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Patented Aug. 21, 1900.

C. P. BRADWAY.
GOVERNOR FOR WATER WHEELS.

(No Model.)

[Application filed Dec. 21, 1899.]

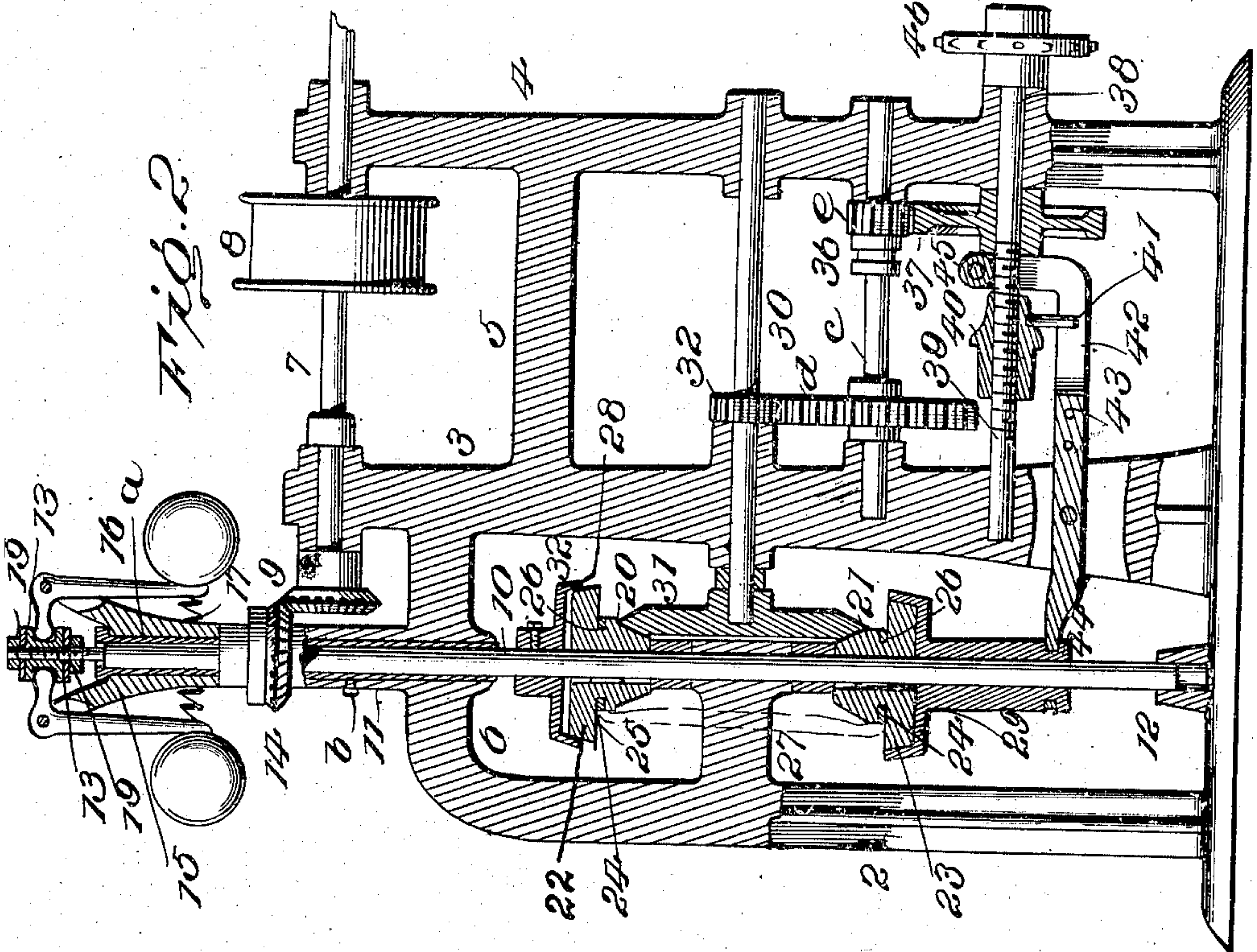
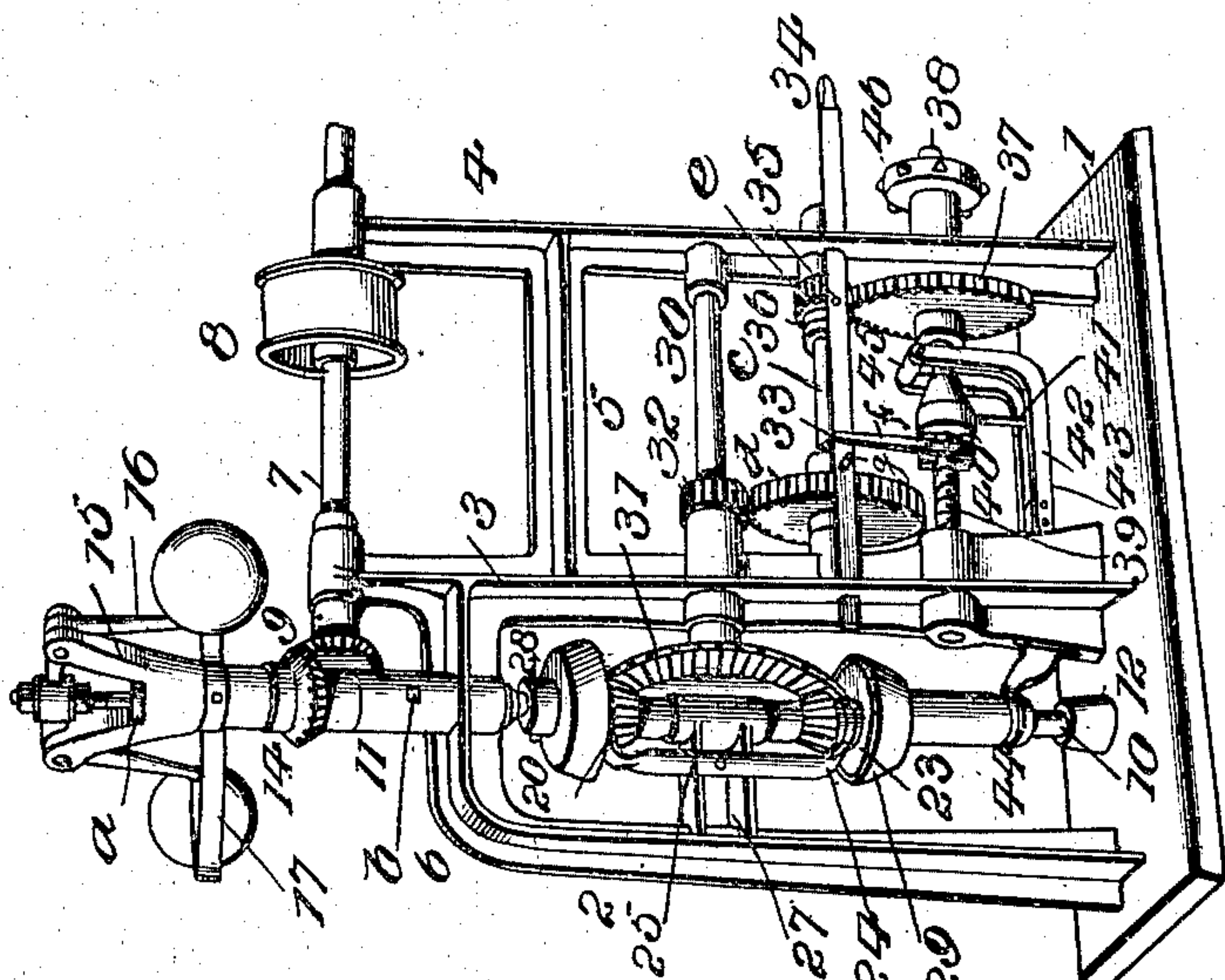


