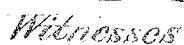


APPLICATION FILED OCT. 5, 1911.

Patented July 16, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



Harry King.

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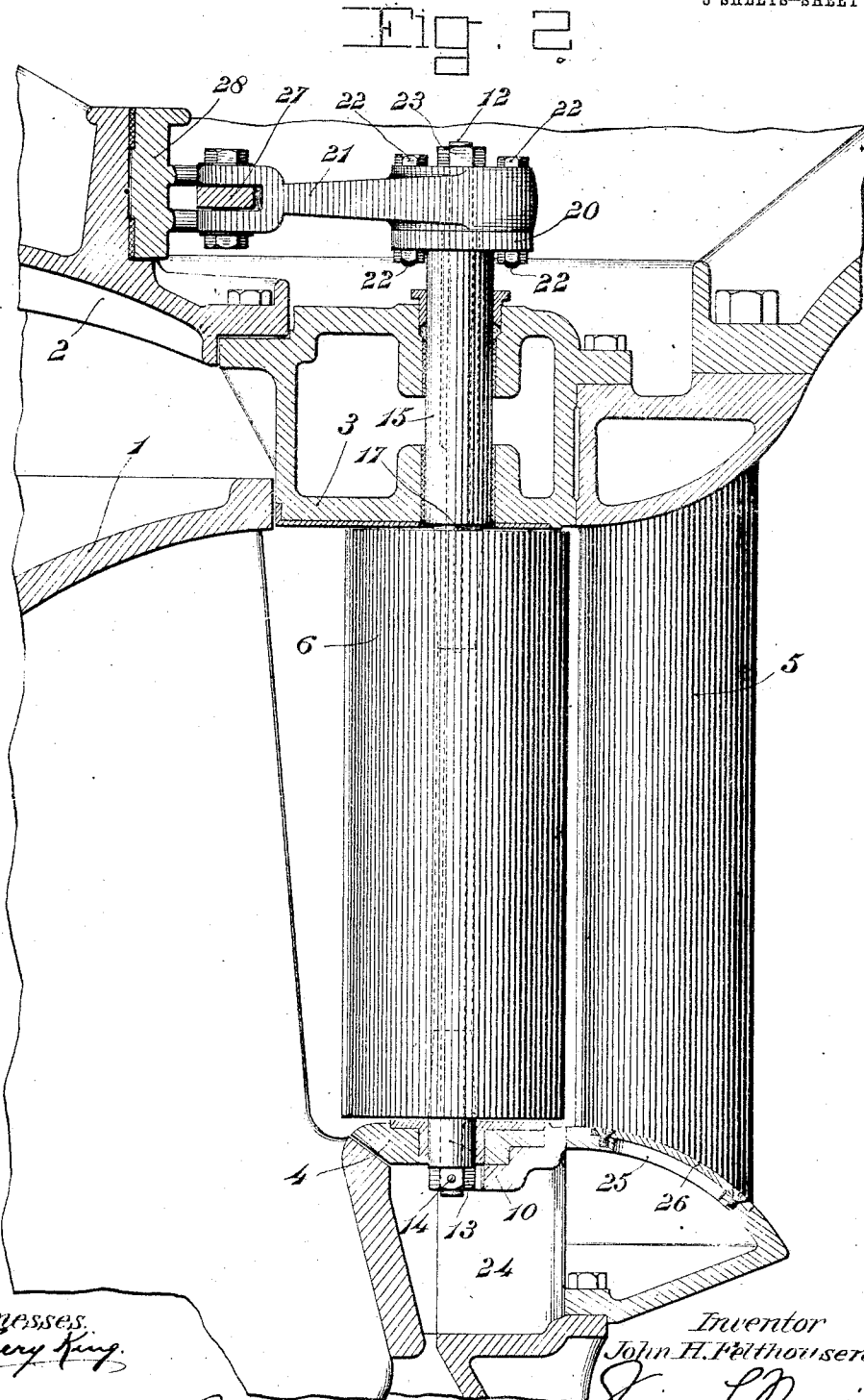
Atty

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TURBINE.
APPLICATION FILED OCT. 5, 1911.

