

No. 656,104.

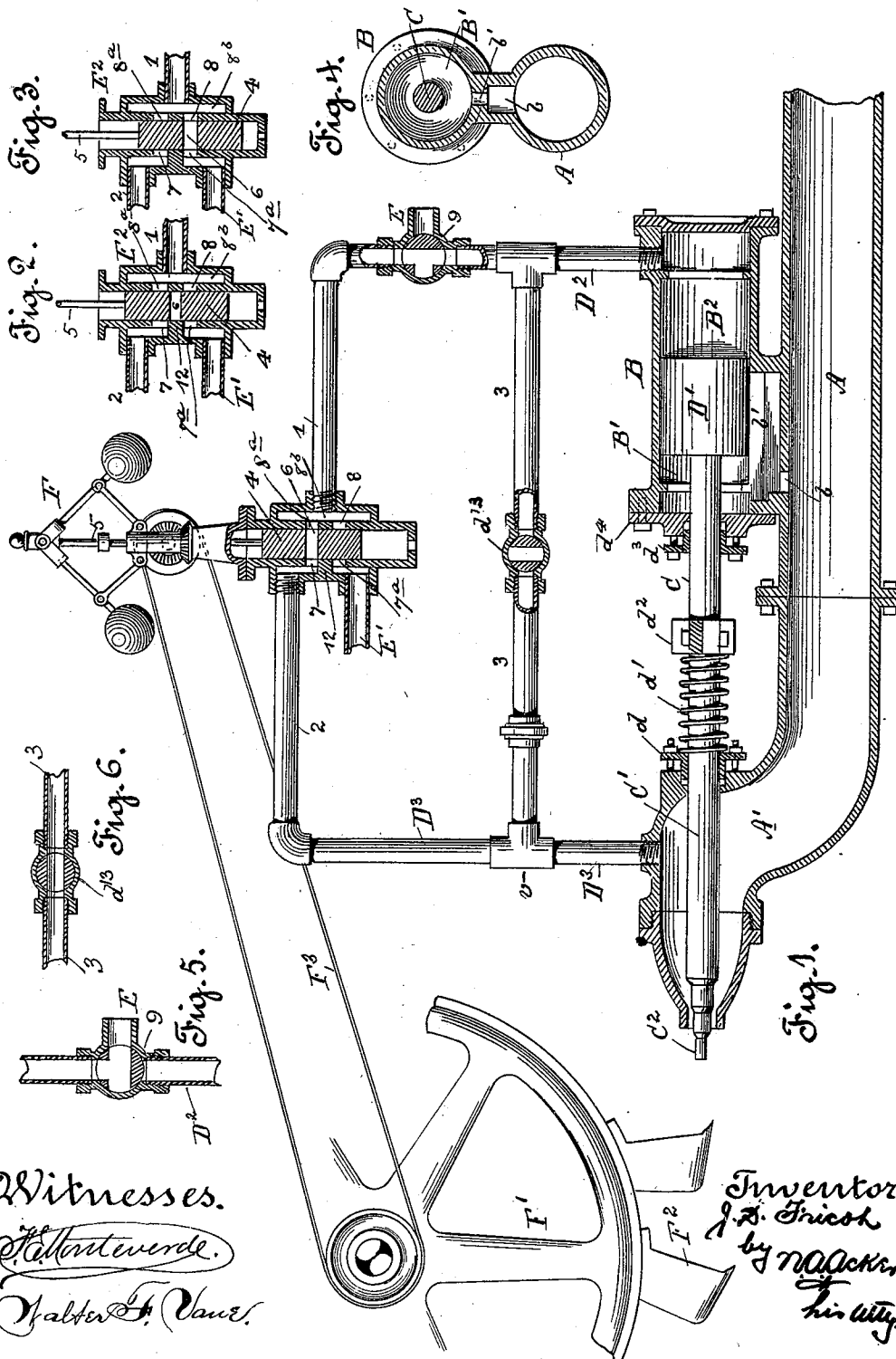
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J. D. FRICOT.

