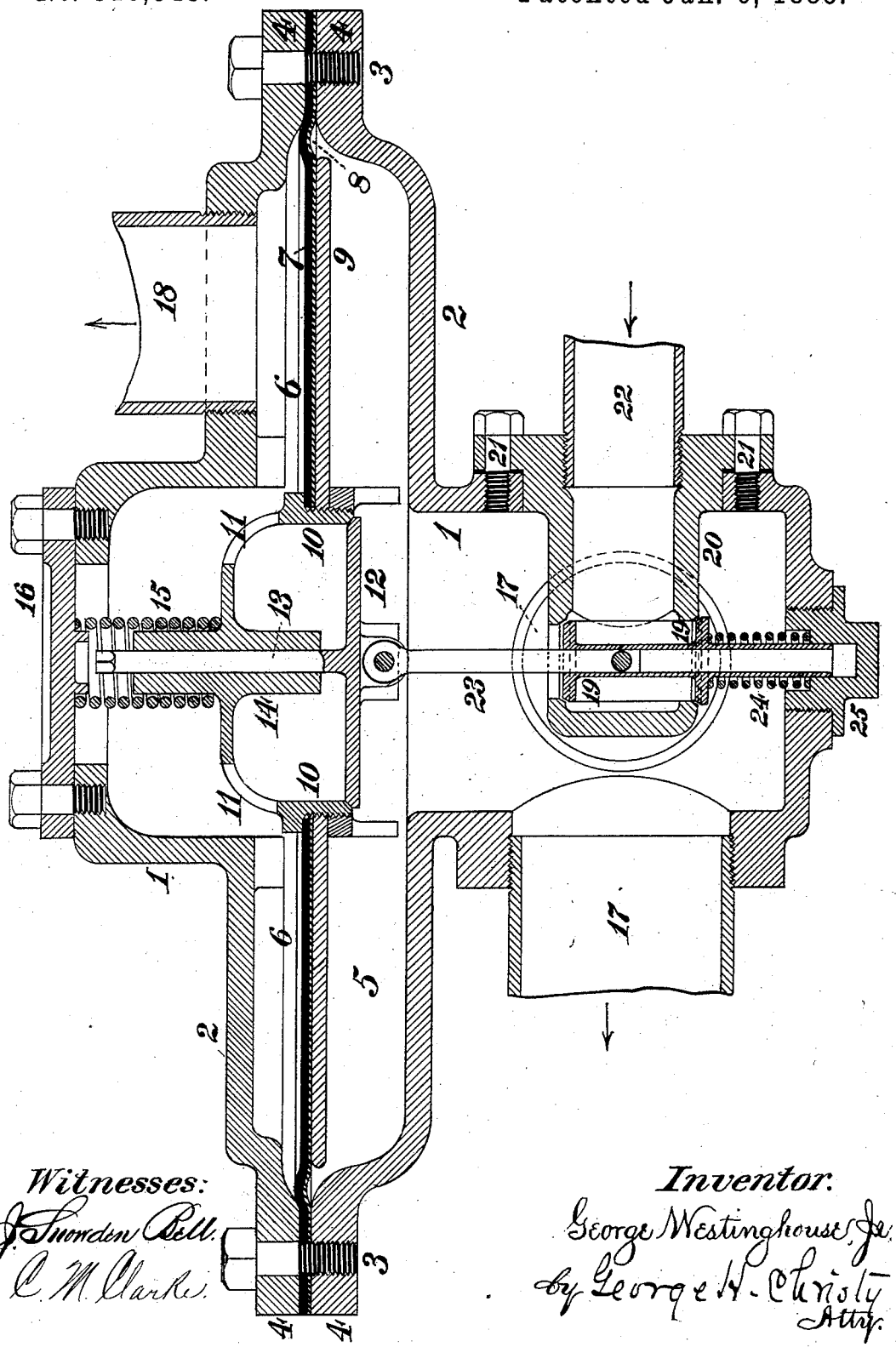
(No Model.)

G. WESTINGHOUSE, Jr.

PRESSURE REGULATOR AND RELIEF VALVE.

No. 310,348. Patented Jan. 6, 1885.



Witnesses:

J. Snowden Bell.

C. M. Clarke.

Inventor.

George Westinghouse, Jr.

by George H. Christy

Atty.

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

PRESSURE-REGULATOR AND RELIEF-VALVE.

SPECIFICATION forming part of Letters Patent No. 310,348, dated January 6, 1885.

Application filed July 1, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Pressure-Regulators and Relief-Valves, of which improvements the following is a specification.

In the accompanying drawing, which makes a part of this specification, the figure is a vertical central section through a combined pressure-regulator and relief-valve embodying my invention.

The object of my invention is to provide in a single apparatus of simple and inexpensive construction means for effecting the delivery of fluid at a desired lower pressure from a pipe or reservoir in which a higher pressure is exerted, and for maintaining the required degree of delivery-pressure by the relief of increase of pressure in the pipe or vessel to which fluid is supplied, due to variations in the conditions of supply to and delivery from the same.

The improvements claimed are hereinafter fully set forth.

