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HYDRAULIC GOVERNOR.

APPLICATION FILED JULY 13, 1908.

928,854. Patented July 20, 1909.

2 SHEETS—SHEET 1.

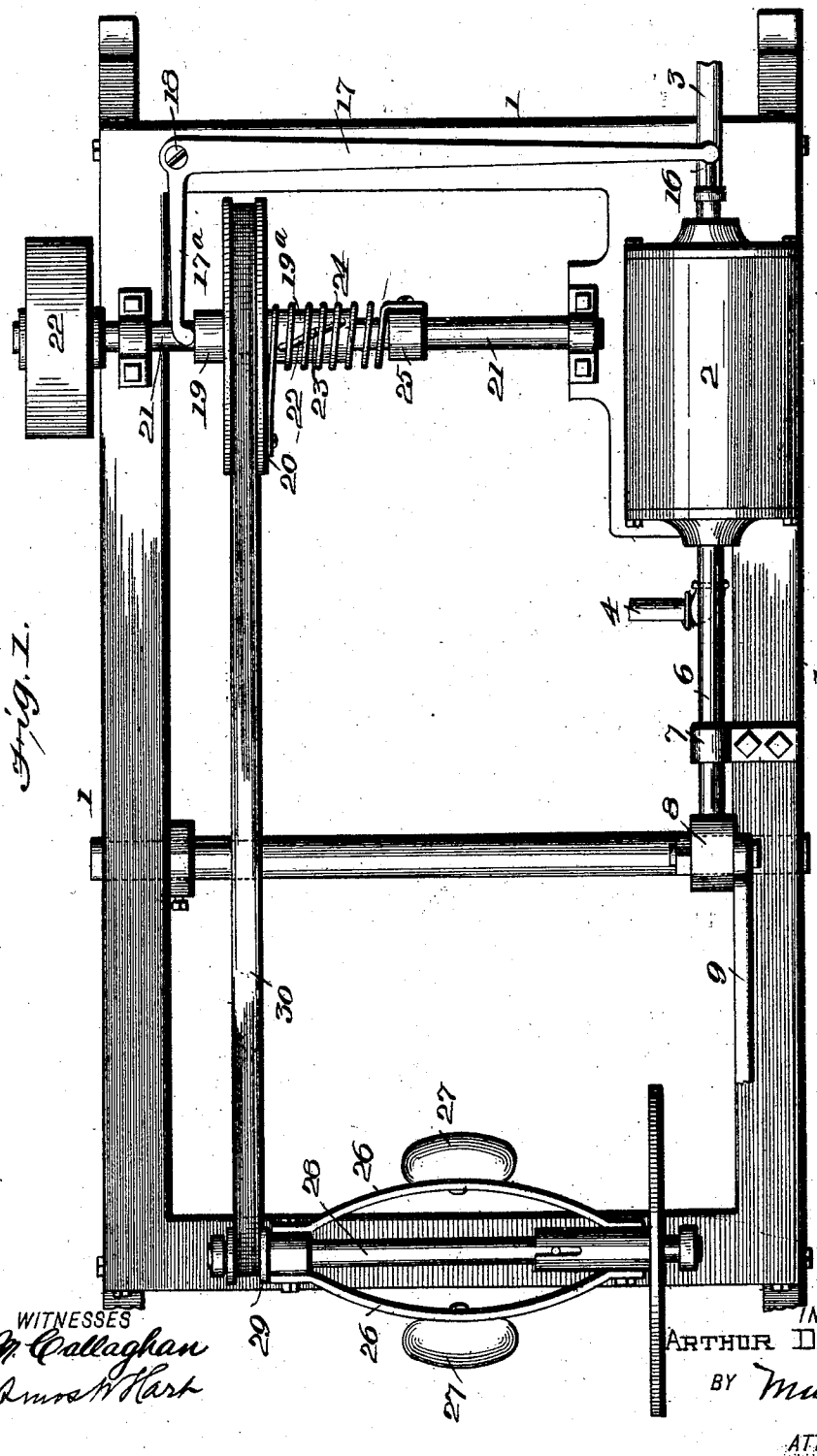



Fig. 1.