REGULATING MEANS FOR HYDRAULIC MOTORS.

(Application filed June 12, 1899.)

(No Model.)



Witnesses.

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UNITED STATES PATENT OFFICE.

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REGULATING MEANS FOR HYDRAULIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 656,104, dated August 14, 1900.

Application filed June 12, 1899. Serial No. 720,255. (No model.)

To all whom it may concern:

Be it known that I, JULES D. FRICOT, a citizen of the United States, residing at the city and county of San Francisco, in the State of California, have invented certain new and useful Improvements in Regulating Means for Hydraulic Motors; and I do hereby declare that the following is a full, clear, and exact description thereof.

This invention relates to certain new and useful mechanism for regulating the flow or stream of water used for the operation or driving of hydraulic motors; and it consists in the arrangement of parts and details of construction, as will be hereinafter fully set forth in the drawings and described and pointed out in the specification.

The object of the present invention is to provide means for automatically controlling or regulating the flow of the impact-stream from the discharge-nozzle, so as to impart approximately a uniform speed to the hydraulic motor driven by the impact-stream in order to permit of a steady transmission of power from the said motor.

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

Figure 1 is a side view in elevation, partly in section, illustrating the regulating mechanism applied to a discharge-nozzle. Fig. 2 is a detail sectional view of the governor-controlled valve, the same being illustrated in position in its casing when the motor is running normal. Fig. 3 is a similar view illustrating the position of the valve when lowered by governor owing to decreased speed of the motor. Fig. 4 is a cross-sectional end view taken through the main water-pipe and rear piston-cylinder. Fig. 5 is a detail sectional view of the three-way cut-off cock, and Fig. 6 is a similar view of the cut-off cock interposed within the central connecting-pipe.

For the purpose of illustration the regulating mechanism is represented as being used in connection with what is known as a "Chavanne" nozzle, or that style of nozzle fully set forth and described in Letters Patent No. 543,228, granted A. Chavanne on the 23d day of July, 1895. However, the invention is equally as well adapted for use in connection

with any style of nozzle used in connection with hydraulic motors.

In the drawings the letter A is used to indicate the main water or supply pipe, to the outer end of which is connected the discharge-nozzle A'. Above the main water or supply pipe is located the piston-cylinder B, which, by means of the piston-head D', is divided into chambers B' and B². Constant communication is established between chamber B' and main supply or water pipe A by means of aperture b, formed through the wall of pipe A, and elongated opening b' in the bottom of chamber B'. Hereinafter I shall term chamber B' the "main" piston-chamber, owing to its established communication with the main supply or water pipe A, and chamber B² the "auxiliary" piston-chamber.

Through stuffing-box d³ in head d⁴ of the cylinder B works the piston-rod C, which at its forward end connects with the rod C', carrying the nozzle-tip C². The rod C' works through stuffing-box d in the nozzle A' and is normally held outward by pressure of spiral spring d', interposed between the stuffing-box d and coupling d² for the rod C' and piston-rod C. This piston-rod C carries a piston-head D', which works within the piston-cylinder B and divides same into chambers B' and B².

Communication may be established between the main supply or water pipe A and the auxiliary chamber B² by means of the pipes D² D³, which connect, respectively, with the chamber B² and nozzle A' or with the atmosphere by means of pipes E E', which communicate, respectively, with pipe D² and valve-casing E², Fig. 1. The valve-casing E² is connected with pipes D² D³ by means of the cross-piping 1 2. Connection is also made between said pipes D² D³ by the cross-pipe 3. The valve-casing E², as shown in the drawings, is conveniently provided at one side with separated ports 8 8^a, which communicate with each other and with pipe 1 by means of a passage 8^b, and at the other side with separated ports 7 and 7^a, the former connecting with pipe 2 and the latter with pipe E'.

