

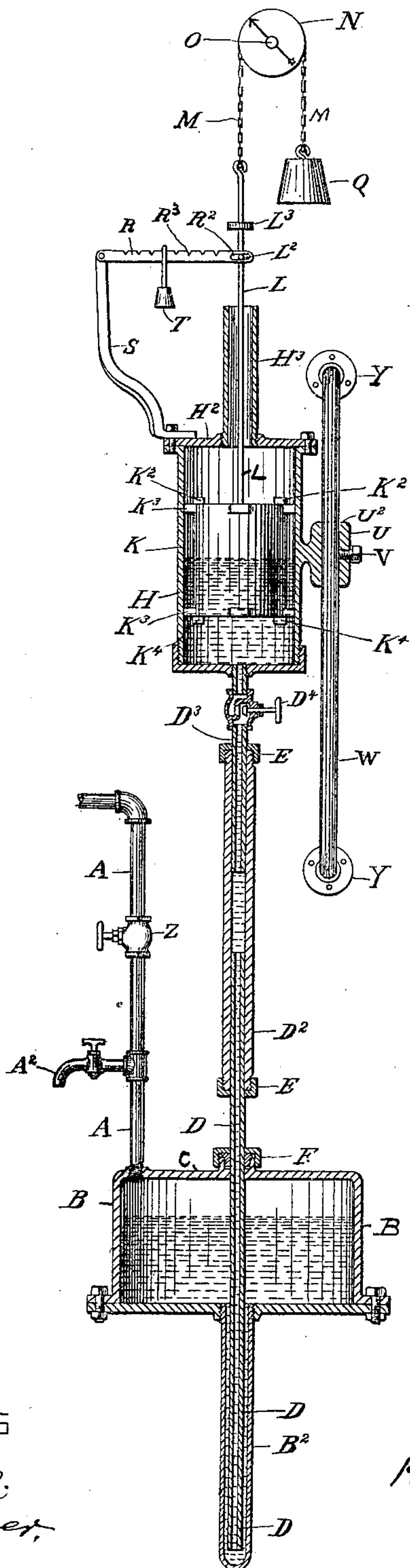
(No Model.)

R. J. FLINN.

MERCURIAL REGULATOR FOR DAMPERS, &c.

No. 354,120.

Patented Dec. 14, 1886.



WITNESSES

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RICHARD J. FLINN, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY DIRECT
AND MESNE ASSIGNMENTS, TO THE FLINN MERCURIAL REGULATOR
COMPANY, OF PORTLAND, MAINE.

MERCURIAL REGULATOR FOR DAMPERS, &c.

SPECIFICATION forming part of Letters Patent No. 354,120, dated December 14, 1886.

Application filed April 17, 1886. Serial No. 199,245. (No model.)

To all whom it may concern:

Be it known that I, RICHARD J. FLINN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and
5 useful Improvements in Mercurial Regulators for Dampers, Valves, &c., of which the following is a full, clear, and exact description.

For the maintenance or regulation at a stated or given pressure of steam in a steam-boiler
10 by an automatic regulation of the draft of the furnace of the boiler through the closing and opening of the damper of the furnace from the action of the steam-pressure in the boiler, as well known, apparatuses of many kinds have
15 been heretofore devised, and among them one using a column of mercury acted upon by the steam-pressure in the boiler, and a float to float in the mercury, and to freely move up and down with its rise and fall as the same occurs
20 from the rise and fall of the pressure of the steam in the boiler in communication therewith, and which is suitably connected to the damper to be operated from its said movements—that is, closed or opened, as the case
25 may require—and it is to this particular kind of such apparatuses that this invention pertains, although, as will be evident from the description hereinafter given of the apparatus of this invention, said apparatus is applicable
30 to other purposes, and as hereinafter stated. Such apparatuses in substance, and as well known, are composed of a siphon stand-pipe, made of metal or other suitable material, and two vessels, one located at each end of and in
35 communication with the stand-pipe. These vessels are of different superficial areas, the area of the upper being greater than that of the lower, and the area of each greater than the superficial area of the siphon stand-pipe
40 connecting the two. In the upper vessel is located a float, floating in the mercury thereof and suitably connected with the damper which is to be operated by the rise and fall of said float from the rise and fall of the mercury in
45 said vessel, and the lower vessel is connected by a pipe or other suitable passage for the steam, the pressure of which is to be regulated to act upon the mercury in the lower vessel, and which is the mercury-reservoir proper,

and through its action thereon secure a rise 50
and fall of the float, as the case may be, and a movement of the damper in accordance therewith.

