G. J. HENRY, JR.

STANDARDIZING DEVICE FOR GOVERNORS.

APPLICATION FILED MAR. 22, 1910.

976,174.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

Fig. 2.

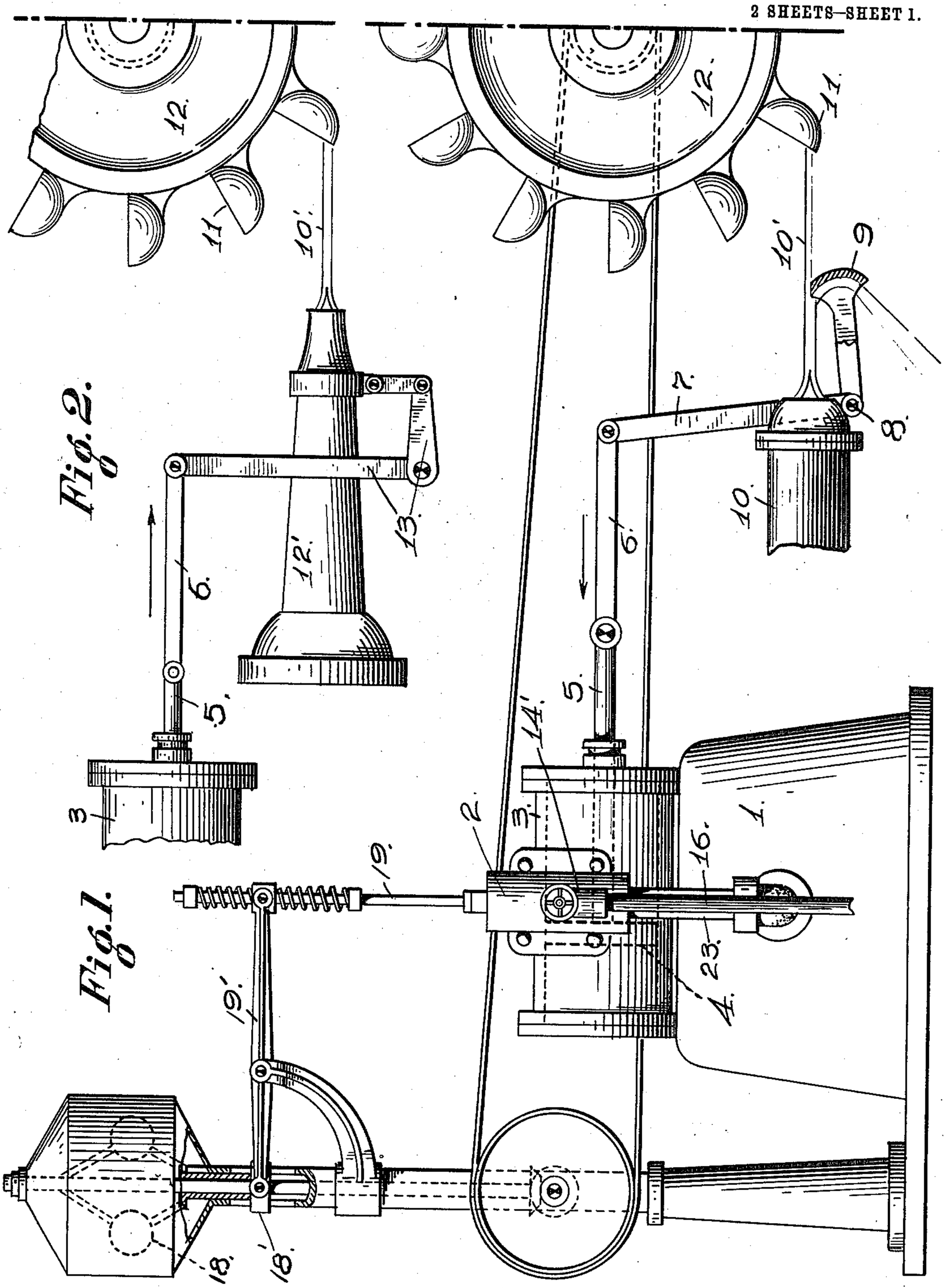

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

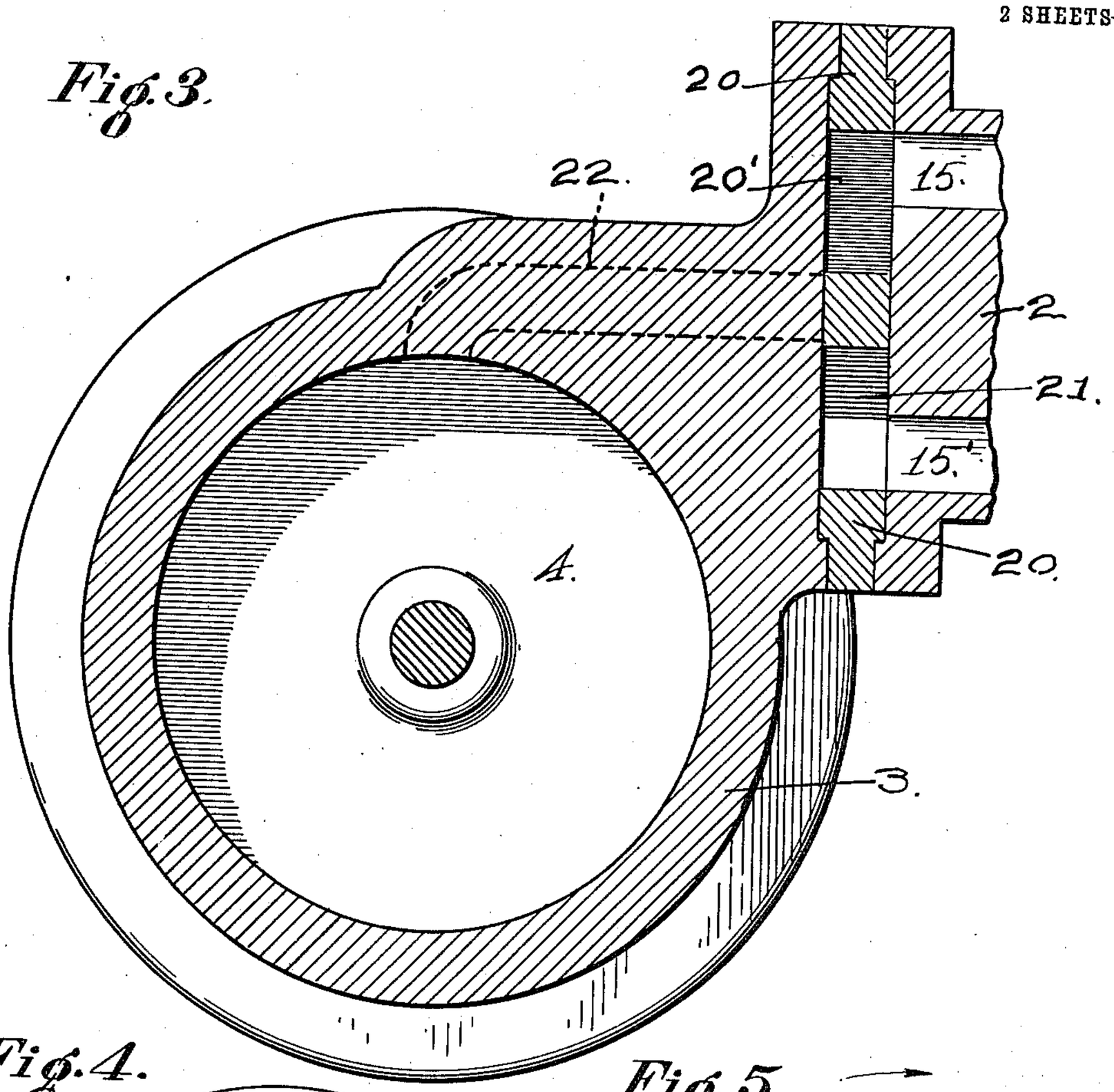


Fig. 4.

