(No Model.)

J. J. ROYLE.

REDUCING VALVE.

No. 363,422. Patented May 24, 1887.

Fig. 1.

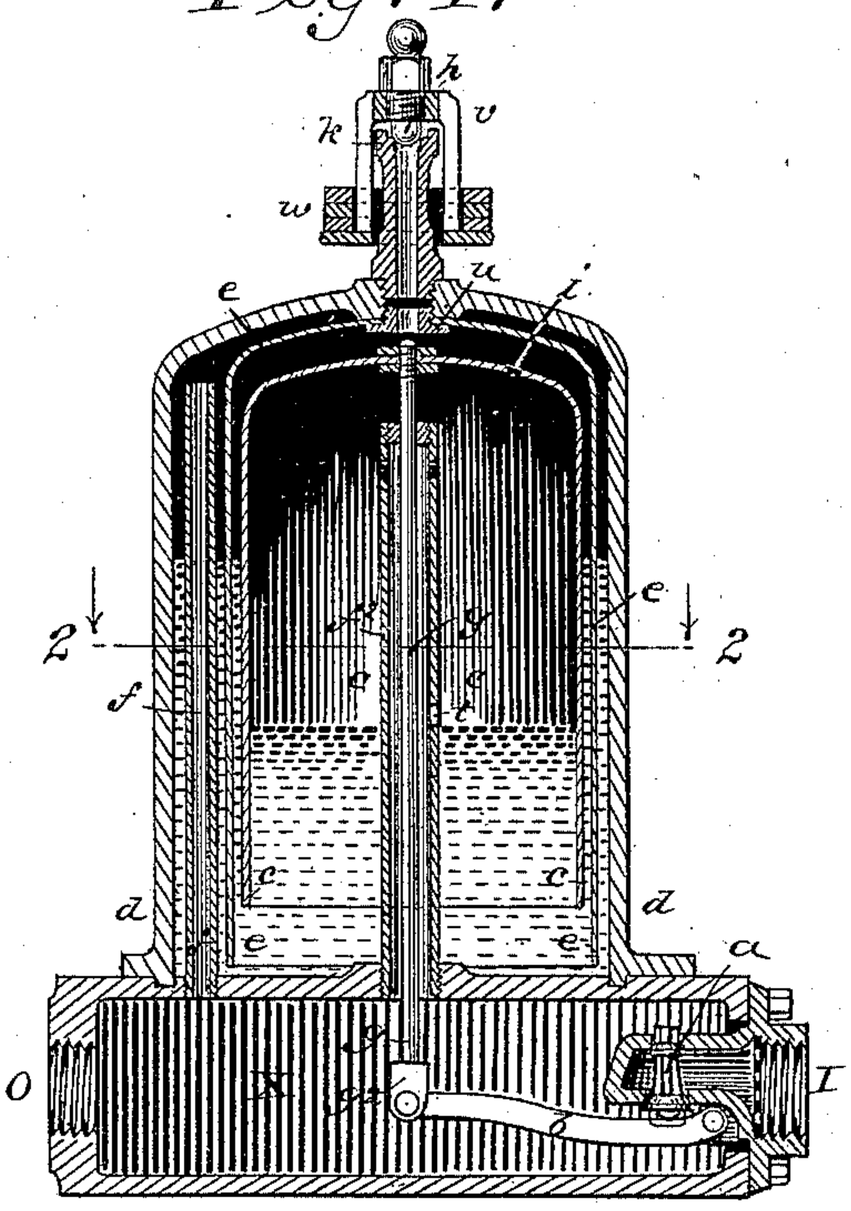


Fig. 2.

