W. A. DOBLE.

HYDRAULIC NOZZLE.

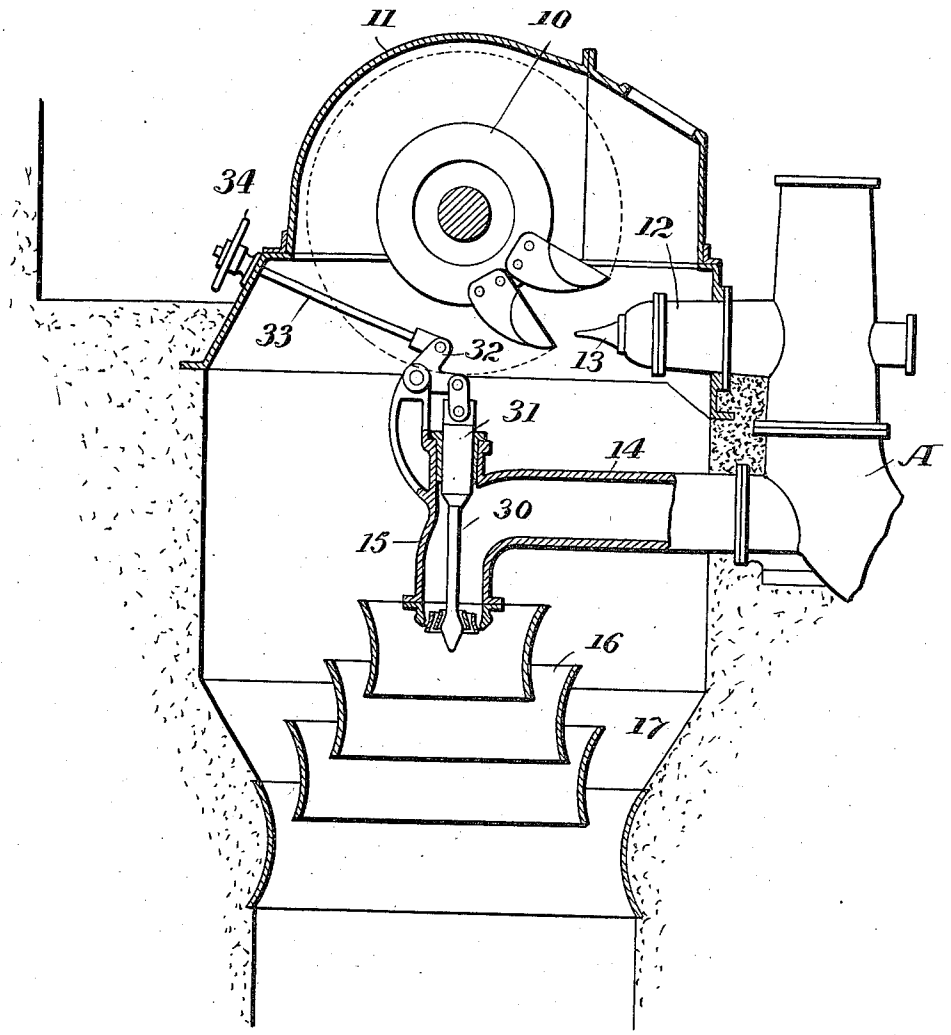
APPLICATION FILED MAY 24, 1910.

1,027,825.

