

G. J. HENRY, JR.
GOVERNOR CONTROLLED MECHANISM FOR HYDRAULIC NOZZLES.
APPLICATION FILED APR. 10, 1906.

1,038,133.

Patented Sept. 10, 1912.

2 SHEETS—SHEET 1.

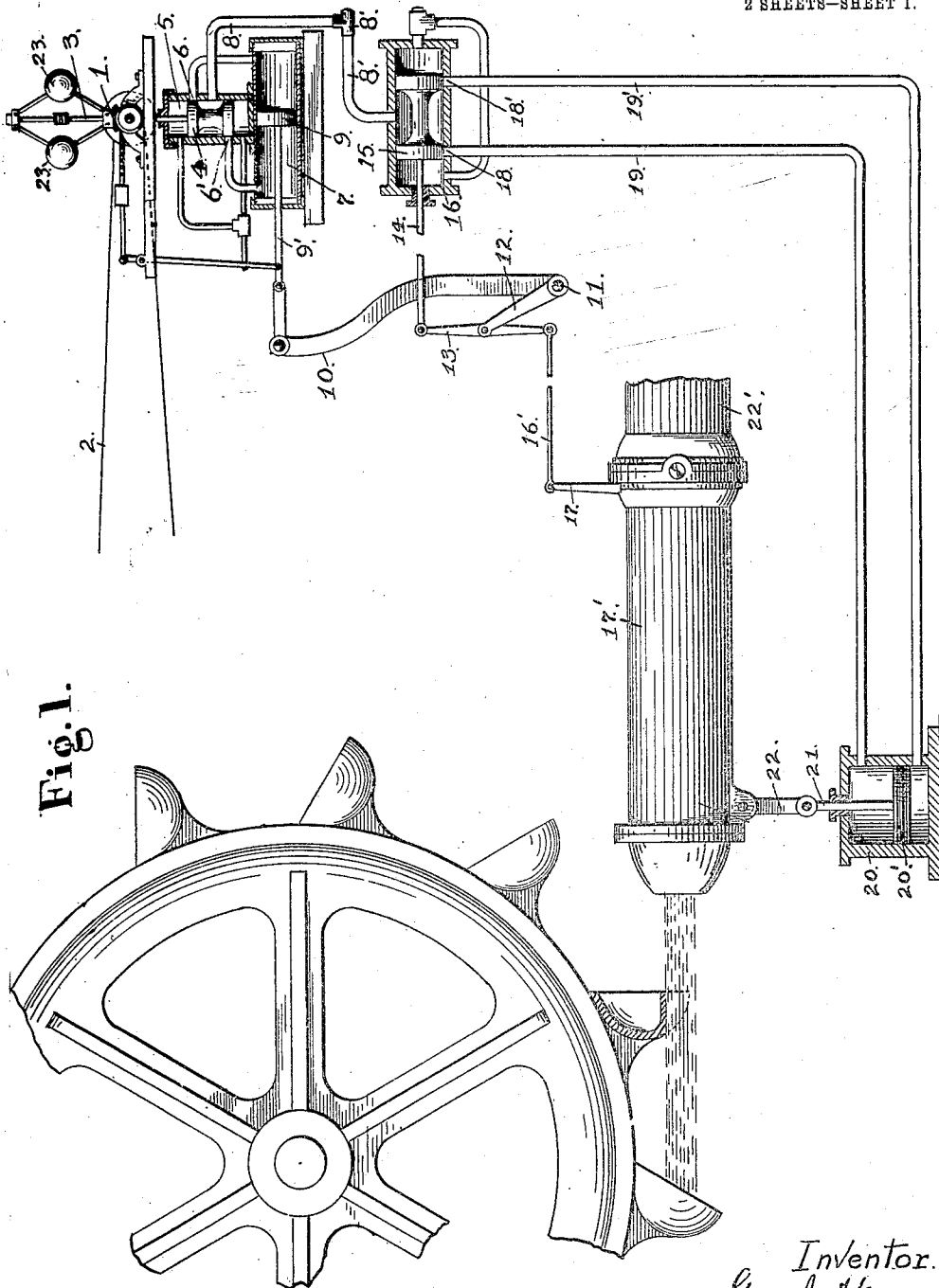


Fig. 1.

