(No Model.)

H. F. COOK.

SAFETY VALVE.

No. 585,084. Patented June 22, 1897.

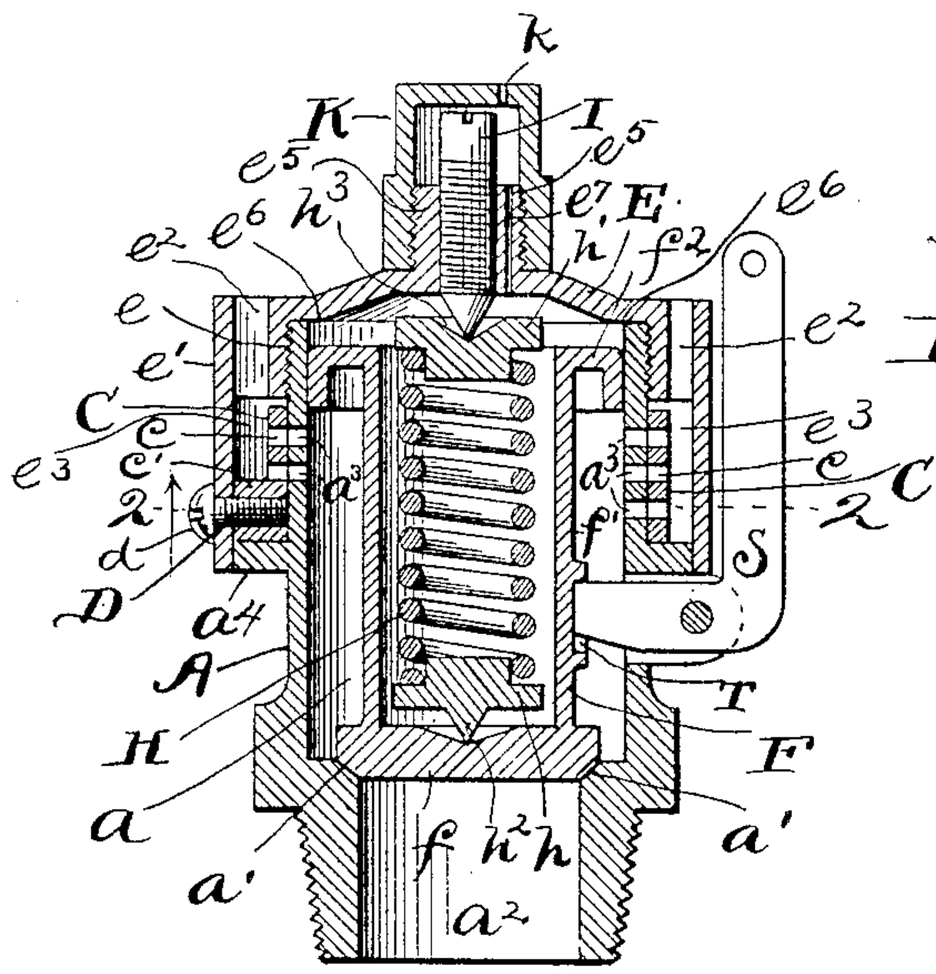

Fig. 1.

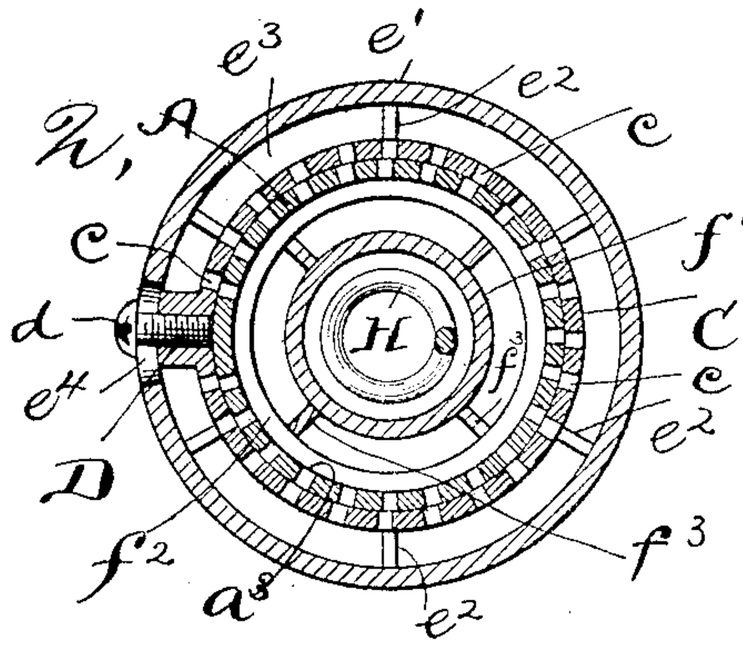

Fig. 2.