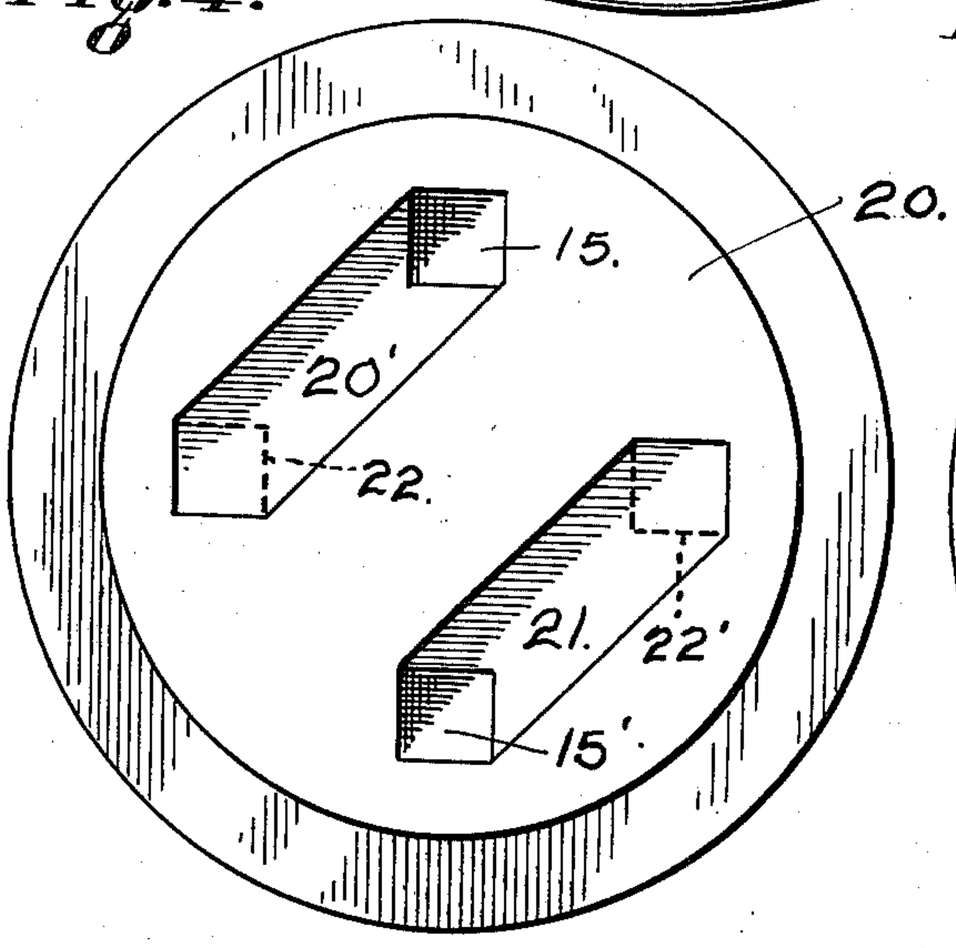
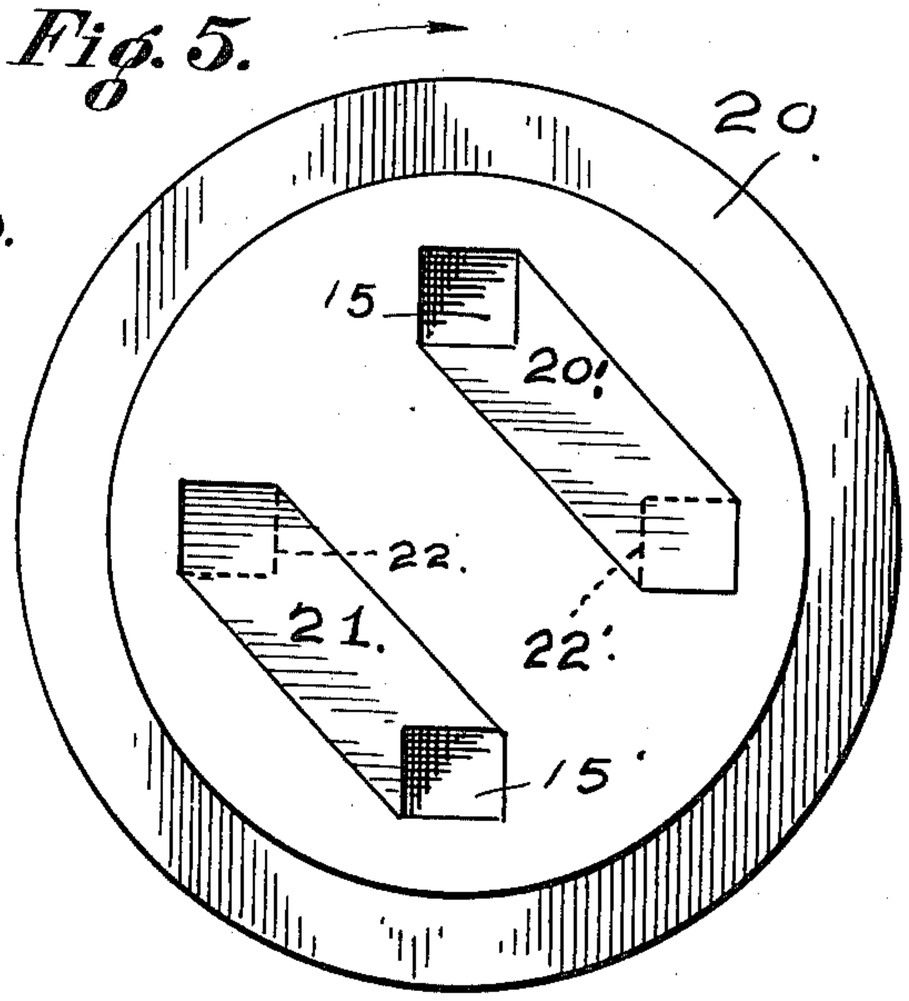


