No. 658,297.

Patented Sept. 18, 1900.

J. W. TAYLOR.

WATER WHEEL.

(Application filed Nov. 10, 1899.)

(No Model.)

4 Sheets—Sheet 1.

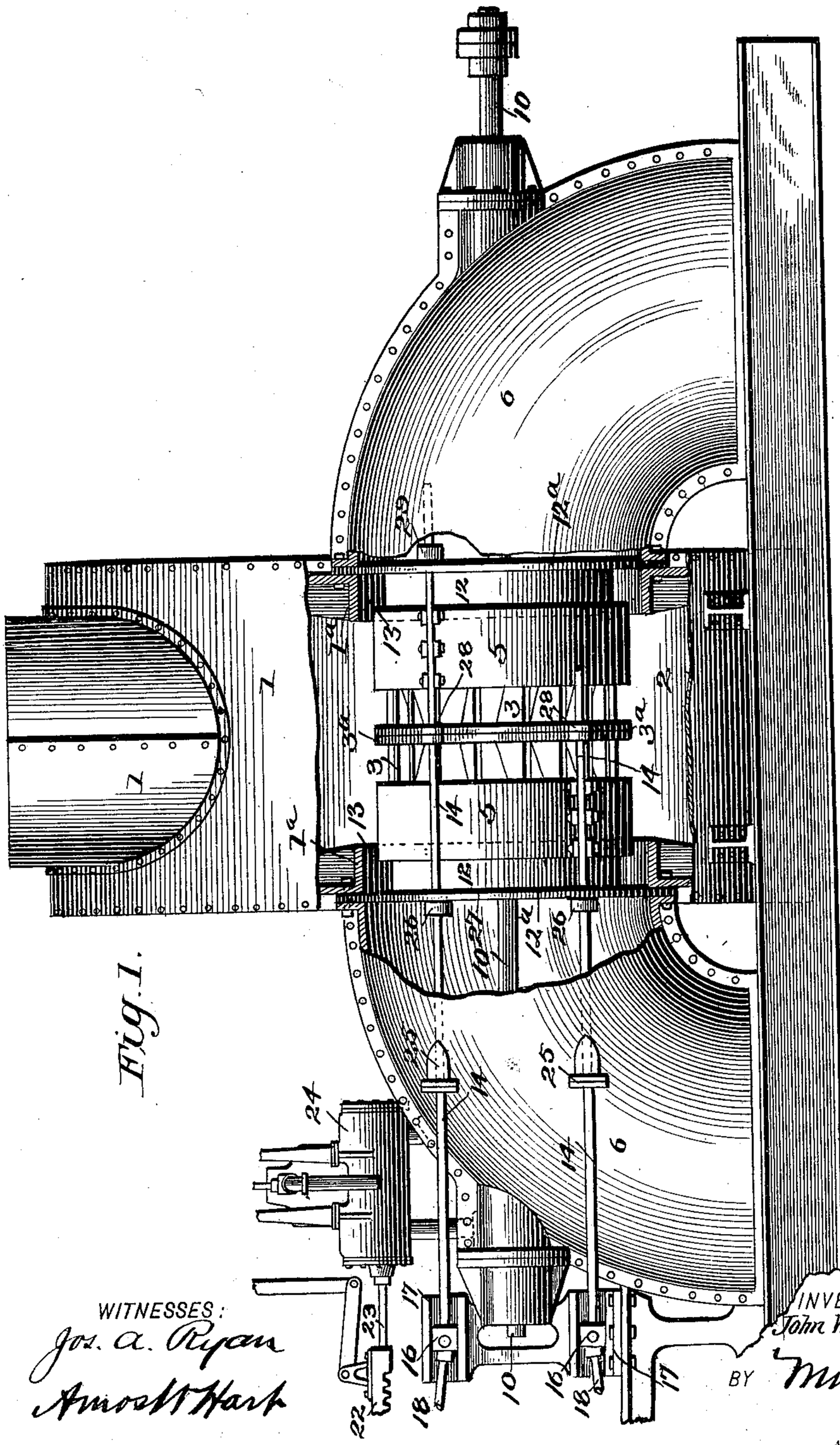

Fig. 1.