Witnesses.

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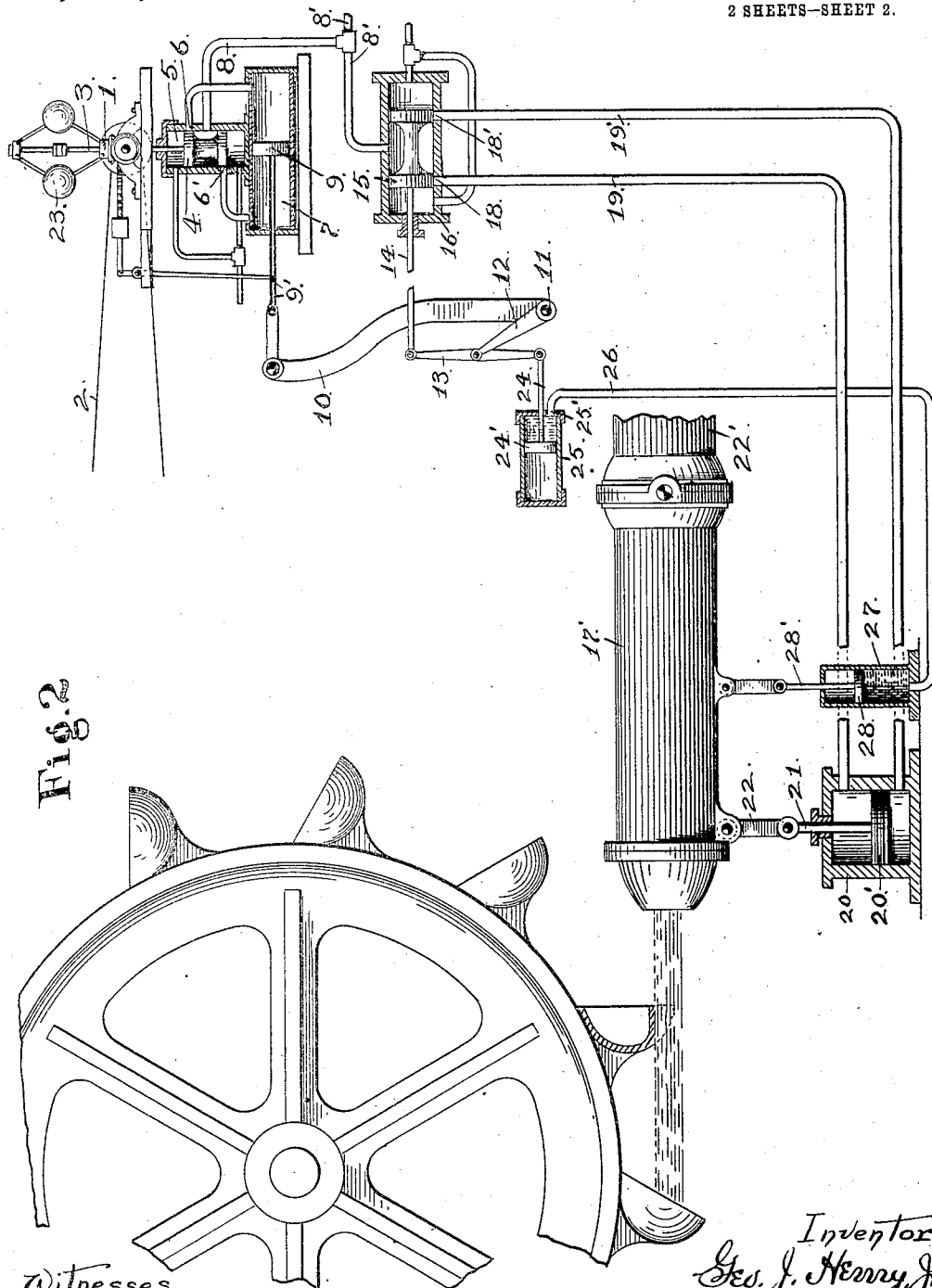
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UNITED STATES PATENT OFFICE.

