No. 724,678. PATENTED APR. 7, 1903.

W. A. DOBLE.

NOZZLE FOR FLUIDS.

APPLICATION FILED MAY 6, 1902.

NO MODEL.

Fig. I

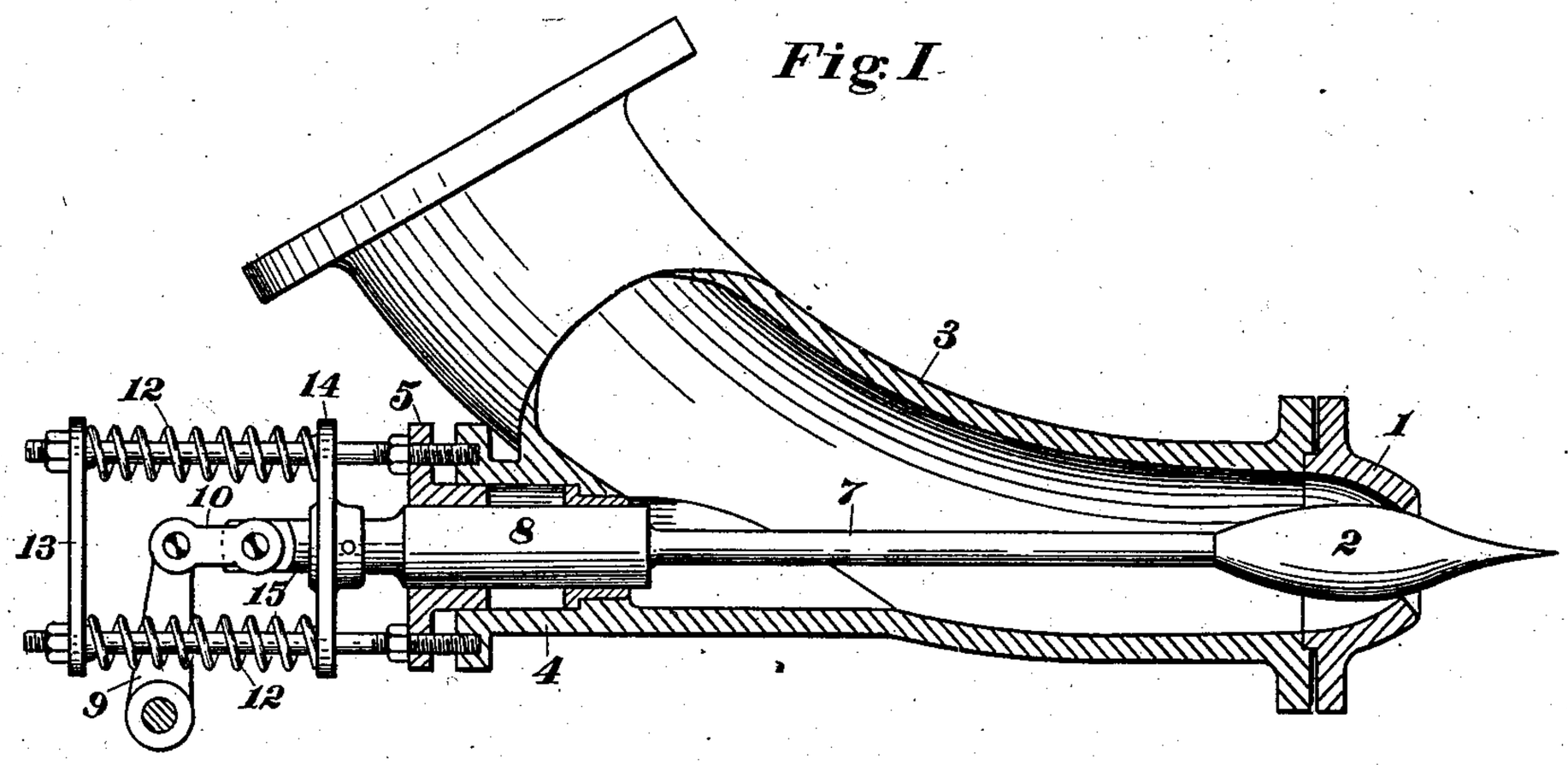
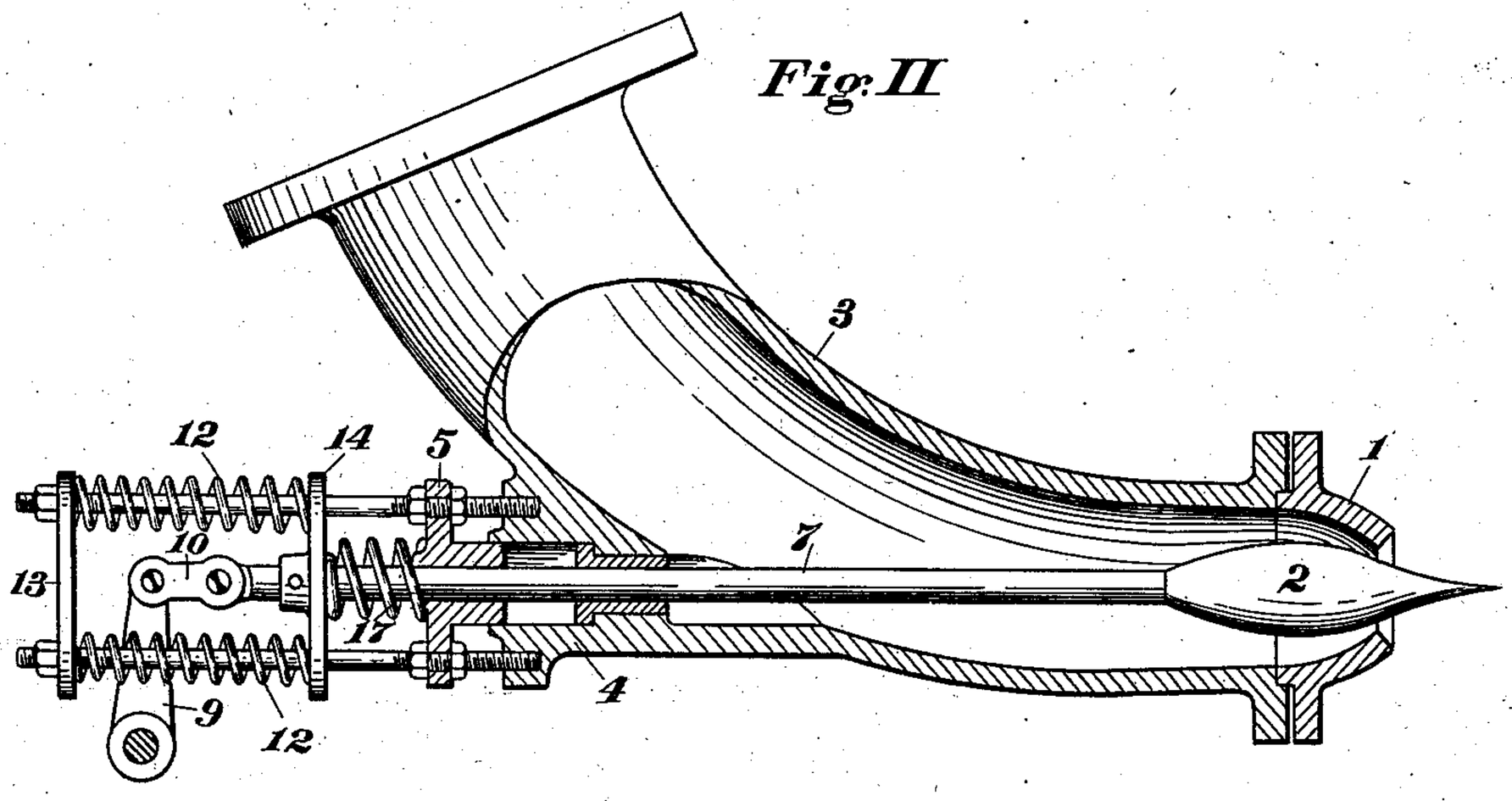


