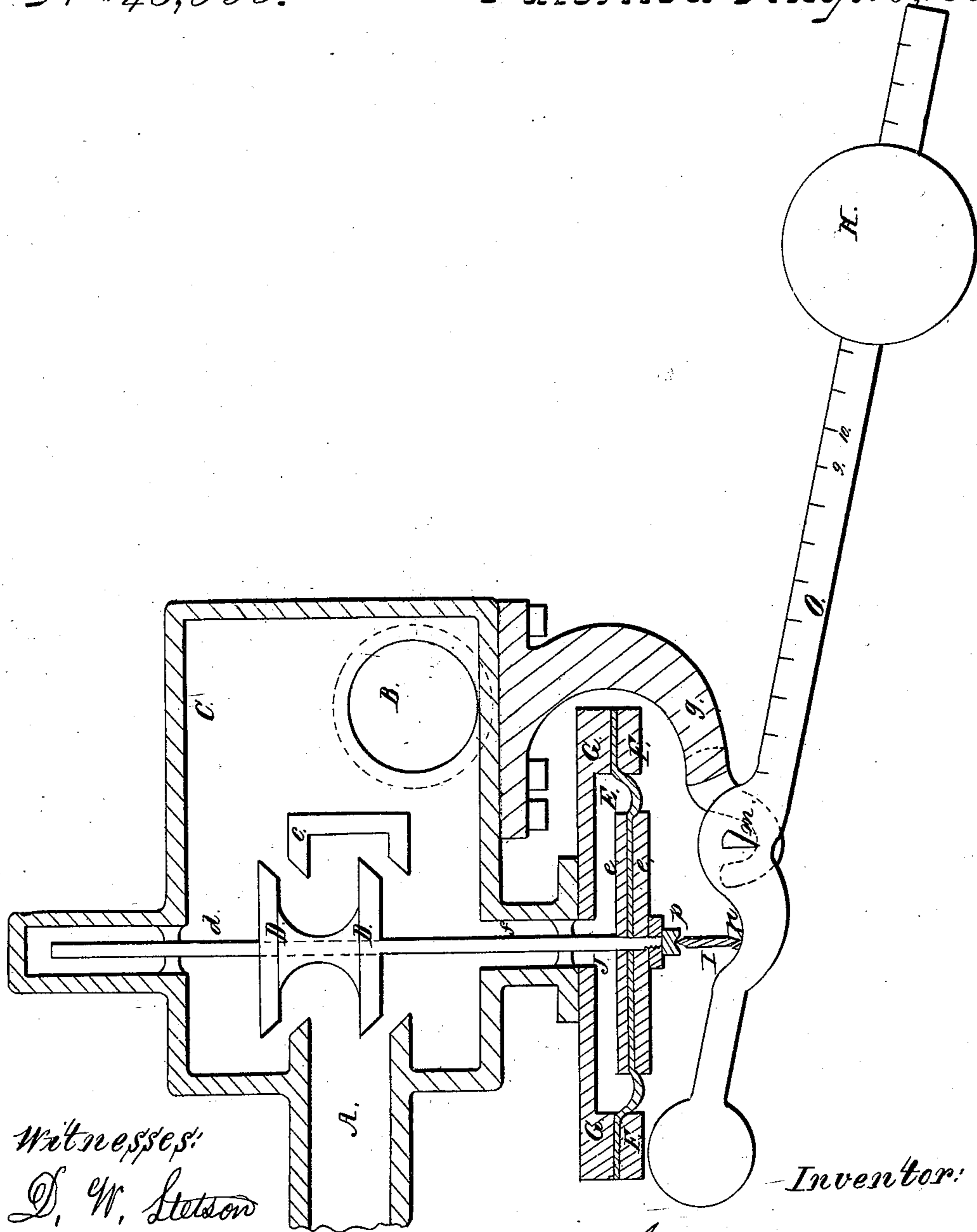


A. Campbell,
Governor.

N^o 43,833.

Patented Aug. 16, 1864.



Witnesses:
D. W. Stetson
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Inventor:
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UNITED STATES PATENT OFFICE.

AUGUSTINE CAMPBELL, OF BROOKLYN, NEW YORK.

IMPROVED SELF-REGULATING PRESSURE-VALVE.

Specification forming part of Letters Patent No. **43,833**, dated August 16, 1864; antedated September 22, 1862.

To all whom it may concern:

Be it known that I, AUGUSTINE CAMPBELL, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Self-Acting Valve for the Regulation of Pressure; and I do hereby declare that the following is a full and exact description thereof, which is prepared with a view to the obtaining of Letters Patent therefor.

My invention is applicable to the regulation of the pressure of gas, air, water, or other fluid, but is more especially designed to be used in regulating the pressure of steam under the conditions which obtain in paper-mills and the like situations where any considerable variation in the pressure in the drying-cylinders seriously retards or injures the work.

My invention is interposed between the boiler or other reservoir in which the pressure is in excess and the drying-cylinders or other vessel in which the pressure is desired to be uniform. Self-regulating valves, acting in a manner more or less analogous to mine, have been before used in such situations, but mine differs from all in its construction and in the effects which it is capable of producing.

