(No Model.)

H. G. ASHTON.

SAFETY VALVE.

No. 303,252. Patented Aug. 12, 1884.

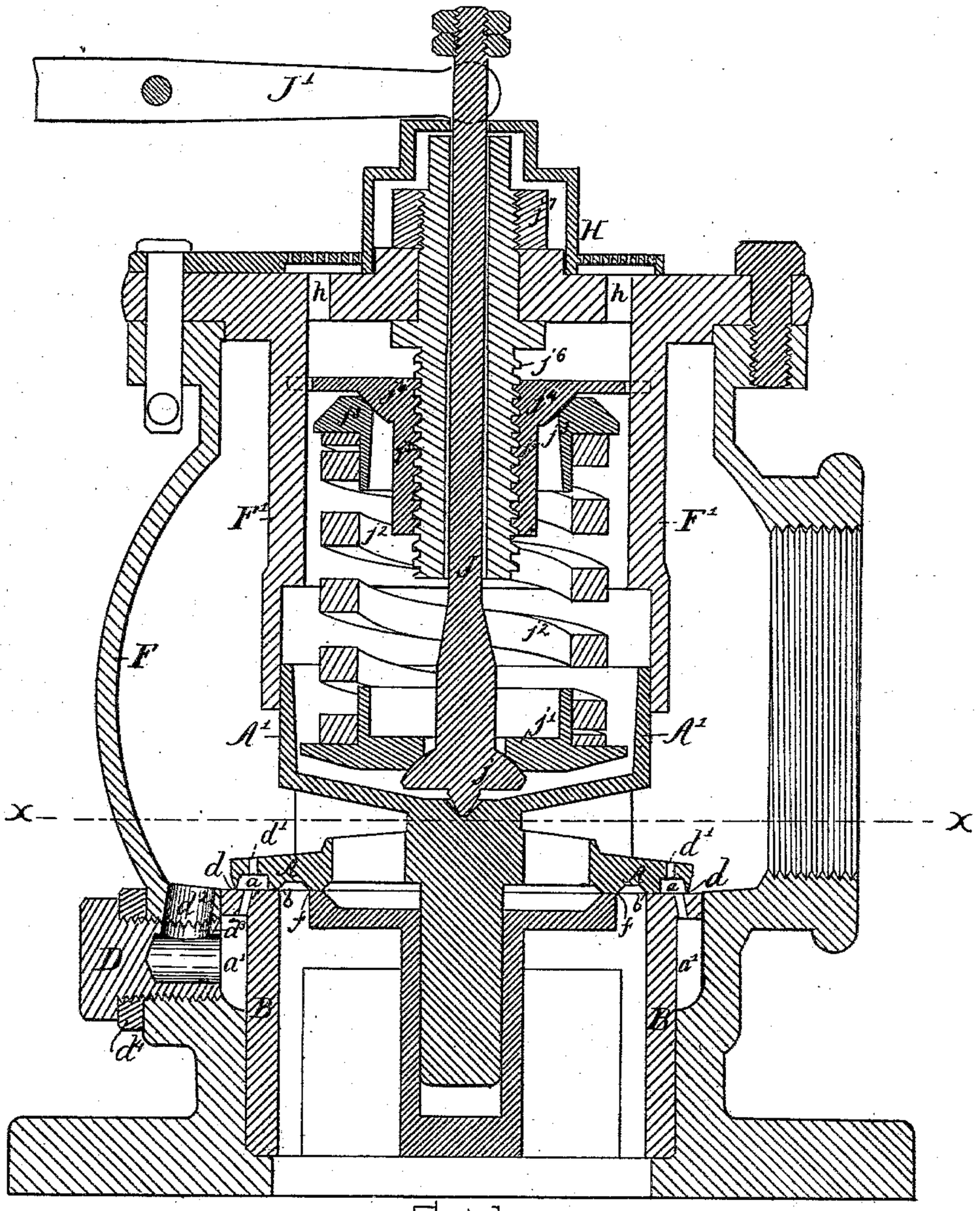

Fig. 1.

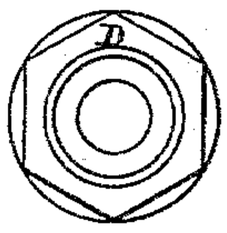

Fig. 3.