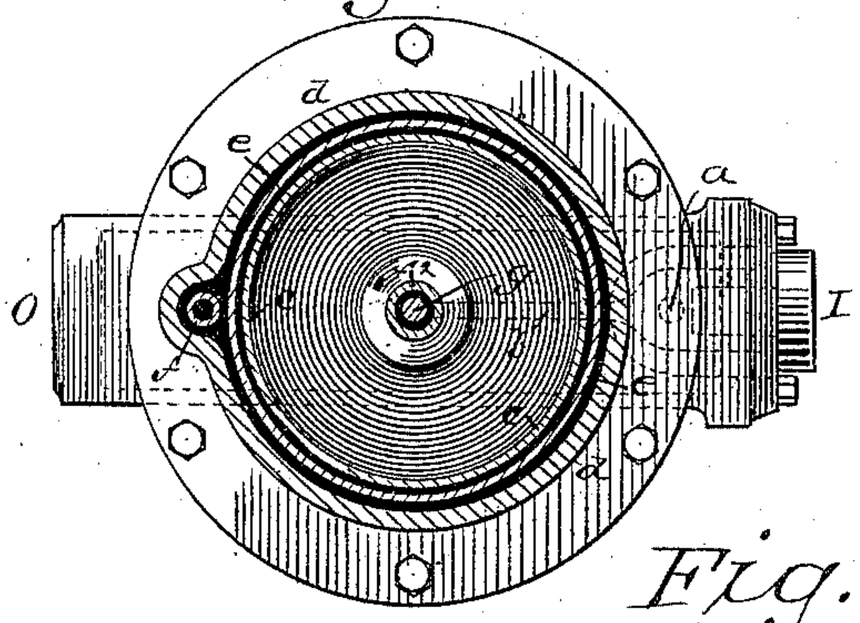


Fig. 3.

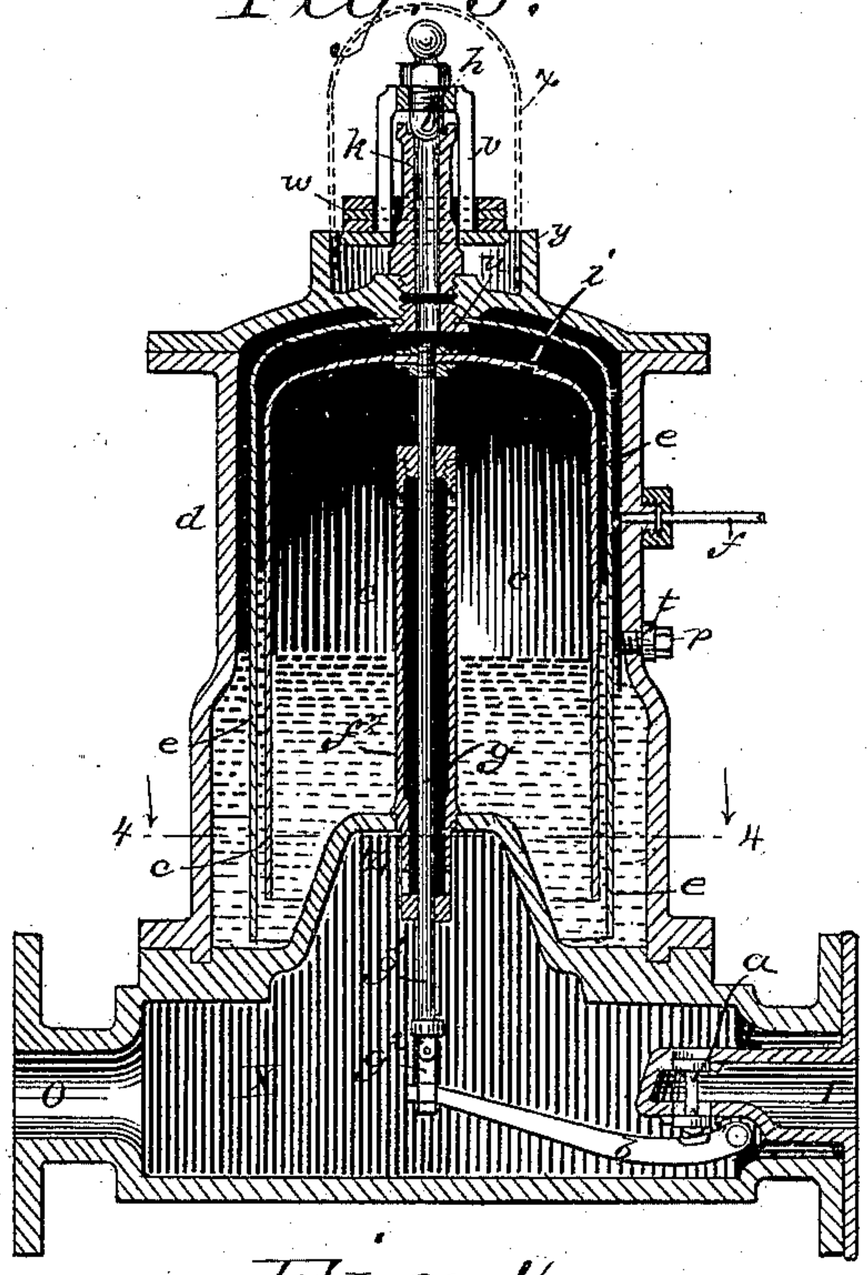


Fig. 4.