In the practice of my invention I construct, preferably, of cast metal a chest or casing, 1, formed in two sections, each having a dished or flattened bowl-shaped plate, 2, projecting from its outer surface, said plates being united by bolts 3 passing through circumferential flanges 4 on the plates, and forming between their adjacent faces a diaphragm-chamber, 5. One or more delivery-pipes, 17, are connected to lateral nozzles or flanged openings on the lower section of the casing 1, and a relief-pipe, 18, is connected to the upper section of the casing or to that portion of the diaphragm-chamber 5 which communicates therewith. A flexible diaphragm or partition, 6, which, in this instance, is composed of a circular plate of rubber, 7, and a similar plate of thin sheet metal, 8, is fitted at or near its periphery between the flanges 4 of the casing-plates 2, and is clamped tightly thereto by the connecting-bolts 3, the requisite degree of stiffness being imparted to the diaphragm by a metal plate, 9, the outer surface of which is not connected to the flanges 4. A metal plate may be fitted on each side of the rubber plate in order to protect the same from the destructive action of the fluid passing through the casing. A cage or casing, 10, is secured centrally in the diaphragm 6, said casing communicating at its top by passages 11 with the upper section of the main casing 1 and diaphragm-chamber, and forming at its lower end the seat or face of a relief-valve, 12, fixed upon a stem, 13, fitting freely in a central guide or socket, 14, in the casing 10. The valve-stem 13 projects upwardly beyond its socket 14, and is squared at its upper end, so that the valve may, by the removal of the bonnet 16, be readily ground on its seat, when desired. A helical spring, 15, bearing at one end against a head or bonnet, 16, which closes the upper end of the main casing 1, and at the other against the top of the delivery-valve casing 10, exerts a downward pressure upon the casing 10 and connected diaphragm 6. A balanced pressure-regulating valve, 19, composed of two disks united by an interposed stem, is fitted to move freely within and seat against upper and lower valve-faces in a regulating-valve case, 20, secured by bolts 21 to the lower section of the main casing 1, and projecting thereinto for such distance as to enable the regulating-valve 19 to be located concentrically with the relief-valve 12. Fluid at the higher or supply pressure is delivered to the regulating-valve case 20 by a supply-pipe, 22, connected thereto, which pipe may be fitted with a screen or diaphragm for intercepting any dirt or solid matter and preventing access of the same to the casing. The regulating and relief valves 19 and 12 are connected by a rod or link, 23, so as to move coincidently in the direction of their common axis, and the length of the connecting-rod 23 and tension of the spring 15 are such as to admit of a degree of opening of the regulating-valve proper to maintain the desired delivery-pressure.

To facilitate the closing of the regulating-valve 19, a comparatively light spring, 24, may be interposed between its lower face and a bonnet, 25, fitting in the bottom of the main casing 1, and serving as a guide for the regulating-valve stem.

In operation the downward pressure of the

spring 15, acting through the casing 11, relief-valve 12, and connecting-rod 23, upon the regulating-valve 19, in opposition to the upward pressure exerted upon the diaphragm 6 by the fluid supplied to the lower section of the main casing and diaphragm-chamber, through the supply-pipe 22 and regulating-valve case 20, maintains the regulating-valve 19 at such distance from its seat as to admit the proper quantity of fluid for the exertion of the required lower pressure in the delivery-pipes 17 and the vessels or compartments connected thereto, the vertical movements of the diaphragm 6, under variations of pressure, correspondingly varying the position of the regulating-valve relatively to its seats. Upon an accretion of pressure in the delivery-pipes and the communicating lower sections of the main casing and diaphragm-chamber beyond the normal and required degree the upward movement of the diaphragm induced thereby acts primarily to close the regulating-valve 19, and thereafter the continued upward movement of the diaphragm carries the casing 11 away from the face of the relief-valve, the latter being prevented from following the casing by its connection, through the rod 23, with the regulating-valve, and fluid will then escape around the periphery of the relief-valve, and through the openings 11 in its case into the relief-pipe 18 until the pressure is sufficiently reduced to enable the spring 15 to move the casing 10 into contact with the relief-valve, closing the escape of fluid and admitting of the subsequent opening of the regulating-valve to the proper degree for a continuance of supply.

The application of my improvements effects an economy in construction by combining in one main casing facilities for regulation of supply and relief of excess of delivery-pressure, and in operation is advantageous in reducing liability to leakage by a reduction of the number of pipe-connections employed and in the readiness of access to the several parts for renewal or repair, as desired.

I claim herein as my invention—

1. In a combined pressure regulating and relieving apparatus, the combination of a pressure-regulating valve actuated by movements of a flexible diaphragm under variations of pressure thereon, and a relief-valve connected to the regulating-valve and effecting the discharge of fluid through an opening in the diaphragm-casing by being held stationary relatively to the diaphragm upon the closing of the regulating-valve, substantially as set forth.

2. In a combined pressure regulating and relieving apparatus, the combination of a main casing, a flexible diaphragm extending across a diaphragm-chamber therein, a relief-valve seated in a casing secured to said diaphragm, the casing being provided with openings on the side thereof farthest from the relief-valve, a balanced pressure-regulating valve governing communication between a supply-pipe and the main casing, a rod or link connecting said regulating-valve with the relief-valve, a spring bearing against the relief-valve casing on the end farthest from the regulating-valve, and delivery and relief pipes connected to the main casing on opposite sides, respectively, of the diaphragm, substantially as set forth.

3. The combination of a main casing, a balanced pressure-regulating valve governing ports or openings in a supply-casing connected thereto, a rod connecting said regulating-valve with a relief-valve fitting against a valve-casing connected to a flexible diaphragm, and a spring bearing against the casing of said relief-valve, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:
J. SNOWDEN BELL,
R. H. WHITTLESEY.