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Fig. 2.

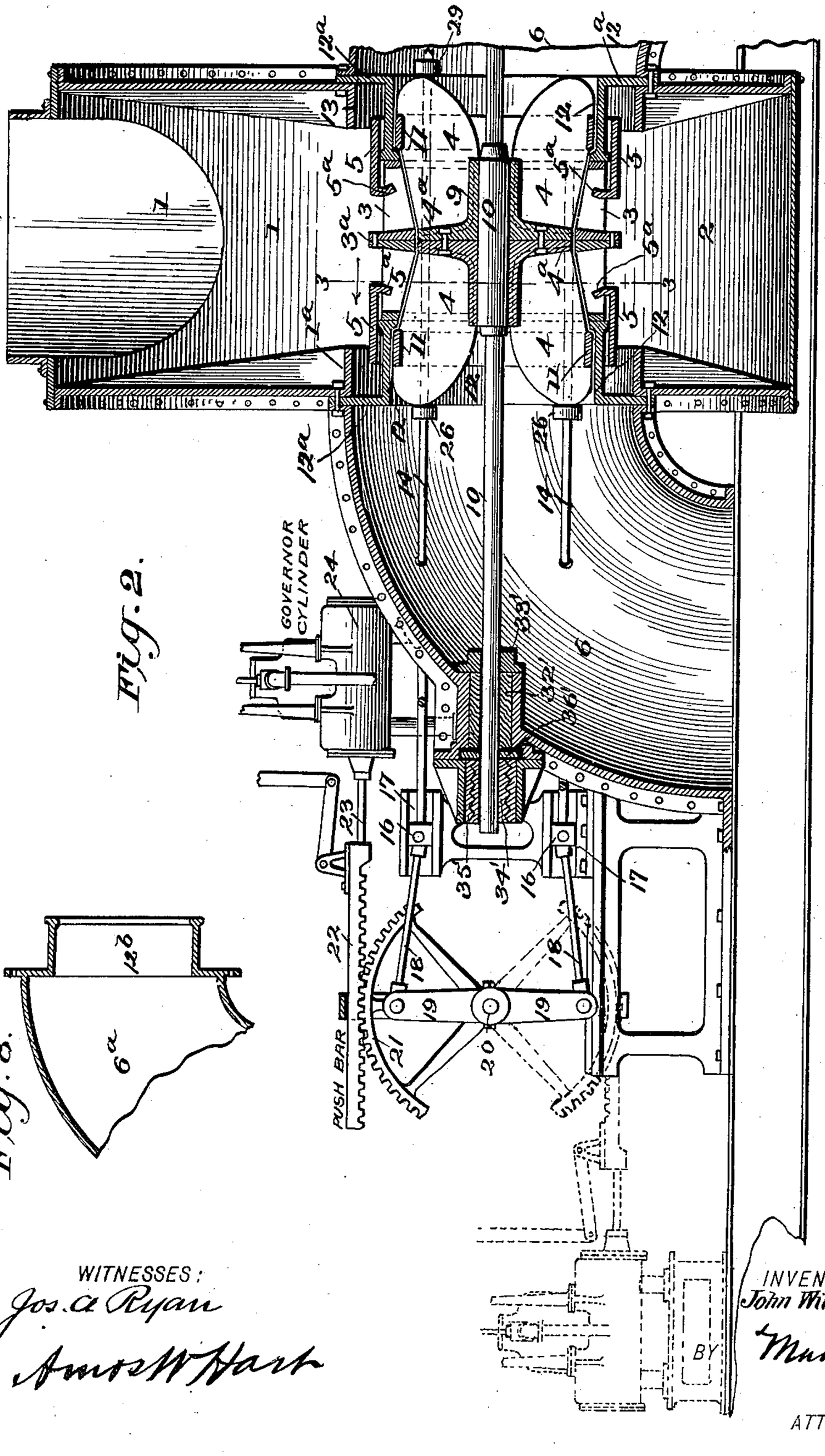

Fig. 8.