Patented May 28, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2

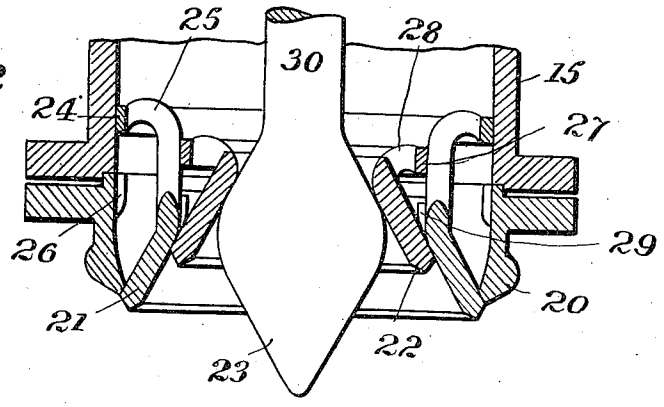


Fig. 3

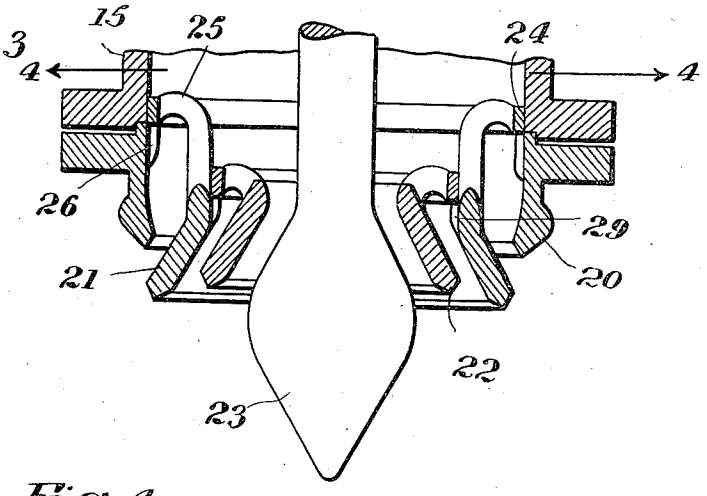
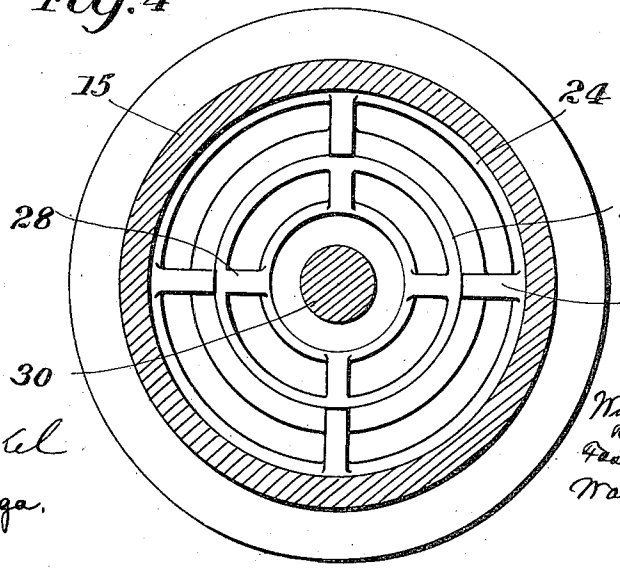


Fig. 4



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WILLIAM A. DOBLE, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO MAY E. DOBLE, OF SAN FRANCISCO, CALIFORNIA.

HYDRAULIC NOZZLE.

1,027,825. Specification of Letters Patent. Patented May 28, 1912.

Application filed May 24, 1910. Serial No. 563,141.

To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States, and resident of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Hydraulic Nozzles, of which the following is a specification.

This invention relates to hydraulic nozzles and particularly to nozzles adapted for use with the draft tubes of hydraulic motors.

The object of this invention is to construct a nozzle the discharge of which may be regulated closely and efficiently.

The invention will be described in connection with the accompanying drawings, in which:

Figure 1 is a section through a hydraulic motor showing this invention; Fig. 2 is an enlarged sectional view of the nozzle in closed position; Fig. 3 is a similar section of the nozzle in open position; and Fig. 4 is a section on the line 4—4 of Fig. 3.

Referring to the drawings, 10 designates the rotor of a hydraulic motor which in this case is shown as of an impact type although the invention is not necessarily limited to this particular type of motor. The motor is provided with the usual housing 11 and a discharge nozzle 12 for directing a jet of water against the rotor, the nozzle being controlled by the usual needle valve 13.

A branch pipe 14 is connected to the main supply pipe A and is provided with a nozzle 15 which is arranged to direct an annular stream of water against a series of annular rings 16, located in the draft tube 17 of the motor. The series of rings and nozzles form together a regulating device for regulating the discharge of the water from the motor and the height of the water in the draft tube as described in my copending application Serial No. 563,140, filed May 24, 1910.