Fig. 5.



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UNITED STATES PATENT OFFICE.

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STANDARDIZING DEVICE FOR GOVERNORS.

976,174. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed March 22, 1910. Serial No. 550,867.

To all whom it may concern:

Be it known that I, GEORGE J. HENRY, Jr., a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Standardizing Devices for Governors, of which the following is a specification.

In the installation of governing mechanism for hydraulic plants, the working of the valve mechanism is such that pressure fluid is admitted within one end of a pressure cylinder to actuate the piston therein for reducing the water quantity of an impact stream relative to a driven motor on an increased speed of the governing mechanism, due to a reduction in the working load of the driven motor, and at the opposite end of the pressure cylinder on a lowering in the speed of the governing mechanism, due to an increase in the working load placed onto the driven motor, for shifting the position of the piston in order to place into operation the regulating means for the impact stream, so as to vary the water quantity of the impact stream onto the driven motor to regulate the speed thereof in accordance with working requirements. Usually, the connection between the piston of the pressure cylinder and the regulating means, is such that on fluid under pressure being admitted to the outer end of the pressure cylinder to force inward the piston thereof, the regulating means is adjusted to decrease the water quantity of the impact stream relative to the driven motor; while on fluid pressure being admitted to the opposite end of the pressure cylinder to force outwardly the piston working therein, the regulating means is adjusted to increase the water quantity of the impact stream onto the driven motor.

It frequently happens that when called upon to install governing mechanism and regulating means for the hydraulic nozzles, for directing an impact stream onto a driven motor, such for instance as a tangential water wheel, the surrounding conditions are such that the connections for the regulating means cannot be so arranged or located as to decrease the water quantity of the impact stream on an inward movement of the piston within the pressure cylinder and increase the water quantity of the impact stream relative to the driven motor on an outward movement of the said piston, without materially changing the working parts of the connecting means, or, in other words, adding thereto additional parts to produce the desired movement of the regulating means. To meet these varying conditions and avoid adding parts to the connections for the regulating means, it has been customary to construct different types of governors or governing mechanism, the construction of each differing in accordance with the form of regulating means for the water quantity to be placed in operation, so that on an increase in speed of the governing mechanism a reduction in water quantity of the impact stream will follow and, on a lowering in the speed of said mechanism an increase in the water quantity of the impact stream will take place relative to the driven motor.

The present invention is to provide for a standard type of governing mechanism for controlling the water quantity of an impact stream, and this irrespective as to the form of regulating means employed, and the object thereof is to provide means whereby the flow direction of the pressure fluid for shifting the controlling means may be varied to actuate the regulating means in accordance with a call for an increase or a decrease in the water quantity of the impact stream to be placed onto a driven motor, so that the direction of movement of the said controlling means may be varied to conform to the form of connection for placing into operation the regulating means, thus permitting the regulating means to act under all working conditions to reduce the water quantity of the impact stream on an increase in the speed of the governing mechanism and to increase the water quantity of the said stream relative to the driven motor on a decrease in the speed of the governing mechanism.

