W. D. DICKEY.

Pressure-Regulator.

No. 203,124. Patented April 30, 1878.

Fig. 1.

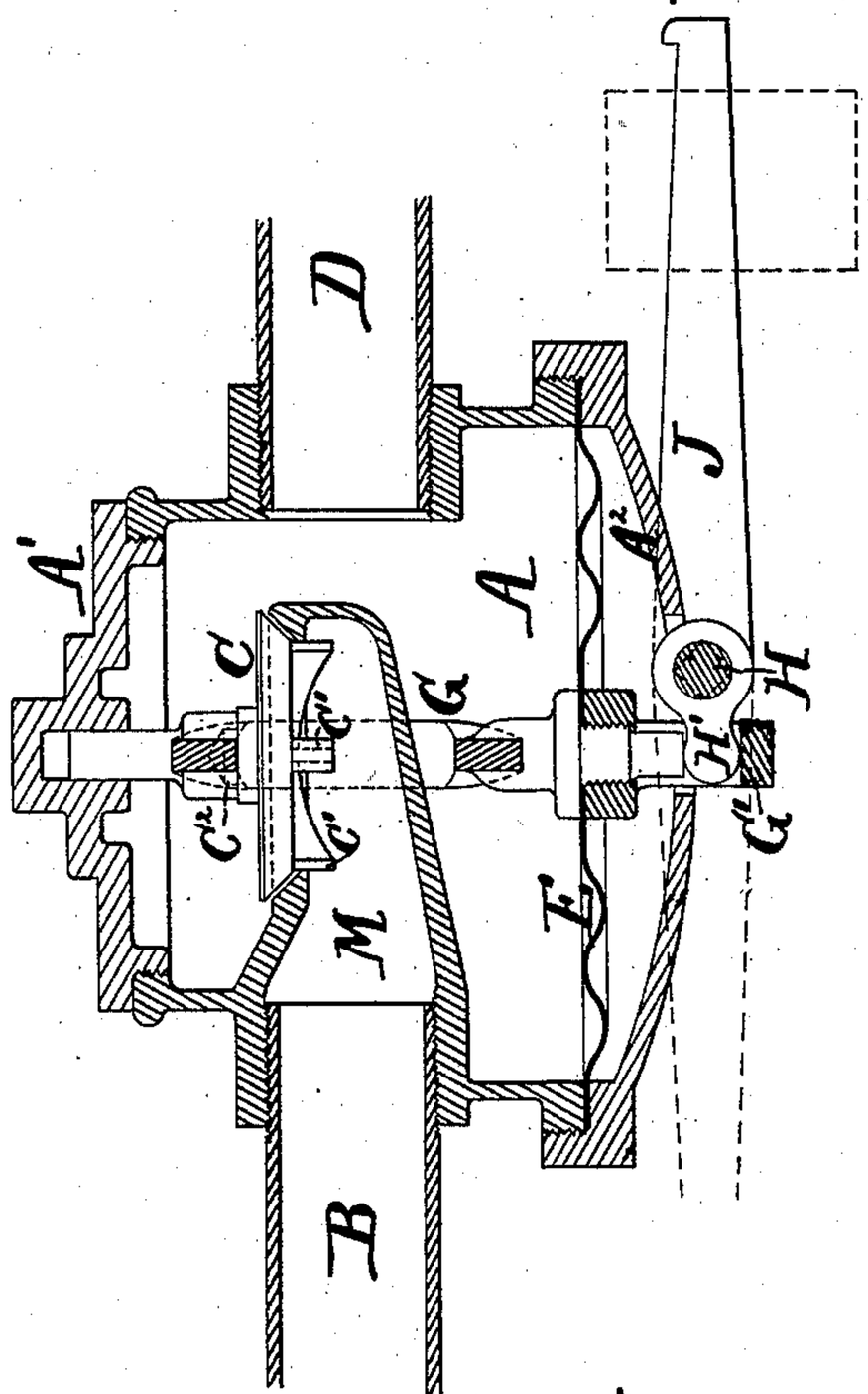

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM D. DICKEY, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND HANDREN & RIPLEY, OF SAME PLACE.

