

UNITED STATES PATENT OFFICE.

GEORGE W. BLAKE, OF NEW YORK, N. Y.

IMPROVED SELF-REGULATING APPARATUS FOR FEEDING STEAM-BOILERS.

Specification forming part of Letters Patent No. 36,270, dated August 26, 1862.

To all whom it may concern:

Be it known that I, GEORGE W. BLAKE, of the city, county, and State of New York, have invented a new and Improved Self-Regulating Apparatus for Feeding Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are vertical sections of the apparatus taken at right angles to each other. Fig. 3 is a plan of the same. Fig. 4 is a vertical section of one of the valve-boxes on a larger scale than Figs. 1, 2, and 3.

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

This invention consists in an apparatus composed of a close vessel arranged at a suitable distance above the intended level of the water in the boiler and connected by two separate pipes with the boiler and by a third pipe with an elevated reservoir, from which it may be filled by gravitation, and having combined with it a novel system of valves and a novel arrangement of levers, weights, an expanding-chamber, and a float, whereby whenever the water in the boiler gets below a certain desired level the said vessel is caused without manipulation to empty itself into the boiler and be refilled from the reservoir or head, and to repeat such process until the water has risen again to the desired level when the operation of the apparatus ceases.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the vessel which receives the water and from which it is discharged into the boiler.

B is the feed-pipe by which the said vessel is connected near its bottom with the lower part of the boiler.

C is a steam-pipe by which it is connected with the boiler at the desired level of the water, and D is the water-pipe by which it is connected with the reservoir or supply head.

The pipes C and D are arranged parallel with each other and at the same level, and are respectively furnished, in valve-boxes C' and D', with valves which are connected with or operated by spindles *c* and *d*, arranged in line with each other, the valve in the box C' open-

ing as that in D' closes, and vice versa. The valves in the boxes C' and D' may be of any kind that will close steam and water tight; but I prefer to use in each a puppet-valve, V, applied and operated as shown in Fig. 4, which is a section of the valve-box C parallel with Fig. 1. The stem *v* of this valve has applied to it a spring, *v'*, to close the valve, and is furnished with a collar, *v²*, to be acted upon for the purpose of opening the valve by a cam, W, on the spindle *c*, which works through a stuffing-box in one side of the box. The cam is so arranged as to open the valve V by a downward movement, and the cam belonging to the valve in the opposite box is arranged to operate on its valve in a manner precisely the reverse.

The pipe B is furnished with a check-valve, *b*, closing toward the vessel A, and the pipe D with a check-valve (not shown) closing toward the boiler. The said vessel A may be at any distance from and above the boiler and the several pipes bent in such a manner as to enable proper connections with the boiler and reservoir or supply head to be made.

The valve-spindle *c* is furnished with a slotted arm, *c'*, and the valve-spindle *d* with a similar arm, *d'*, and these arms are connected with an upright rod, E, by means of a pin, *e*, inserted through the said rod and entering the slots of the said arms. This rod works in a fixed guide, *f*, in an arch, F, which is secured to and supported by the pipes D and C, and it has a vertical slot, *g*, in its upper part and a notch, *h*, at about the middle of its length, and has a weight, G, attached to its lower part by a cord, *i*, running over a pulley, *j*, which is supported in the arch F, said weight exerting a constant tendency to raise the said rod and by that means so to act upon the arms *c'* *d'* as to close the steam-valve in C and open the water-valve in D; but there is attached to the guide *f* by a fulcrum-pin, *k*, a toothed lever, H, whose tooth is capable of entering through a hole, *l*, in the guide and into the notch *h* of the rod E for the purpose of locking the said rod in a position shown in Fig. 1, in which it keeps the steam-valve open and the water-valve closed. The tooth of the said lever is kept in the notch *h* by the weight of the opposite arm of the lever.

I J K L are different parts of the expanding-chamber, the part I consisting of a close cylinder or tube inserted through one side of and extending nearly across the vessel A, the part J consisting of a basin outside of the said vessel, the part K consisting of a flexible diaphragm covering the basin J, and the part L consisting of a pipe connecting the tube or cylinder I with the basin J. This expanding-chamber is filled with water, the escape of air while filling being provided for by the removal of a screw-plug, *m*. Above and resting upon the diaphragm K there is a piston or plunger, K', upon which there bears a loaded lever, M, which works on a fixed fulcrum, *n*, the said lever passing through a guide-slot in a fixed standard, N, and entering the slot *g* of the rod E. This lever should be loaded sufficiently by a weight, M', to make it overcome the effect of the weight G. The said lever has attached to it a hook, *p*, arranged so that it is caused to catch hold of the lever H and draw the tooth of the latter from the notch *h* of the rod E by an upward movement of the said lever.