Within the valve-casing E² is located the vertically-movable valve 4, which is raised and lowered by means of the ball-governor F

through the medium of the governor rod or piston 5, which connects with the upper end of the valve 4. Through the slide-valve 4 is cut the transverse port 6, which communicates with the upper ports 7 and 8^a and lower ports 7^a 8 of the valve-casing as the valve is raised or lowered its full distance, Figs. 1 and 3 of the drawings.

Communication of the chamber B² with the atmosphere is dependent upon the position of the three-way stop-cock 9, introduced within the pipe D², so as to control the pipe E and the position of the slide-valve 4, which in its turn is dependent upon the speed of the driven motor F'. The three-way stop-cock 9 also controls the flow of water into the chamber B² through the pipes D³ 2, valve-casing E², and pipe 1, while direct communication of pipe D³ with pipe D² through cross-pipe 3 is controlled by the stop-cock d¹³, located within said pipe.

The motor F' is driven by the water ejected from the nozzle A' striking against the buckets or vanes E², attached to the periphery of said motor, the speed of the motor being dependent upon the force of the impact-stream discharged from the nozzle. By means of the endless belt F³ the motion of the motor is transmitted to the governor F.

Figure 1 of the drawings illustrates the position of the governor-balls when the speed of the motor has increased beyond its proper limit. As the governor-balls have diverged, the slide-valve 4 has gradually raised until its port 6 coincides with the upper ports 7 and 8^a of the valve-casing E². The consequence of such registration of the ports is that a portion of the water from the main supply or water pipe flows from the nozzle A' into pipe D³ and through pipe 2, ports 7 6, and pipes 1 and D² into auxiliary chamber B² back of the piston-head D'. The operative area of chamber B² being larger than the operative area of chamber B', due to the area of chamber B' being reduced by the piston-rod C, the pressure on the rear face of piston-head D' will be greater than that upon its outer face, and as a consequence the piston-rod C will be forced forward, carrying therewith the rod C', and thus moving the nozzle-tip C² outward within the nozzle, so as to reduce the area of the outlet-opening and diminish the flow of the water in order to reduce the speed of the motor. As the speed of the motor is reduced the governor-balls fall and the slide-valve is lowered until the speed of the motor is that of normal. When this is reached, the port 6 of the slide-valve will register with the solid portion 12 of the valve-casing, Fig. 2 of the drawings. When in this position, communication with the chamber B² will be closed. The pressure of the water upon each face of the piston-head being then equal, the rod C will remain stationary. Should, however, the speed of the motor fall below normal, then the governor-balls will fall and the slide-valve move downward within the valve-casing until port 6 co-

incides with ports 7^a and 8. This will establish communication of the pipe E', which leads to the atmosphere, with pipe D² leading to chamber B². An open communication being thus established the pressure of the water from the main pipe or water-supply upon the outer face of piston-head D' will suffice to force the piston-rod C rearward, the piston-head as carried therewith forcing the water from within the chamber B² into pipe D², from which it escapes through ports 8 and 7^a and pipe E' into the atmosphere. This movement of the piston-rod C draws the rod C' therewith and moves the nozzle-tip C², so as to enlarge the outlet for the escape of water from within the nozzle A', thus increasing the flow of water, so as to raise the speed of the motor to normal. The position of the slide-valve when lowered to establish communication between pipe E' and chamber B² is clearly shown in Fig. 3 of the drawings.

Presuming the nozzle to be tightly closed by the nozzle-tip and it is desired to start the motor, the three-way stop-cock 9 is then turned to the left in order to open outlet-pipe E and establish communication between auxiliary chamber B² and the atmosphere, while at the same time stop-cock d¹³ is turned to close communication between pipes D² and D³ through pipe 3. The pressure of water on outer face of piston-head D' will force the piston-rod C inward and move the nozzle-tip so as to open outlet of nozzle, while at the same time the movement of the piston-head D' with piston-rod C will cause the water in chamber B² to blow out into the atmosphere. The moment the motor is started stop-cock 9 is turned to the right to close outlet-pipe E and open connection between chamber B² and valve-casing E², Fig. 1 of the drawings.