GEORGE J. HENRY, JR., OF SAN FRANCISCO, CALIFORNIA.

GOVERNOR-CONTROLLED MECHANISM FOR HYDRAULIC NOZZLES.

1,038,133.

Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed April 10, 1906. Serial No. 310,980.

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, State of California, have invented certain new and useful Improvements in Governor-Controlled Mechanism for Hydraulic Nozzles; and I do hereby declare the following to be a full, clear, and exact description of the same.

The present invention relates to improved means actuated by the governor of a hydraulic plant for controlling an impact stream issuing from a hydraulic nozzle for driving a water wheel.

The object of the invention is to control the impelling jet stream by the action of the governor mechanism so as to eliminate the expensive and cumbersome connections heretofore employed to accomplish this end, thereby obviating the excessive strains incident to such connections, reducing the heavy wear to which such connecting parts were subjected, eliminating the loss of motion, expense and inconvenience of such larger connections, thereby making quite a gain in accuracy of regulation, and making a more positive and sensitive means of regulation than possible with the mechanism at present used for this purpose.

In the hereinafter described invention the governor actuated mechanism is illustrated as controlling the movement of a deflectable nozzle, for directing an impact stream onto and off of the buckets of a water wheel, but the same is equally as well adapted for operating a deflecting gate, hood or shield carried by a stationary nozzle, for regulating the impact stream for the buckets of a water wheel, also for operating a regulating needle valve within the nozzle to control the outlet area thereof to proportion the impact stream in accordance with the working load of the motor.

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

Figure 1 is a side view in elevation disclosing the controlling means as used in connection with a deflectable nozzle, the valve controlled governor cylinder, the pressure cylinder, and the control cylinder being sec-

tioned to illustrate the location of the working pistons therein for regulating the flow of the pressure fluid for actuating the same in accordance with variations in the working of the governor, due to load changes of the motor; and Fig. 2 is a similar view of the said means adapted for distant control, that is, arranged for actuating the controlling means for the impact stream a distance from the nozzle for the impact stream.

In the drawings the numeral 1 is used to designate any suitable type of governor, which is driven by means of the drive belt 2. The vertically movable stem 3 of the governor carries the pilot valve 4, which works within the small valve chamber 5 and controls the ports 6—6' leading from said chamber to the governor actuating cylinder 7. With the chamber 5 communicates an extension 8 of the fluid supply pipe 8', which pipe admits liquid or fluid under pressure into the chamber 5.

Within the horizontally disposed actuating cylinder 7 works the actuating piston 9, the stem 9' of which piston connects with an arm 10 upwardly extending from a rock shaft 11. On this shaft is secured an arm 12 to which arm is pivoted a lever 13. One end of the lever 13 is connected to the stem 14 of a main or controlling valve 15, working in the main valve casing or cylinder 16, while its opposite end is connected to a rod 16' secured to a stud 17 carried by, in the present case, the deflectable nozzle 17'. The valve 15 controls the ports 18—18' of the controlling cylinder 16, with which ports connect respectively the pipes 19—19'. These pipes lead to the motor cylinder 20, so as to supply therein fluid under pressure above and below the motor piston 20' working therein, the stem 21 of said piston being connected, in the present case, by a link 22 to the deflectable nozzle 17', which nozzle is mounted to swing on the line pipe 22'.

The operation of the device as so far described, is as follows: Presuming the working load on the motor to be suddenly reduced, the result will be that the fly balls 23 of the governor are thrown outwardly, which raises the stem 3, moving the pilot valve 4 to uncover the port 6, admitting fluid under pressure from the supply pipe

