S. A. HAND.

Differential Pressure Regulator.

No. 201,243. Patented March 12, 1878.

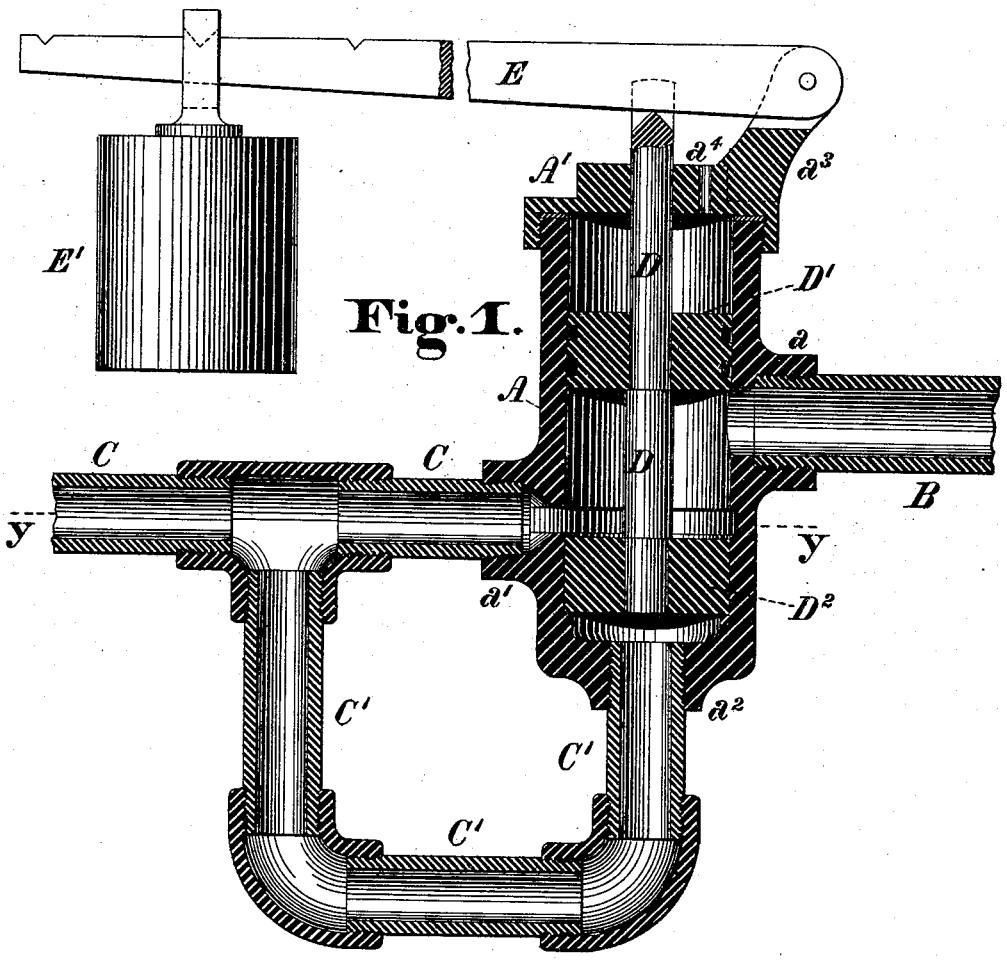
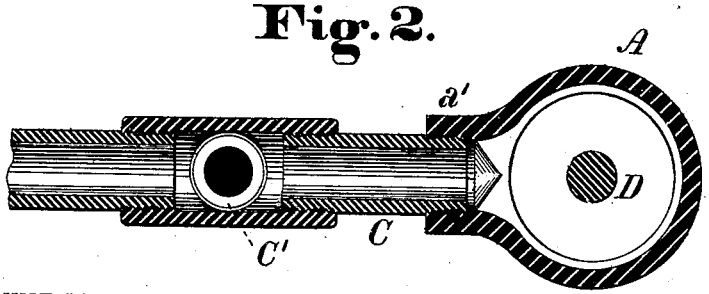


Fig. 1.

Fig. 2.



WITNESSES:

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SAMUEL A. HAND, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN DIFFERENTIAL-PRESSURE REGULATORS.

Specification forming part of Letters Patent No. **201,243**, dated March 12, 1878; application filed January 30, 1878.

To all whom it may concern:

Be it known that I, SAMUEL ASHTON HAND, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Differential-Pressure Regulators, of which the following is a specification:

The object of my invention is to provide simple and efficient means for affording a supply of steam or other fluid at a pressure lower than that which is exerted in the generator or source of supply, in order that the latter may be caused to furnish, where required, steam or other fluid having a specified pressure which is different from that of the fluid in the source of supply without having a fixed ratio thereto, and is not, therefore, subject to variation by changes of initial pressure.