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Fig. 3.

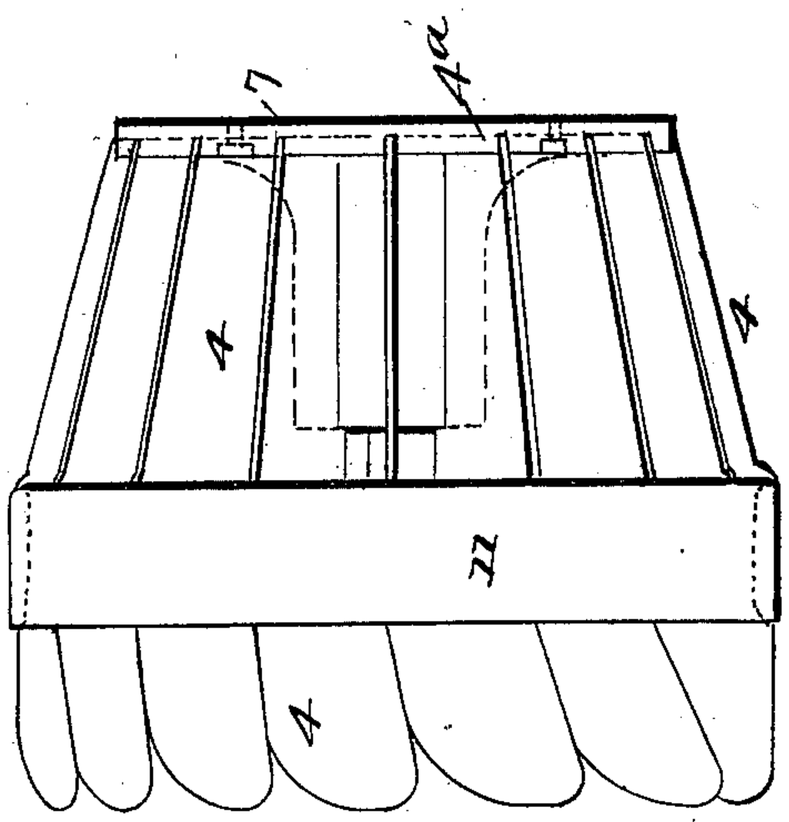

Fig. 4.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 6.

