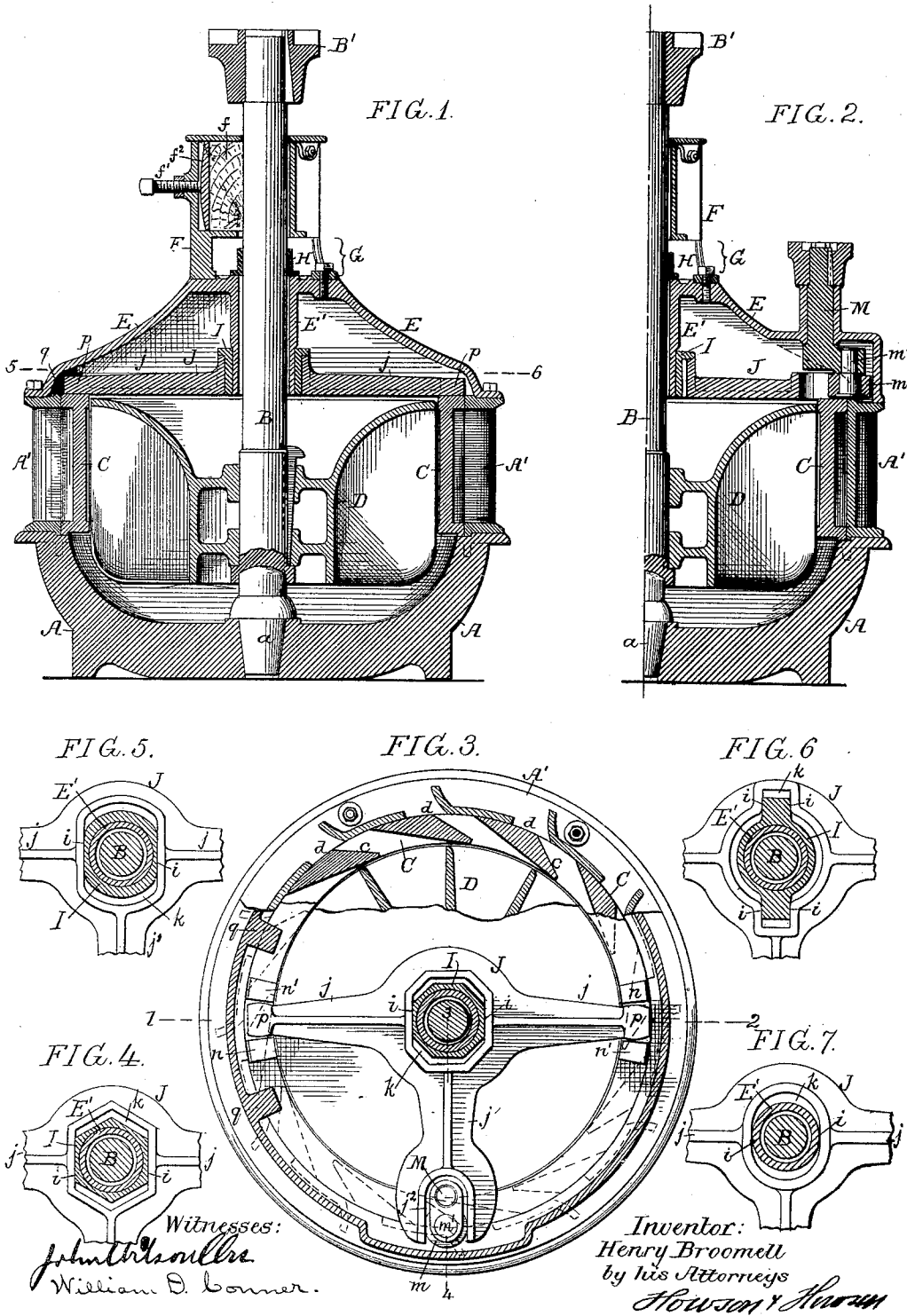


(No Model.)

H. BROOMELL.
TURBINE WATER WHEEL.

No. 410,487.

Patented Sept. 3, 1889.



UNITED STATES PATENT OFFICE.

HENRY BROOMELL, OF PHILADELPHIA, PENNSYLVANIA.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 410,487, dated September 3, 1889.

Application filed March 7, 1889. Serial No. 302,256. (No model.)

To all whom it may concern:

Be it known that I, HENRY BROOMELL, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain
5 Improvements in Turbine Water-Wheels, of which the following is a specification.

One object of my invention is to so construct a turbine water-wheel in which a circular register-gate is used that the mechanism for operating said gate will bear upon
10 two diametrically-opposite points of the same with equal force when in the act of turning, the said mechanism being self-adjusting in order to compensate for slight irregularities
15 in construction or those due to wear, thus maintaining a balanced draft.

A further object of my invention is to dispense with the usual packing-box, which prevents the water gaining access to the wheel
20 through the shaft-space, and substitute a simple ring or collar therefor.

These objects I attain, as fully described hereinafter, reference being had to the accompanying drawings, in which—

25 Figure 1 is a vertical section of my improved turbine water-wheel on the line 1 2, Fig. 3. Fig. 2 is a vertical section on the line 3 4, Fig. 3. Fig. 3 is a sectional plan view on the line 5 6, Fig. 1, and Figs. 4, 5, 6, and 7 are
30 views of modifications.