Fig. 1.



Witnesses

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CHARLES P. BRADWAY, OF STAFFORD, CONNECTICUT.

GOVERNOR FOR WATER-WHEELS.

SPECIFICATION forming part of Letters Patent No. 656,504, dated August 21, 1900.

Application filed December 21, 1899. Serial No. 741,166. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. BRADWAY, a citizen of the United States, residing at West Stafford, in the county of Tolland and State of Connecticut, have invented certain new and useful Improvements in Governors for Water-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to governor mechanism for hydraulic motors to control the speed according to load and pressure of water, the mechanism being designed to open and close the gate more or less as may be required to meet existing conditions.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction of the means for effecting the result reference is to be had to the following description and to the drawings hereto attached.

While the essential and characteristic features of the invention are necessarily susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a governor for a turbine water-wheel constructed in accordance with and embodying the essence of the invention. Fig. 2 is a front view, partly in section, and showing a coil-spring connecting the governor-arms.

Corresponding and like parts are referred to in the following description and indicated in both views of the drawings by the same reference characters.

The framework for supporting the working parts of the governor mechanism may be of any form of construction, and, as illustrated, consists of a base 1, uprights 2, 3, and 4, a cross-piece 5, connecting the uprights 3 and 4, and a transverse bar 6 between the uprights 2 and 3. A shaft 7 is journaled in bearings provided at the upper ends of the parts 3 and 4 and has a band-pulley 8 and a gear-wheel 9. This shaft is driven from the shaft or other rotating part of the turbine wheel or engine in any convenient way, preferably by means of a belt (not shown) passing over the pulley 8. Bearings 11 and 12 are provided at re-

spectively the upper and the lower ends of the frame, and a sleeve *a*, fitted in the bearing 11, is held in place by a clamp-screw *b*. A vertical shaft 10 is journaled in bearing 12 and sleeve *a* and is provided at its upper end with spaced plates or washers 13, adjustably connected therewith. A block or sleeve 18, movable on the upper reduced threaded end of the shaft 10, is clamped between the washers 13 and has depressions in its opposite sides for the purpose presently to be explained. A gear-wheel 14, intermeshing with the gear-wheel 9, is secured upon the yoke 15 to rotate therewith, and the yoke 15 is mounted upon the upper end of the sleeve *a* and turns freely thereon. The shaft 10 has free vertical and rotary movement through the sleeve *a*. The governor-arms 16 are fulcrumed to the yoke, and their horizontal arms enter the depressions in the sides of the block 18, so as to effect a positive movement of the shaft 10 in either direction. A spring 17 connects the pendent arms of the parts 16 to materially assist in returning them and the operating parts to a normal position after being actuated. This spring may be flat and bowed, as shown in Fig. 1, or it may be of the coil type, as shown in Fig. 2. By having the washers 13 adjustably connected with the shaft 10 they may be moved to accommodate the governor-arms or any relative position of the members thereof. The block or spacing-sleeve 18 is adjusted by backing one of the washers and correspondingly advancing the other washer. Binding-nuts 19, mounted upon the threaded end of the shaft 10, secure the washers 13 and part 18 in an adjusted position.

Gear-wheels 20 and 21 are mounted upon the shaft 10, so as to turn therewith, yet admit of said shaft moving freely therein vertically under the action of the governor mechanism. Friction-cones 22 and 23 are formed with or secured to the respective gear-wheels 20 and 21, and the bent ends 24 of a yoke-bar 25 enter the grooves or spaces 26, formed between the cones and gear-wheels to hold them in fixed relation. This yoke-bar 25 is secured to an extension 27 of the upright 2. Friction-cups 28 and 29 are adjustably connected with the shaft 10 and rotate therewith and are adapted to engage with the respective friction-cones 22 and 23 to positively drive the

gear-wheels 20 and 21 in alternation to rotate the gearing-wheel 31 in reverse directions to effect a corresponding movement of the shaft 30, mounted in bearings of the uprights 3 and 4.