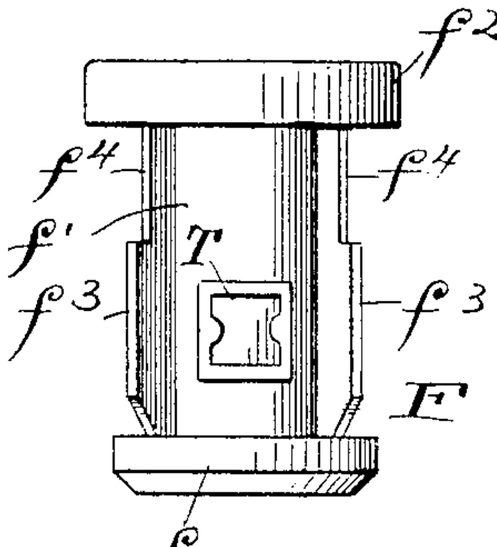

Fig. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

HERBERT F. COOK, OF CLEVELAND, OHIO.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 585,084, dated June 22, 1897.

Application filed January 21, 1897. Serial No. 620,162. (No model.)

To all whom it may concern:

Be it known that I, HERBERT F. COOK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Safety-Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is for a safety-valve, and its object is to provide a device in which the pressure at which the valve operates and the duration of the blow-off period may be accurately and conveniently regulated, in which the noise due to the escapement of the steam or other fluid shall be minimized, which may be easily cleaned and tested, and which is not liable to get out of order either by the deposit of dust therein or through any other cause.

The invention consists of a cylindrical casing having an internal annular valve-seat and having perforations through its cylindrical wall above said valve-seat and an adjustable ring surrounding said wall and having correlative perforations, in combination with a valve pressed against the annular seat and controlling the admission of fluid to the chamber which said casing incloses.

It also consists in the combinations of parts hereinafter described, and pointed out definitely in the claims.

The drawings show the best embodiment of my invention at present known to me.

Figure 1 is a vertical central section of the invention. Fig. 2 is a horizontal section taken on line 2 2 of Fig. 1. Fig. 3 is a view in elevation of the piston.

A is a cylindrical casing which incloses a chamber a, and is provided with an internal annular valve-seat a', below which is a continuation a^2 of the casing of contracted internal diameter. This continuation may be connected in suitable manner with the boiler containing the steam or other fluid. Through the casing and above the valve-seat a' are the perforations a^3. Surrounding this wall and resting upon an annular flange a^4 is a ring C, having perforations c, adapted to register with the perforations a^3. By means of a set-screw D, passing through a boss c' on this ring and impinging against the outer surface of the valve-casing, the ring may be locked in desirable position. A cap E, having internal threads e, is screwed onto the upper end of the casing. A cylindrical flange e', which is fastened to the cap by means of a plurality of arms e^2, surrounds the valve-casing, its lower edge embracing and fitting more or less tightly upon the flange a^4. This forms an annular chamber e^3, surrounding the valve-casing, into which steam is discharged through the perforations in the valve-casing and ring C, and from which the said steam escapes through the open top of said annular chamber. The set-screw D projects through a slot e^4 in this flange e' and has a head d on the outside thereof. It may thus be turned on the outside to unlock the ring and furnishes convenient means for shifting the ring into the desired position.

Seated on the valve-seat a' is the valve F, formed of a circular plate f, which is fashioned externally to fit the valve-seat a', and a barrel f', extending above the same and having an external flange f^2 at its upper end, which engages with the inner cylindrical surface of the casing A. Contained within the barrel portion of this valve is a compression-spring H, which is held between blocks h and h', the former of which has a conical projection h^2, bearing in a depression in the plate f, and the latter of which has a depression h^3, in which the conical point of the set-screw I projects. This set-screw is threaded into the boss e^5 in the top of the cap E, and is protected from accidental displacement by the cap K. By turning the set-screw the pressure of the spring may be adjusted as desired. Owing to the manner in which connection is made between this spring and the valve and set-screw there is no tendency of the spring to cause any lateral tipping or binding of the valve, and the same is free to move vertically. Projecting from the outer surface of the barrel of the valve are the wings f^3, the outer edges of which engage the inner cylindrical surface of the casing and guide the valve. A portion of the wings are preferably of reduced width, as shown at f^4, to allow free circulation of steam about the barrel.

In operation, when the pressure upon the

plate *f* has reached a predetermined maximum the valve is lifted slightly against the pressure of the spring H and the steam or other fluid is admitted to the chamber *a* around the barrel *f'*. After such admission the steam acts upon the flange f^2 of the valve and, owing to this additional area, causes the valve to rise quickly, the increase of area more than compensating for the increasing spring force. After the valve has risen the upper surface of the flange f^2 contacts with the seat e^6 on the inner surface of the top of the cap E, and thus any steam that might accidentally leak around the flange f^2 is prevented from passing farther. Holes e^7 and *k* through the caps E and K lead from the top of the chamber *a* to the outer air, and thus equalizes the aerial pressure on the top of the valve.

