C. G. KOPPITZ.

FLUID PRESSURE REGULATOR.

APPLICATION FILED JULY 23, 1909.

994,167.

Patented June 6, 1911.

2 SHEETS—SHEET 1.

FIG. 1.

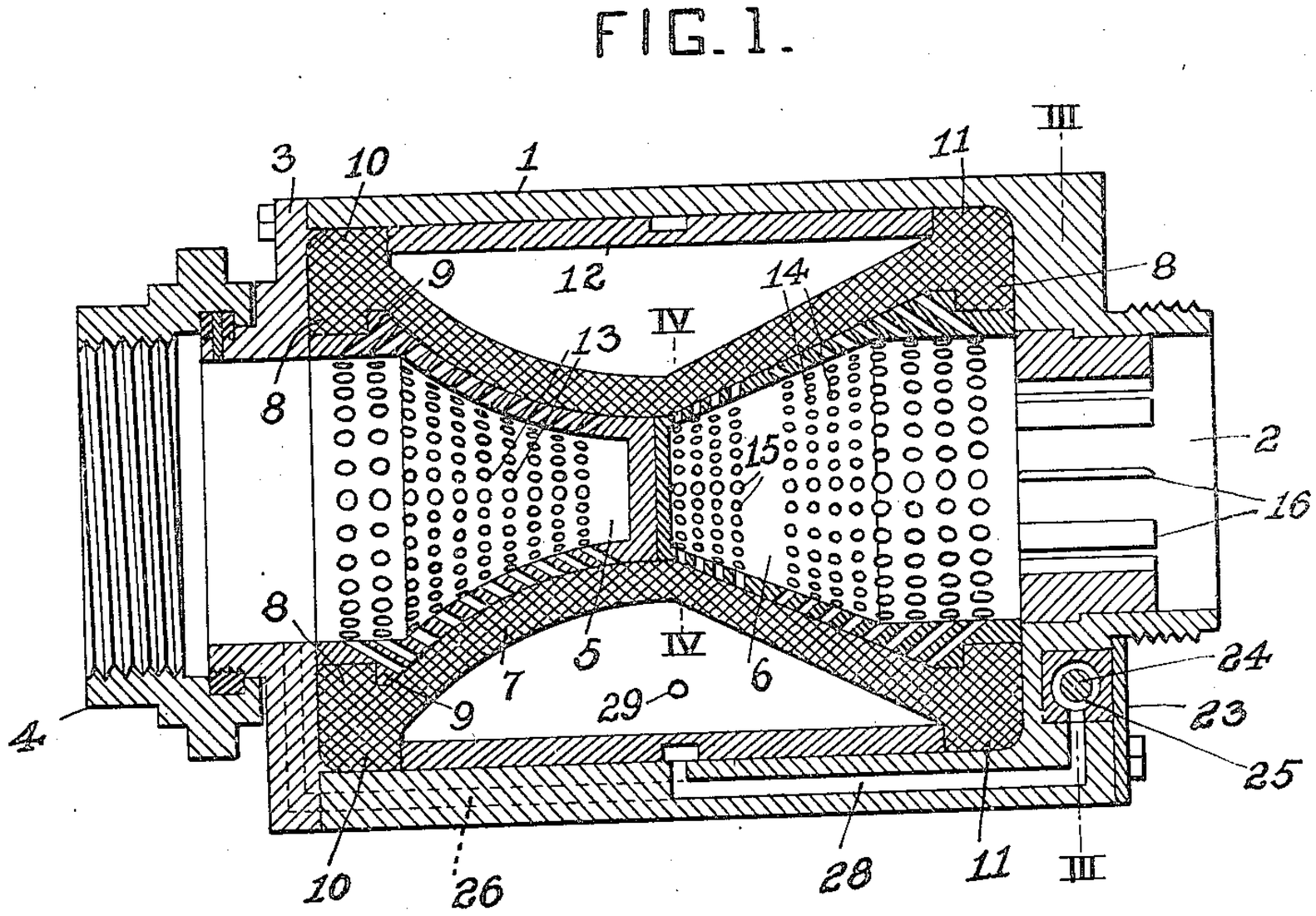
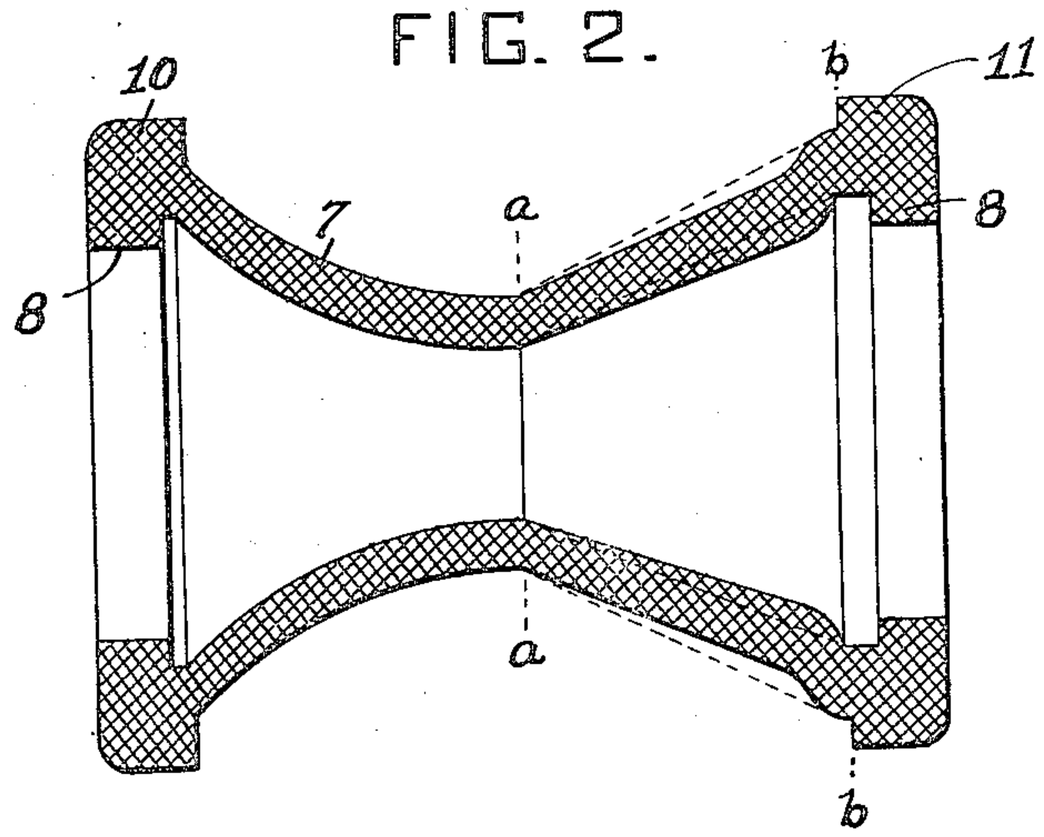


