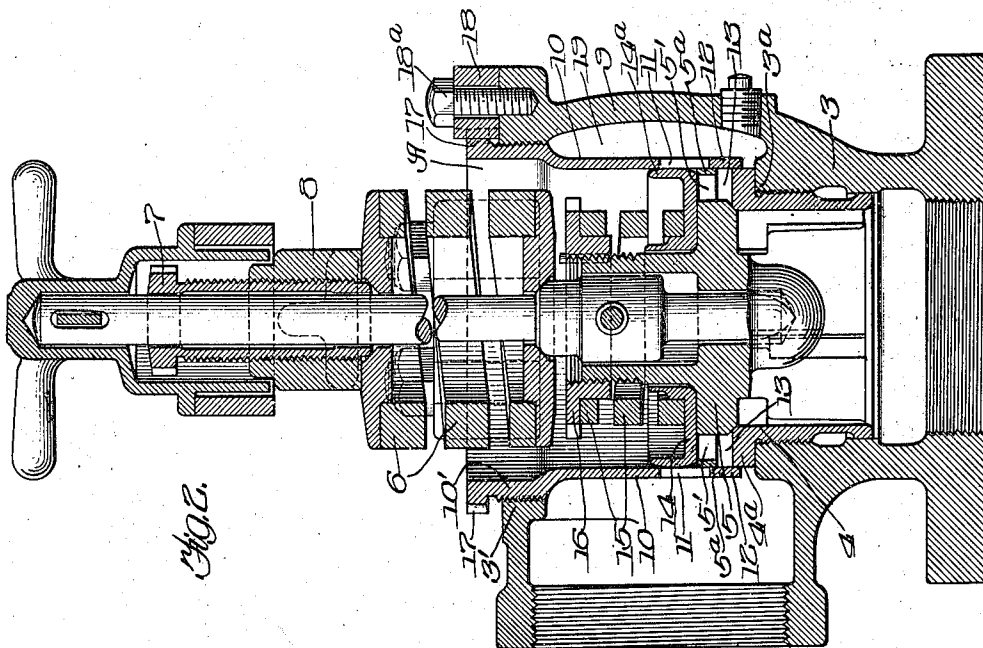
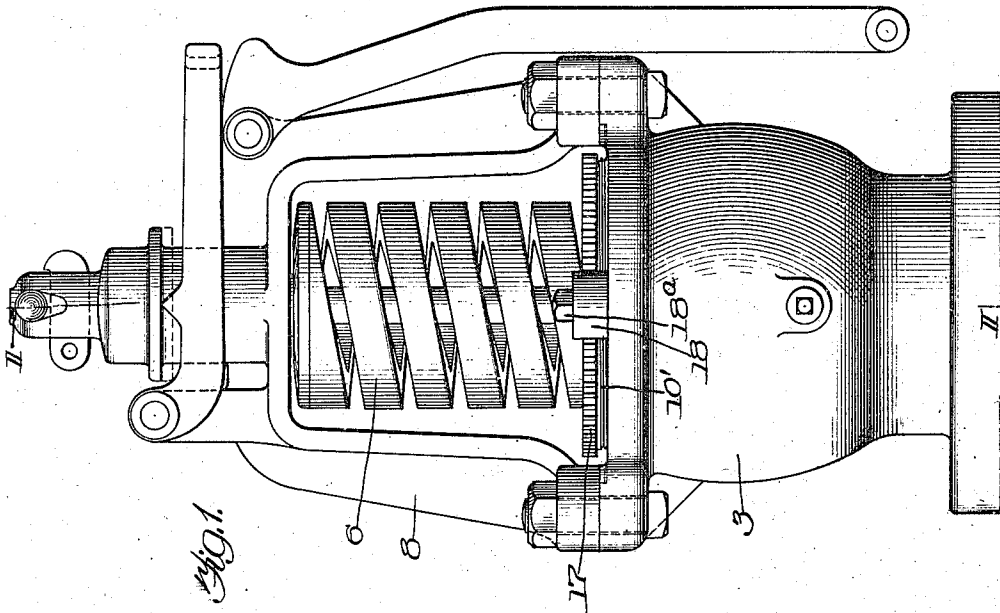


A. M. HOUSER.
SAFETY VALVE.
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UNITED STATES PATENT OFFICE.

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SAFETY-VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ARTHUR M. HOUSER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Safety-Valves, of which the following is a full, clear, and exact description.

My invention relates to the class of safety valves, and more particularly to that form of valve known in the art as pop safety valves.

One object of my invention is to provide an improved means for regulating the pop adjustment in a valve of this character, which is designed to be conveniently and easily regulated by the operator, and positioned therein to incase and protect the valve springs from the action of the steam and at the same time where it cannot be rendered inoperative by scale, etc. Another object of my invention is the provision in such a valve of regulating means affording the greatest possible range of adjustment in set pressures and which by its simplicity and consequent cheapness of manufacture reduces the cost over existing types. My invention further contemplates a novel construction and arrangement of a pop regulating means which is adapted to maintain the least waste of steam between the opening and closing points; and which further permits the valve to be made to gages.