1,032,887.

Patented July 16, 1912.

3 SHEETS-SHEET 2.



Witnesses.
Harry King

Clarence A. Bateman

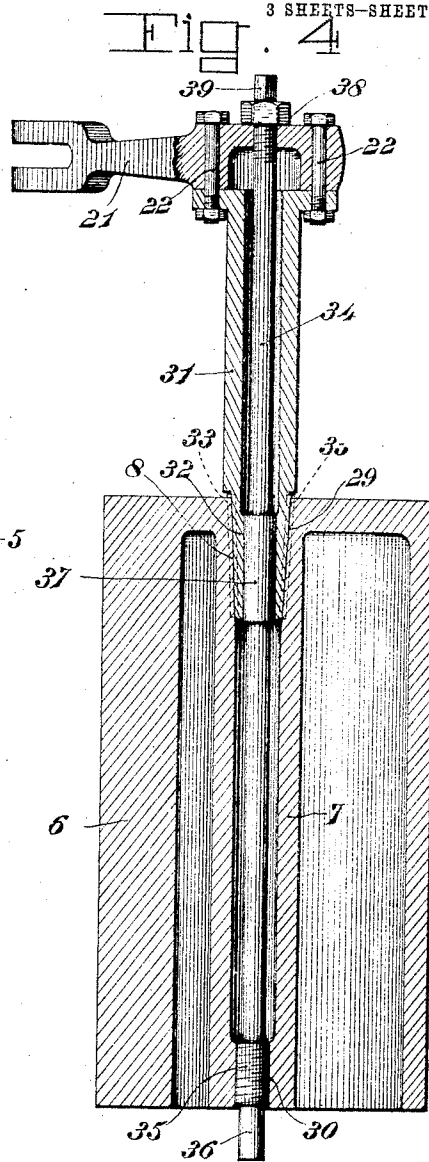
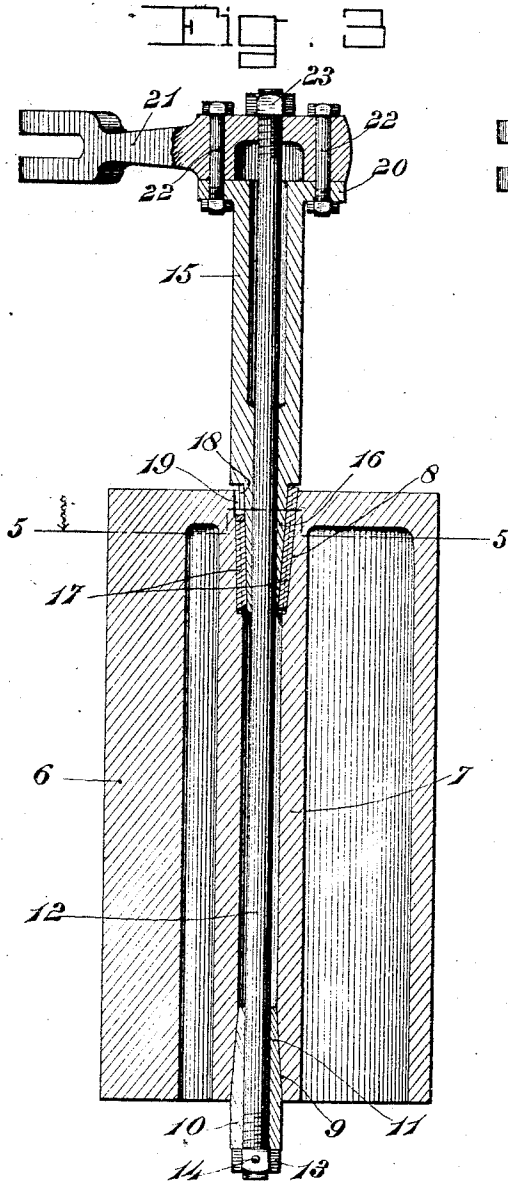
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3 SHEETS-SHEET 3.

