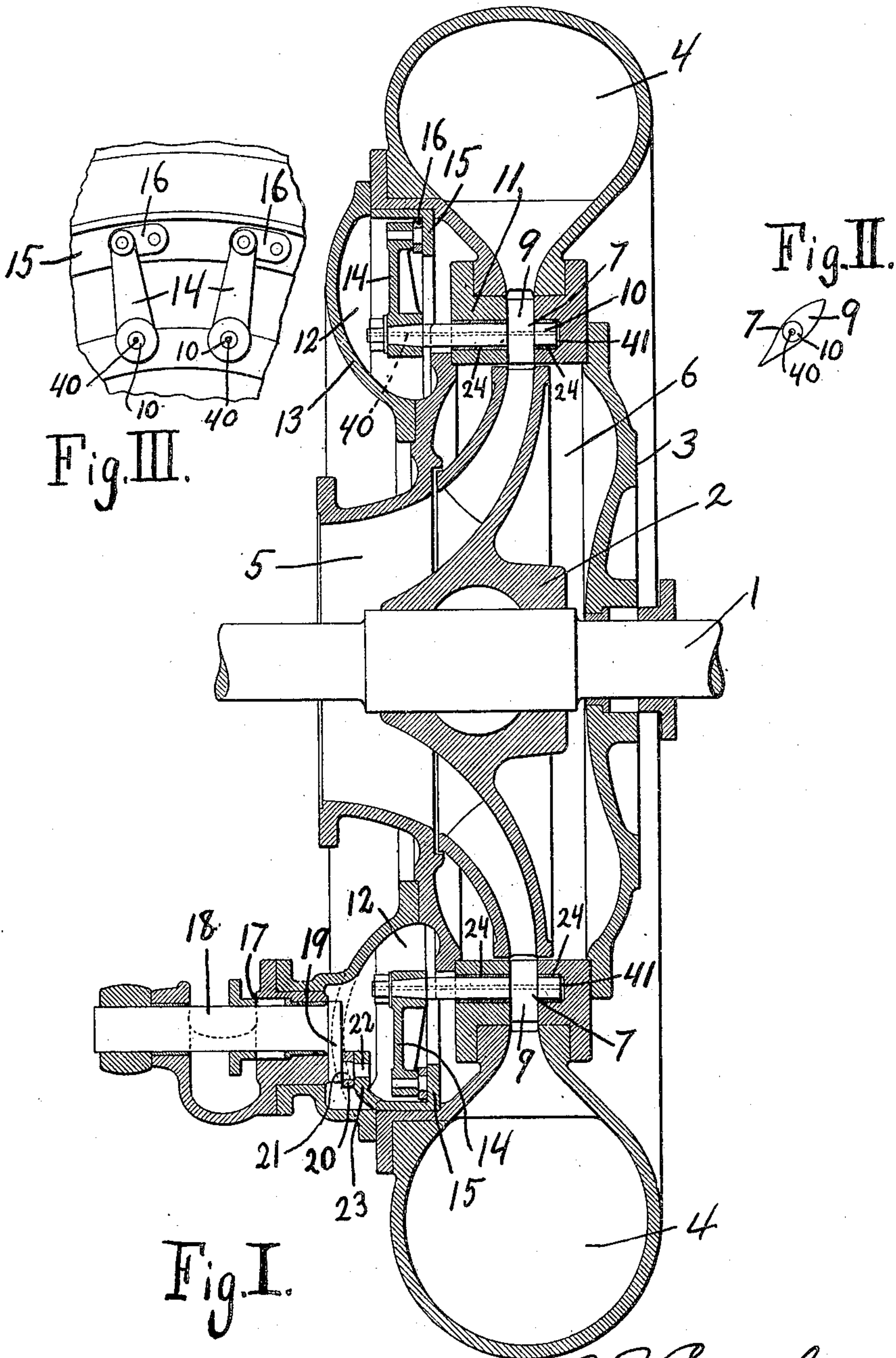


E. F. CASSEL.
HYDRAULIC TURBINE.
APPLICATION FILED OCT. 22, 1906.

921,950.

Patented May 18, 1909.



WITNESSES:
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UNITED STATES PATENT OFFICE.

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OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW JERSEY.

HYDRAULIC TURBINE.

No. 921,950.

Specification of Letters Patent.

Patented May 18, 1909.

Application filed October 22, 1906. Serial No. 339,912.

To all whom it may concern:

Be it known that I, ELMER F. CASSEL, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Hydraulic Turbines, of which the following is a specification.

This invention relates to hydraulic turbines and specifically to the arrangement of the means for operating the gates which control the flow of water through a turbine.