My invention also contemplates certain novel details of construction, combination and arrangement of parts of the improved device, whereby certain important advantages are attained, as will be more fully described hereinafter, and pointed out in the claims.

The foregoing, together with such other objects as may hereinafter appear, or are incident to my invention, I attain by means of a construction which is illustrated in preferred form in the accompanying drawings, wherein:

Figure 1 represents a front elevation of a safety valve embodying my invention, and

Figure 2 is a vertical sectional view of Figure 1 taken on the line I I, and slightly enlarged, the upper portion of stem and spring being broken away to accommodate the figure on the drawing.

In this art it is customary to provide a

pop or huddling chamber into which the steam expands, so that the pressure tending to lift the main valve is greater after the valve has left its seat than before, in this manner compensating for the increased tension of the main valve spring which is a resultant from its further compression when the main valve lifts. Means have also been provided in this connection to relieve the pressure in the huddling chamber.

This present invention is more particularly directed to novel construction of pop regulator, which is designed to cooperate with other valve parts constituting the huddling chamber, and in such a manner as to enable the valve to fully open, and to close promptly and easily when the boiler pressure falls to a predetermined degree, eliminating premature closing, and also that excessive waste of steam present in many safety valves where there is a failure of the valve to promptly close at a point when the pressure in the boiler is sufficiently reduced.

In the drawings, the numeral 3 indicates the casing of the safety valve which is tapped at its lower end for connection with the boiler, and at one side for connection with a pipe through which the waste steam passes for discharge at a point distant from the casing. The lower inner portion of the casing is formed to receive the flanged valve seat 4, the opening therethrough being controlled by the main valve 5, which is held closed on its seat against pressure in the boiler by the main valve spring 6, whose upper end takes against the screw pressure plug 7, adjustment of which in the yoke 8 varies the pressures at which the valve may be set. The above is a conventional construction, and may be varied from if desired.

The casing 3 is provided with the larger diametered intermediate portion 9, and its upper end above this portion is interiorly threaded as at 3' to receive the pop regulator A which "penetrates" downwardly into the casing. The said regulator comprises a ring portion 10 disposed within and spaced away from the larger diametered portion of the casing, which portion 10 tapers outwardly at its upper end 10' where it is exteriorly threaded to screw into the the interiorly threaded portion 3' of the casing. The said regulator extends down-

wardly to overlap the outwardly extending valve seat flange 4^a which rests upon the shouldered and smaller diametered portion 3^a of the casing, and at a suitable distance short of its lower edge I form a series of ports 11 in its wall and short of the lip 12 which forms the lower terminal thereof.

To increase the area of resistance to the upward pressure of the steam when the main valve initially lifts, the valve 5 is provided with a laterally extended rim portion 5^a which overhangs the seat flange 4^a but is spaced away therefrom to form the huddling chamber 13, and is perforated to provide orifices 5' which extend to the upper face of the valve. Resting upon this upper face is an imperforate auxiliary valve 14, for which the main valve acts as a seat, and fitted upon the main valve 5 as to close the orifices 5' when it is down. It is held in contact with the valve 5 by the spring 15 whose upper end takes against the nut 16 which is fast on the valve.

By a reference to Figure 2 it will be seen that the lip 12 also overlaps the vertical outer face of the valve extension 5^a thus aiding to confine the steam in the huddling chamber 13. The degree of lap is decreased, or increased, by imparting a turning movement to the regulator in the casing to obtain a greater or lesser clearance between these members when the valve lifts. This variation in lap relation is obtained by manipulating the upper portion 17 which projects sufficiently from the casing interior to permit ready access thereto through the opening intermediate the arms of the yoke member 8. The numeral 18 represents a lock nut on the casing in engagement with teeth formed on the upper portion 17, so arranged that when the regulator is properly adjusted the lock nut is secured by the set screw 18^a, in order to prevent unauthorized tampering with the regulator.

It will be noted that the ring 10, which with the intermediate portion 9 of the casing forms the steam exit chamber 19 communicating with the discharge side of the valve, also incases the springs 6 and 15 against the action of the steam; and with this end in view I further provide the auxiliary valve 14 with a flange 14^a which has a working fit in the ring and normally extends upwardly past the ports 11 to shut off any escape of steam therethrough from the chamber 19.

One of the advantages incident to my invention is the capability of easy assemblage of the component parts, which are few in number, and in this connection it will be apparent that the valvular mechanism may be readily removed out of the regulating sheath 10 upon the uncoupling of the yoke member 8, and which may be as readily replaced.

With the parts in position as shown, the operation is substantially as follows: When the steam pressure rises beyond the point to which the valve is set, the latter lifts and the escaping steam expands in the huddling chamber, which in effect provides a larger area of resistance to compensate for the increased tension of the main valve spring. As the main valve lifts the extent of lap between the rim 5^a and the lip 12 diminishes until there is a clearance for the escape of steam through the ports 11 to the discharge side of the valve casing. The steam entering the orifices 5' raises the auxiliary valve 14, there being thus provided an additional outlet for the escape of the steam, which cannot act upon the already incased springs as the ports are closed in the manner already described.