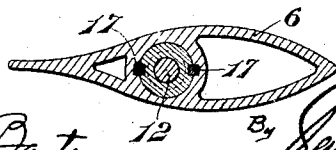


Witnesses

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Fig. 5



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UNITED STATES PATENT OFFICE.

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TURBINE.

1,032,887.

Specification of Letters Patent.

Patented July 16, 1912.

Application filed October 5, 1911. Serial No. 652,971.

To all whom it may concern:

Be it known that I, JOHN H. FELTHOUSEN, a citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented new and useful Improvements in Turbines, of which the following is a specification.

This invention relates to improvements in wicket gates for water wheels of the turbine type, and the primary object of the invention is to provide improved mountings and operating connections for gates of this character whereby such gates may be assembled and dismantled with the greatest facility and when desirable or necessary any of the gates may be quickly and easily removed and renewed or replaced, the present invention providing means whereby this may be accomplished without dismantling or disturbing any parts of the turbine structure other than those pertaining to or forming parts of the particular gate to be removed or replaced, and hence, renewal or repair of the gates can be made with a minimum delay and at small expense, although the gate and its adjusting or operating connections possess practically the strength of the usual solid integral, cast or forged gates.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawings:—Figure 1 is a view partly in section of the peripheral portion of a turbine water wheel equipped with wicket gates constructed in accordance with the present invention; Fig. 2 represents a section on the line 2--2 of Fig. 1; Fig. 3 is a detail sectional view of one of the gates and its mounting and operating connections; Fig. 4 is a view similar to Fig. 3 showing a modified form of the invention; and Fig. 5 represents a transverse section of the gate shown in Fig. 3 and on the line 5--5 of that figure.

Similar parts are designated by the same reference characters in the several views.

The present improvements are applicable generally to water wheels and more especially to those of the turbine type employing a set of wicket gates which are adjustable in

unison to regulate the flow of water to the revoluble wheel or runner. In the present instance I have shown the improvements as applied to a conventional form of turbine of this type, 1 designating a portion of the revoluble wheel or runner, 2 the dome or crown above the wheel or runner, 3 and 4 the upper and lower supports for the wicket gates, there being an annular row of these gates which surround the wheel or runner, and 5 designates the fenders which are located in an annular row exteriorly of the row of gates, as shown clearly in Fig. 1.

Each gate 6 comprises a body of well known or appropriate form having a bore 7 which extends vertically or axially there-through and in that form of the invention shown in Figs. 1 to 3 inclusive, the upper and lower ends of this bore 7 are tapered to form reversely disposed conical or tapered seats 8 and 9. A gate stem 10 is provided for the bottom of each gate, this gate stem having a conical or tapered portion 11 which is complementary to and adapted to be forced axially into the conical or tapered seat 9 in the bottom of the gate, and this lower gate stem has an axial bore through which the lower end of a main gate pin or bolt 12 passes, the lower end of this pin or bolt 12 being threaded and provided with a removable nut 13, the latter being preferably provided with a cotter pin 14 to prevent loosening thereof. An upper gate pin 15 is also provided, it having a conical or tapered lower end 16 which is adapted to be forced axially into the complementary conical or tapered seat 8 in the upper end of the gate, and in order to properly secure the upper gate pin to the gate and prevent relative turning movement between these parts, a pair of feathers 17 are provided, these feathers being mounted in key seats 18 formed in the conical or tapered portion of the upper pin 15 and when the latter is inserted into the corresponding seat in the gate, the feathers engage and interlock with appropriately positioned key seats 19 formed in the conical or tapered seat 8 in the gate. The upper pin 15 extends through a bore provided for it in the upper gate support or casting 3 and it is provided at its upper end with a flange 20 to receive an operating crank 21, the hub of the latter being removably locked or secured to the flange 20 by suitable means, such, for example, as the

bolts 22, and the main pin or bolt 12 extends upwardly through the gate, through a bore formed in the upper pin 15, and through the hub of the crank 21, the upper end of the pin or bolt 12 being threaded and provided with a nut 23 which bears upon the top of the crank hub.