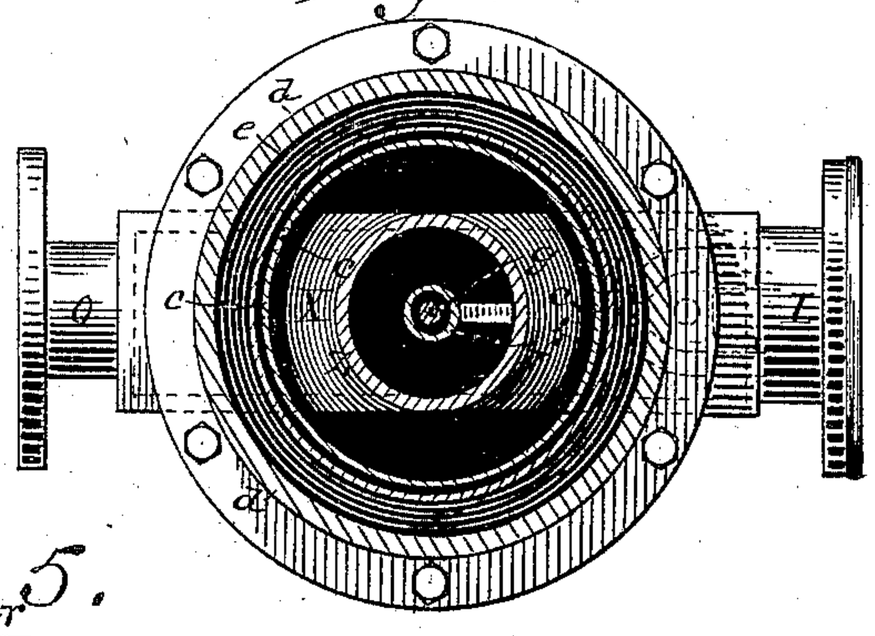
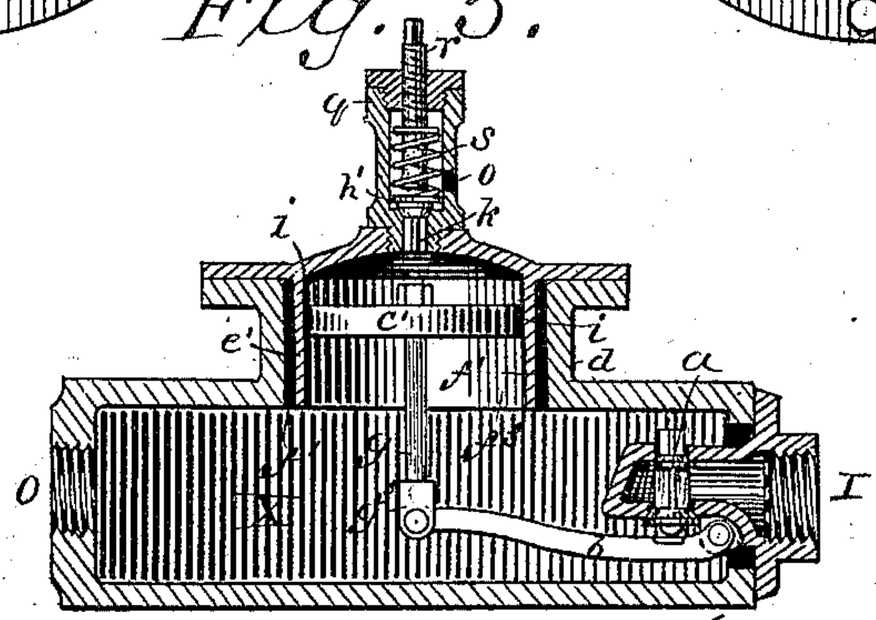


Fig. 5.



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN JAMES ROYLE, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 363,422, dated May 24, 1887.

Application filed July 30, 1886. Serial No. 209,560. (No model.) Patented in England December 30, 1882, No. 6,231; in Germany May 23, 1883, No. 24,839; in France June 27, 1883, No. 156,269, and in Belgium June 28, 1883, No. 61,861.