The nozzle 15 is provided with a removable discharge end 20 which is bolted thereto. A series of annular members 21 and 22 and a core piece or needle valve 23 are located in the nozzle. The annular member 21 is connected to a ring 24 by means of a series of ribs 25. The ring 24 is arranged to slide axially in the nozzle so as to guide the annular member 21, and the nozzle end 20 is provided with a series of stops 26 which limit the outward movement of the ring 24 and the annular member 21. The annular member 22 is similarly connected to ring 27 by means of a series of ribs 28, and the ring 27 slides in the annular member 21, the annular member 21 being provided with a series of stops 29 so as to limit the outward movement of the member 22. The core piece 23 is provided with a stem 30 which has an enlarged shank 31 guided in a stuffing box in the nozzle body and constructed so as to balance the core piece. A bell crank lever 32 is mounted upon a bracket on the nozzle body and has connected to it a threaded rod 33 which is provided with a hand-wheel 34 so that the position of the core piece may be regulated.

The annular members 21 and 22 are conical in form and are arranged to form with the discharge end and the core piece 23 a series of annular conical ports so as to discharge a series of annular conical jets against the rings 16. These ports are arranged to be brought into operation successively as follows: In Fig. 2 the nozzle is shown entirely closed. If now the core piece is moved downwardly by the hand-wheel 23 the pressure of the water will cause all of the annular rings to move downwardly with the core piece so as to open the port between the annular member 21 and the discharge end 20. The other ports will however remain closed, but if the opening movement of the core piece is continued the ring 24 will abut against the stops 26 so as to limit the opening movement of the annular member 21, and a further downward movement of the core piece will cause the water to open the port between the annular members 21 and 22. The port between the annular member 22 and the core piece 23 will however remain closed until the ring 27 abuts against the stops 29, when a further opening movement of the core piece 23 will open the port between the core piece and the annular member 22. A closing movement of the core piece will close the ports in the reverse order. It will thus be seen that the ports are successively brought into operation in both the opening and closing movement.

The annular jets of water are directed against the annular rings so as to flow along the inner surfaces of the same thus causing the air in the motor casing to be drawn downwardly through the draft tube and into the tail race by the induced action of the water. Moreover a jet of water directed against the

water discharged from the motor will impart thereto an accelerated movement and cause the same to be forcibly ejected from the draft tube and into the tail race so as to prevent the back water from backing up into the draft tube as described in the application referred to above. The bulb of the core piece and the annular members 21 and 22 are so designed as to direct the streams of water against the inner surfaces of the rings so as to cause efficient operation. It is found in practice that by providing a multiple jet nozzle of the type described that the discharge of the water can be closely and efficiently regulated especially where the head is high as in impact water motors.

It is obvious that various changes may be made in the details of construction without departing from this invention, and it is therefore to be understood that this invention is not to be limited to the specific construction shown and described.

What I claim is:

1. A hydraulic nozzle having a discharge end, a plurality of axially movable annular members constructed to form a plurality of concentric discharge ports, and a core or needle in said members.

2. A hydraulic nozzle having a discharge end, an axially movable ring within said discharge end constructed to form an annular port, a needle or core piece extending through said member and engaging said member, and stops on said nozzle body to limit the outward movement of said annular member.

3. A hydraulic nozzle having a discharge end, a plurality of axially movable nested conical rings constructed to form a plurality of annular ports, and means to adjust said rings.

4. A hydraulic nozzle having a discharge end, a plurality of axially movable nested conical rings constructed to form a plurality of annular ports, and a headed core or needle passing through said rings.

5. A hydraulic nozzle having a discharge end, a plurality of axially movable nested conical rings constructed to form a plurality of annular ports, and coöperating stops on said rings and nozzle body.

6. A hydraulic nozzle having a discharge end, a plurality of axially movable annular members constructed to form a plurality of concentric discharge ports, interlocking means between said members permitting limited relative axial movement, and means for axially moving the inner member.

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

WILLIAM A. DOBLE.

Witnesses:

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