A space or chamber such as the chamber 24 is formed or provided below the bottom gate support or plate 4, the nut 13 on the lower end of the main pin or bolt 12 being accessible from this space or chamber 24. Access to the space or chamber 24 from the exterior is afforded by a suitable number of hand-holes 25, there being preferably one of these holes between each pair of fenders 5, and each of these holes may be covered normally by a removable plate 26. The crank 21 for each gate is operatively connected to suitable adjusting means. For example, in the present instance each of these cranks is connected by a link 27 to a rotatable adjusting ring 28, the latter serving to simultaneously adjust all the wicket gates in unison.

In using wicket gates provided with mountings and operating connections such as just described, each gate can be mounted or assembled in the following way: The gate is placed in position between the upper and lower supports 3 and 4, the lower gate pin 10 is then inserted through the hand-hole 25 (the cover plate 26 being removed), and this pin can be passed by hand from the chamber or space 24, through the bearing provided for it in the bottom gate support 4 and into the lower end of the gate. The upper gate pin 15 is passed through the upper support or casting 3 until its lower tapered or conical end enters the conical or tapered seat 8 in the upper end of the gate, the feathers engaging in the keyways 19. The main pin or tie bolt 12 is then passed downwardly through the upper pin 15, through the gate, and through the lower pin 11, and the nut 13 is applied to the lower end thereof, the crank 21 is then applied and bolted to the upper end of the pin 15, and finally the upper nut 23 is applied to the upper end of the main pin or tie bolt 12 and is tightened, the crank being appropriately connected to the adjusting ring 28. Tightening of the nut at the upper end of the main pin or tie bolt draws the tapered portions of the upper and lower pins firmly into engagement with the correspondingly tapered seats in the ends of the gate and thereby forms a rigid and firm connection between the gate and the crank. To remove any one of the gates, it is only necessary to repeat these operations in reverse order, it being obvious that any gate can be inserted or removed quickly and without the necessity of removing or disturbing any other parts of the turbine structure.

In Fig. 4, I have shown a modified form of mounting wherein the upper end of the gate has a tapered or conical seat 29 and the lower end of the gate has a threaded portion 30. An upper pin 31 is used in this instance which is similar to the pin 15 in the previously described construction, it having a conical or tapered lower end 32 which engages in the conical or tapered seat 29 in the upper portion of the gate and feathers 33 serve to key these parts together. The crank 21 is removably bolted or secured to the upper end of the pin 31 as in the previous instance. A main pin or tie bolt 34 extends downwardly through the hub of the crank, the upper pin 31, and the gate, and it has a threaded shoulder 35 which cooperates with the threaded portion 30 at the bottom of the gate, this pin or tie bolt 34 having a cylindrical extension 36 which projects below the gate and cooperates as a journal pin with a suitable bearing provided for it in the bottom gate support. This main pin or tie bolt may have a boss 37 at an intermediate point to engage within the conical portion 32 of the upper pin and the upper end of the pin or bolt 34 is threaded to receive a nut 38 which bears upon the top of the crank, the pin or bolt 34 having a square or angular portion 39 which projects above the nut 38 and is adapted to receive a wrench or other implement. In mounting a gate constructed as shown in Fig. 4, the gate is first placed in position, the main pin or bolt 34 is then inserted, its lower end being threaded into the bottom of the gate, the upper pin 31 is then placed over the upper end of the pin or bolt 34 and its tapered or conical portion introduced into the correspondingly formed seat in the upper end of the gate, the crank is then placed in position, and finally, the nut 38 is applied to the upper end of the pin or bolt 34 and tightened, the pin or bolt 34 being held from turning, if necessary, by placing a wrench upon the squared extension at the top thereof. Tightening of the nut 38 will force the conical or tapered portion of the upper pin 31 into the correspondingly formed seat in the upper portion of the gate and, in this manner, the entire structure will be locked together as a unit. The gate may be removed by similar operations performed in reverse order.