FIG. 2.



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2 SHEETS—SHEET 2.

FIG. 3.

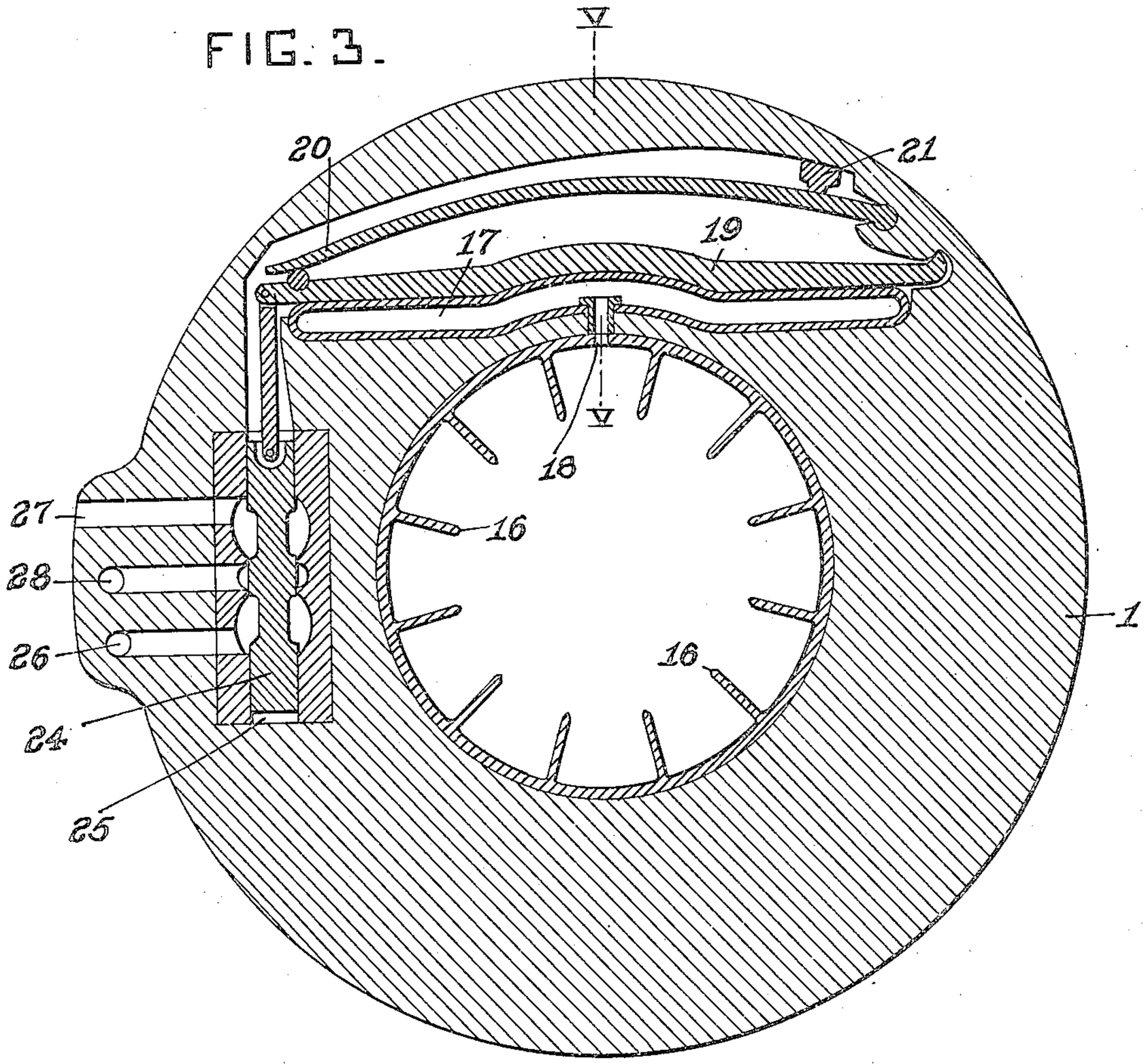


FIG. 5.