To all whom it may concern:

Be it known that I, JOHN JAMES ROYLE, a subject of the Queen of Great Britain and Ireland, and a resident of Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Reducing-Valves, (for which I have obtained Letters Patent in Great Britain and Ireland, No. 6,231, dated December 30, 1882; in France, No. 156,269, dated June 27, 1883; in Belgium, No. 61,861, dated June 28, 1883, and in Germany, No. 24,839, dated May 23, 1883,) of which the following is a specification.

The present invention relates to the construction of "reducing-valves" for regulating the flow of fluids or liquids at reduced pressures.

The special objects of this invention are to render such apparatus extremely sensitive in its action, not liable to "stick" in its working parts, and free from springs and mercury, which have been found to have serious defects in practice; also, and more particularly, to fully utilize the highly sensitive and reliable character of a "dead-weight" valve for operating mechanism which shall effectively control the regulating-valve, or "main valve," as it is hereinafter termed, so as to obtain the reduced pressure desired.

Said invention consists in certain peculiar combinations of parts, hereinafter set forth and claimed, whereby said objects are accomplished.

A sheet of drawings accompanies this specification as part thereof.

Figure 1 of the drawings is a vertical section of a reducing-valve, illustrating the main features of this invention; and Fig. 2 is a plan view thereof, partly in section on the line 2 2, Fig. 1. Fig. 3 is a vertical section of another apparatus constructed according to the same invention and illustrating certain preferred and optional modifications; and Fig. 4 is a plan view of this apparatus, partly in section on the line 4 4, Fig. 3. Fig. 5 represents a vertical section of a reducing-valve for marine engines constructed according to the same invention in part.

Like letters of reference indicate corresponding parts in the several figures.

My reducing-valves are especially designed for regulating the pressure of steam, and will be described as so applied. In each form thereof a main valve, *a*, which is preferably a balanced or nearly balanced puppet-valve, as shown, is actuated through the medium of a lever, *b*, within the reduced-pressure chamber X in the base of the apparatus by a rising and falling bell-shaped float, *c*, or a piston, *c'*, as a substitute for the latter, within a steam-jacketed chamber. The latter is formed within a suitable casing, *d*, by a lining, *e* or *e'*, steam being admitted into the space between the same by means of a pipe, *f*, or an equivalent connection, *f'*. Steam is admitted within or against said float or piston from the reduced-pressure chamber by a tube, f^2, or an opening, f^3, and the float or piston is connected by a depending rod, *g*, and a shackle, g^2, with said lever *b* of the main valve *a*, and said steam passes to an escape-valve, *h* or *h'*, through passage-ways *i k*. The "leakage" through said passage-way *i* permits the float or piston to gravitate so as to open the valve *a* through said connections *g* g^2 *b*, and the escape-valve *h* or *h'* is weighted so as to remain closed until the required pressure is exceeded. Steam entering now at I flows past the valve *a* through the reduced-pressure chamber X and outlet O, and at the same time, through the medium of said tube or opening f^2 or f^3 and passage-ways *i k*, fills the space within or below the float or piston *c* or *c'*, and also the space between the latter and the escape-valve *h* or *h'*. At the same time the jacketing-space between the casing *d* and lining *e* or *e'* is filled through said pipe or connection *f* or *f'*, and the steam within said lining is thus protected against excessive condensation. When the steam within said outlet O, chamber X, &c., exceeds the proper reduced pressure, it begins to escape through said valve *h* or *h'* and larger passage-way *k*. As soon as this escape exceeds the leakage through the passage-way *i*, the float or piston begins to rise and close the main valve *a*. The upward movement of the float or piston continues until the supply of high-pressure steam by the main valve *a* is so far diminished that the escape of steam at *h* or *h'* just equals the leakage at *i*, when the float or piston remains stationary. From this it will be obvious that the slightest variation in the reduced pressure affecting the escape-valve *h* or *h'* will cause the float or piston *c* or *c'* to

