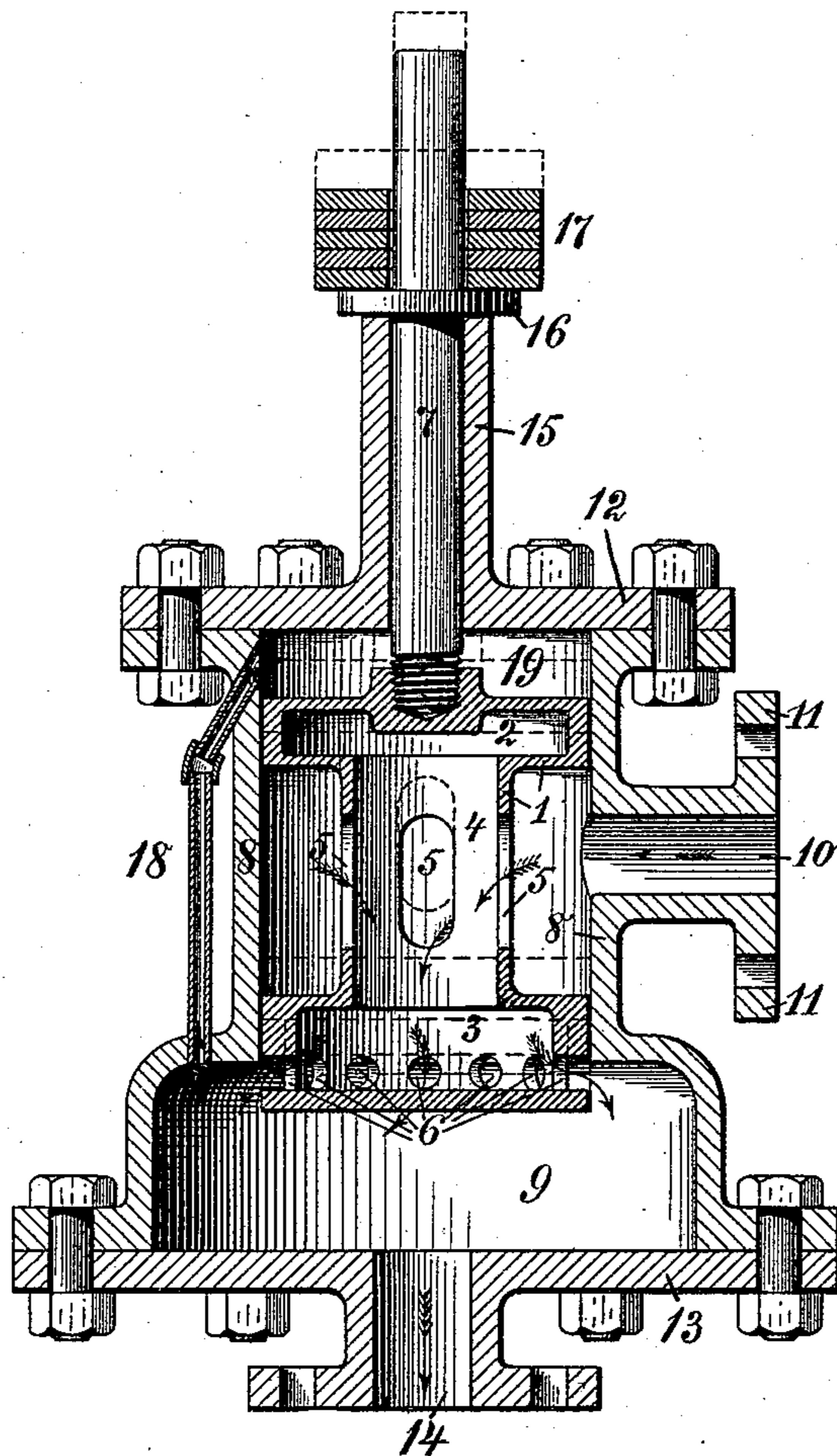


(No Model.)

R. H. MATHER.
REDUCING VALVE.

No. 355,543.

Patented Jan. 4, 1887.



Witnesses:

Wm. Dyckman
Geo. E. Waldo.

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UNITED STATES PATENT OFFICE.

RICHARD H. MATHER, OF WINDSOR, CONNECTICUT.

REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 355,543, dated January 4, 1887.

Application filed June 10, 1886. Serial No. 204,735. (No model.)

To all whom it may concern:

Be it known that I, RICHARD H. MATHER, of Windsor, in the county of Hartford and State of Connecticut, have invented certain
5 new and useful Improvements in Reducing-Valves, of which the following is a specification, illustrated by the accompanying drawing.

This invention is designed for the reduction
10 of steam and other fluids from any higher pressure to a uniform lower pressure; and it consists of a balanced piston-valve constructed in a peculiar manner and provided with ports and chambers, as hereinafter described.