WITNESSES

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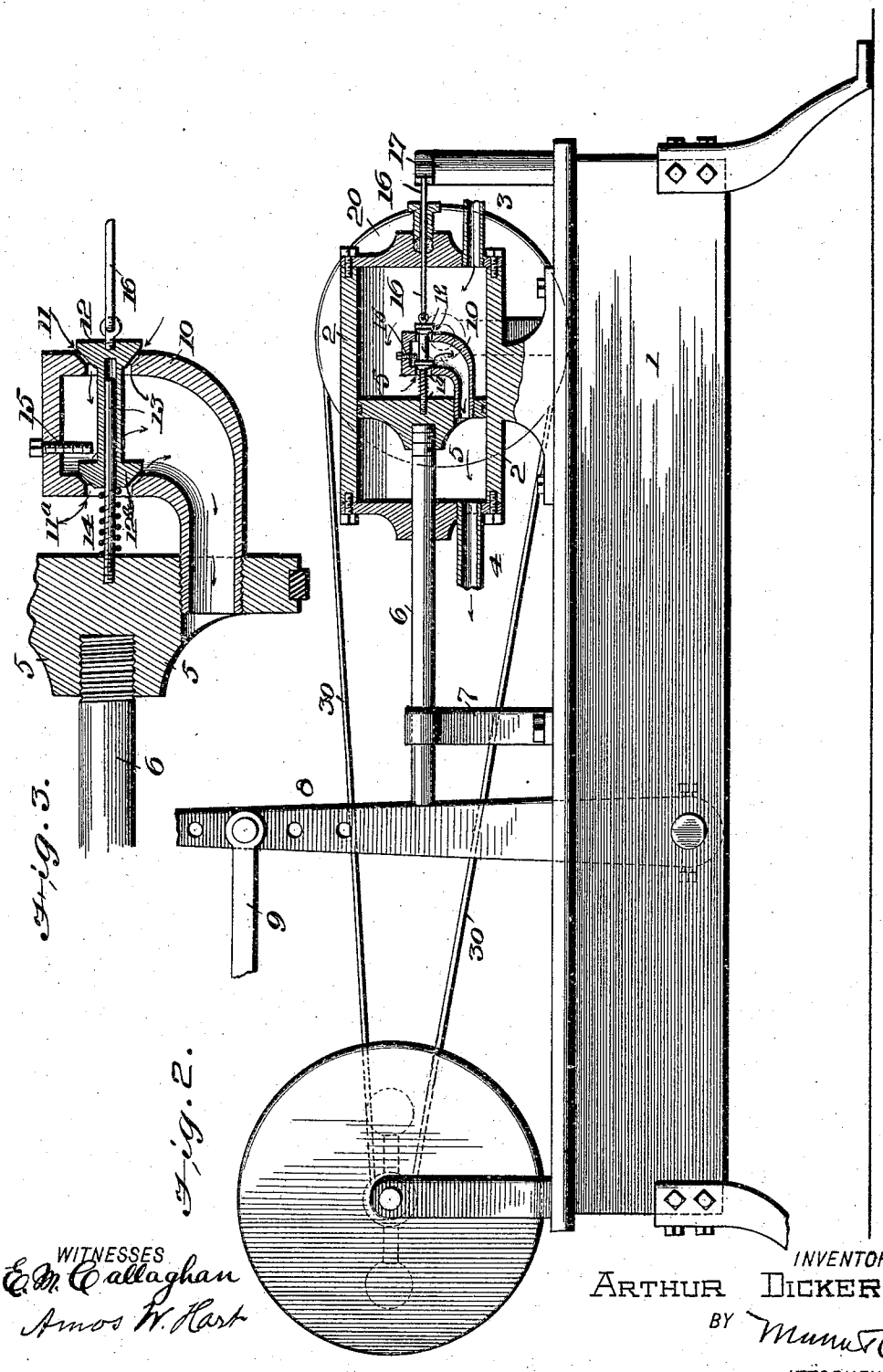


Fig. 3.

Fig. 2.

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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC GOVERNOR.