IMPROVEMENT IN PRESSURE-REGULATORS.

Specification forming part of Letters Patent No. **203,124**, dated April 30, 1878; application filed January 11, 1878.

To all whom it may concern:

Be it known that I, WILLIAM D. DICKEY, of New York city, in the State of New York, have invented certain new and useful Improvements in Pressure-Regulators, of which the following is a specification:

My invention is intended to apply more particularly for the regulation of pressure in steam-heating apparatus where the pressure in the boiler is liable to exceed that for which the radiators or other parts of the heating apparatus are adapted.

I propose, for example, to heat trains on railroads by steam, and to receive steam from the locomotive, either in the form of exhaust-steam, with a merely nominal pressure above the atmosphere, or in the form of live steam at one hundred or more pounds per square inch above the atmosphere.

My regulating device will prevent the pressure, under the latter condition, ever exceeding ten pounds, or such other moderate pressure as it may be set for.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a central vertical section, and Fig. 2 is a corresponding section at right angles thereto.

The figures show the valve slightly opened, the condition in which it will ordinarily stand when there is a high pressure to be reduced.

Similar letters of reference indicate like parts in both the figures.

A is a casing of brass or other suitable material having a removable top, A^1, and bottom A^2. D is a pipe, screwed or otherwise strongly and tightly connected thereto, which leads to the radiators, or to such other apparatus as requires steam at the reduced pressure. The pressure within the main body of the casing A must be the reduced pressure desired.

E is a diaphragm of sheet iron, steel, or other suitable metal, corrugated in rings, and adapted to yield downward in obedience to any excess of pressure within the casing A.

G is a yoke, strongly engaging with the diaphragm E, and guided by a suitable steadiment at the top. This yoke contributes its weight to press downward in the center of the diaphragm E, except as the weight may be relieved or increased by acting on a rocking shaft, H, which is supported in suitable bearings in the bottom plate A^2, and which is adapted to act by an arm, H′, in a cavity in the lower end G′ of the yoke G.

J is a removable lever, which may be shipped at will on the squared end of the shaft H, and will contribute its weight, as also that of an added weight, (not represented,) if desired, to raise the yoke if it is in the position represented, or to depress the yoke if it is simply unshipped and attached anew, so as to extend in the opposite direction.

M is a strong casing extending into the casing A from one side, as shown. The steam, the pressure of which is liable to be in excess, is introduced into this casing through a strongly and tightly attached pipe, B.

The casing M reaches into the center of the casing A, and in its top is fitted a puppet-valve, C, which is adapted to rise and sink, being guided by wings C^1 on its lower face. Its upper face is formed with a stout boss, C^2, which is loosely inclosed in the recess formed in the yoke G.

Suppose the fluid to be regulated by steam from the boiler at a pressure of one hundred pounds above atmosphere; the interior of the casing M and bottom of the valve C are subject to such pressure. The force tends to lift the valve C, which presses it strongly up against the yoke G, tending to lift the yoke and to spring the diaphragm E upward. This effect will take place, and the valve will lift and steam will flow through, filling the interior of the case A, and the pipe D and its connections, until it induces an appreciable pressure downward on the diaphragm E. When this condition is attained, the pressure on the diaphragm E forcibly draws down the yoke G, tending to close the valve C and prevent the reception of any more steam. This will ensue when the pressure in the casing A in the least degree exceeds that desired.

Under ordinary conditions the condensation of the steam in the radiators (not represented)

will require a constant accession of steam from the pipe B, which will flow past the valve C, and maintain a just sufficient pressure in the pipe D and its connections. The moment the pressure is diminished on the diaphragm E, it fails to hold down the yoke G with sufficient force to restrain the valve C, which rises a little, and the increased flow of steam from the pipe B soon raises the pressure, and induces a sufficient downward pressure of the diaphragm E to bring the parts into equilibrium.

If at any movement the pressure in the pipe D and its connections rises above the point desired, the increased pressure downward on the diaphragm E pulls the valve C closely down to its seat, and further restrains the influx of steam.