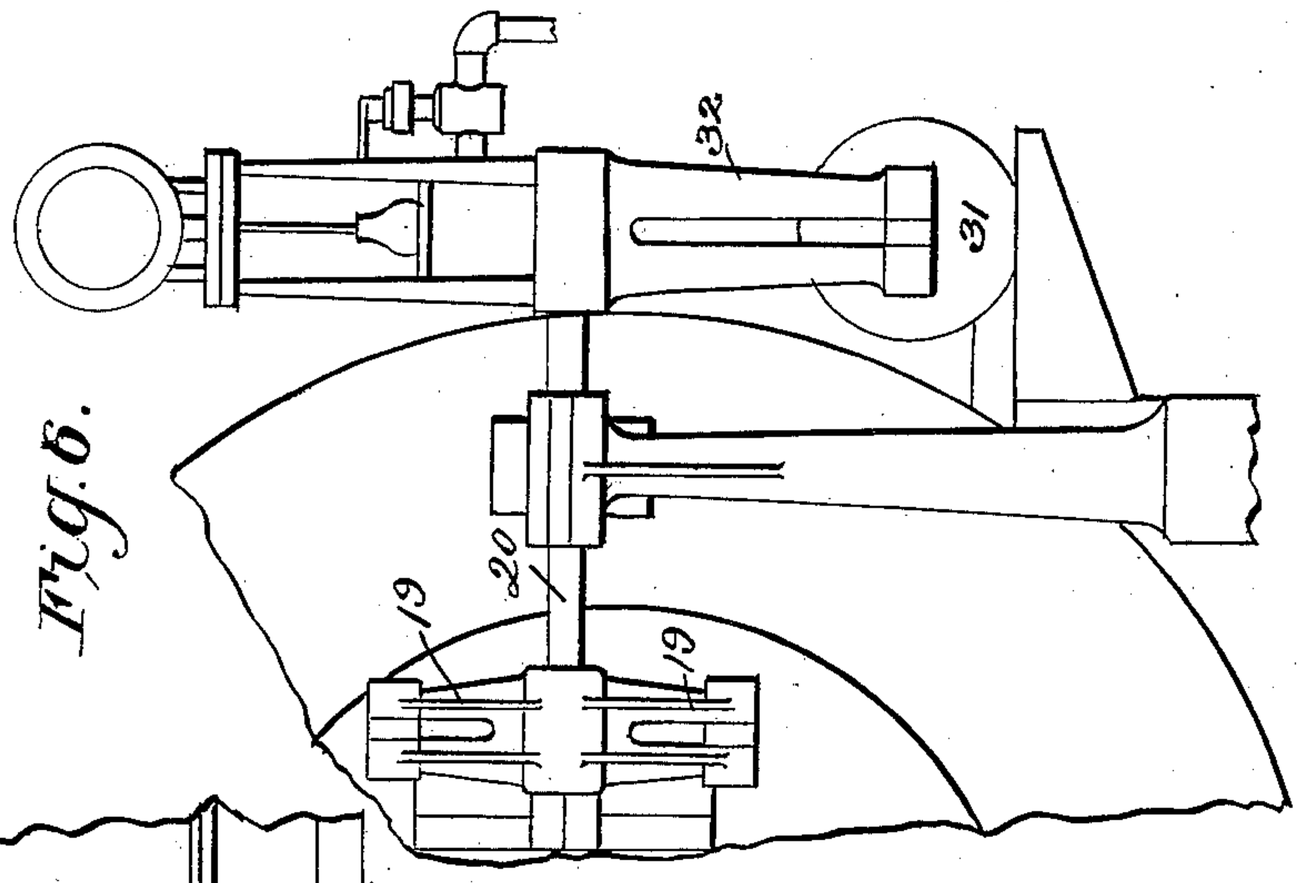


Fig. 5.