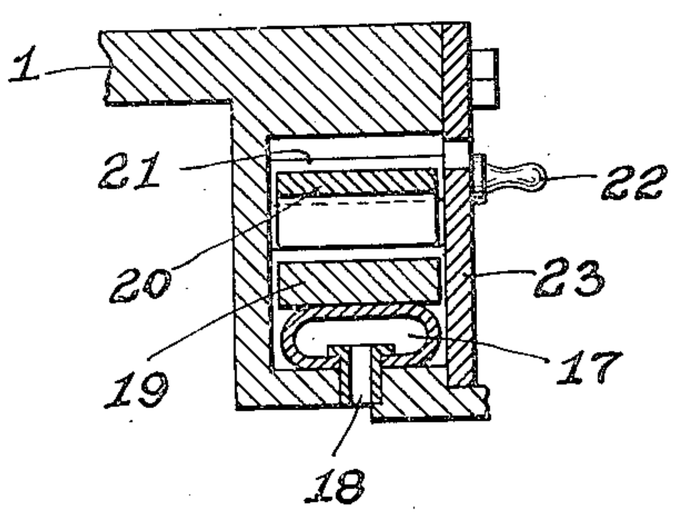
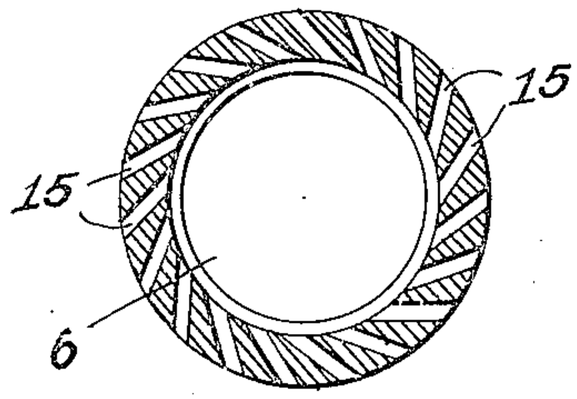


FIG. 4.



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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE REGULATOR.

994,167. Specification of Letters Patent. Patented June 6, 1911.

Application filed July 23, 1909. Serial No. 509,145.

To all whom it may concern:

Be it known that I, CARL G. KOPPITZ, residing at Youngstown, in the county of Mahoning and State of Ohio, a citizen of the United States, have invented or discovered certain new and useful Improvements in Fluid-Pressure Regulators, of which improvements the following is a specification.

The invention described herein relates to certain improvements in means for establishing and automatically maintaining any desired difference of pressure between a fluid pressure supply and the delivery line.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification Figure 1 is a sectional elevation of my improved regulator; Fig. 2 is a sectional elevation of the resilient sleeve; Fig. 3 is a sectional view on a plane indicated by the line III—III Fig. 1; Fig. 4 is a transverse section of the delivery cone on a plane indicated by the line IV—IV Fig. 1; and Fig. 5 is a sectional detail on a plane indicated by the line V—V Fig. 3.

In the practice of my invention the external cylinder or case 1 is preferably made with its side and one end integral with each other as shown, the end being provided with a nozzle 2, to which the delivery line, as hose, can be attached. The opposite end of the cylinder is closed by a removable cap 3, provided with a nozzle 4 and with suitable means whereby the cylinder may be attached to the supply line. Within this cylinder or case is placed the regulating means consisting of two hollow parts or members 5 and 6, preferably cone-shaped and having the inner ends closed while the outer ends are open and in line respectively with the discharge and inlet nozzles 4 and 2 respectively. These parts or members are inclosed in a flexible and preferably resilient sheath 7, their closed ends being in contact or adjacent to each other as shown. The parts or members are inserted into opposite ends of the sheath, which is provided at its ends with internal shoulders 8 adapted to engage corresponding shoulders 9 on the parts or members so that the latter are held together by the sheath and serve as an internal brace to hold the sheath extended. The sheath is provided adjacent to its ends with external shoulders 10 and 11, and an external brace in the form of a longitudinally sectional shell 12 is interposed between the shoulders 10 and 11. When the sheath is placed in the cylinder, one end of the former will bear against the closed end of the latter and the cap 3 will bear against the opposite end of the sheath. By the conjoint action of the parts or members 5 and 6, the bracing shell 12 and the ends of the cylinder 1, the ends of the sheath are securely anchored, but the portions of the sheath intermediate of such anchored portions are free to move as hereinafter described.