As to such apparatuses, this invention consists in the combination, with the float-chamber 55
and a float floating in the mercury thereof, of a stop or abutment to the upward movement of the float from the rise of the mercury in the float-chamber and a chamber or receptacle above said abutment or stop, which at all times 60
is open to the mercury of the float-chamber, and preferably is of a reduced superficial area as compared with that of the float-chamber; also, in a relative construction of the vertical 65
sides of the float and of the mercury-chamber therefor, to secure a positive guide of the float in its rise and fall and allow a movement of the mercury along and about the sides and at and over the top of the float; again, in a relative construction of the lower 70
end of the float and of the floor of the chamber containing it and the mercury in which it floats, so that with the float at rest on the floor of the float-chamber an open communication will still be had for the movement of the mercury 75
under the float and between it and said floor; also, in the adaptation of the float to be readily changed in weight; also, in the construction of the mercury-reservoir for an in and out adjustment of the stand-pipe, making 80
connection between it and the float-chamber; again, in the combination, with the apparatus, of a petcock for discharging it of its fluid contents without escape of the mercury contained in it, and, also, of a valve located in the stand- 85
pipe and to be operated by the hand for closing the apparatus to the further movement of its contained mercury, all substantially as hereinafter described.

In the drawing forming a part of this specification, the figure is a central vertical section 90
of the improved apparatus of, and in one form of construction in accordance with, this invention.

In the drawing, A is a pipe for the passage 95
of the fluid the pressure of which is to be regulated, or of a fluid acted upon by the pressure of such fluid to the apparatus of this in-

vention—as, for illustration, if it is the pressure of steam in a boiler which is to be regulated, the pipe A may lead either from the steam or the water space of the boiler. The pipe enters at the upper portion of and there opens to a closed shell or vessel, B, which is the lower of the two vessels, making, with other parts, the apparatus of this invention, and is the mercury-reservoir thereof, and hereinafter to be so called.

D D² D³ is a vertical pipe—the stand-pipe of the apparatus, and hereinafter to be so called. This stand-pipe D D² D³, as shown, is composed of three sections, an intermediate section, D², and opposite end sections, D D³. The end sections, D D³, both telescope the intermediate section, D², which at each end is provided with a suitable stuffing-box, E, to close the joints between it and the end sections. The lower end section, D, telescopes the mercury-reservoir B, passing through a stuffing-box, F, in the upper wall, C, thereof, and it enters into a downward-extending tubular projection or well, B², from the bottom or floor of the reservoir and in continuation thereof. The upper end of the upper end section, D³, is attached to the lower end of and opens to a shell or vessel, H—the upper of the two vessels of the apparatus of this invention, and making the float-chamber thereof, and hereinafter to be so called.

K is a float located in the float-chamber H. The float K is made of metal, or other suitable material and otherwise all so as to float in the mercury contained in said float-chamber H, as will hereinafter appear, and from the downward movement or fall of the mercury to secure an operation of the mechanism connected with the float, as hereinafter described. A horizontal partition, or, as it is shown, the top H² of the float-chamber, makes a stop or abutment to the rise of the float in its chamber, and beyond this stop the float-chamber has an upward extension or chamber, H³. This extension-chamber H³ is open at all times to the mercury contained in the float-chamber, and whether the float is on or off of its abutment at H², and one construction of parts for insuring such continuous open communication, and which is shown, consists in providing the top of the float with separate raised knobs K², so that with the float at rest against the stop or abutment therefor an open space will still be left over the top of the float for the passage of the mercury to the chamber H³, in extension of the float-chamber above its said stop or abutment for the float. These knobs K² may be dispensed with and communication had between the float-chamber and the upward extension H³ thereof by vertical passages up through the float from end to end, and these knobs may be on the inner face of the top H² of the float chamber in lieu of on the top of the float, or on both, and still secure the same open space for the flow of the mercury.

K³ K³ are separate knobs on the upright

sides of the float in the float-chamber, to guide the float in its rise and fall in its chamber, and these knobs may be on the sides of the chamber, in lieu of on the float, as described, or on both the sides of the float and its chamber.