move either up or down, and so alter the opening of the main valve *a* and adjust it to the altered condition of the reduced-pressure steam. In the preferred construction represented by Figs. 1 to 4 said valve *h* is a "dead-weight escape-valve," provided with annular weights *w*, concentric therewith. These are accommodated by a saddle, *v*, with which the valve proper is provided, so as to locate them below its plane and balance them relatively to the valve-face, which is, moreover, made hemispherical, so as to preclude binding. The float *c* in each of these apparatus, having a simple and frictionless water seal, serves, furthermore, to insure sensitiveness; and said lining *e* in each of these apparatus is bell-shaped and held in place within the neck that leads to the escape-valve by a screw-bushing, *u*, as clearly seen in Figs. 1 and 3, so as to effectively extend the steam-jacket above the float, while it may be conveniently made in this style of sheet-copper like the float. An overflow-hole, *t*, in each apparatus provides for the discharge of surplus water from the float-chamber. In the arrangement represented by Figs. 1 and 2 said hole *t* is formed in the steam-tube f^2 and discharges into the chamber X. In the arrangement represented by Figs. 3 and 4 it is formed in the outer casing, *d*, and provided with a screw-plug, *p*. In said arrangement represented by Figs. 3 and 4 a dome, *z*, extends the chamber X upward within the water-space of the apparatus, so as to afford a higher support for the steam-tube *f* and as an additional aid against condensation; and the casing *d* is provided with a crown-flange, *y*, which provides for inclosing the escape-valve within a dome-cover, *x*, as shown in dotted lines in Fig. 3.

For marine purposes, where oscillation would prevent the use of an inverted or bell float working in water, I substitute the arrangement shown in Fig. 5, comprising a piston or disk, *c'*, loosely fitted within the steam-jacket lining *e'*, so as to form said passage-way *i* around it, to permit the steam to escape past the disk in sufficient quantity to insure the requisite falling action. In place of the dead-weight escape-valve, I employ in this arrangement a spring safety-valve, *h'*, with its spring *s* adjusted by a set-screw, *r*, and its casing *q* provided with a suitable outlet, *o*. It will thus be seen that the loosely-fitting disk *c'* is in action the mechanical equivalent of the inverted float *c*. I have found in practice that the same may be made to fit very loosely in the cylinder if of moderate diameter, so as to avoid all possibility of "sticking."

Although I prefer to employ an intermediate lever, *b*, between the disk *c* and the valve *a*, I would here observe that this is not essential, as by having the valve in equilibrium the disk might be situated immediately over the valve, and, instead of a disk, a diaphragm might be substituted by having the passage-way *i* formed between one side of such diaphragm and the other, to impart the necessary falling action, like the hole *i* in Figs. 1 and 3.

It will be observed that the inlet and outlet connections shown in Figs. 1 and 2 and in Fig. 5 are adapted for wrought-iron pipes, and those shown in Figs. 3 and 4 are adapted for cast-iron pipes. Each may obviously be used on either form of the apparatus, and other like mechanical details may be varied by makers without departing from the object, means, and mode of operation hereinbefore set forth.

Having thus described my said improvement in reducing-valves, I claim as my invention and desire to patent under this specification—

1. In a reducing-valve for steam apparatus, a steam-jacket, in combination with the chamber in which its inlet-controlling bell-float piston or diaphragm works, substantially as herein specified.

2. The combination, with the outer casing of a reducing-valve, of a depending lining surrounding its bell-float piston or diaphragm and a connection admitting steam to the space surrounding said lining, substantially as herein specified.

3. The combination, in a reducing-valve, of an escape-valve, a bell-float piston or diaphragm working in a steam-jacketed chamber and provided with a contracted passage-way for escape-steam, and an inlet-controlling main valve connected with said float piston or diaphragm, substantially as herein specified.

4. The combination, in a reducing-valve, of a dead-weight escape-valve, a bell-float working in a steam-jacketed water and steam chamber and provided with a contracted passage-way for escape-steam, and a balanced main valve controlling the high-pressure inlet and connected with said float and main valve, substantially as herein specified.

5. The combination, in a reducing-valve, of a reduced-pressure chamber in the base of the apparatus, a water and steam chamber above the same, and a dome extending said reduced-pressure chamber upward within the water-space, substantially as herein specified.

6. The combination, in a reducing-valve, of an escape-valve at the top of the apparatus, a water and steam chamber immediately beneath the same, a bell-shaped lining depending from a bushing within the neck which leads to the escape-valve, a bell-float working concentrically within said lining and provided with a contracted passage-way for escape-steam, and connections admitting steam within the steam-jacket and float, respectively, substantially as herein specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN JAMES ROYLE.

Witnesses:
JOHN G. WILSON,
JOHN SLATER.