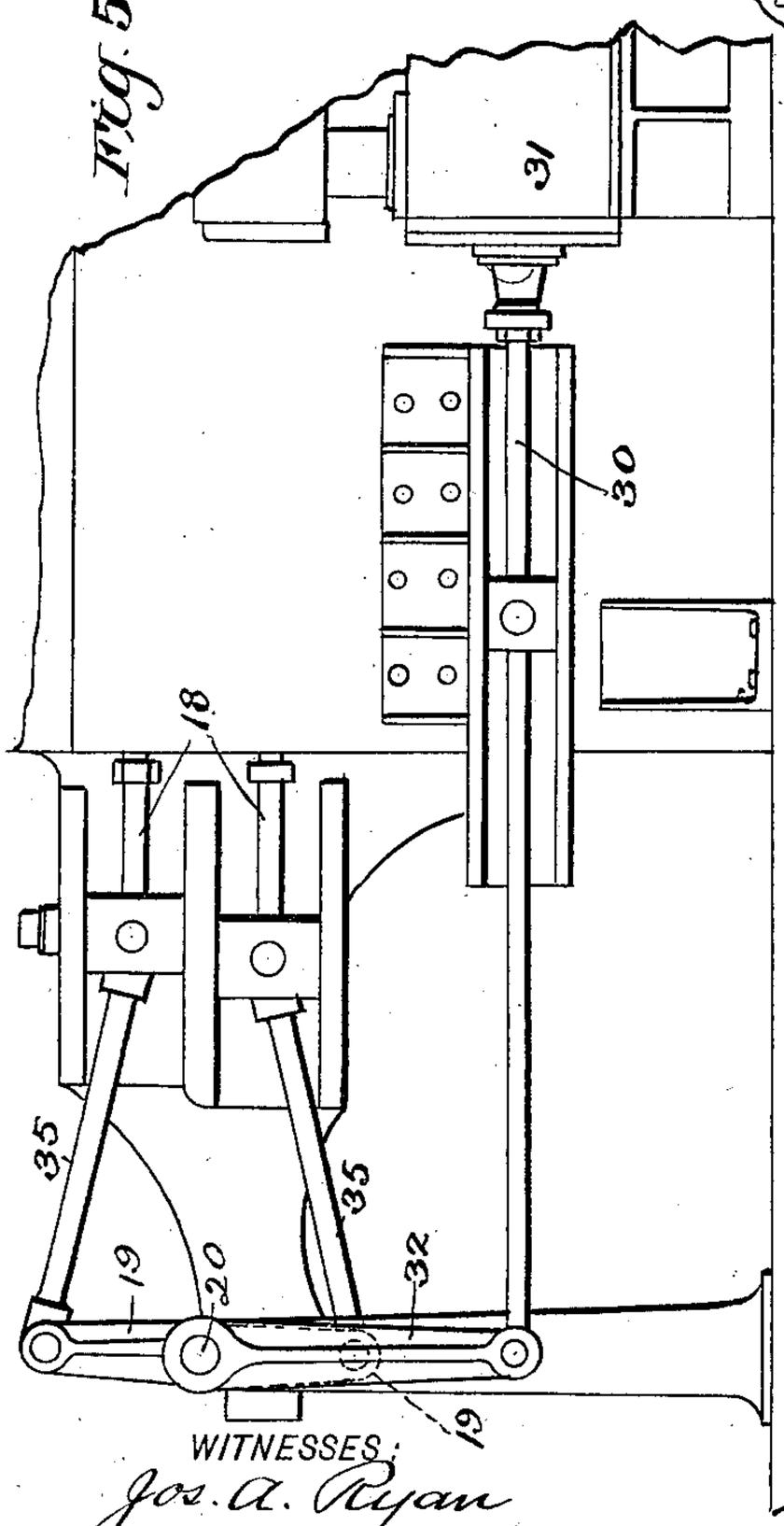
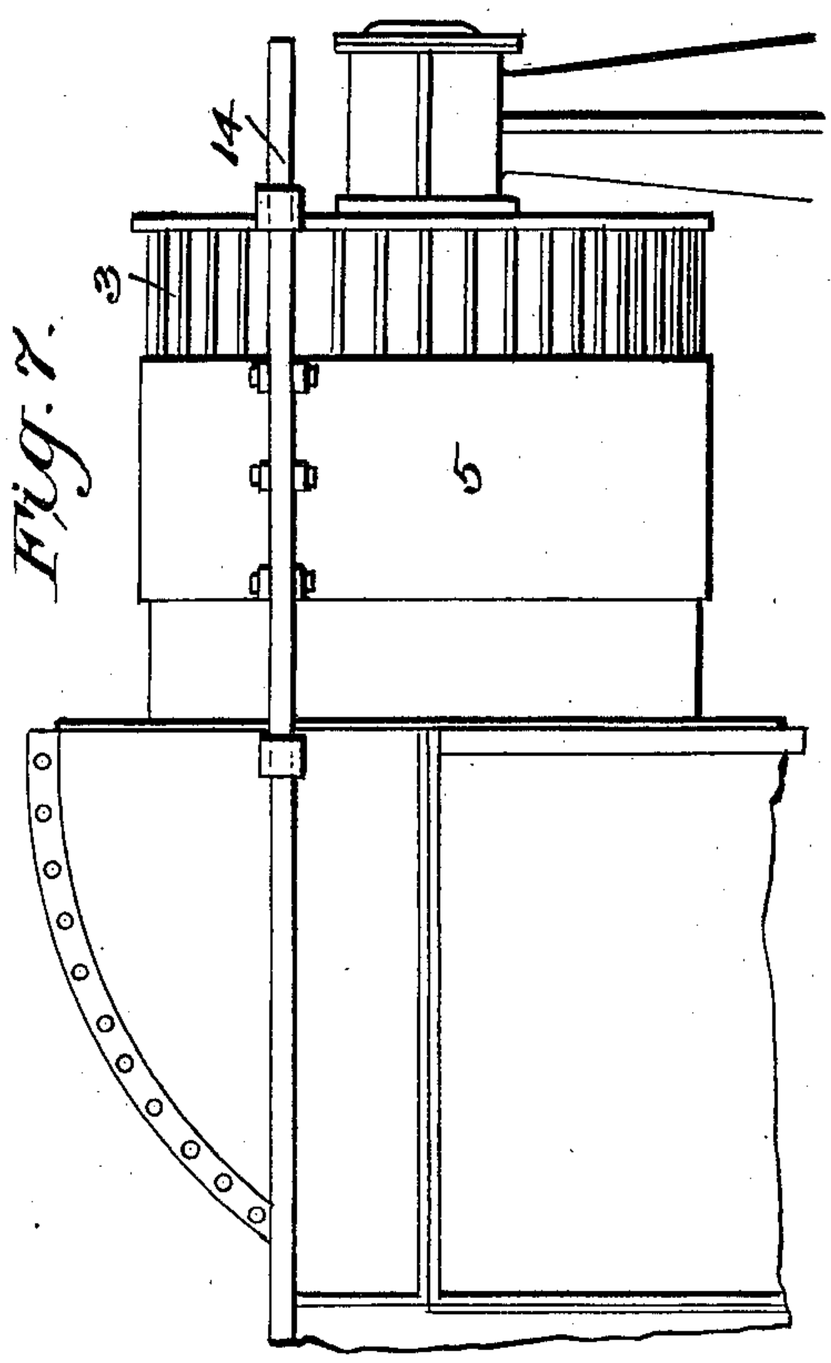