To comprehend the invention reference should be had to the accompanying sheets of drawings, wherein—

Figure 1 is a view in side elevation illustrating the governor controlled mechanism as connected for shifting the position of a deflecting hood or shield to control the water quantity of an impact stream relative to a tangential water wheel. Fig. 2 is a similar

view illustrating the connection between the fluid actuated piston and a deflectable nozzle for regulating the water quantity of an impact stream relative to a tangential water wheel. Fig. 3 is an enlarged cross sectional view of the pressure cylinder and a broken section of the valve casing, illustrating the position of the reversing plate for controlling the flow direction of the pressure fluid. Fig. 4 is a view in elevation of the reversing plate positioned as disclosed by Fig. 3 relative to the valve casing, the position of the port inlets for pressure cylinder being indicated by dotted lines. Fig. 5 is a view similar to Fig. 4 illustrating the position of the reversing plate relative to the outlet ports of the valve casing and the inlet ports of the pressure cylinder on the reversing plate being given a one-quarter turn.

In the drawings, the numeral 1 is used to indicate any suitable form of a supporting structure, the base of which, in the present case, serves as a sump or well for the fluid to be used in actuating the pressure controlled parts. This base structure supports a valve casing 2 and a pressure cylinder 3, within which pressure cylinder works the piston 4. The stem 5 of the said piston is illustrated by Fig. 1 of the drawings as connected by a link 6 to a crank arm 7, for actuating a rock-shaft 8 carrying a deflecting hood or shield 9, arranged to work in advance of the outlet orifice of a stationary nozzle 10, which nozzle directs an impact stream 10′ onto the buckets 11 of a tangential water wheel or driven motor 12. As thus connected, an inward movement of the piston 5 operates to raise the deflecting hood or shield 9 and place the same into the impact stream, to deflect a portion thereof from off the buckets of the water wheel, while an outward movement of the said piston 4 throws the connections to move the deflecting hood or shield out of the path of the impact stream, and by so doing increasing the water quantity of the impact stream relative to the driven motor.

In Fig. 2 of the drawings, the operating piston 4 is illustrated as controlling the movement of a deflectable nozzle 12′, the outer end of the connection 6 being secured to a crank lever 13, which, in turn, is attached to the outer end portion of the deflectable nozzle 12′. Under this arrangement, if an inward movement of the piston 4 within the cylinder 3 be permitted on an increase in the speed of the governing mechanism, calling for a reduction of water quantity, it would result in the deflectable nozzle being raised and, an increase in water quantity of the impact stream 10′ placed onto the buckets of the water wheel, instead of a decreased quantity; whereas, on an outward movement of the piston 4, due to a lowering speed of the governing mechanism calling for a reduction of water quantity, the deflectable nozzle would be lowered and a reduced water quantity of the impact stream placed onto the buckets of the water wheel, instead of an increased quantity as called for by the governor. To compensate for such variations in types of regulating means for the water quantity of an impact stream relative to the driven motor and make the same responsive to the call of the governor or governing mechanism, due to the changes in the working load placed onto the driven motor, it is required that provision be made whereby the flow direction of the fluid under pressure into the pressure cylinder 3, for operating the piston 4 may be changed to meet the requirements of the type of regulating means which may be employed to control the water quantity, so that under certain conditions an inward movement of the piston 4 will cause a reduction as to water quantity relative to the driven motor or water wheel, and under other conditions such a movement of the said piston will cause an increase in the water quantity of the impact stream onto the said driven motor.

The valve mechanism for admitting fluid under pressure to the pressure cylinder 3, comprises a valve casing 2, provided with an inlet port 14′ and outlet ports 15 and 15′, fluid under pressure being admitted into the valve casing 2 through the inlet port 14′ from a supply pipe 16, by the action of a suitable pressure pump. The outlet ports of the valve casing 2 are controlled by a valve working within the valve casing, the said valve when at central or zero position covering the outlet ports 15 and 15′ thereof.

The construction and operation of the fluid controlling valve mechanism will be fully understood by reference to a pending application Serial Number 542,824, filed by me in the United States Patent Office on the 9th day of February 1910, for an improved safety means for valve mechanism.

The fluid controlling valve is lowered and raised by an increase and decrease speed as to the fly balls 18 of the governor, which raise and lower, respectively, a sleeve 18′, connected to the valve operating rod 19 by a fulcrumed lever or rocker arm 19′.