The tendency is to induce a pressure in the pipe D and connected radiators, (not represented,) which is always in a given ratio less than that in the pipe B and its connected boiler. (Not represented.) Suppose, for example, the area of the diaphragm E to be exactly four times that of the valve C; then the pressure of the steam in the boiler being one hundred above atmosphere, the pressure on the diaphragm E, and consequently in the radiators, will be twenty-five pounds above atmosphere. These figures would cause an exact equilibrium, except for the weight of the parts and for the force which may be applied through the lever J, which we will now consider.

The weight of the valve C and of the yoke G tends to close the valve with a force which will require a certain definite pressure—say, two pounds to the square inch—in the pipe B to overcome. By consequence, the pressure in the radiators will be two pounds per square inch less than one-quarter that in the boiler. This condition will be always attained except for the force applied through the lever J. This lever, when applied in the position represented, tends by its gravity and that of any added weight to lift the yoke G. As shown, it will nearly balance the yoke G, thus reducing the supposed disturbing influence of two pounds to one pound, or less, and allowing the pressure in the radiators to always closely approximate to one-quarter that in the boiler. Now, by applying a weight, (indicated in dotted lines at J,) and moving it outward or inward on the lever, a point can be found where it will exactly balance the weight of the yoke, and allow the steam in the radiators to be in theory, and very closely to approximate in practice, the desired fraction of the boiler-pressure.

If the weight be increased or moved outward, the pressure in the radiators will be always a certain fixed amount above the given ratio to the boiler-pressure.

If the lever J be taken off from the squared end of the shaft H and turned around, so as to extend in the opposite direction, as partly indicated in dotted lines, its gravity and that of any added weight will be applied to hold down the diaphragm E and its connections, and to diminish by a given amount—as, for example, five pounds—the pressure in the radiators below the given ratio to that of the boiler.

I have so far described the valve C as rigidly connected to the yoke G. This may be preferable in theory. By its means I can insure that the valve C will be lifted with the yoke by the action of the lever J, and thus the flow of steam to the radiators, when at a very low pressure, can be promoted. That plan is preferable when it is desired to sometimes use exhaust-steam. Such weak steam coming through the pipe B might be seriously obstructed by the weight of the valve C alone.

A strong union of the valve with the yoke holds up the valve half an inch, more or less, and allows the steam free access to the radiators under those conditions.

When the exhaust-steam is turned off and boiler-pressure put on, as would be frequently required in making a long stop in cold weather, the moment the strong steam had induced a sufficient downward pressure on the diaphragm the valve would close.

Where the steam will always be sufficiently strong a loose connection should be made between the valve C and the yoke G.

I have shown this as being effected by a pin or boss on the valve engaging in a recess of sufficiently smaller diameter in the yoke, the bearing being on the collar or shoulder of the valve around the pin.

Various modifications may be made in the proportions.

The apparatus may be worked the other side up, so that the gravity of the valves will contribute, with the force of the steam, to tend to open the valves.

I can make a double seat, one in the top and one in the bottom of the case M, and use what is designated as a "balance-puppet," or, more correctly, a "partially-balanced puppet," instead of the single valve C. In such case the valve will be pressed open only by the pressure on the difference of the areas of the two disks or parts, as will be familiar to those accustomed to steamboat-engineering.

My invention may be used to reduce the pressure of steam for other purposes than for heating, or to reduce the pressure of other fluids than steam—as, for example, in the plumbing in the lower part of high buildings which are supplied from a tank on the top, where the excess of pressure is liable to burst the pipes, particularly when a cock is, through inexperience or other cause, shut too rapidly.

It will be understood that any of the ordinary or approved precautions may be taken to prevent the cracking of the diaphragm along the lines where it joins to the solid metal. I can use other materials than metal for the diaphragms.

I claim as my invention—

1. The valve C, provided with the wings C^1

and boss C^2, in combination with the yoke G, casings M and A, diaphragm E, and pipes B D, as herein specified.

2. The rocker-shaft H, arm H′, and lever J, in combination with the extension G′ of the yoke G, adapted to serve, relatively to the diaphragm E, valve C, and pipes B D and their connected casings, as herein specified.

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

WM. D. DICKEY.

Witnesses:
THOMAS D. STETSON,
H. A. JOHNSTONE.