The parts or members 5 and 6 and the sheath are so constructed that the latter will normally fit closely against the outer surfaces of the parts or members 5 and 6 closing the perforations through the walls of the latter. The perforations are arranged in peripheral rows along the parts or members, the perforations 13 in the receiving part 5 and a portion as 14 of those in the outlet part 6 are inclined in the direction of flow of the fluid, while the perforations 15 adjacent to the inner end of the part or member 6 are preferably so formed in planes approximately at right angles to the axis of the part or member, as to impart a swirling movement to the fluid as it enters that part or member as shown in Fig. 4. The purpose of this construction will be hereinafter described. The sheath is made of some flexible impervious material, and is preferably resilient, and as before stated is so proportioned as to hug the parts or members tightly. When fluid under pressure enters the part 5 and passes through the perforations therein, the sheath will be forced outwardly from the parts 5 and 6, uncovering perforations in both parts, and forming a passage way from one part to the other. It is preferred that the perforations in the part or member 6 should be uncovered progressively from the inner to the outer end. This function may be accomplished in many ways, as for example the portion of the sheath fitting around the part 6 is constructed to have a progressively increasing rigidity from a point or plane in line with the inner row of perforations in the part 6. When the sheath is made of rubber or other suitable resilient material as is preferred, the portion of its wall between the lines *a*—*b* Fig. 2 is made of a sufficiently

small internal diameter, that when the part 6 is forced into the sheath, the latter will bear most tightly and with less resilience against the perforations at the outer end of such part or member. In such a construction the rows of perforations at the inner end will be uncovered first and then the other rows progressively as the pressure increases.

When the pressure is low so that only the first two, three or four rows of perforations in the part 6 are uncovered, the flow of fluid into the part or member 6 will be less than the delivery capacity of its discharge outlet, and if the perforations in these rows were inclined as the other perforations, to direct the fluid in the direction of the desired flow, the stream would not fill the part 6 or its outlet and would be irregular. In order to overcome this objection, the perforations 15 are formed at an angle as described, so as to impart a swirl to the fluid. To break up this swirl and the hollow stream produced thereby, radial baffle plates 16 are arranged in the nozzle 2, as shown in Figs. 1 and 3.

As will be readily understood the flow of water will be proportional to the number of perforations in the parts or members uncovered by the outward movement of the sheath, and that by varying the pressure of the sheath on the parts or members 5 and 6 any desired difference of pressure between the supply and outlet may be obtained. Of course this regulation may be obtained by varying the resilience of the sheath, but it is preferred to effect the regulation by varying the pressure of a fluid employed for holding the sheath in contact with the surfaces of the parts or members 5 and 6. To this end the annular space between the sheath and the cylinder is connected to the high pressure or supply side of the regulator, and an outlet port from such space is provided. By means of a suitable valve mechanism, the flow of fluid to and from this annular space is regulated, said valve mechanism being controlled by the pressure of fluid on the discharge side of the regulator. The construction shown is desirable for this regulation. A closed receptacle 17 having resilient walls is arranged in a recess in the head at the discharge end of the cylinder and is connected by a port 18 to the discharge or outlet nozzle 2. As the pressure in the outlet increases the receptacle will be enlarged shifting a lever 19 held against the receptacle by a spring 20. As shown the tension of this spring can be regulated by shifting a movable abutment 21 arranged between the spring and the wall of the recess in which the parts are arranged. The abutment is provided with a handle 22 projecting through a covering plate 23. The lever 19 is connected to a valve 24 movable in a suitable chamber 25. As shown in Figs. 1 and 3 a passage 26 is formed in the wall of the cylinder connecting the supply side of the regulator with the chamber 25, from which extends an outlet passage 27. A passage 28 in the wall of the cylinder connects the chamber 25 with a groove in the shell 12 and ports 29 connect the groove with the annular space around the sheath. The valve 24 is so constructed that when shifted by an enlargement of the receptacle 17, the passage 28 to the annular space will be connected to the passage 26 permitting fluid to enter the annular space and force the sheath against the parts or members and cover some of the perforations. When pressure in the outlet drops the receptacle 17 will partially collapse permitting the spring to shift the lever and valve and thereby connect the passage 28 with the outlet 27 permitting of an escape of fluid from the annular space and a consequent outward movement of the sheath uncovering more perforations.