This arrangement also insures the prompt closure of the valve upon the fall of the steam to the set pressure, whether the valve be set for a high or low pressure. The resistance of the valve to closure is diminished by the rising of the auxiliary valve, and on closing, the huddling chamber and lip 12 of the regulator cooperate to confine the steam and cushion the main valve in its downward movement without chattering or hammering. By manipulating the regulator the degree of lap and clearance may be increased or decreased as desired to regulate the area for the escape of the steam and the area of resistance to the upward pressure of the steam, thereby to maintain the least waste of steam between the opening and the closing points.

From the foregoing the essential features, elements and operation of the device, together with its simplicity and other advantages thereof, will be clearly apparent to those skilled in the art.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent, is the following:—

1. In a safety valve, the combination of a body member having inlet and outlet openings and an upper open bore disposed in substantial alinement with the inlet opening, the latter being provided with a seat, a pop valve mechanism depending from the bore to the said seat, a pop regulating means therefor adjustably mounted in the body member and arranged about and normally in a lap relation with the said mechanism, said means comprising a ring-like member constructed to permit the exit of steam through the outlet opening when the valve mechanism is unseated and having its upper end disposed in a projecting relation with reference to the opening of the bore to provide for its direct manipulation to vary the lap relation of said member with the valve mechanism.

2. In a safety valve, the combination of a valve body having inlet and outlet openings and comprising a casing provided with a seat and a bore located above said seat, a
 5 pop valve mechanism depending from the bore to the seat and presenting dissimilar areas to the pressure when seated and unseated, and a pop regulating means therefor adjustably mounted in said casing and comprising a tubular member having its lower
 10 portion normally disposed in a lap relation with that part of the valve presenting the greater area to the pressure, the diameter of the bore being slightly greater than that of the said valve part, said member having its
 15 upper portion disposed in said bore for its ready manipulation to vary the lap with said mechanism.

3. In a pop safety valve, the combination of a casing provided with a seat and an upper bore, a pop valve mechanism extending downwardly through the bore to said seat, and a pop regulating means therefor adjustably mounted in the casing and normally in
 25 a lap relation with the said mechanism, said means comprising a valve inclosing sheath member having an outwardly projecting upper portion extending through said bore whereby the sheath may be manipulated
 30 thereby to vary the lap, substantially as described.

4. In a pop safety valve, the combination of a casing provided with a seat and an upper bore, a pop valve mechanism extending
 35 downwardly through the bore to said seat, a pop regulating means therefor adjustably mounted in the casing and normally in a lap relation with the said mechanism, said means comprising a valve inclosing sheath member
 40 having an outwardly projecting upper portion extending through said bore whereby the sheath may be manipulated thereby to vary the lap, and a locking means engaging said extending portion to lock the sheath in
 45 an adjusted position.

5. In a pop safety valve, and in combination, a casing provided with a seat and an upper bore, a pop valve mechanism comprising a main valve on the seat having an apertured circumferential rim portion and an
 50 auxiliary valve seated thereon, and a pop

regulating means comprising a valve inclosing sheath mounted in the casing to have its ported lower end in lap relation with said auxiliary valve and rim portion
 55 to provide a double exit for the pressure when these members are lifted, said sheath having its upper portion extended beyond the bore to provide for its direct manipulation to vary the lap with said mechanism.

6. In a safety valve, the combination of a casing having an inlet and a seat therein and provided with an upper open bore and a lateral outlet intermediate the upper bore and said inlet, a pop valve mechanism in
 65 operative relation with said seat, and a pop regulating means therefor in lap relation with said mechanism, comprising a valve inclosing sheath member associated with said bore and disposed with reference thereto
 70 and to the wall of the casing in such a manner as to form a closed chamber extending substantially from the bore to the seat and communicating directly with the lateral outlet, said sheath member being adjustable in
 75 the bore to vary the lap relation with said mechanism.

7. In a pop safety valve, the combination of a casing provided with a seat and having at its upper end an opening, a pop valve
 80 mechanism depending from said opening to the seat and comprising a main valve having an apertured rim portion and an auxiliary valve seated thereon to form one boundary of a blow-back chamber at the
 85 rim, and an adjustable pop regulating means forming another boundary of the blow-back chamber comprising a ring-like member having its ported lower end in lap relation with said mechanism to provide through said
 90 ported lower end an exit for the pressure when the main and auxiliary valves are lifted, said member having its upper portion disposed in said opening for its adjustment to vary the lap with said mechanism.

In testimony whereof I have hereunto signed my name in the presence of the two subscribed witnesses.

ARTHUR M. HOUSER.

Witnesses:

M. W. LINK,
 F. T. DONOHUE.