No. 680,294. Patented Aug. 13, 1901.

F. TRUMP.

BALANCING DEVICE FOR WHEEL SHAFTS HAVING END THRUST.

(Application filed Oct. 24, 1900.)

(No Model.)

Fig. 1

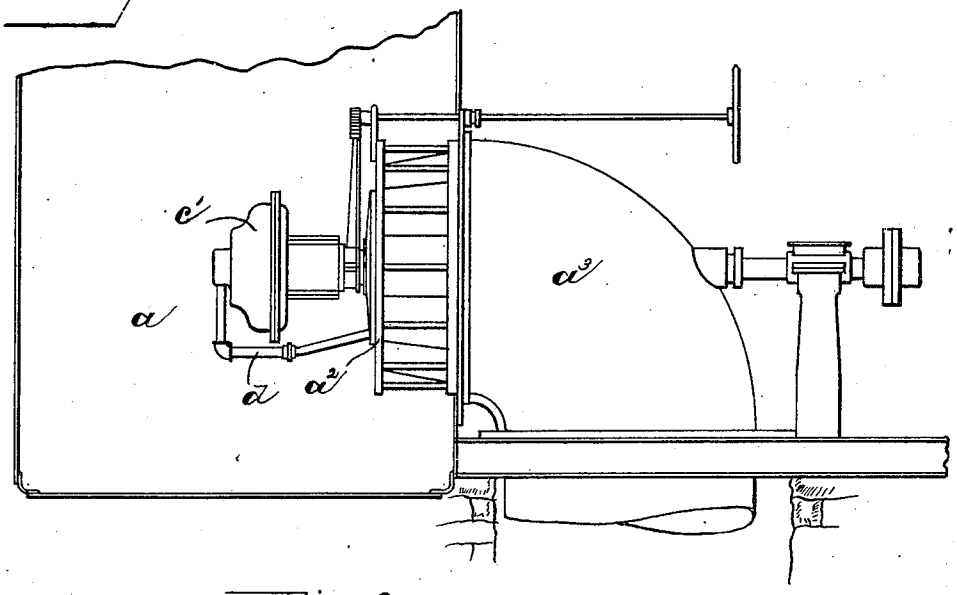
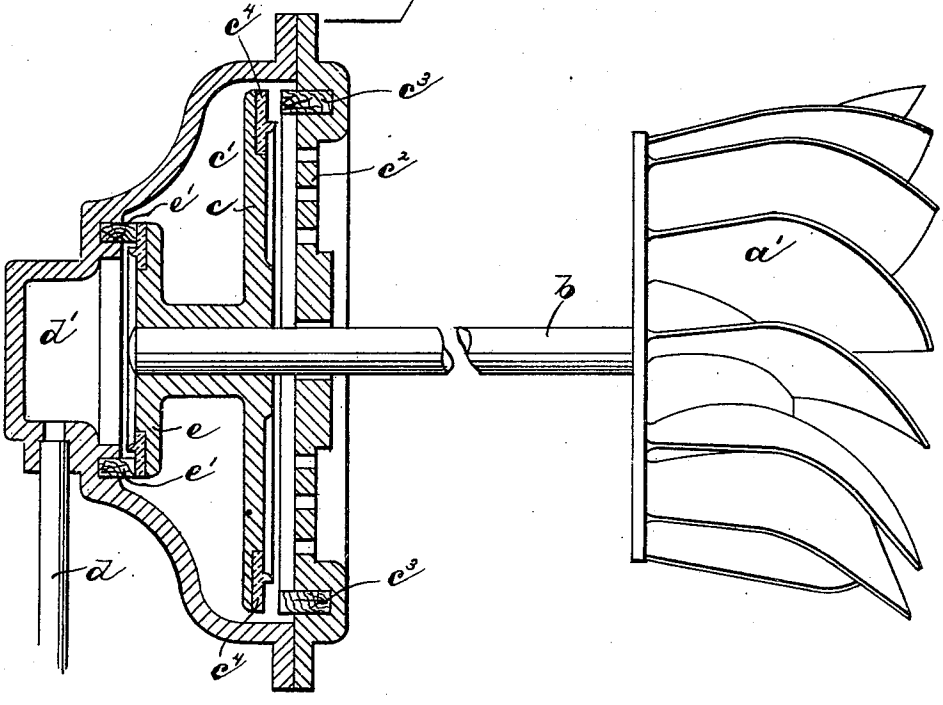


Fig. 2



WITNESSES:

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BALANCING DEVICE FOR WHEEL-SHAFTS HAVING END THRUST.

SPECIFICATION forming part of Letters Patent No. 680,294, dated August 13, 1901.

Application filed October 24, 1900. Serial No. 34,166. (No model.)

To all whom it may concern:

Be it known that I, FULLER TRUMP, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Balancing Devices for Wheel-Shafts Having End Thrust, of which the following is a specification.

My invention relates to improvements in water-wheels, and relates particularly to devices for counterbalancing the end thrust or pressure which occurs in turbine water-wheels, particularly those of the single-discharge pattern.