To this end my improvements consist in the combination of a cylindrical regulating-chamber, two balance-pistons secured upon a stem and having the capacity of longitudinal movement therein, a supply and a delivery pipe communicating with the regulating-chamber between the inner faces of the balance-pistons, a weighted lever or spring by which pressure is applied in one direction to the balance-pistons, and a pipe or channel-way by which the pressure of the fluid in the delivery-pipe is applied to the outer face of one of the balance-pistons in opposite direction to the pressure of the weighted lever, as hereinafter more fully set forth.

In various manufacturing processes steam of comparatively low pressure is required for certain operations and uses, and, as a general rule, the normal duty of the generators employed is such as to necessitate the maintenance of considerably higher pressure therein. Instances are met with in paper-mills, dye-houses, bleacheries, &c., and most frequently in the heating of buildings or vessels by steam; and to avoid the use of a special boiler or boilers to furnish steam of the lower pressure or pressures required, a proper regulating device is necessary.

My improvements furnish, in a simple and compact form, an apparatus which can be manufactured and sold at a reasonable price, and which is accurate and reliable in its operation, without liability to derangement of its parts.

In the accompanying drawings, Figure 1 is a vertical central section of a pressure-regulator embodying my improvements, and Fig. 2 a transverse section of the same at the line *y y* of Fig. 1.

To carry out my invention, I provide a cylindrical regulating-chamber, A, having side nozzles *a* and a^1, for the attachment, respectively, of the supply-pipe B, through which steam from the generator is admitted to the regulator, and the delivery-pipe C, through which it is led to the apparatus in which it is to be used. A nozzle, a^2, is formed upon the lower closed end of the chamber, for the attachment of a back-pressure pipe, presently to be described, and the upper end of the chamber is closed by a cap, A′. The chamber A is bored out truly, and two balance-pistons, D^1 D^2, secured upon a central stem, D, are fitted neatly therein. The stem D passes freely through the cap A′ of the chamber, and a lever, E, pivoted at one end to a lug, a^3, on the cap, and carrying a weight, E′, which may be adjusted to different points upon it, bears on the upper end of the stem. An opening, a^4, is formed in the cap, to admit of the escape of air, or of any steam that may, by leakage, pass by the upper piston D^1. An annular recess or belt may be formed around the chamber A, communicating with the opening of the delivery-nozzle a^1, for the purpose of increasing the available area of discharge relatively to the movement of the lower piston D^2 in uncovering said opening; and the piston D^2, when at the lower extremity of its traverse, should rest upon a shoulder or on projections on the interior of the chamber, as shown, instead of directly on the bottom thereof, so as to have nearly the full area of its outer face exposed to the pressure of the steam in a back-pressure or counterbalance pipe, C′, by which the lower nozzle of the chamber A and the delivery-pipe C are made to communicate. The counterbalance-pipe may, if preferred, be a passage or channel-way formed upon the chamber A, instead of being, as shown, attached thereto; and it will be obvious that the pressure of a direct-acting weight or of a spring may be sub-

stituted for the weighted lever without variation of principle.

In the operation of the regulator, the weight E′ being adjusted in such position upon the lever E as that the downwardly-acting pressure upon the balance-pistons D^1 D^2 shall be equal per square inch to that which it is desired to maintain in the delivery-pipe C and the apparatus to which it is connected, the steam from the generator, which is admitted between the pistons through the supply-pipe B, will pass into the delivery-pipe C, and, acting through the counterbalance-pipe C′ upwardly upon the outer face of the lower piston D^2, will exert a pressure in the delivery-pipe in equilibrium with the required delivery-pressure regulated by the weight E′. Any increase or decrease of initial pressure will elevate or depress the balance-pistons, so as respectively to decrease or increase the area of opening through the delivery-nozzle in corresponding ratio, and the required degree of delivery-pressure will, consequently, be maintained, irrespective of variations of that in the generator.

I claim as my invention and desire to secure by Letters Patent—

The combination, in a pressure-regulator, of a cylindrical regulating-chamber, two balance-pistons fitted to and movable coincidently therein, a supply and a delivery pipe communicating with the regulating-chamber between the balance-pistons, a pipe or channel connecting the delivery-pipe with the regulating-chamber at one of the ends thereof, and a weight or spring by which pressure is applied to the balance-pistons in reverse direction to that exerted by the fluid in the connecting pipe or channel, constructed and arranged as shown, and for the purpose set forth.

S. ASHTON HAND.

Witnesses:

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