Fig. 7.



WITNESSES:
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UNITED STATES PATENT OFFICE.

JOHN WILLIAMS TAYLOR, OF ATLANTA, GEORGIA, ASSIGNOR TO THE TAYLOR MANUFACTURING COMPANY, OF LYNCHBURG, VIRGINIA.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 658,297, dated September 18, 1900.

Application filed November 10, 1899. Serial No. 736,468. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLIAMS TAYLOR, residing at Atlanta, in the county of Fulton and State of Georgia, have invented a new and useful Improvement in Water-Wheels, of which the following is a specification.

It is the object of my invention to provide several important improvements in the class of turbine water-wheels.

I have a pending application for Letters Patent for a vertical wheel, filed September 24, 1898, Serial No. 691,809, in which certain novel features of construction, arrangement, and combination of parts are described and claimed. My present invention is a horizontal turbine; but some features of it are applicable as well to vertical ones.

My improvements pertain more particularly to gates which are made sensitive and easy working and so arranged exteriorly to the wheel and chute-box and so supported as to work without friction and wear with the parts the gates inclose; also, to a construction and arrangement of parts for operating the gate simultaneously in opposite directions, lengthwise of the chute-boxes, and wheels proper. These and other features of invention are hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is mainly a side view and in part a section of a horizontal double wheel embodying my improvements. Fig. 2 is a vertical central section of the wheel. Fig. 3 is a side view of one of the duplicate sections or halves of the double wheel. Fig. 4 is an enlarged transverse section on line 3 3 of Fig. 2. Fig. 5 is a side view of a modification of the gate-adjusting mechanism. Fig. 6 is an end view of the same. Fig. 7 is a side view showing a single gate applied to one of a pair of wheels keyed on the same shaft. Fig. 8 shows a modification of the construction of the wheel-chamber.