A is the base of the turbine, in which is a stud or step *a*, for supporting the vertical shaft B, said shaft being secured to the blade-casting D, which may be of any of the well-known forms used in the construction of turbine water-wheels. Secured to the upper portion
35 of the base A is a curb A', and secured to the curb is a cap E, supporting a casting F, in which are bearing-blocks *f* for the upper portion of the shaft B, these bearing-blocks being adjustable in the usual manner by a set-screw *f'*, bearing against the plate *f''*, as shown clearly in Fig. 1. Between the base
40 of the casting F and the cap E is a space G. Surrounding the shaft B is a collar H, fitting snugly on the shaft, but resting loosely on the cap E. The object of providing the shaft with a collar is to prevent the water from
45 gaining access to the wheel through the shaft-space, said collar being substituted for the packing-box commonly used. The water

above the wheel gains access to the collar H through the space G, and tends to keep a pressure at all times upon it and keep it to its seat on the cap. At the upper end of the
55 shaft B is the usual coupling B'.

Projecting downward from and forming part of the cap E is a sleeve E', on which is a collar I, the periphery of which is of octagonal shape, as shown in Fig. 3, although it will
60 be understood that the periphery of the collar may be of any desired form, so long as there is a bearing-surface *i* on each side, for the purpose described hereinafter. This collar rests in a yoke J, of the form shown in Fig. 3,
65 having arms *j*, *j*, and *j'*, said yoke having an opening *k*, fitting snugly at the sides of the bearing-surface *i* of the collar I, but being sufficiently large at each end to allow for a certain independent movement of the yoke
70 transversely to the axis of the shaft. In the present instance the arm *j'* is slotted at *j''*, and in this slot works a friction-wheel *m* on the crank *m'* of a shaft M, which is suitably shaped at its upper end for the reception of
75 a coupling for hand-wheel shaft, said shaft M being supported in a bearing projecting from the cap E, as shown in Fig. 2.

C is the gate in the form of a ring, having an opening or chute *c* for each opening *d* in
80 the periphery of the curb-ring A'. This gate C has on its upper surface two sets of lugs *n* *n'*, and between each set of lugs extends the outer end *p* of the arms *j* *j* of the yoke J.

q *q* are stops on the cap E, which serve to
85 limit the movement of the ring in either direction.

The usual device for turning the gate-rings of water-wheels of this class has been a rack on the periphery of the ring, with which
90 meshes a small pinion, on turning which the ring will be turned in one direction or the other; but this device is objectionable on the ground that the ring binds against the corresponding ring or curb, owing to the fact that
95 the power is applied to only one point. It has been sought to overcome this defect by providing the gate-ring with arms firmly attached and having a closely-fitted bearing near the center, while the main rings are less
100 closely fitted; but this small central bearing is liable to wear loose and cease to serve the

purpose intended, while a loose fit of the gate causes leakage.

Turbine water-wheels have also been devised in which two arms extended diametrically across the wheel, but these arms were loose and fitted snugly at the center, and consequently it has been impossible to obtain an even bearing at the two points without very great care in construction, and if obtained slight wear or springing of the parts under pressure of the water will defeat the object sought.

By providing a yoke having two arms adapted to bear upon the gate-ring at two diametrically-opposite points, and having a loose center portion and devices for turning the yoke and allowing it to slide freely, so that in the first movement of the ring, if it should bear upon one point—say upon the projection *n* on one side, this point acting as the fulcrum of the lever—it will not turn the ring until the opposite arm *j* comes in contact with the opposite lug *n*. Then, when the two arms are in contact with the two lugs *n n'*, the pressure will be equalized and the yoke will turn the ring without the friction usual in this class of wheels.

It will be understood that the periphery of the collar I may be of hexagonal form, as shown in Fig. 4, or may be oval, as shown in Fig. 5, having flat portions *i i* for the side bearings.

It will be evident that any form of sleeve may be employed, so long as the yoke is free to move toward and from the lugs *n n'* and turned to open or close the gate-ring. The collar I may also be made in the form shown in Fig. 6, which is substantially the same as that shown in Fig. 3. It is also evident that the collar I might be dispensed with, the yoke J, with its elongated opening, having its bearing directly upon the sleeve E', as shown in Fig. 7, the object of the collar I being to provide a better bearing for the yoke.

Turbine wheels have been constructed with a sleeve projecting downward from the cap to serve as a guide for the gate-ring through the medium of arms attached thereto, but the sleeve E' is here used as a pivot for the yoke J.

I claim as my invention—

1. The combination, in a turbine water-

wheel, of a gate-ring, with an operating-yoke therefor, having arms acting on said ring, said yoke being pivoted at the center, but being free to move transversely in respect to the axis of the pivot, substantially as and for the purpose set forth.

2. The combination, in a turbine water-wheel, of the gate-ring, an octagonal pivot-block, a gate-operating yoke having arms acting on said gate-ring, and having a central octagonal opening larger in one direction than the pivot-block, and mechanism for turning said yoke, substantially as specified.

3. The combination, in a turbine water-wheel, of the gate-ring, the octagonal pivot-block, the operating-yoke having arms acting on the ring, and an octagonal opening receiving the block, but larger in one direction than the latter, and a yoke-operating shaft having an arm acting upon an arm of the yoke, substantially as specified.

4. The combination, in a turbine water-wheel, of a gate-ring having lugs or bearings, with an operating-yoke having arms fitting loosely between said lugs or bearings, said yoke being pivoted at the center, but free to move transversely in respect to the axis of the pivot, substantially as and for the purpose set forth.

5. The combination, in a turbine water-wheel, of the base and curb, the cap having a depending sleeve, the wheel-shaft passing through said sleeve, the gate-ring, and the gate-operating yoke loosely pivoted to the sleeve and having arms acting on the gate-ring, and an arm by which it is operated, substantially as specified.

6. The combination, in a turbine water-wheel, of the cap having a depending sleeve, with a collar mounted thereon, the gate-ring, the gate-operating yoke loosely pivoted on the collar and having an operating-arm, and arms for acting on the gate-ring, substantially as and for the purpose set forth.

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

HENRY BROOMELL.

Witnesses:

WILLIAM D. CONNER,
HENRY HOWSON.