P is a bent lever arranged to work transversely to the lever M upon a fulcrum, *q*, secured in the standard N below the latter lever. This lever P has near its upper end a shoulder, *r*, to catch under and support the loaded lever M, and its lower end is situated over a tappet, *s*, on a rock-shaft, Q, to which is attached, by an arm, *t*, a float, R, situated within the vessel A, the said rock-shaft working through a stuffing-box in a chamber, A², that is provided at one side of the vessel A for the float-arm *t* to work in.

The operation of the apparatus commences whenever the level of the water in the boiler is below the upper edge of the mouth of the pipe C at the connection of the said pipe with the boiler. While the water continues above this level and steam is up, the vessel A is kept filled by the pressure of the steam, the steam-valve V in the box C' being kept open by the pressure of the loaded lever M on the rod, and the water-valve in the box D' being closed; and the float R is raised. As soon as the water gets below the upper edge of the pipe C and permits the entrance of steam into the vessel A the water in the said vessel, being placed *in equilibrio*, descends through the tube B into the boiler by gravitation as the said vessel fills with steam, and the float R descends so far that the tappet *s* of its rock-shaft Q is removed from the lever P and the said lever permitted to fall against the side of the lever M, as shown in Fig. 2. The steam, having filled the vessel A, quickly increases the heat of the water in the tube or cylinder I, so that the said water, by its expansion and partial conversion into steam, forces upward that which is contained in the pipe L and basin J, and so presses upward the diaphragm K and piston K' against the lever M and causes the said lever to move upward. During this movement of the lever

the valves remain undisturbed, the lever M working in the slot *g* of the rod until the lever H is caused by the lifting action of the hook *p* to unlock the rod E, after which the said rod is quickly moved upward by the weight G, and caused by its action on the arms *c' d'* of the valve-spindles to reverse the position of the valves—viz., to open the water-valve in the box D' and to permit the steam-valve in the box C' to close. When the valves have been thus reversed, the filling of the vessel A with cold water from the reservoir or head commences, and the water in the tube or cylinder I is thereby cooled and caused to contract, so that the descent of the loaded lever M may be permitted; but this lever, having in its previous ascent passed the shoulder *r* of the lever P, is stopped upon the said shoulder almost as soon as its descent commences, and thereby held up until the vessel A is full or nearly full of water, when, by the rise of the float, the toe *s* is caused to raise the lower end of the lever P, and so throw aside its upper end from the lever M, and the latter lever, being then unsupported, drops suddenly and carries down with it the rod E, which by its action on the arms *c' d'* opens the steam-valve in the box C' and permits the closing of the water-valve in the box D'. If the level of the water in the boiler is still below the upper edge of the mouth of the steam-pipe C, the steam enters the vessel A by the said pipe, and the above-described operation of the apparatus is repeated until the level of the water is above that point, when on the vessel A having been filled in the manner described the apparatus comes to rest until the level becomes low enough to permit the entrance of steam through the pipe C.

In the above-described operation the valves are moved quickly, and are caused to remain in either of their two positions long enough to fill or discharge the vessel A, being secured in the position for filling by the combined action of the weight G and stop-lever P, and in the position for discharging by the combined action of the weight G and lever H.

I have described the expanding-chamber I J K as being filled with water or with any other suitable fluid; but instead of being constructed as described it may consist of a pipe connected with the vessel A in such manner that it will be filled with steam when the said vessel is filled with steam, or with water when the said vessel is filled with water, and thereby be caused to expand and contract and operate upon the loaded lever M in the same manner as the chamber constructed as described.

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

1. The expanding-chamber I J K L, loaded lever M, float R, rock-shaft Q, tappet *s*, lever P, rod E, weight G, catch H, and hook *p*, or their equivalents, the whole arranged and applied in combination with each other, and the

valve-spindles *c d*, and with the vessel A, to operate substantially as herein specified.

2. The arrangement of the steam and water pipes C and D and their valves and valve-spindles *c d* in such manner that the two valve-spindles will occupy the same horizontal line, and thereby provide for the two valves being

operated simultaneously by a weight acting vertically, substantially as and for the purpose herein described.

GEO. W. BLAKE.

Witnesses:

JAMES LAIRD,
R. GAWLEY.