Referring now to Figs. 1 and 2, 1 indicates the vertical portion of a flume, and 2 its enlarged cylindrical portion, which surrounds the chute-box 3, the double wheel proper, 4, and its two sleeve-gates 5. The quarter-turns or curved draft-tubes 6 conduct water from the wheels in opposite directions. The wheel proper is formed of two like parts, one being shown in Fig. 3, which are provided with flat heads 7, that are bolted together, as shown in Fig. 2, to form a double or composite wheel whose blades or buckets project horizontally in opposite directions or from each other. This double wheel 4 has thus a central radial rib 4^a (see Fig. 2) at the middle, and its hubs 9 are keyed on the axle 10. The blades of each wheel 4 are joined and braced near their outer or free ends by an encircling band 11. The middle portion of the double wheel 4 is surrounded by the circular chute-box 3, which is also double, each part being formed of a series of parallel horizontal guides consisting of thin bars united at each end to rings that are bolted together and to the inner ends of the cylinder 12, forming the casing of the outer or discharge end of the runner. It is obvious that the water passes from the flume-box 2, between the guides of the chute-box 3, upon the respective halves of the wheel 4, the double rib 3^a of the chute-box serving as a divider of the two currents that flow in opposite directions into the quarter-turns. The central flange of the double wheel is within and alined with the concentric annular rib 3^a of the chute-box, so that both serve to divide and guide the water upon the two sets of blades. The cylinder 12 fits loosely around the entire portion of the blades or buckets which project horizontally beyond the chute-box 3. Thus the cylinder 12 retains the water upon the wheel 4 until discharged from both, a feature essential to the highest efficiency of the wheel as distinguished from mere speed. The cylinder has an important relation to a sleeve-gate sliding outside a runner, for without it the gate would come in contact with the base-ring and the gate could not open. The dome used on wheels having cylinder-gates arranged inside is not required. The said cylinder 12 has a right-angular or radial base-flange 12^a, which is made separate from and bolted to the adjacent quarter-turn 6; but in some cases, for sake of economy and solidity of construction, I cast the two parts solid or in one piece, as shown in Fig. 8. It will be noted the quarter-turn 6 has a much greater diameter than the cylinder 12,

so that upon the water leaving the latter it finds ample space for free escape or delivery. The wheel-bands 11 are inclosed by the cylinders 12, as shown in Fig. 2, and abut the inner flanged ends of the same.

Two sleeve-gates 5 are employed, the same being duplicates and each encircling one of the halves of the double wheel 4 and a corresponding section of the double chute-box 3. These gates 5 are moved simultaneously from and toward each other to allow access of water to the wheel proper, 4, or shut it off therefrom, as may be required. The means for effecting this adjustment will be presently described. Each sleeve-gate 5 is constructed in halves or of two like semicircular parts, Fig. 3, whose heads are bolted together, as shown in Fig. 4. The gates are shown provided with inwardly-projecting lips or flanges 5^a, that work between the chute-bars; but this feature is unimportant. Each gate slides upon an alined chute-box 3 and cylinder 12 lengthwise thereof. When moved outward or toward the flume-head, it allows inflow of water upon the inner end of the runner 4 and is closed and shuts off the water when moved in the opposite direction. When moved outward, the gates are practically housed in annular chambers 13, (see Fig. 2,) which are formed by the concentric arrangement of the horizontal base-flanges 1^a of the flume-section 1 with the cylinders 12. It will be seen that the pressure of inflowing water upon the gates is thus relieved to a considerable degree.