The shaft 30 has a gear-wheel 31 at its inner end in mesh with the gear-wheels 20 and 21 and a pinion 32 in mesh with a gear-wheel *d*, affixed to a shaft *c*, parallel with the shaft 30 and journaled in the uprights 3 and 4. A pinion *e* is slidable on the shaft *c*, but keyed to rotate therewith. A shipper-bar 33 is slidably mounted in ways in the uprights 3 and 4 and has a handle 34 at its outer end and a pin 35 to enter a groove 36 in a hub extension of the pinion *e*. Upon operating the shipper 33 the pinion *e* can be thrown into or out of gear with the gear-wheel 37, fixed upon a shaft 38, parallel with the shafts 30 and *c* and mounted in bearings of the uprights 3 and 4. The shaft 38 is threaded, as shown at 39, and a trip 40 is mounted thereon and carries a pin 41, working in a slot 42 of a lever 43, arranged below the shaft and fulcrumed to the upright 3. The inner end of the lever 43 coöperates with a collar 44, attached to the shaft 10, and its outer end is forked and bears a roller 45, arranged in the path of the trip 40, so as to be struck thereby and prevent injury to the turbine when overloaded. A gear element 46 is applied to the outer end of the shaft 38 and is connected with the gate-operating mechanism in any desired manner, so as to control the supply of water to the wheel and regulate its speed.

Under normal conditions the shaft 10 will occupy a position with both sets of friction cups and cones out of engagement. When speed of the turbine exceeds the required number of revolutions per minute, the governor-arms will fly outward at their weighted ends and depress the shaft 10 in the manner set forth and bring the cup 28 and cone 22 into engagement and rotate the shaft 38 in one direction and shut off the water-supply. Should the engine run too slow after the parts have been set for a given speed, the weighted ends of the governor-arms will gravitate and effect an upward movement of the shaft 10 and bring the cone 23 and cup 29 into engagement; whereby the shaft 38 is rotated in a reverse direction and more water admitted to the wheel. The shaft 10 and cups 28 and 29 occupy a neutral position when the turbine is running at the required speed. The shaft *c*, with its gear elements *d* and *e*, reduces the speed of the shaft 38 and prevents racing and enables the gate of the turbine to be actuated at a moderate speed. When the trip 40 passes under the roller 45, the outer end of the lever 43 is raised and its inner end depressed, thereby preventing contact of the friction-cup 29 with the cone 23. This occurs when the wheel-gate of the turbine is fully opened and more speed called for, thereby preventing damage which might oc-

cur from continuing to work after the gate is fully opened. In order to prevent damage to the turbine when the gate is shut by auxiliary power and to throw the regulator out of gear, an arm *f* is attached to the trip 40 and extends within the path of a pin or stop *g* of the shipper-bar 33: When the trip 40 reaches the limit of its inward movement, the arm *f* will strike the pin *g* and move the shipper-bar 33 and throw the pinion *e* and gear-wheel 37 out of gear and the regulator out of action.

Having thus described the invention, what is claimed as new is—

1. In governor mechanism, the combination with the vertical shaft, governor-arms coöperating therewith, and a horizontal shaft adapted to be driven in reverse directions by means of said vertical shaft and having a threaded portion, a trip mounted upon the threaded portion of the horizontal shaft, a lever having one end operatively related with reference to the vertical shaft and having its opposite end independent of and projected in the path of the aforementioned trip, and means between the said trip and lever to prevent relative rotation of the trip upon its shaft, substantially as set forth.

2. In governor mechanism, the combination with the vertical shaft, governor-arms coöperating therewith, and a horizontal shaft adapted to be driven in reverse directions from the vertical shaft and having a threaded portion, a lever having one end in engagement with the vertical shaft and having its opposite end portion longitudinally slotted and bent to embrace opposite sides of the aforementioned horizontal shaft, a connecting device joining the terminal portions of the spaced parts of the lever and located in the path of the trip, and a pin projecting from the trip and entering the slotted end of the lever, as and for the purpose set forth.

3. In governor mechanism, the combination with the vertically-movable shaft, the governor-arms, a driven shaft geared to the vertical shaft, and adapted to be rotated in reverse directions, clutches coöperating with the vertical shaft and gearing, and a gate-controlling shaft geared to the driven shaft, of a shipper-bar for throwing the gate-controlling and driven shafts into and out of gear and having a stop, a trip connected by screw-thread with the gate-controlling shaft, a lever adapted to be operated by means of the trip to throw the clutches out of action, and an arm applied to the trip and movable therewith and adapted to strike the stop of the shipper-bar, substantially as described.

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

CHARLES P. BRADWAY. [L. S.]

Witnesses:

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