I claim as my invention:—

1. In a turbine, the combination of a casing having opposed gate supports, a gate operative between them, gate pins removably engaging the opposite ends of the gate and pivotally engaging the respective supports, and means for removably coupling one of said pins to the gate to turn the latter, and gate-adjusting means connected to said coupled pin.

2. In a turbine, the combination of a cas-

ing having opposed gate supports, a gate operative between them, a pair of individually removable pivot pins projecting from opposite ends of the gate and coöperative with the respective gate supports, one of said pins having means for detachably coupling it to the gate, and an adjusting member connected to said coupled pin and operative to turn the gate on said pins as an axis.

3. In a turbine, the combination of a casing having gate supports, a gate turnable between said supports, a pair of pivot pins coöperative with the respective supports, one of said pins being removably coupled to the gate to turn the latter, and a gate adjusting member connected to said coupled pin.

4. In a turbine, the combination of a casing having gate supports, a gate operative between them, a pair of individually removable pivot pins coöperative with the gate and the respective supports, means for detachably coupling one of said pins to the gate to turn the latter, and an adjusting member connected to the coupled pin and operative to turn the gate on the pivot pins as an axis.

5. In a turbine, the combination of a casing having a pair of gate supports, a gate operative between such supports, a pivot pin coöperative with one of said supports and removably coupled to the gate, a second pin coöperative with the gate and with the other support, and means for locking said pins together.

6. In a turbine, the combination of a casing having opposed gate supports, a gate operative between the latter, a pivot pin adapted to be removably coupled to one end of the gate, a second pin for the opposite end of the gate, said pins coöperating with the respective supports, a gate adjusting member connected to the coupled pin first mentioned, and means for locking the pin first mentioned in coupled relation to the gate.

7. In a turbine, the combination of a casing having opposed supports, a gate arranged between them, a pivot pin having means for removably coupling it to one end of the gate, and a tie bolt passing through said pin and through the gate and bearing a second pin for the opposite end of the gate, said pins coöperating with the respective supports.

8. In a turbine, the combination of a casing having a pair of gate supports, a gate arranged between such supports, a pivot pin coöperative with one of said supports and having means for removably coupling it to one end of said gate, a removable tie bolt extending through said pin and gate and bearing a second pin coöperative with the other support, and means connecting said pin first mentioned and the tie bolt for locking such pin in coupled relation to the gate.

9. In turbines, the combination of a gate having a tapered seat at one end, a pivot pin having a tapered portion to removably engage said seat, a removable member extending through said pin and gate and bearing a pivot pin for the opposite end of the gate, and means connecting said member and the pin first mentioned for forcing the tapered portion of the latter into engagement with said tapered seat in the gate.

10. In turbines, the combination of a gate having a tapered seat in one end thereof, a pin having a correspondingly tapered portion to removably engage said seat, a feather between said tapered portion and seat to key such parts together, a gate adjusting member connected to said pin, and means for locking said pin to the gate.

11. In turbines, the combination of a gate having tapered seats formed in its opposite ends, pins having reversely tapered portions removably engaging the respective seats, a member for securing and retaining said pins in engagement with the gate, and a gate adjusting member connected to one of said pins.

12. In a turbine, the combination of a casing having opposed gate supports, said casing having an accessible chamber behind one of said supports, a gate arranged between the supports, and a pair of pivot pins removably engaging the opposite ends of the gate and coöperative with the respective supports, the pins being removable by withdrawal in opposite directions through the respective supports.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN H. FELTHOUSEN.

Witnesses:

CLARENCE C. FREY,
MARGARETTA WILEY.