entering the valve chamber 5 to flow through the said port 6 into the actuating cylinder 7 back of the piston 9, working therein, the pressure of the fluid back of the piston 9 forcing the same outwardly and causing the stem 9' to actuate the arm 10 to throw the rock shaft 11, the movement of which shaft in turn throws outwardly the arm 12, which causes the lever 13 to swing on its fulcrum point and draw outwardly the stem 14 of the valve 15, working within the controlling cylinder 16. This movement of the valve 15 uncovers the port 18 of the cylinder 16, and permits of the fluid under pressure entering the said cylinder 16 through the supply pipe 8' to escape therefrom through the pipe 19 into the motor cylinder 20 immediately above the piston 20' working therein. The pressure of the fluid thus admitted above the piston 20' forces the same downwardly within its cylinder 20, drawing therewith the piston stem or rod 21, which being connected with the deflectable nozzle 17' by the link 22 draws the said nozzle downward so as to deflect a portion of the jet stream issuing therefrom, until the nozzle is so positioned that the impact stream admitted to bear onto the buckets of a tangential water wheel is proportioned in accordance with the working load. It is obvious that as the speed of the motor decreases, that the reverse action will take place, that is to say, the fly balls 23 will move inwardly, depressing the stem 3, moving the valve 4 to cover the port 6 and open the port 6', admitting fluid under pressure in advance of the piston 9 within the regulating cylinder 7, causing the same to move inwardly, and through its stem 9' drawing the arm 10 to impart an opposite movement to the rock shaft 11, which in turn throws the arm 12 to swing the lever 13 so as to force inward through the stem 14 the valve 15 within the controlling cylinder 16, thereby closing the port 18 and opening port 18'. When the fluid admitted under pressure into the said cylinder 16 escapes therefrom through the port 18', and is conveyed by the pipe 19' to the motor cylinder 20 back of the piston 20' working therein, the result is that the piston 20' is forced upwardly and through its connection with the nozzle 17', moving the said nozzle in an upward direction. It will thus be noticed that the movement of the nozzle is varied to change the position thereof in accordance with the slightest variation in the working load of the motor.

In Fig. 2 of the drawing the controlling means is illustrated as adapted for a distant control of the nozzle or the parts to be actuated thereby. In this case the lower end of the floating lever 13 is connected to the outer end of the stem 24 of a piston 24', which piston works within a cylinder 25,

said cylinder being provided with an outlet port 25' from which leads a pipe 26, said pipe being connected with a displacing cylinder 27, within which cylinder works a piston 28, connected to the nozzle 17' through the medium of its stem 28'. By this form of connection the actuating means for the motor cylinder 20 may be located at any distance from the nozzle 17' or the parts to be actuated by the movement of the piston within the motor cylinder 20, thus enabling the said means to be placed adjacent the attendant station.

With the form of connection illustrated in Fig. 2 of the drawings, as the piston 20' is moved up or down within the motor cylinder 20, the fluid within the cylinders 27 and 25 is shifted or displaced, from one cylinder to the other, through the connecting pipe 26, depending as to whether the piston 28 is moved upward or downward.

It will be understood that the nozzle 17' or the part to be actuated by the piston 20' moving within the motor cylinder 20 remains stationary momentarily while the mechanism actuated from the actuating cylinder 7 is moved to actuate the valve 15 within the controlling cylinder 16, the fluid pressure for actuating the piston 20' being admitted into the cylinder 20, the moment the valve 15 of the controlling cylinder 16 has moved to open either port 18 or 18' to control the passage of fluid under pressure through the pipes 19 and 19'.

While only one deflectable nozzle has been illustrated in connection with the present application, it is obvious that a series of such nozzles may be employed, each nozzle being actuated by a duplicate set of devices shown and described for actuating the nozzle illustrated, with the exception that in such case the rock shaft 11 will be a common shaft for all of the arms 12 for actuating the respective controlling means for each independent nozzle, said rock shaft being actuated by the arm 10, operated from the regulating cylinder 7, so that two or more nozzles may be put into operation from a common regulating cylinder 7.

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

1. In an apparatus of the character described, means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston working therein and having direct connection with the regulating means, a governor, an actuating cylinder with a piston therein, a pilot valve actuated by the governor and controlling the actuating cylinder, a main controlling valve cylinder, means for connecting the piston of the actuating cylinder and valve of the main controlling valve cylinder, means establishing communication between

the motor cylinder and the main controlling valve cylinder, a displacing cylinder, a piston therein connected to the means for regulating the impact stream, an auxiliary cylinder having connection with the displacing cylinder, a piston in the auxiliary cylinder, and an actuating connection between said piston and the connecting means between the actuating cylinder piston and the valve of the main controlling cylinder.