K⁴ K⁴ are separate knobs on the bottom of the float, making feet, as it were, through which the float can rest on the floor or bottom of the float-chamber, as stated, or on both, and in all cases free communication is left in the float-chamber around all of said surfaces or sides of the float for the movement of the mercury at all times.

L is a vertical rod attached to and projecting upward from the center of the top of the float and through the chamber H³, in extension of the float-chamber, as has been described. The rod L, at its upper end, is connected to the lower end of a belt, chain, or other flexible line, M, which passes upward and about a vertically-placed grooved pulley-wheel, N, carried by a horizontal shaft or rod, O, turning in suitable bearings, and which, for instance, may be the damper-rod of the damper to the furnace of a steam-boiler, or the stem of a steam, water, gas, or other fluid valve, and such like, but for the purposes of this specification will be assumed to be a damper-rod of the furnace to a steam-boiler, and hereinafter to be so called.

The damper-rod O has a weight, Q, applied to it on the side opposite to that at which the chain M of the float K enters upon its grooved pulley N. This weight Q may be either suspended from the opposite end of the chain M to that from which the float is suspended or from the pulley-wheel or damper-rod, and if from either the pulley-wheel or damper-rod the chain M requires to be fastened to the pulley-wheel or rod. The weight Q is sufficient, as the float rises in its chamber, from the rise of the mercury, releasing the weight to action, to secure a turning of the damper-rod O and its damper and all otherwise so that a fall of the float from a fall of the mercury in the float-chamber will secure an opening of said damper, and a rise of the float from a rise of the mercury in the float-chamber will secure a closing of said damper.

The damper, furnace, and steam-boiler are not shown, as it is not deemed necessary, being so well known, and as they of themselves form no part of this invention.

The chamber H³, in upward extension of the float-chamber, is always open at its upper end, and as it is also always open to the float-chamber, plainly no cushioning of air or forming of a vacuum can take place in the float-chamber.

R is a horizontal lever or beam, at one end fulcrumed on an upright, S, of the float-chamber, and at the other end connected by and resting through a slot, R², on a cross rest-pin, L², of the rod L of the float, and between such ends notched along its upper edge for the hanging of a weight, T, therefrom. By this means the float is adapted to have its weight readily increased, as may be desired or practical, and the same result may be attained by providing said

float-rod L with a rest or support, as at L³, for weights to be separately placed thereon, one on top of another, each weight having a hole through it and a side opening leading thereto, to enable it to be so placed and removed.

By suitably marking the beam or lever R at its separate notches, R³, and with the use of any given weight thereon, obviously the weighting of the float may be determined with accuracy, and the same is true with the weights which are to be applied at the rest or support L³ of the float-rod L, also marked for identification.

U is an ear-piece projecting horizontally from one side of the float-chamber H, and fitting by its eye U² upon a stationary vertical rod, W, secured by end ear-pieces, Y, to a suitable stationary and suitably-located support therefor.

V is a set or thumb screw, screwing through the ear-pieces U, and which, turned up to a bearing on the rod W, fastens the float-chamber to said rod. This vertical rod W is to be graduated along its length, and the graduations (not shown) marked—as, for instance, the lower one, 60, and the others running upward therefrom in regular steps of fives, 65, 70, 75, and so on to the upper graduation of the series, and all so that each graduation shall be in representation of a corresponding pressure of the steam, water, gas, or other fluid the pressure of which is to be regulated by the use of the apparatus of this invention—and thus provide a practical and serviceable means of accurately adjusting the apparatus to the pressure of fluid desired to be maintained.

The float-chamber H, and the mercury-reservoir B, but which forms no part of this invention, preferably are of different superficial areas, the mercury-reservoir having the greater superficial area; and again, the superficial area of the stand-pipe D D² D³, connecting the float-chamber H and mercury-reservoir B, is less than the superficial area of either thereof. The mercury-reservoir has a greater cubic capacity for mercury than the combined cubic capacity for mercury of the float-chamber, with the float therein, and the stand-pipe connecting the reservoir and chamber.

Z is a valve in the pipe A, leading to the mercury-reservoir B, and making communication with it for the fluid the pressure of which is to be regulated, and A² is a petcock, also located in said pipe, and D⁴ is a valve. (Shown as located in the upper end section, D³, of the stand-pipe D D² D³.)