Fig. II



WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM A. DOBLE, OF SAN FRANCISCO, CALIFORNIA.

NOZZLE FOR FLUIDS.

SPECIFICATION forming part of Letters Patent No. 724,678, dated April 7, 1903.

Application filed May 6, 1902. Serial No. 106,188. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Nozzles for Fluids; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an improvement in nozzles to discharge water, steam, or other fluids on motive wheels or for like purposes where accurate regulation of quantity discharged is required.

My improvement consists in a nozzle provided with a longitudinally-adjustable core-piece, preferably of spindle form, such as is described in Letters Patent of the United States, No. 660,789, granted to me on the 30th day of October, 1900, for hydraulic regulating-nozzles, but is applicable to any form of nozzle having a regulating core-piece that can be put into equilibrium by means of a variable resistance caused by springs or like devices that balance and compensate the variable pressure and friction of the fluid around or upon this regulating core-piece, enabling it to be moved and adjusted without other force than that required to overcome friction of the mechanical connections.

The object of my invention is to secure accurate regulation of fluid-nozzles with a minimum resistance to the actuating or governing devices that regulate the amount of fluid discharged without altering the pressure thereof. To attain this end, I employ devices as hereinafter described, and illustrated by drawings herewith forming a part of this specification.

Figure I is a longitudinal section through a fluid-nozzle provided with a compensating piston and my improvements; and Fig. II a section through a similar nozzle without a balancing-piston, also provided with like improvements, modified in each case to suit the differences of construction.

In regulating the quantity of any fluid discharged through a nozzle, especially inelastic fluids, without changing their pressure it is obvious that the area of the water-passage must be altered if the pressure is maintained. This is most simply accomplished by discharging the fluid through a variable annular passage, as in my Letters Patent before cited; but fluid-pressure on the core-pieces varies as the area of the annulus exposed or opened thereby. In the case of sliding gates for water-wheels the same rule applies, and a considerable force has to be exerted to compensate this varying pressure on the gates, and it is common to employ some force independent of the regulating devices to perform adjustment. Such conditions do not apply when regulation is performed by varying the pressure behind a nozzle. In that case balanced throttling-valves can be applied. By the devices forming my invention the forces acting on the regulating agent, whatever it may be, are made quite uniform throughout its range, as will now be explained by the aid of the drawings, which represent a discharge-nozzle 1 with a central core-piece 2.

The main member 3 is made of tapering form, preferably curved, and adapted to receive nozzles 1 of different sizes, as may be required, an extension 4 being formed on one side in alinement with the nozzle 1 and provided with a packing-gland 5.

Referring to Fig. I, the core-piece 2 is held by a flexible rod 7, that permits this core-piece to assume a concentic position in the nozzle 1 by action of the water. The rod 7 connects to a piston 8, whose sectional area is approximately the same as that of the bore of the nozzle 1, so that when the nozzle is closed, as in the drawing, the whole is in equilibrium. This proportion may, however, be altered to meet special conditions of use for which the nozzle is designed. When the core-piece 2 is drawn back, it is evident that while the pressure on the piston area at rear remains constant, or nearly so, the outward or closing pressure on the core-piece will diminish in proportion to the annular area opened around the same, thereby disturbing the former equilibrium. To offset this disturbance, I introduce a variable counterbalancing agency in the form of the compression spring or springs 12, which thrust inwardly against the plate or cross-head 14, fastened on the extension 15 of the piston 8, and bear outwardly against the adjustable cross-plate 13, borne on the rods which support the coiled springs 12.

These springs are so calibrated as to compensate as far as practicable the varying thrust on the core-piece 2, an adjustment for tension being provided for in the screw-nuts which retain the plate 13 in place. This adjustment is in practice ordinarily best made by actual trial and experiment, since there are certain minor forces in operation not readily computable to be accounted for, such as a slight fall of pressure in the main chamber, and consequently upon the piston area, when the nozzle is opened and also a counter force on the core-piece due to traction of the flowing current on its way to the relief-passage.

The rod or bar 7 is extended through the gland 5 and connected to the link 10 and crank 9; but when the compensating piston 8 is omitted, as shown in Fig. II, the closing pressure on core-piece 2 is not compensated, except as to an area equal to the section of the rod 7, and to compensate this difference I employ a counter-spring to offset a portion of the closing force acting upon the core-piece 2. This latter construction is not so effective as that shown in Fig. I and is introduced here to show the manner of applying my invention to existing nozzles not arranged with a special view to my improvement.

Weights and radial links or other devices can be employed instead of springs to produce the varying forces required for compensating the action of the fluid on the core-piece 2 and the piston 8; but springs are more convenient and more easily calibrated to the varying force required and are free from inertia and momentum, that interfere with rapid movement.

The springs 12 and 17 can be of any number and disposed in various ways. The former, as arranged in Fig. I, are two or more in number, as the pressure of the fluid may require.

Having thus explained the nature and objects of my invention and the manner of its use in practice, I claim as my invention and desire to secure by Letters Patent—

In a discharging-nozzle, an adjustable core-piece for regulating the amount of discharge, means for counterbalancing the pressure on this core-piece, means for moving the core-piece, and means, as springs, for affording a variable reinforcement to the core-piece, as the counterbalancing force is disturbed by the opening of a variable area of discharge, substantially as specified.

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

WILLIAM A. DOBLE.

Witnesses:

ALFRED A. ENQUIST,

P. W. J. LANDER.