No. 928,854. Specification of Letters Patent. Patented July 20, 1909.

Application filed July 13, 1908. Serial No. 443,288.

*To all whom it may concern:*

Be it known that I, ARTHUR DICKERSON, a citizen of the United States, residing at American Fork, in the county of Utah, State of Utah, have invented an Improvement in Hydraulic Governors, of which the following is a specification.

The object of my invention is to provide an automatic equalizer or controller for regulating the flow of water used for any purpose.

In carrying out my invention, I employ in part, mechanism constructed and operated upon the same general principle as in the steam governor for which I have received Letters Patent of the United States No. 887,778, dated May 19, 1908.

The details of construction, combination, and operation of parts comprising my invention are as hereinafter described and illustrated in the accompanying drawing, in which—

Figure 1 is a plan view of the entire apparatus. Fig. 2 is mainly a side view of the same, the hydraulic cylinder and attachments being shown in vertical section. Fig. 3 is an enlarged sectional view of the attachment of the hydraulic piston.

The operative parts comprising the invention are mounted upon an oblong, rectangular frame, or bed-plate, 1. 2 indicates a hydraulic cylinder having an inlet 3 at one end and an outlet 4 at the other. A piston 5 is adapted to slide in the cylinder, and its stem or rod 6 is supported exteriorly in a fixed guide 7, and abuts a pivoted lever 8 which normally stands vertical or nearly so, and is adapted to swing in a vertical plane. A rod 9 is connected with the free end of said lever 8 and its opposite end is operatively connected with a water gate or valve (not shown) which controls the flow of water used for operating the engine whose speed is to be controlled by the governor mechanism.

In passing from the cylinder inlet 3 to the outlet 4—see Fig. 2—water must flow through the piston 5. This flow is governed by an attachment which will now be described. An upwardly curved tube 10 is screwed into an opening in the piston 5, and its upper end or head is closed, as shown in Fig. 3; but adjacent to said head, it is provided with two openings 11 and 11ª having valve seats. A double valve having heads 12 and 12ª adapted to seat in the two openings, is provided and the same is adapted to slide on a rod 13 that is fixed in and projects horizontally from the face of the piston 5. A spiral spring 14 surrounds the rod 13 and is interposed between the valve 12ª and the face of the piston. A stop 15 projects inward from the head of the tube 10 and serves, by contact with the valve head 12ª to limit the movement of the double valve due to the pressure of the spring 14. To the outer head 12 of the double valve, there is attached a rod or stem 16, which, as shown in Fig. 1, is in contact with the longer arm of an elbow lever 17, which is pivoted at its angle 18, and whose shorter arm 17ª abuts the hub 19 of a flanged pulley 20 which is mounted loose on the drive shaft 21. The latter is provided with a band pulley 22—see Fig. 2—and is held in boxing on the bed-plate 1, it being arranged at right angles to the axis of the cylinder 2 this pulley is in practice to be belted to the shaft of the water wheel whose speed is to be controlled. The inner hub 19ª of the pulley 20 is provided with a diagonal or spiral slot 22 which receives a pin 23 fixed in the shaft. A spiral spring 24 encircles the hub 19ª and an adjacent portion of the driving shaft 21, and one end is secured to a collar 25 that is fixed on the shaft and the other end to the pulley 20.

A governor, which includes curved plate springs 26 and weights 27 attached thereto, is mounted rotatably on a shaft 28 arranged parallel to the shaft, but on the opposite end of the base frame. A small flanged pulley 29 is attached to one end of this shaft, and a belt 30 runs therefrom to the large flanged pulley of the drive shaft 21.