Between the valve casing 2 and the pressure cylinder 3 is interposed a reversing plate 20, which is formed with two inclined channels or fluid passage-ways 20′ and 21, which connect respectively the outlet ports 15 and 15′ of the valve casing, with the port or channel-ways 22 and 22′ leading to opposite ends of the pressure cylinder 3. When the ports are so connected by the reversing plate, Fig. 4 of the drawings, a downward movement of the valve within the casing 2, due to an increase in the rotating speed of the fly balls, opens the port 15′ to fluid un-

der pressure and permits the pressure fluid to enter the cylinder 3 through its port 22′ in advance of the piston 4, the pressure of which forces inwardly the said piston and operating its connecting means, where the type of regulating means disclosed by Fig. 1 of the drawings are employed, to raise the deflecting hood or shield 9 and place the same into the impact stream 10′ to deflect a portion thereof from off the buckets of the driven motor and thereby reduce the water quantity relative thereto. During this movement of the piston 4, the fluid at the opposite end of the cylinder 3 is displaced and returned through the connected ports 15 and 22 into the discharge chamber of the valve casing.

On an upward movement of the valve within the casing 2, due to a decrease in the speed of the fly balls of the governor, calling for an increase of the water quantity of the impact stream relative to the driven motor, the outlet port 15 is opened to fluid under pressure, which permits of the pressure fluid flowing into the pressure cylinder 3 back of the piston 4 through the port opening 22, the pressure of which admitted fluid forces outwardly the piston 4 and causes the connecting means to throw downwardly the deflecting hood or shield 9 from within the impact stream 10′, thereby increasing the water quantity of the said impact stream onto the driven motor. During this movement of the piston 4, the fluid within the cylinder 3 in advance thereof is expelled through the port 22′ and returned by means of the port 15′ into the discharge chamber of the valve casing 2.

In case the regulating means illustrated by Fig. 2 of the drawings are employed for controlling the water quantity, it is required that a reduction in the water quantity be brought about by a deflection of the pivoted nozzle 12′, and, for this purpose, the deflectible nozzle must swing downwardly with the movement of the piston 4, on an increase in the speed of the fly balls of the governor. To bring about this result, the reversing plate 20, is given a part or one-quarter turn, Fig. 5 of the drawings, so as to place its channels or passage-ways 20′ and 21, respectively, in communication with the ports 15 and 22′ and 15′ and 22, of the valve casing 2 and the pressure cylinder 3. When the ports are so connected, being the reverse of that previously described, the pressure oil or fluid, on a downward movement of the valve within the valve casing, will flow through the port 15′ into the pressure cylinder 3 through its port 22, back of the piston 4, the pressure of such admitted fluid forcing outwardly the said piston and through its connections depressing the outer end portion of the deflectible nozzle 12′, and by so doing removing a portion or all of the impact stream 10′ from off the bucket of the water wheel or driven motor, thereby regulating its speed in response to a call from the governing means for a reduction in the water quantity of the impact stream.

On an upward movement of the valve within the valve casing 2, the flow of fluid pressure will be through outlet port 15 and inlet port 22′ respectively, of the valve casing and pressure cylinder, in which case the piston 4 will be forced inwardly and the deflectible nozzle 12′ swung upwardly to increase the water quantity of the impact stream relative to the driven motor. On such an inward movement of the piston 4, the fluid oil in advance thereof is expelled from the pressure cylinder into the valve casing and escapes through the discharge pipe 23 leading therefrom. By being thus permitted to change the direction of flow of the pressure actuating fluid relative to the controlling piston for the regulating means, for proportioning the water quantity of the impact stream in accordance with variations in the working load of the driven motor in response to increased and decreased speeds of the governor or governing mechanism, a single form of governor may be successfully used in connection with the various types of regulating means at present employed for controlling the water quantity of an impact stream delivered onto a driven motor.

In the present case, the invention is disclosed as associated with a pressure cylinder containing a working piston connected for actuating the regulating means for varying the water quantity of an impact stream relative to a water wheel or driven motor in accordance with load changes, but it is apparent that the working piston may be applied to other purposes and that its use is not confined to hydraulic motors.

For convenience, the pressure chamber 3 is illustrated in close proximity to the valve casing 2 and each supported by a structure common to each, which gives economy as to floor space utilized for the placing of the working mechanism. However, while such an arrangement is desirable, it is not essential; inasmuch as the pressure cylinder 3 may be located a distance apart from the valve mechanism. These are details of construction, which in no manner whatever bear upon the invention.