It is customary in some types of turbines to use a plurality of gates for controlling the flow of water and it is important that these gates be freely movable. It is customary to provide a stuffing box in the casing for each gate stem and to connect the stems outside the casing so that all of the gates can be moved simultaneously. The use of a plurality of stuffing boxes is objectionable on account of their tendency to leak and the resistance they offer to the movement of the gates, especially when the packing is set up to stand high pressures.

The object of this invention is to so arrange and dispose the several parts of a turbine structure that the plurality of stuffing-boxes may be dispensed with, and this is accomplished by placing the gate operating mechanism within a casing which to all intents and purposes is the main casing of the turbine but which for structural reasons is preferably formed as a separate casing and secured to the main casing.

This invention therefore provides a turbine casing, which is provided with a plurality of gates for controlling the flow of water into the runner, with means for operating said gates, said means being disposed within a water space of the casing, and said means in turn being controlled through a single shaft which projects outwardly from said casing through a stuffing box.

In the drawings which accompany this specification and form a part of the same and on which the same reference characters are used to indicate the same elements in each of the several views, Figure 1 represents a vertical section through a turbine embodying this invention. Fig. 2 is an elevation of one of the water controlling gates viewed at right angles to the position in which it is shown in Fig. 1. Fig. 3 is an elevation, taken at right angles to the view shown in Fig. 1, of

a fragment of the casing and ring showing the connection of the ring with two of the water gate arms.

Numeral 1 represents the shaft of a turbine; 2 the runner mounted thereon, and 3 the complete casing of the turbine inclosing the runner and provided with the water inlet space 4 and the water outlet space 5, all of which may be of the ordinary or any preferred construction. Controlling thoroughfares between the water passage 4 and the interior 6 of the casing 3, are a plurality of gates 7. Each of these gates is provided with a wing portion 9 which is supported approximately midway of its length upon a stem 10, said disposition of the parts being such that the wing member 9 will not be turned in either direction about its stem 10 by reason of the water pressure. The stems 10 are seated in the ring member 11 and project outwardly into a space 12 which is formed by the casing 13 secured to the turbine casing. Upon the end of each of the stems 10 and in the chamber 12 is disposed a crank arm 14, each of which is in turn connected with a link or ring 15 by means of links 16 pivoted to said ring and to said crank arms.

The numeral 17 represents a stuffing box or gland secured to the casing 13 through which projects the shaft 18 into the chamber 12 and within said chamber said shaft is provided with the crank arm 19 which engages with the ring 15 by means of the link 20, which is substantially a duplicate of the links 16, and the pins 21 and 22, the ring 15 being provided with the inturned projection 23 to more readily accommodate this form of connection.

The numeral 24 represents bushings which may be of brass or any suitable metal to prevent the stems 10, which are usually composed of steel or iron, from corroding and sticking. Each of the stems 10 is provided with a thoroughfare 40 extending from end to end through which the pressures of the water in sockets 41 and space 12 are equalized.

The operation of the apparatus is as follows: Water is admitted from the usual penstock or equivalent device to the water passage 4 from whence it passes through the thoroughfares controlled by the gates 7 to the interior 6 of the casing 3, being, however, for the most part directed immediately into

the channels of the runner 2, from whence it is discharged through the outlet passage 5 of the casing. The stems 10 of the gates 7 are seated comparatively loosely in the bushings 5 24 and the water consequently can escape somewhat between said stems and said bushings, and in so escaping will pass into the space 12 contained within the casing 13, but will be retained therein, as said casing is 10 closed except for the stuffing box 17. By rotating the shaft 18 more or less in either direction the ring 15 is rotated to a certain extent whereby the links 16 are actuated, moving the crank arms 14 and opening or 15 closing more or less the gates 7.

The improvement which results from this arrangement of the several parts really consists in locating the movable elements which are necessary to actuate a plurality of gates 20 within the turbine casing so that the gates can be fitted comparatively loosely whereby ease of operation is assured and access is had to the gates for manipulating them through a single stuffing box.

25 What I claim is,—

The combination of a casing, a runner in the interior of said casing, an inlet passage in said casing and an outlet passage leading from said casing, thoroughfares leading from said inlet passage to said runner, gates con- 30 trolling said thoroughfares, a space in said casing, a socket in said casing for loosely seating one end of one of said gates, a seat in said casing for loosely seating the other end of said one of said gates whereby said end ex- 35 tends into said space, balancing ports through said gates connecting said seats with said space, operating means in said space for commonly operating said gates, a single stuffing box in said casing extending to said 40 space, and means passing through said stuffing box for actuating said common operating means from without said casing.

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

ELMER F. CASSEL.

Witnesses:

G. J. DEWEIN,

FRANK E. DENNETT.