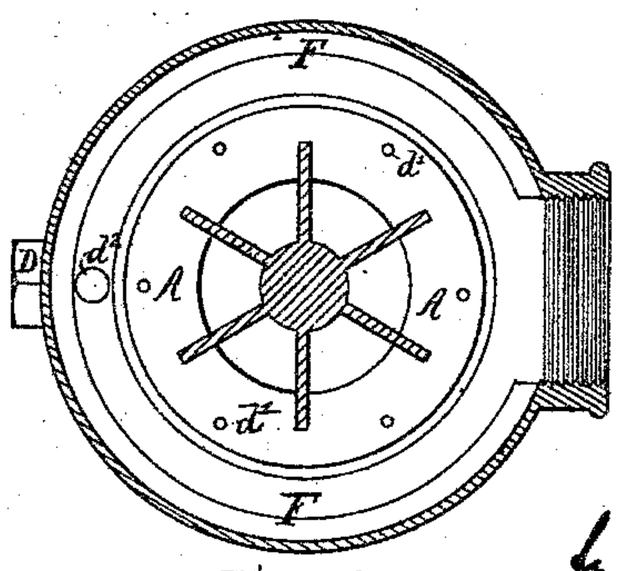

Fig. 2.

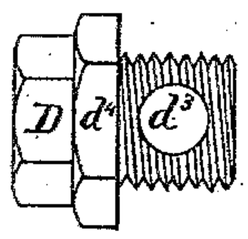

Fig. 4.

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UNITED STATES PATENT OFFICE.

HENRY G. ASHTON, OF SOMERVILLE, MASSACHUSETTS.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 303,252, dated August 12, 1884.

Application filed February 14, 1881. (No model.) Patented in England September 22, 1880, No. 3,849.

To all whom it may concern:

Be it known that I, HENRY G. ASHTON, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Safety-Valves, (for which I have obtained a patent in Great Britain No. 3,849, bearing date September 22, 1880,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, making a part hereof, in which—

Figure 1 is a vertical section. Fig. 2 is a section on line *x x* of Fig. 1. Figs. 3 and 4 are details.

My invention relates, primarily, to that class of valves commonly called "pop-valves;" and its main feature is an adjustable cock connected with the pop-chamber, the upward pressure upon the valve, when open, being regulated by the adjustment of this cock. In all pop-valves the escaping steam passes first into the pop-chamber, and pressure of the steam in this chamber aids in lifting the valve against the force of the spring, and as the area of the opening through which the steam enters the pop-chamber is determined by the diameter of the valve-seat and the height to which the valve rises, the pressure in the pop-chamber depends upon the boiler-pressure and the area of the opening through which the steam escapes from the pop-chamber, as will be clear to all skilled in this art. Moreover, as the pressure required in the pop-chamber depends upon the increased tension of the spring caused by the rising of the valve and the area of the surface exposed to the pressure of the steam in the pop-chamber, the proper area of the outlet from the pop-chamber depends upon the stiffness of the spring, the boiler-pressure, the size of the valve, and the area of the surface exposed to the pressure of the steam in the pop-chamber, and very great nicety and skill are therefore required to make these valves so that they will work to good advantage at the desired pressure; and after they are adjusted for that pressure it is difficult and often impossible to readjust them for a different pressure, especially when the second pressure is as much as one-third more or less than the first.

The first part of my invention is intended to remedy this evil, and its main purpose is to furnish a pop-valve which can be made in quantity and then adjusted for its work. This part of my invention is illustrated in the drawings as applied to that form of pop-valve described in my Patent No. 200,119, dated February 12, 1878, but is applicable to other forms of pop-valve.

In the drawings, *a a'* represent the pop-chamber, *b* the inlet-opening of the pop-chamber, and *d* the outlet-opening from the pop-chamber—that is to say, the steam escapes over the corner *b* of the bushing or seat B as soon as the boiler-pressure is sufficient to start the valve A from seat B, and this escaping-steam enters the pop-chamber *a a'* and expands in that chamber, its pressure in that chamber (supposing the cock D to be closed) depending upon the area of the opening at *b* and the boiler-pressure on the one hand, and the area of the opening at *d* on the other hand. When the lip of the valve at *d* is formed to rest upon the upper surface of the seat B, a number of small holes, *d'*, are formed through the valve-lip, as shown in the drawings, the opening at *d* being insufficient, and the total area of the outlet-opening from the pop-chamber being the area of the opening at *d* added to the areas of the holes *d'*.