2. In an apparatus of the character described, means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston working therein and having direct connection with the regulating means, a governor, a pilot valve chamber with a valve connected to the governor and controlled thereby, an actuating cylinder with a piston therein, a main controlling valve cylinder, a valve in the controlling valve cylinder, a plurality of communicating connections between the pilot valve chamber and the actuating cylinder, and independent communications between the pilot valve chamber and the main controlling valve cylinder, means for connecting the piston of the actuating cylinder and valve of the main controlling valve cylinder, means establishing communication between the motor cylinder and the main controlling valve cylinder, a displacing cylinder, a piston therein connected to the means for regulating the impact stream, an auxiliary cylinder having connection with the displacing cylinder, a piston in the auxiliary cylinder, and an actuating connection between said piston and the connecting means between the actuating cylinder piston and the valve of the main controlling cylinder.

3. The combination with means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston therein having direct connection with the regulating means, governor mechanism and controlling devices for the motor cylinder interposed between the governor and motor cylinder and comprising an actuating cylinder and piston therein, a pilot valve actuated by the governor and controlling the actuating cylinder, a controlling valve cylinder and valve therein, a rock shaft, a lever carried by said shaft having connection with the valve of the controlling valve cylinder and an auxiliary lever carried by the rock shaft having connection with the piston of the actuating cylinder, pipes establishing communication between the controlling cylinder and the motor cylinder, and a cylinder for the pilot valve having communication with the controlling valve cylinder, and means for returning the controlling valve to normal position.

4. The combination with means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston there-

in having direct connection with the regulating means, governor mechanism and controlling devices for the motor cylinder interposed between the governor and motor cylinder and comprising an actuating cylinder and piston therein, a pilot valve actuated by the governor and controlling the actuating cylinder, a controlling valve cylinder and valve therein, a cylinder for the pilot valve having communication with the controlling valve cylinder, a rock shaft, a lever carried by said shaft having connection with the valve of the controlling valve cylinder and an auxiliary lever carried by the rock shaft having connection with the piston of the actuating cylinder, and a plurality of pipe connections between the controlling cylinder and the motor cylinder, said last mentioned pipe connections communicating with the motor cylinder at points respectively upon opposite sides of the piston in the motor cylinder, and means for returning the controlling valve to normal position.

5. The combination with means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston therein having direct connection with the regulating means, governor mechanism and controlling devices for the motor cylinder interposed between the governor and motor cylinder and comprising an actuating cylinder and piston therein, a pilot valve actuated by the governor and controlling the actuating cylinder, a controlling valve cylinder and valve therein, a rock shaft, a lever carried by said shaft having connection with the valve of the controlling valve cylinder, and an auxiliary lever carried by the rock shaft having connection with the piston of the actuating cylinder, pipes establishing communication between the controlling cylinder and the motor cylinder, and a cylinder for the pilot valve, and means for returning the controlling valve to normal position.

6. The combination with means for regulating an impact stream for tangential water wheels, of a motor cylinder, a piston therein having direct connection with the regulating means, governor mechanism and controlling devices for the motor cylinder interposed between the governor and motor cylinder and comprising an actuating cylinder and piston therein, a pilot valve actuated by the governor and controlling the actuating cylinder, a controlling valve cylinder and valve therein, a cylinder for the pilot valve, a rock shaft, a lever carried by said shaft having connection with the valve of the controlling valve cylinder and an auxiliary lever carried by the rock shaft having connection with the piston of the actuating cylinder, and a plurality of pipe connections between the controlling cylinder and the

motor cylinder, said last mentioned pipe connections communicating with the motor cylinder at points respectively upon opposite sides of the piston in the motor cylinder, and
5 means for returning the controlling valve to normal position.

In testimony whereof I have hereunto af-

fixed my signature in the presence of witnesses.

GEORGE J. HENRY, JR.

Witnesses:

N. A. ACKER,

D. B. RICHARDS.