The nature of my invention consists in a combination and arrangement of parts whereby I obtain a frictionless machine at small cost which is capable of maintaining the pressure in drying-cylinders or corresponding vessels very uniformly at any point desired, and also of indicating precisely when that pressure is reached or exceeded, so as to avoid the necessity for any steam-gage or similar instrument on any part of the apparatus to indicate to the fireman when his steam is sufficient to fulfill the conditions required.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawing.

A is the pipe by which the steam flows from the boiler, and B is the pipe supposed to stand at right angles to the first, through which it flows to the drying-cylinders. C is a suitable case or valve-box containing within it on one side the interior case, *e*. The latter is provided with equal conical valve-seats adapted to receive the two like parts of a balanced puppet-valve, D, which is mounted on a stem, *d*.

A pair of suitable disks, *e e*, are fixed on the base of the stem *d*, and between these disks is firmly held the central portion of a flexible diaphragm, E. The periphery of this diaphragm is held by a casting, F, which presses it tightly against a suitable ring, G, which projects downward a little distance from the bottom of the valve-box C, as represented. The casting F, with the open connecting-neck *f*, the disks *e*, and the diaphragm E, together inclose a space or chamber, J, which, by reason of its being below the chest C, may contain water to protect the disk E from the direct contact of the steam. On an arm, *g*, extending down from the valve-box C, is mounted the graduated lever O, loaded with an adjustable weight, H, as represented. The short arm of O presses upward through the intervention of a short link, I, against the base of the valve-stem *d*. The lever O may be loaded on its short arm so as to allow the parts to be perfectly balanced, independently of any pressure in B, if desired, and the bearings or centers *m*, *n*, and *p* may all be knife-edges, so as to turn without friction, as represented. The lever O is graduated so that when the weight H is moved to any position other than that at which the weight of the parts perfectly balance each other the degree of pressure per square inch of surface which obtains in B will be indicated by the position of the weight H on said lever.

It results from my combination and arrangement of parts that when the weight H is placed at any point—say the point marked “10” on the graduations on O—the pressure on the top of the diaphragm E, and consequently on the entire interior of C and B, and the vessels connected therewith, will be exactly ten pounds per square inch above atmosphere. If it rises at any moment above that point, the surplus pressure upon E will move the lever O and contract the spaces between the double valve D and its seats, while with a pressure which is too low a reverse movement will be produced, and the spaces enlarged to allow the steam to pass from A into C more freely.

An obvious proportioning of the weight of the poise H to that of the valve-stem *d* and its connections, and to the weight of the water in J, will allow of the use of my valve to regu-

late pressure below that of the atmosphere, when such may be desired.

I employ steadiments at or near the top and bottom of my valve stem *d* which keep it in position without sensible friction, in the manner shown in the drawing, and my apparatus is tight, strong, durable, and almost or absolutely frictionless, being in this respect widely different from any device for analogous purposes in which packing for a piston or piston-rod is necessary.

It will be observed, as already remarked, that the position of the diaphragm *E*, and of the chamber or space *J* between it and *C*, is below the pipes *A* and *B*. As a consequence, when steam is the fluid regulated, the space next the diaphragm fills with water produced by its condensation, which soon cools and exerts no evil effect on the vulcanized rubber or like material of *E*, however high may be the pressure and temperature of the steam. When coal-gas or any other fluid is regulated, which would affect the rubber diaphragm injuriously, water may be poured in through a suitable opening (not represented) to protect the gum.

Among the advantages which my self-regulating valve possesses over others are the following: First, the inverted water-chamber *J* performs the functions of protecting the diaphragm from the direct action of gas or steam, and also acts as a counterbalance for the weight of the lever; second, the connection of the inverted water-chamber directly and freely with the interior of the valve-chest through the open neck *f*, which loosely incloses the valve-stem *d* without requiring any stuffing-box, relieves the working parts from all friction; third, the use of a scale-beam balance,

with sliding or adjusting weight, enables the apparatus to be perfectly balanced before putting it in operation, and when in use to be adjusted to the desired pressure, and will indicate to the eye when that pressure is reached or exceeded.

Having now fully described my self regulating valve, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A pressure-regulator composed of a flexible diaphragm and of the following elements, combined and arranged on the opposite sides thereof as follows, to wit: on one side of said diaphragm a balanced valve connected thereto without packing through a free communication between the proper surfaces of the valve and that side of the diaphragm, and on the other side of said diaphragm a loaded lever performing the double functions, first, of resisting the pressure upon the diaphragm with the force desired, and, second, of indicating to the attendant when the pressure has reached and, approximately, how much it exceeds that required.

2. So arranging the parts of the above-described apparatus that water will accumulate or may be introduced to protect the diaphragm from injury by the contact of the steam or other fluid, substantially in the manner herein set forth.

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

AUGUSTINE CAMPBELL.

Witnesses:

THOMAS D. STETSON,
D. W. STETSON.