The mercury-reservoir B is charged with the quantity of mercury necessary for the working of the apparatus, and which quantity must be sufficient to fill the stand-pipe D D² D³, the float-chamber H, with the float therein, and the mercury-reservoir, and to a sufficient height in the latter that the end of the stand-pipe opening to the mercury-reservoir shall be at all times covered or closed by the mercury thereof. The apparatus thus charged with mercury is ready for use, and as a pertinent illustration of its use suppose it to be con-

nected, as has been hereinbefore described, to a steam-boiler, and the damper-rod of the damper of the furnace of the boiler. In this application of the apparatus the float K must be of a weight not only to float in the mercury of the float-chamber, but also as the mercury lowers in said chamber to lower with it and turn the damper-rod to open the damper; and the apparatus as a whole, and connected, as described, obviously is to be suitably supported, the support not being shown, as it is so obvious what it should be as to require neither illustration nor description. Again, as so applied with an open communication between the steam-pressure of the steam-boiler and the mercury-reservoir, the apparatus, if not already adjusted to the steam-pressure desired to be maintained, is to be so adjusted; and for this adjustment the apparatus must first be relieved of any pressure on its contained mercury by closing the valve Z and opening the petcock A², on which, the mercury having all accumulated in the mercury-reservoir, the thumb-screw V and stuffing-boxes E E F are loosened and the parts of the stand-pipe moved upon each other or through the mercury-reservoir, or in both respects so moved until an index-mark, (not shown,) suitably located on the ear-piece U of the float-chamber, is brought to the graduation of the rod W, marked in accordance with the pressure desired to be maintained in the steam-boiler, when the stuffing-boxes are to be tightened up and the thumb-screw V turned up against the graduated rod W. With the apparatus thus adjusted, as the steam-pressure rises and lowers, acting through the mercurial column, the float rises and lowers in its chamber—in the one case turning the damper-rod in a direction to close and in the other case in a direction to open the damper.

With the damper fully closed, which is when the desired steam-pressure has been reached, the float is at the limit of its upward movement or rise; or, in other words, it is at a rest against its stop or abutment H², and on any further rise of steam-pressure in the boiler the float remains stationary; but as the mercury at such times is free to flow up around the float it passes into the upward-extending chamber H³ of the float-chamber above said stop or abutment, and which is of suitable size to contain it, the mercury, so flowing upward and prevent any overflow thereof.

The apparatus herein described may be also adjusted within given limits as to the steam-pressure which it is to regulate or maintain in the steam-boiler to which it is connected, by increasing or decreasing the weight of the float, as has been described.

The intermediate section, D², of the stand-pipe may be dispensed with, and the two end sections, D D³, either telescoped of themselves or made continuous, and only telescoped within the mercury-reservoir B and through a stuffing-box, F, of its upper side, as described.

The telescoping of the stand-pipe and of the

mercury-reservoir and the downward-extending well B² of the mercury-reservoir, to receive and accommodate the stand-pipe, as also the stuffing-box F in the upper side of the mercury-reservoir for the passage of the telescoping-pipe, are features of this invention; and as is plain in the practical use of the apparatus the mercury of the reservoir B never comes in contact with the stuffing-box F thereof, contact being only made therewith by the fluid the pressure of which is to be regulated—a quite important advantage.

The entering of the stand-pipe into the mercury-reservoir and sinking it therein, so as always to be below the level of the mercury therein, secures a seal of the open end of the stand-pipe by the contained mercury of the mercury-reservoir, and thus a closing thereof to the entrance of the steam or other fluid in connection with which the apparatus is arranged to act, and which, if it were allowed to enter, would, under its pressure, be forced upward through the mercury in the stand-pipe and float-chamber.

The upward and downward moving float may be connected in many ways to the damper-rod other than that particularly described—as, for instance, by a vertical rack-bar meshing with a pinion gear-wheel on the damper-rod—and it is not intended to limit this invention in the relation of the connection of its float with the part to operate from its rise and fall.

The float-chamber and its float may be varied in length and diameter, as also the mercury-reservoir, for adaptations of the apparatus to special purposes, but taking care in each instance to preserve the relative superficial areas and cubic capacities between the float-chamber and mercury-reservoir, as has been described.