After the valve has risen the steam passes from the chamber *a* through the holes a^3 and *c* into the annular chamber e^3 and from thence escapes to the air. The exit thus provided for the escaping steam causes it to leave the valve structure vertically, wherefore it does not scatter spray laterally, while the effect of the numerous perforations opening into a larger chamber is to muffle the steam and nullify or minimize its noise. By means of the adjustment provided by the ring D the period during which the steam is escaping may be regulated at will. It is evident that the steam must escape until the pressure on the increased area of the valve is less than the spring-pressure. Then the valve will close and will remain closed until the pressure has again risen to such a degree that, acting upon the area of the plate *f* alone, it is able to raise the valve somewhat. The limit between the pressure at which it closes and the pressure at which it opens will vary in practice, according to the results desired, and may be conveniently regulated by the means heretofore described.

In order to lift the valve by hand and allow the steam to blow off before the predetermined maximum pressure has been reached, I provide the bell-crank S, the inner end of which engages with a box-shaped lug T, formed on the wall in the barrel *f'* above the valve-seat *a'*. A pull on the upper end of the bell-crank will thus raise the valve and permit enough steam to escape to reduce the pressure to any extent desired. By having the valve-seat itself at its lower end the normal contact of the steam is confined to the lower surface of the plate *f*, and I can therefore connect the bell-crank directly with the valve by the simple construction shown, the opening through the casing for the bell-crank play being immaterial during the blow-off, whereas the same space would be disastrous if said opening were below the valve-seat *a'* and therefore constantly open to the escape of live steam.

Another advantage in having the valve-seat itself at its lower end is that the spring acts directly upon the plate *f* and causes more perfect seating than would result if the seating portion of the valve were upon its barrel. My valve is very compact and neat and is not liable to get out of order. The deposit of dust or dirt upon the valve-seat is practically prevented, since such dust must enter the top of chamber e^3 and thus pass through the perforations. In point of fact, the dust which might otherwise deposit and prevent the proper action of the device is deposited upon the flange a^4, which forms the floor of the annular chamber. Moreover, the device may easily be taken apart for cleaning, when desired, by removing the bell-crank and set-screw D and unscrewing the cap E.

Having described my invention, what I claim is—

1. In a safety-valve, a cylindrical valve-casing having an internal annular valve-seat and having perforations above said valve-seat, an adjustable ring surrounding said casing and having perforations adapted to register with the perforations in the casing, in combination with a valve within the casing which is pressed against said valve-seat and controls the admission of fluid to the chamber within said casing, and a flange or piston connected to the valve and located in the casing above the perforations, substantially as and for the purpose specified.

2. In a safety-valve, a cylindrical valve-casing having an internal annular valve-seat near its lower end and having one or more horizontal rows of perforations above said valve-seat, a ring, embracing and adapted to be turned upon said casing, and having perforations adapted to register with those in the casing, a cap secured upon said casing, a cylindrical flange surrounding that part of the casing in which the perforations are made thereby forming an annular chamber around the valve-casing, said flange having a horizontal slot through which a screw or other device may pass to engage with said ring, in combination with a valve within the casing, said valve having its lower end fashioned to fit the valve-seat, and having an external flange above the perforations which fits said casing, and a spring pressing said valve against the seat, substantially as and for the purpose specified.

3. In a safety-valve, a cylindrical valve-casing having an internal annular valve-seat near its lower end, one or more annular rows of perforations above the valve-seat, and an external flange below said perforations, an adjustable ring embracing the perforated part of the casing and having perforations which may register with those in the casing, a cap secured upon said casing, a cylindrical flange which surrounds the casing and fits said external flange thereon, combined with a spring-actuated valve in the casing having its lower end fashioned to fit the valve-seat,

and having an external flange which fits the casing above the said perforations, substantially as and for the purpose specified.

4. In a safety-valve, the combination of a cylindrical valve-casing having an internal valve-seat near its lower end and perforations above said valve-seat, and an adjustable ring embracing the perforated part of the casing and having perforations which may register with those in the casing, and a cap secured upon the upper end of the casing, with a valve consisting of a barrel, a bottom plate which closes its lower end and is fashioned to fit the valve-seat, and an external flange above said perforations which fits within the casing, a set-screw adjustable through the cap, and a spring inclosed in the barrel and compressed between said set-screw and bottom plate of the valve, substantially as and for the purpose specified.

5. In a safety-valve, the combination of a cylindrical valve-casing having an internal valve-seat at its lower end, and having above the valve-seat one or more annular rows of perforations, a ring embracing the casing and having perforations adapted to register with the perforations in the casing, and a cap secured upon the top of said casing, with a valve consisting of a barrel, a plate which closes its lower end and is fashioned to fit the valve-seat, and an external flange at the upper end of the barrel which flange fits said casing, a set-screw adjustable through the cap, and a spring inclosed in said barrel and compressed between the bottom plate of the valve and set-screw, substantially as and for the purpose specified.

6. In a safety-valve, in combination, a cylindrical valve-casing having an internal annular valve-seat near its lower end, and perforations above said valve-seat, a cap secured over its upper end, an inclosed spring-actuated valve having its lower end fashioned to fit the valve-seat and having an annular flange which fits the casing above the perforations, and having below said flange a lug, a lever passing through and pivoted to the valve-casing and engaging with the last-named lug on the valve, substantially as and for the purpose specified.

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

HERBERT F. COOK.

Witnesses:

E. L. THURSTON,

ALBERT H. BATES.