It will be seen that I provide an additional opening, d^2, from the pop-chamber, and control that opening by the cock D; and it is this additional opening which is the distinguishing characteristic of my invention, as by it I can construct the valve with the outlet-opening from the pop-chamber much smaller than is requisite in practice—for example, by reducing the number of the holes *d'*, or omitting them altogether—and with the opening d^2 so large that the sum of the areas of the usual outlet-openings, *d* and *d'*, (when those holes are used,) and the additional outlet-opening, b^2, will be abundantly large; then by adjusting the area of the additional outlet-opening, d^2, the valve can be adjusted readily and with the utmost accuracy, after the valve is applied to the boiler and while exposed to steam-pressure. When the pop-chamber *a* is as small as in the valve shown, it is well to enlarge it, as shown at *a'*, for greater ease in attaching the cock D to the additional outlet-opening, d^2.

The best form of cock D is a hollow screw, let in, as shown, so that the hollow part of it is open to the pop-chamber. The hole d^3 can be brought to coincide with outlet d^2 when the additional outlet, d^2, is required to be wide open, or can be varied with relation to d^2, as desired. The check-nut d^4 holds screw D where set. The outlet d^2 may lead into the open air, instead of into the case F, as shown.

Heretofore the safety-valves of steamboats have discharged into the open air with so great a noise as to be in the highest degree objectionable for many reasons. I have arranged a safety-valve of a large steamer by carrying its discharge-pipe down below the water-line, and have discovered that that mode of discharging the steam does away with all objectionable noise, the very great advantages of which will be plain to all familiar with the navigation and management of steamboats. Any valve which is what is known as an "under-discharge pop-valve," (see my Patent No. 197,072, dated November 13, 1877,) will answer for this purpose; but the valve shown in the drawings is better adapted for this especial use than any other known to me, for it is not only an under-discharge pop-valve, but is also a double-seated under-discharge valve, and the first of this kind, so far as I know or have any reason to believe—that is to say, it is an annular valve, or has two faces or bearings, b and f, which, when the valve leaves its seat, afford two outlets for the steam, and is provided with a head, A′, which fits in a cylindrical part of the case F′, so that the pressure of the steam within the case F is prevented from aiding to force the valve back on its seat. The cylindrical part F′ of the case is made in a separate casting from the part F, because of certain advantages of construction, and also serves as a chamber for the spring j^2 and its supports. The holes h prevent any pressure within the cylindrical part F′ by expansion of the air or the leaking of steam between head A′ and cylinder F′. The cover H is too well known to need description here.

In a steamboat-valve a spindle, J, and lever J′ are desirable; and a minor feature of my invention consists in a novel combination of valve, its spindle, its spring, and the screw and nut by which the spring is adjusted. The spindle J is pivoted on the valve and is formed with a convex collar, j, at its lower end. By this collar the disk j' is supported, and the lower end of the valve-spring j^2 rests upon this disk j'. The upper end of the valve-spring j^2 is pressed upon by the disk j^3, which is pressed upon by the convex collar j^4 on nut j^5, and nut j^5 is actuated by hollow screw j^6, through which spindle J passes. Nut j^5 cannot turn in case F′, but screw j^6 can be turned after loosening check-nut j^7 to increase or decrease the tension of spring j^2.

What I claim as my invention is—

1. In a pop safety-valve, the additional outlet, d^2, from the pop-chamber $a\,a'$, controlled by cock D, substantially as described.

2. In combination, annular valve A, having two faces or bearings, b and f, head A′, exterior case, F, and interior case, F′, the case F serving to confine the waste steam and compel it to pass through a pipe leading from case F, and the interior case, F′, in connection with head A′, serving to form an interior chamber open to the atmosphere, all so combined together, substantially as shown, that the pressure of the waste steam shall be upon the interior of case F and upon the exterior of case F′ and head A′, the pressure within the chamber formed by case F′ and head A′ remaining substantially atmospheric.

3. In a safety-valve, the combination of spindle J, pivoted upon the valve, and having collar j, with disk j', spring j^2, disk j^3, collar j^4, nut j^5, and screw j^6, substantially as described.

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