The apparatus as particularly described and shown is capable of adjustment to varying pressures; but this capability may be dispensed with, if so desired. Again, although the apparatus has been particularly shown and described for securing the opening and closing of a damper to the furnace of a steam-boiler as the pressure of steam in the boiler falls from or rises to the pressure desired, the same apparatus, and without substantial or material changes in the construction, arrangement, and operation of its parts, may be usefully, advantageously, and practically employed for other purposes—as for instance, to the opening and closing of valves in apparatuses of various kinds using steam, air, gas, and other fluids, to the end of maintaining such fluids at a given or stated pressure—and therefore it is not intended to limit the invention in this regard. As a few illustrations of its uses above referred to may be mentioned the valves of steam, hot-air, and hot-water heating and drying apparatuses, feed-water and air pressure apparatuses, safety and reducing valves, valves for regulating pressure of steam, water, or gas, and the vacuum in a vacuum-pan or in the condenser of a steam-engine, through regulating the speed

of the pump or other apparatus producing the vacuum, or the flow of the injection-water to the condenser, &c.

The apparatus constructed to telescope its stand-pipe through the mercury-reservoir, as has been described, is particularly adapted for application to reducing-valves, in which case the float would be connected to the stem of the reducing-valve and the mercury-reservoir to the pipe in which the valve is placed, at the low-pressure side of the valve, and the whole arranged and adjusted so that on a rise of the pressure to the pressure desired the valve would be closed, and on a reduction of such pressure opened, and so on. By closing the valve D⁴ of the stand-pipe D D² D³ the damper can be held in whatever position it may then be, and the petcock A² in the pipe A enables the apparatus to be relieved of the pressure in it without escape of the mercury. The valve D⁴ in the stand-pipe D D² D³ is useful for holding the damper closed.

The apparatus herein described and shown in the drawing in some respects resembles the apparatus described and shown and claimed in my applications for Letters Patent of the United States, Serial Nos. 184,319, filed November 30, 1885, and 199,244, filed April 17, 1886, and as the same fully appears on examination and comparison, and for such purpose reference is hereby had thereto. All such resemblances, separately and combined, are hereby disclaimed as forming any part of this invention, except in so far as they become a part by combination or by arrangement, and all as fully and clearly set forth in this specification and the claims thereto.

Having thus described my invention, I claim—

1. In combination, a mercury-reservoir, B, a float-chamber, H, containing a float, K, a stand-pipe connecting said reservoir and float-chamber, a stop or abutment, H², to the rise of the float, and an upward-extending chamber, H³, above said stop, in communication at all times with the mercury of the float chamber, and said reservoir and float each separately connected, substantially as described, for the purpose specified.

2. A mercury-reservoir, B, and a float-chamber, H, and a float, K, relatively constructed for a guide of the float in its rise and fall in the chamber, and for a flow of the mercury around it, in combination with the upward-extending chamber H³, open to the float-chamber, and said reservoir and float each separately connected, substantially as described, for the purpose specified.

3. A mercury-reservoir, B, and a float-chamber, H, and a float, K, relatively constructed for an open space between the bottom of the float and the floor of the chamber for the flow of mercury under the float should the float be seated on said floor, and said reservoir and float each separately connected, substantially as described, for the purpose specified.

4. A mercury-reservoir, B, and a float-cham-

ber, H, containing a float, K, and connected
to and telescoping through a stuffing-box, F,
of said reservoir, and the reservoir and float
separately connected, substantially as de-
5 scribed, for the purpose specified.

5. A mercury-reservoir, B, and a float-cham-
ber, H, containing a float, K, and connected
to and telescoping through a stuffing-box, F,
and entering into a well, B², of said reservoir,
10 and the reservoir and float separately con-
nected, substantially as described, for the pur-
pose specified.

6. A mercury-reservoir, B, a float-chamber,
H, containing a float, K, a stand-pipe connect-

ing said reservoir and float-chamber, and a 15
petcock, A², and valve Z, located in the pipe-
connection of the mercury-reservoir, with the
boiler and the float separately connected, sub-
stantially as described, for the purpose speci-
fied. 20

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

RICHARD J. FLINN.

Witnesses:

ALBERT W. BROWN,
KATE E. BELLOWS.