Having thus described the invention what is claimed as new and desired to be protected by Letters Patent is:—

1. The combination with a governor, of a valve actuated thereby for controlling the flow of fluid under pressure through a valve casing provided with an inlet port and outlet ports, a pressure cylinder containing a fluid actuated piston, and means interposed between the valve casing and the pres-

sure cylinder for varying the flow direction of fluid toward and from the said pressure cylinder.

2. In combination with a pressure cylinder, a fluid actuated piston working therein, a valve casing provided with an inlet port and outlet ports, means for admitting fluid under pressure to said casing, a valve within the casing controlling the outlet ports thereof, connections between said ports and inlet ports in the pressure cylinder for admitting fluid pressure to either end of the cylinder, and means interposed between the said cylinder and the valve casing for reversing the flow direction of fluid toward and from the pressure cylinder to vary the movement of the piston working therein.

3. The combination with a pressure cylinder, a fluid actuated piston working therein, for regulating the quantity of an impact stream issuing from a nozzle relative to a hydraulic motor, means thrown into action by the movement of the piston for varying the water quantity of the impact stream relative to the driven motor to proportion the same to load variations, mechanism for supplying fluid under pressure to the pressure cylinder for moving the piston inwardly and outwardly, and means for reversing the flow of the fluid under pressure relative to the pressure cylinder to vary the movement of the piston working therein.

4. The combination with a valve casing provided with an inlet port and outlet ports for the flow of fluid under pressure, mechanism for supplying fluid under pressure thereto, a valve within the casing controlling the outlet ports thereof, a pressure cylinder provided at each end with an inlet port, a fluid actuated piston working therein, and a reversible plate provided with fluid passageways for controlling the flow of fluid under pressure from the valve casing into the pressure cylinder, the said plate permitting the flow direction of the flowing fluid to be varied toward and from the pressure cylinder.

5. The combination with a pressure cylinder, a fluid actuated piston working therein, of controlled mechanism for supplying fluid under pressure to either end of the pressure cylinder, and means interposed between the said mechanism and the pressure cylinder for reversing the flow of fluid into and out of the pressure cylinder for varying the movement of the piston working therein.

6. The combination with a governor, valve mechanism controlled thereby for regulating the flow of fluid under pressure, means for supplying fluid under pressure thereto, a pressure cylinder receiving fluid under pressure from the valve mechanism, a fluid actuated piston working within the pressure cylinder, for regulating an impact stream issuing from a nozzle relative to a driven motor, devices thrown into action on the movement of the piston for proportioning the water quantity of the impact stream relative to the working load requirements of the motor, and means interposed between the valve mechanism and the pressure cylinder for permitting the flow direction of the fluid toward and from the pressure cylinder to be reversed for varying the movement of the piston working therein.

7. The combination with a pressure cylinder, of a fluid actuated piston working therein, of governor controlled mechanism for admitting fluid under pressure to the respective ends of the pressure cylinder for operating the piston therein, and means for reversing the flow of the pressure fluid relative to the pressure cylinder without varying the movement of the governor controlled mechanism.

8. The combination with a valve casing provided with an inlet and outlet ports for the flow therethrough of fluid under pressure, a valve within the casing controlling the outlet ports thereof, governor controlled means for shifting said valve to open and close the outlet ports, a pressure cylinder provided with inlet ports for the admission of fluid pressure to either end thereof, a fluid actuated piston working therein, connection between said piston and the means to be thrown into operation by the movement thereof, and a reversible deflecting plate interposed between the valve casing and the pressure cylinder, inclined passageways in said plate for varying the communication between the outlet ports of the valve casing with respect to the inlet ports of the pressure cylinder to permit a reversal as to the direction of the flow of the fluid toward and from the said pressure cylinder.

9. The combination with a pressure cylinder, a fluid actuated piston working therein, controlled mechanism for supplying fluid under pressure to either end of the said cylinder, and means independent of the controlled mechanism for reversing the flow of fluid toward and from the pressure cylinder to vary the movement of the piston therein.

10. The combination with the governor controlled fluid pressure actuated mechanism, of a pressure cylinder containing a fluid actuated piston, connections between the governor controlled mechanism and each end of the pressure cylinder for admitting fluid under pressure therein, and a reversing plate interposed within said connection for permitting the direction of the pressure fluid to be varied relative to the pressure cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE J. HENRY, Jr.

Witnesses:

N. A. Acker,

D. B. Richards.