In order to stop the working of the motor, it is only necessary to turn the three-way stop-cock 9 so as to close communication of chamber B² with pipe E or valve-casing E², Fig. 5 of the drawings, and move stop-cock d¹³ so as to open pipe 3, Fig. 6, and establish communication between pipe D and D³. The water from the main pipe A, flowing into nozzle A', will then pass into pipe D³ to point v and pass through pipe 3 into pipe D² and from there into the auxiliary chamber B² back of the piston-head D'. The pressure of the water upon the inner face of the piston-head D' will force the piston-rod C forward until the nozzle-tip C² tightly closes the outlet of the nozzle.

It will be understood that as the water-main A communicates with the chamber B' there is a constant pressure of water against the outer face of piston-head D'. So long as the pressure upon each face of piston-head D' is equal the running of the motor will be at a uniform speed. The moment the pressure upon one face exceeds that upon the other then that having the less pressure will give to that having the greater pressure, and piston-rod C will accordingly be moved in order

to increase or decrease the outflow of water in accordance with the variance in the pressures upon the piston-heads.

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

1. The combination with the main pipe, of a cylinder, a piston in said cylinder dividing the same into a main and an auxiliary chamber, the former of which communicates directly with the main pipe, a piston-rod connected to said piston and working in the main chamber only, whereby different operative areas are obtained on opposite sides of the piston, a pipe connection between said main pipe and auxiliary chamber, a controlling device for the main-pipe outlet operated by said piston-rod, and means interposed in said pipe connection for controlling the water communication between the main pipe and auxiliary chamber, substantially as described.

2. The combination of a motor, a water-supply pipe therefor, a cylinder communicating with said supply-pipe, a piston in said cylinder, a controlling device for said supply-pipe, connected to said piston, a pipe connection between said supply-pipe and said cylinder, a valve-casing interposed in said pipe connection, a valve in said valve-casing, mechanism for operating said valve in accordance with the speed of the motor, a valve-controlled discharge for said pipe connections, and an intermediate pipe connection constituting a by-pass around said valve, and a stop-cock in said by-pass, substantially as described.

3. The combination, with the main pipe having a nozzle, of a cylinder parallel with said main pipe, a piston in said cylinder and dividing the same into a main and an auxiliary chamber, the former of which communicates directly with the main pipe, a nozzle-tip, a

piston-rod connected with said piston and with said nozzle-tip and working in said main chamber only for the purpose set forth, a pipe connection between said main pipe and auxiliary chamber, and means in said connection for controlling the admission and exhaustion of fluid to and from said auxiliary chamber, substantially as described.

4. The combination with a main pipe having an outlet-nozzle, of a cylinder, a piston in said cylinder dividing the same into a main and an auxiliary chamber, the former of which communicates with the main pipe, a piston-rod connected to said piston and working in the main chamber only, pipe connection between the main pipe and auxiliary chamber, and means for controlling the movement of the piston through variation of the water-pressure in accordance with the speed of the driven motor, substantially as described.

5. The combination with a nozzle, a piston-cylinder and the pipe connections between the nozzle and piston-cylinder, of a ported-valve casing interposed within said pipe connections, a single ported valve fitted within said casing, mechanism for operating said valve in accordance with the speed of the driven motor, communication between said pipe connections and the atmosphere, a stop-cock for controlling said communication, and an intermediate or middle pipe connection constituting a by-pass around the valve, and of a stop-cock located therein.

In testimony whereof I hereunto affix my signature in presence of two witnesses this 2d day of June, 1899.

JULES D. FRICOT.

Witnesses:

N. A. ACKER,
WALTER F. VANE.