I claim herein as my invention:

1. A pressure regulator having in combination hollow receiving and delivery parts or members, having perforated walls, and common means formed of flexible material covering the perforations in said parts or members and forming a portion of the passage for the flow of fluid from the receiving to the delivering member, and adapted when shifted by pressure of the fluid to permit the latter to flow into the delivery part or member.

2. A pressure regulator having in combination hollow receiving and delivery parts or members, having perforated walls, and common means formed of flexible material covering the perforations in said parts or members, and adapted when shifted by pressure of the fluid to permit the latter to flow into the delivery part or member, and means operative on such cover and controlled by pressure in the delivery part or member for holding the cover in closed position.

3. A pressure regulator having in combination hollow cylindrical parts or members having perforated walls the perforations being so formed that the fluid is not discharged directly from one member into the other and a sheath formed of flexible material inclosing said parts or members and adapted to close the perforations.

4. A pressure regulator having in combination hollow cylindrical parts or members having perforated walls and a sheath formed of flexible material inclosing said parts or members and adapted to close the perforations, and means controlled by pressure in the delivery part or member for controlling the movement of the sheath relative to the parts or members.

5. In a pressure regulator, the combina-

tion of hollow cylindrical parts or members having perforated walls and a resilient sheath inclosing the parts or members, the portion of the sheath inclosing the delivery part having a progressively greater rigidity toward its outer end.

6. In a pressure regulator, the combination of a cylinder having receiving and delivery nozzles, hollow parts or members oppositely arranged in the cylinder and having perforations through their side walls, a sheath formed of resilient material inclosing the parts or members and normally closing the perforations in the parts or members.

7. In a pressure regulator, the combination of a cylinder having receiving and discharge nozzles, hollow conical parts or members oppositely arranged in the cylinder and having perforations through their side walls, a sheath inclosing the parts or members and so arranged within the cylinder as to provide an annular chamber, means connecting said chamber with the supply side of the regulator, an outlet port from the chamber and a valve operative by pressure on the delivery side of the regulator for controlling the flow of fluid to and from the chamber.

8. In a pressure regulator the combination of a cylinder having receiving and discharge nozzles, hollow parts or members oppositely arranged in the cylinder and having their side walls perforated, the perforations adjacent to the inner end of the receiving part or member being formed at an angle to the radii of the parts or members so as to impart a swirl to the fluid within said part, a flexible sheath inclosing the conical parts or members, and baffle plates arranged to destroy the swirl of the fluid as it passes from the regulator.

9. In a pressure regulator, the combination of a shell having receiving and discharge nozzles, hollow parts or members oppositely arranged in the shell and having their side walls perforated, a flexible sheath inclosing the parts or members and means for insuring a solid stream of water through the discharge nozzle when the flow is less than the full capacity of the nozzle.

10. In a pressure regulator, the combination of a shell having receiving and discharge nozzles, hollow parts or members oppositely arranged in the shell and having their side walls perforated, a resilient sheath inclosing the parts or members, the portion of the sheath inclosing the delivery part or member having a progressively greater rigidity toward its outer end and means for insuring a solid stream of water through the discharge nozzle when the flow is less than the full capacity of the nozzle.

11. A pressure regulator having in combination two cup-shaped oppositely arranged parts or members each having perforated side walls, a sleeve or sheath formed of expansible material inclosing said parts or members and engaging the members outside of the perforated portions, and means for holding the sleeve or sheath in engagement with the parts or members.

12. A pressure regulator having in combination two cup-shaped oppositely arranged parts or members provided with external and internal shoulders, a sleeve or sheath formed of expansible material inclosing the parts or members and engaging the shoulders on the parts or members and a brace engaging the external shoulders on the sheath and holding the latter in engagement with the parts or members.

13. A pressure regulator having in combination two cup-shaped oppositely arranged parts or members having perforated side walls, a sleeve or sheath formed of expansible material inclosing and engaging said parts or members, whereby said parts and sheath are held the one by the other in operative relation.

In testimony whereof, I have hereunto set my hand.

CARL G. KOPPITZ.

Witnesses:
ALICE A. TRILL,
CHARLES BARNETT.