15 In said drawing, which is a central vertical section of my invention, the numeral 1 denotes a hollow piston of irregular cylindrical form, being larger at each end and smaller at the middle. The enlargement or head 2 at the
20 upper end of piston 1, and the enlargement or head 3 at the lower end of said piston, are of uniform diameter, and are connected by a hollow neck, 4, which is of considerably less diameter. The ends of piston 1 are closed, but
25 neck 4 has several large ports, 5, which are conveniently located midway between heads 2 and 3, while head 3 has numerous small ports, 6, located as near as convenient to the bottom of piston 1. To the top of said piston
30 is attached the valve-rod 7. The casing 8, containing the piston, is also of irregular cylindrical form, the upper part being uniformly of suitable size to receive and fit snugly upon the head of piston 1, and the lower part
35 being expanded to form the chamber 9. In the side of casing 8 is a supply-port, 10, provided with a suitable external projection and flange, 11, to which a steam-pipe or other supply-pipe may be bolted. The upper and lower
40 ends of casing 8 are respectively provided with disks 12 and 13, which are tightly bolted thereto. Disk 13 has a large central port extending outward and provided with a flange, to which a connecting-pipe may be bolted.
45 Disk 12, in like manner, has a central opening extended in sleeve 15, which closely embraces the valve-rod 7. This rod is provided with a fixed collar, 16, which rests upon the top of sleeve 15 whenever piston 1 reaches the limit
50 of its inward motion in casing 8. This rod and collar are weighted by removable rings 17

to any extent which may be required by the operation of the device, as explained hereinafter. Said chamber 9, and also the chamber 19, which is formed within casing 8 between
55 head 2 and disk 12, are connected with each other by the intercommunicating tube or pipe 18. It is to be observed that the bottom area of the piston practically exceeds the top area of the same by an area equal to a cross-section
60 of rod 7.

The remaining features of construction of this invention sufficiently appear from the drawing and from the mode of operation, which is now to be described. 65

When the described invention is not in use, the piston is depressed by weights 17 to the position shown in the drawing. Such being the relative positions of piston 1 and casing 8, steam or any other fluid under pressure being
70 admitted by port 10 enters the hollow interior of piston 1 by ports 5, and thence escapes by ports 6 into chamber 9, and from chamber 9 by port 14, as may be desired. Chambers 9 and 19 are maintained at a uniform
75 pressure by reason of intercommunication at pipe 18. So long as the pressure in these two chambers does not rise to such a point that the difference between the aggregate upward pressure upon the bottom of piston 1 and the aggregate downward pressure
80 upon the relatively smaller top of the same is equal to the weight of piston 1, rod 7, and weights 17, the same relative positions are maintained; but when the pressure in said
85 chambers rises above the point just described the excessive upward pressure upon piston 1 raises the same toward the position indicated by the dotted lines. Thereby the ports 6, being carried within the smaller close-fitting
90 portion of casing 8, are closed; hence the pressure in chamber 9 cannot rise beyond the point above described. When the pressure in said chamber falls below that point, the piston is forced down again by the action of
95 gravitation, ports 6 are opened, and the normal pressure is immediately restored from the interior of said piston. The degree of pressure within said chambers is regulated by increasing or diminishing the weight 17, which
100 is applied to the valve-rod 7. It is also to be observed that pipe 18 is too small to allow

any considerable quantity of steam or other fluid to pass suddenly between chambers 9 and 19, and for this reason the automatic adjustments above described are executed by
 5 gradual and steady movements and with less jerkiness and friction than are produced by those other devices which have hitherto been constructed for the same general purpose.

I claim as my invention—

10 1. In a pressure-regulator, a hollow piston which is provided with ports of induction and ports of eduction and with terminal heads of differential areas, in combination with a cylindrical casing which is provided with a port
 15 of induction and a port of eduction and with two intercommunicating pressure-chambers, between which said piston is balanced when the pressure in said chambers stands at a predetermined or normal limit, substantially as
 20 and for the purpose specified.

2. In a pressure-regulator, a piston-valve formed within a cylindrical casing by means of a piston which is provided with terminal heads of unequal areas and with radial ports
 25 of eduction, and is adapted to reciprocate within said casing between two intercommunicating pressure-chambers which are located at opposite ends of said piston, and are adapted to receive steam or other fluid through
 30 said valve-ports, substantially as and for the purpose specified.

3. In a pressure-regulator, a valve which is formed by a reciprocating piston in a surrounding casing, said piston being provided
 35 with terminal heads of unequal areas and with radial ports of eduction, and said casing being provided with inlet and outlet ports and with two pressure-chambers which are located at opposite ends of said piston, and are provided with a small intercommunicating pas-
 40 sage which is adapted to permit the gradual transfer of fluid from one to the other of said chambers, and thereby to equalize the pressure in said chambers in a slow and gradual
 45 manner, substantially as and for the purpose specified.

4. In a pressure-regulator, a piston having radial ports, in combination with a surrounding case having inlet and outlet ports and two intercommunicating pressure-chambers
 50 which are located at opposite ends of said piston, and are adapted to receive steam or other fluid through said radial ports, substantially as and for the purpose specified.

5. In a pressure-regulator, a piston-valve, 55 constructed substantially as described, having a vertical piston-rod which is surrounded by a stationary sleeve, and is provided with a stop-collar adapted to encounter said sleeve when said valve is wide open, in combination
 60 with a number of annular weights surrounding said rod and supported by said collar, substantially as and for the purpose specified.

6. In a pressure-regulator, a piston provided with heads of unequal areas and with circum- 65 ferential ports adjacent to one of said heads, in combination with a valve-casing provided with inlet and outlet ports and with two intercommunicating pressure-chambers which are located at opposite ends of said piston, and
 70 are adapted to receive steam or other fluid through said circumferential ports, substantially as and for the purpose specified.

7. In a pressure-regulator, a piston whose heads are of unequal areas, in combination 75 with a surrounding case which is provided with two pressure-chambers, between which said piston is adapted to reciprocate, said chambers being connected with each other by means of an intercommunicating pipe or other
 80 passage which is of small capacity, and is adapted to equalize the pressure within said chambers in a gradual manner whenever the equality of that pressure is disturbed, substantially as and for the purpose specified. 85

In testimony whereof I have hereunto set my name in the presence of two witnesses.

RICHARD H. MATHER.

Witnesses:

H. R. WILLIAMS,
 WILLARD EDDY.