From the foregoing description, the operation of my invention may now be understood. Water flows continuously from the inlet 3 through the curved tube 10, the piston 5, and the discharge pipe or outlet 4, and consequently there is practically an equalization of hydraulic pressure on the opposite sides of the piston. The amount or volume of water thus flowing through the piston in a given time, is determined by the position of the double valve forming an attachment of the curved tube 10, and this in turn is controlled by the elbow lever 17, and the operation of the governor coacting with the flanged pulley 20. If the speed of the drive shaft be high, the flanged pulley 20 which is connected with it through the medium of the

spiral spring 24, will drive the ball governor at a corresponding speed, and the greater the speed, the greater the centrifugal action, and consequently the greater the resistance offered by the governor, it is apparent that the spiral spring will be wound more tightly or compressed to a greater degree corresponding to the increase of speed, and thus will cause the pulley to rotate on the shaft to a slight degree independently of the rotation of the shaft, and thus the pulley 20 will shift its position slightly toward and from the cylinder 2. Such shifting of the pulley will change the position of the elbow lever 17, which in consequence will shift the double valve 12, $12^a$, correspondingly, and thus practically enlarge or reduce the openings in the tube 10, so that more or less water will flow through the piston. In brief, the shifting of the flanged pulley 20 due to the action of the governor which is related to the speed of the drive shaft will in turn effect a corresponding movement of the elbow lever and thereby of the double valve, so that the flow of water through the tube 10 and the piston 5 is regulated as required. When the double valve closes to a certain degree, it is obvious that the pressure of water on the face of the piston 5 will be increased and thereby the piston will be forced to the left and its rod thus caused to push the lever arm 8 to the left, whereby the position of the gate with which the said arm is connected, will be shifted correspondingly.

Water wheels are often provided with devices for diverting all or a portion of the water from the wheel. The governor forces the gate or other deflecting device one way, and the force of the water current tends to force it the other way. When more water is required on the wheel, the governor sleeve recedes, thus liberating to a certain extent the small coil spring 13, which in turn forces the valve from its seat and thus allows more water to escape or pass through the piston than passes through it normally. This naturally decreases the pressure on the face of the piston so that the gate is forced back automatically and water is consequently supplied to the wheel. On the other hand, when, by reason of change of speed, the sleeve moves in the opposite direction, the elbow lever 17 is forced harder against the stem 16 whereby the coil spring 14 is compressed more or less and the valve is caused to close, or at least move closer to its seat, thereby either cutting off or decreasing the flow of water through the piston, so that the pressure behind the piston rises and the gate or other deflector forces the water off the wheel. Thus it will be seen that in my improved mechanism, the hydraulic piston of itself constitutes an automatic check to the movement of the whole gate mechanism. The gate must follow every move of the governor, and if there is any change of pressure of the water on the gate, the whole will automatically readjust itself with out necessitating a change in speed of the engine. In this way, the "hunting" (or undue movement of the governor) is overcome or prevented.

What I claim is:

1. The combination, with a governor responsive to changes in the speed of the motor, of a cylinder having a water inlet and discharge, a piston arranged slidably therein and operatively connected with a gate for controlling the flow of water, the piston being provided with a tube having an opening for the flow of water through it, a valve adapted to close such opening, and a lever attachment which operatively connects the valve with the governor, substantially as described.

2. The combination with a governor responsive to changes in the speed of the motor and a lever for controlling the position of a water gate, of the hydraulic attachment comprising a cylinder having inlet and discharge at opposite ends, a piston sliding in the cylinder whose rod engages the said lever, a piston attachment comprising a tube provided with openings so that water may flow through it and the piston, a slidable valve arranged for closing the openings more or less, and means for automatically controlling the position of the valve so that more or less water is allowed to pass, as described.

3. The combination with a cylinder provided with inlet and discharge openings at opposite ends, a piston adapted to slide therein and provided with a tube having an opening for passage of water through it and the piston, a valve seated in such opening and adapted to control the flow of water through it, a spring which normally holds the valve off its seat, and means for automatically closing the valve more or less, substantially as described.

4. The combination with a hydraulic cylinder having inlet and discharge, and a piston adapted to slide therein, of the attachment comprising a tube having an opening that permits flow of water through it and the piston, a hydraulic valve adapted to seat in said opening, a horizontal support for said valve which is fixed on the face of the cylinder, a spring interposed between the piston and the valve and holding the latter normally off its seat, a lever which is connected with the valve, and governor mechanism for shifting the position of the lever automatically, as shown and described.

ARTHUR DICKERSON.

Witnesses:
W. S. NEEDHAM,
H. C. JOHNSON.