.

This device enables the manufacturer to quickly and accurately adjust the wheel to its correct vertical position; but what is more important it provides for wear of the step, in use, and a ready readjustment, so that very infrequent renewals of the step are required. A good step may, in this way, be used many years and the wheel be kept in proper position without expense.

Surrounding the wheel A, is the chute ring or curb C, and outside the chute ring is the gate or gate ring D. Directly below the gate is the guide ring E. The wheel is covered by the cap I, resting on the curb. The curb C, consists of upper and lower plates *p* and *q*, Figs. 2 and 3, connected by the plates *c, c*, shown in Fig. 1. These are so arranged

as to form chutes to conduct the water to the wheel. These chutes are divided horizontally by the plates *d d*, Figs. 2 and 3. The use of these plates is to prevent the water from spreading upward, as much as it would without them, when the gate is only partly opened, and thus maintain more nearly solid streams when the wheel is operating at what is technically called part gate. The object is to secure higher efficiency at part gate operation. The gate D, has a vertical movement for opening and closing and is operated by suitable gearing, not shown, through the rods *r, r*, four of which are generally used.

In Fig. 2 the gate is shown opened about half way, while in Fig. 3 it is closed. It will be noticed that the closed gate laps over the edge of the plate *q*, of the curb C, while the guide ring E, is depressed to the same extent from its position in Fig. 2. To provide for this action the guide ring has a number of enlargements *e*, to which are attached flanged pins P, surrounded by coiled springs H, resting on lugs *f*, on the draft tube F. The springs are under compression and serve to keep the guide ring in the position shown in Fig. 2, with its tops even with the top of plate *q* until depressed by the gate. It is prevented from rising higher by the tops of the pin flanges striking projections *o*, on lower side of upper flange of the draft tube F. The pins keep the springs in place. The purpose of this arrangement is described as follows. It is well known by hydraulic engineers that water, entering an opening, under pressure and passing over a sharp angle will be formed into what is technically called the contracted vein and that the size of the stream will be reduced and its velocity retarded. If the guide ring E, was not used this would be the effect on the water if it passed into the chutes of the curb C, over the sharp edge *b*, of the plate *q*. By using the ring E, with its curved upper surface and giving the lower edge of the gate a similar form a smooth, funnel shaped entrance to the chutes is formed all around the wheel. But when the gate is closed it is important that the sharp edge *a*, shall close over the sharp edge *b*, in a shearing manner and a lap joint be made, as by this means obstructions will be easier cut away and a tight joint more surely obtained than would be the case if the gate should shut down on a plane surface. Hence provision is made

that the ring E shall yield to the pressure of the gate, in closing, but return to what may be called its normal position when the pressure is removed.

5 As points in good practice it may be stated that while the gate should be fitted closely to the upper and lower rings of the curb, the guide ring needs not to have a close fit and is made quite loose at its lower edge
10 so that it may yield unevenly without sticking or locking. This provides for inequality in depression due to unequal obstructions that may lodge between the gate and the guide ring.

15 The water wheel described above is a vertical wheel—that is a wheel on a vertical shaft or having a vertical axis and the step, bridge-tree and supporting bolts apply only to wheels of this class, while all other devices and improvements described apply not
20 only to such wheels but also to wheels having horizontal axes, or what are commonly known as horizontal wheels.

25 Certain terms that I have used in describing the vertical wheel, which have ref-

erence to the actual positions of the parts described, would need to be changed, somewhat, to properly describe similar parts in a horizontal wheel, but the relative positions of these parts would remain the same. 30

I claim:

In a water turbine, the combination with a casing provided with an inlet channel or channels, of a turbine contained in said casing, a gate governing the inlet, a movable 35 water guide arranged with its guiding surface normally flush with that interior surface of the inlet channel or channels toward which the gate moves in closing, and a yielding support for said guide, by which it is 40 held in its normal position until engaged by the gate in closing and by which it is returned to its normal position when the gate is withdrawn in opening.

In testimony whereof I affix my signature 45 in presence of two witnesses.

HENRY BROOMELL.

Witnesses:

E. G. BROOMELL,

H. L. CARUTHERS.