Two rods 14 are attached to each gate 5 at opposite points, the same being secured between the gate-flanges 5^b, Fig. 4, by means of the same bolts 15 that hold the gate-sections together. As shown in Figs. 1 and 2, these rods 14 are connected in pairs to blocks or cross-heads 16, that slide in horizontal guides 17, arranged one above another. Said cross-heads 16 are connected by rods 18 with the opposite radial arms 19 of a rock-shaft 20, upon which are mounted sector-gears 21, that project in opposite directions and engage opposite rack push-bars 22. The latter are in turn attached to the rods 23 of pistons (not shown) working in cylinders 24, constituting part of an automatic governor, whose construction and operation require no particular description here. It is apparent that if one of the governors operates to push a rack-bar 22 in either direction the rock-shaft 20 will be rotated in turn and its radial arms 19 thereby caused to slide the two sets of gate-rods 14 in opposite directions, with the effect of opening or closing the two gates 5 simultaneously to a greater or less extent, and thus admitting water upon the center of the wheel, beginning at the heads of the buckets.

The sector-gears 21, rack-bars 22, and the governors are shown duplicated by dotted lines, Fig. 2, to illustrate a difference of location that may be availed of as conditions require.

It is an important feature that the gates 5 are so supported and guided in their opening and closing movements as to be quite independent of the runner 4 and have no bearing upon or friction with the chute-box 3, so that they may be operated with maximum ease and without wear of themselves or inclosed and adjacent parts. To this end I provide that the adjusting-rods 14 shall work in fixed guides in such manner as to support the gates and hold them concentrically true with the intermediate chambers 12. As shown in Fig. 1, the gate-rods 14 work in stuffing-box guides 25, fixed in the quarter-turns 6, also in guides 26, fixed to the flume-heads or flanges 12^a of the intermediate chambers 12. Two rods 14 also project inwardly beyond one of the gates 5 and work in guides 28, fixed on the radial double-rib 3^a of the chute-box 3, while the other two rods extend beyond the other gate and work in guides 29, fixed on the adjacent flume-head 12^a.

I show in Figs. 5 and 6 a different arrangement of apparatus for operating gate-adjusting rods by hydraulic pressure, the piston-rod 30 of a hydraulic cylinder 31 operating a crank-arm 32, attached to rock-shaft 20.

In some cases the gate-adjusting rods 18 will not pass through the quarter-turns 6, but be arranged exterior thereto. In such contingency the rods may work in exterior guides, as shown in Fig. 7. This construction is adapted to a single wheel or a pair of wheels arranged adjacently and operated by the same shaft.

In Fig. 2 I show an end-thrust bearing for the runner-shaft 10. The latter passes through a wooden block 32′, and a cap 33′ is applied to the inner end of the same to exclude water to a certain extent. A corrugated bearing-block 34′ is secured on the shaft and runs in a correspondingly corrugated or grooved block 35′, fixed in surrounding casing. Between the wooden block 32′ and corrugated ones 34′ 35′ is arranged a loose flange 36′, as shown. This end-thrust bearing is very essential for single wheels working on a horizontal shaft and also in the case of two wheels keyed on the same shaft, since it is often necessary to close the gate on one wheel and let the other do the labor.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a water-wheel and a chute-box, of a gate surrounding the same, slidable rods attached to the gate, and bearings for said rods which are arranged on the inner and outer ends of the gate, whereby the latter is supported and operated substantially as shown and described.

2. The combination, with a water-wheel, or runner, a chute-box arranged horizontally, an annular gate made in halves surrounding said chute-box and adapted to slide lengthwise of the same, of horizontal rods attached to and suspending the gate, being connected

to gates by means of the lugs holding the two halves of the gate together and fixed bearings for said rods which are arranged on the inner and outer ends of the gate, substantially as shown and described.

3. The combination with two horizontal runners, arranged head to head, and surrounding chute-boxes, the flanges of same being bolted together, of two annular gates which are split, the same surrounding and sliding on the respective chute-boxes longitudinally thereof, and horizontal rods attached to split gate by lugs joining same, bearings for said rods which are affixed exteriorly on the flume-heads and the crown-plate of the chute-box for supporting the gates and sliding them simultaneously in opposite directions, longitudinally of the chute-boxes, substantially as shown and described.

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