My invention also relates in its nature to improvements upon devices set forth in my Patent No. 660,282.

The object of my invention is to simplify the construction of the counterbalancing arrangement shown in my previous patent, particularly those constructions constituting an outlet-valve from the diaphragm-chamber, and other improvements which will clearly appear from the more detail description following and the annexed drawings, in which—

Figure 1 is a general view of a single-discharge water-wheel to which my counterbalancing device is attached, this view representing one of a number of well-known types of water-wheels to which the invention is applicable. Fig. 2 is a transverse sectional view of the same.

Like parts are represented by similar letters of reference in both views.

In the drawings, *a* represents a penstock in which a water-wheel *a'*, inclosed in the usual casing a^2, is mounted and adapted to discharge into the draft-tube a^3 in the usual manner. The water-wheel is mounted upon a shaft *b* in the usual way, and there is attached rigidly to this shaft *b* a diaphragm *c*, constructed in substantially the same manner as in my prior patent referred to. This diaphragm *c* is located within a chamber *c'*, the front of which is preferably composed of a perforated plate c^2, which plate supports an annular bearing-ring c^3, preferably of wood, the diaphragm *c* being preferably provided near its periphery with a bearing ring or seat c^4, of brass or other suitable material, to form with the bearing-ring c^3 a valve as well as a support, which valve permits the water to enter the diaphragm-chamber *c'*. An outlet-pipe *d* leads from the chamber *c'*; but it preferably connects directly with an intermediate chamber *d'*, which is separated from the diaphragm-chamber *c'* by what is termed an "outlet-valve," which is preferably constructed with a diaphragm *e* and a bearing-ring *e'*, substantially like the parts *c* and c^3, heretofore described. This diaphragm or valve is connected to the water-wheel shaft *b* and is preferably formed integral with the main or counterbalancing diaphragm *c*. The water-wheel and its shaft admits of a sufficient amount of lateral motion to seat and unseat the respective diaphragms or valves from their bearing-rings or supporting-seats. The discharge-pipe *d* leads into the wheel-case or into any other convenient point of discharge, so as to be relieved from the pressure of the water within the penstock or that which acts against the diaphragm.

The action of the device is substantially the same as that described in my former patent. The pressure of water against the main diaphragm tends to counteract the pressure or end thrust of the wheel in the direction of the flow of the water. So long as the outlet-valve or smaller diaphragm is moved from its seat the water in the chamber will pass out through the discharge-pipe, and the pressure from the water in the penstock will be correspondingly exerted against the main diaphragm. If the end thrust upon the wheel caused by the flow of the water is increased, it will increase the size of the outlet-opening from the diaphragm-case and decrease the size of the opening into said case, and thereby decrease the pressure in said case and increase the pressure on the diaphragm, and thus establish an equilibrium.

The perforated plate which permits the passage of the water to the main diaphragm prevents dirt and trash from getting into the bearing-seat; but it is obvious that it performs no important function in the counterbalancing feature of the invention and may be dispensed with when the conditions of the water employed will permit. By having the outlet-valve in the form of a diaphragm and bearing-ring the end thrust, which may result from a sudden opening or closing of the case, is received directly upon the respective

bearing-rings, the construction being such that where the end thrust from the flow of water is uniform the diaphragms will run substantially free from their bearing-seats and in what may be termed a "water-cushion," and thus there will be very little friction.

I have shown this device as employed in connection with a horizontal wheel of the single-discharge type. It is obvious that it is capable of use with water and similar wheels of either the horizontal or vertical type, and by its use the ordinary step or thrust bearing may be entirely dispensed with, if desired, the bearing-rings and diaphragms or valves being sufficient to receive and support any pressure which would come thereon by reason of a sudden change in pressure on the wheel and which might not be at once compensated for by the counterbalancing influence of the water-pressure on the main diaphragm.

Having thus described my invention, I claim—

1. The combination with a water-wheel, a diaphragm rigidly connected thereto, the connected parts being free to move longitudinally, a housing within which said diaphragm is placed, said diaphragm being adapted to form an inlet to said chamber, another diaphragm in said chamber rigidly connected to said water-wheel in like manner with said first-named diaphragm and adapted to form an outlet-valve to said chamber, each of said diaphragms being provided with seats or bearing-rings, substantially as and for the purpose specified.

2. The combination with a water-wheel and its shaft, a diaphragm secured rigidly to said shaft and arranged within a housing or chamber, a bearing-seat forming with said diaphragm a valve for an inlet-opening to said chamber, an outlet-opening from said chamber provided with a bearing-seat, a valve positively connected with said diaphragm adapted to control said outlet-opening, substantially as specified.

3. The combination with a wheel-shaft, of a counterbalancing member rigidly connected thereto and located within a chamber, openings in said chamber provided with bearing-seats, which, together with the respective ends of the counterbalancing member, form inlet and outlet valves to said chamber, and means for furnishing liquid under pressure against said counterbalancing member and to said chamber, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand this 9th day of October, A. D. 1900.

FULLER TRUMP.

Witnesses:
CHAS. I. WELCH,
EDMOND J. OGDEN.