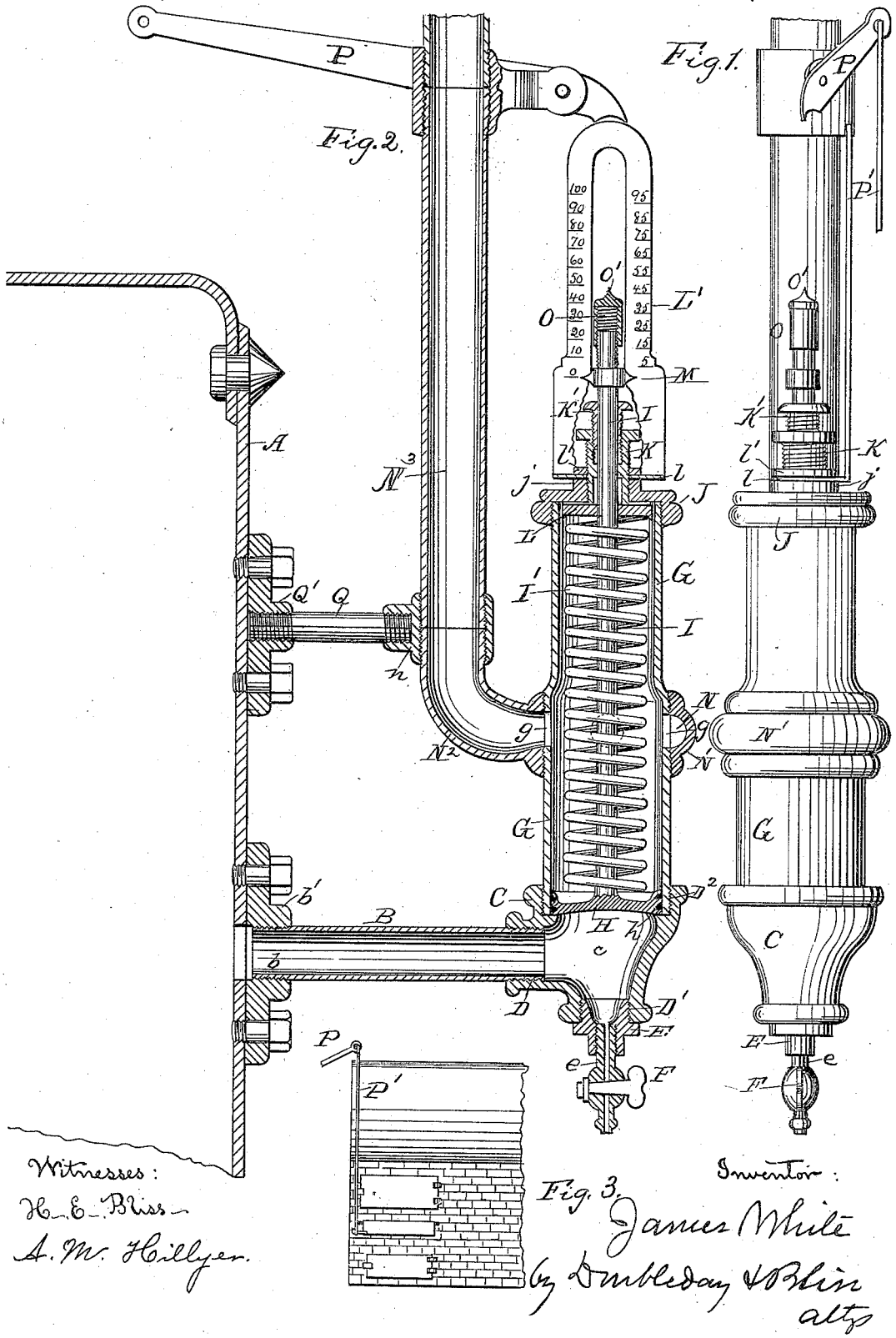
(No Model.)

J. WHITE.

SAFETY VALVE.

No. 306,447. Patented Oct. 14, 1884.



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UNITED STATES PATENT OFFICE.

JAMES WHITE, OF CANTON, OHIO.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 306,447, dated October 14, 1884.

Application filed December 12, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES WHITE, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Safety-Valves, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a side elevation of an apparatus embodying my improvements, and of a portion sufficient to show the manner of attaching thereto the said devices. Fig. 2 is a vertical section. Fig. 3 shows the manner in which my device is connected to the damper.

In the drawings, A represents that part of the boiler which is illustrated. To this there is connected, at any suitable point, the tube B, through which the steam passes to the gage. It may be of any suitable length, though I have found for ordinary circumstances that a length of four or five inches is sufficient. It is secured to the boiler by means of a thread at *b*, engaging with a threaded plate, *b'*, which is bolted or riveted to the boiler. At the outer end it is connected with a metallic piece, C. The latter is cast with an interior chamber, *c*, and three threaded sockets, D D' D², the tube B fitting the socket D.

E is a cap-piece, which fits the socket D', and with which there is connected the threaded and perforated tube *e*, having the stop-cock F, whereby the water of condensation can be withdrawn from the chamber *c*.

G is the main tube, cylinder, or barrel, fitting the threaded socket D². Within there is fitted a plate or head, H, it being provided with a packing of suitable character, as at *h*, whereby it is made to fit the cylinder or barrel G tightly. To this is secured a rod or bar, I, which passes upwardly through and beyond the top of the barrel or cylinder G. The plate or head H can yield and move upward when the steam presses against it, and when so moving it carries upward also the rod or bar I.

I' is a coiled spring, placed around the rod or bar within the cylinder or barrel G, and as it bears against an abutment at the upper end it tends to hold the plate or head H down against the pressure of the steam.

J represents a cap, which engages with and closes the upper end of the cylinder or barrel G, there being a threaded sleeve projecting upward and concentric to the barrel or cylinder G.

K is a thimble provided with an external thread, by means of which it engages with the thread on sleeve *j*, and with an internal thread, by means of which a threaded plug, K', can be secured to it, these parts being so constructed and related as to form a stuffing-box, through which passes the rod or bar I.

Below the cap J, and within the barrel or tube G, is arranged loosely a plate, L, which rests upon the coiled spring I', and serves as the abutment against which the said spring bears upwardly. The tension of the spring can be regulated by means of the threaded thimble K—that is to say, by turning the thimble so as to force its lower end into the barrel or cylinder G the spring will be compressed, and vice versa.

L' represents a gage which is supported in place by means of flange *l* at the lower end, which, clamped between the cylinder *j* and a nut, *l'*, engages with the external thread on the thimble K. The stem or rod I passes up through and to a point somewhat above the plug K', and carries near the upper end an index, M, so situated that when the head or plate H is at its lowermost point it (said index) shall indicate zero upon the scale. As the pressure of steam below the head or plate H increases the stem or rod I rises and the index indicates the pressure which the steam has.

Heretofore it has been customary to have the steam-gage so arranged as to give only visible or audible signals to indicate that the pressure had reached a certain point. In some cases use has been made of a visible or audible signaling apparatus connected with the boiler at one point, in combination with an automatically-operating valve, whereby the pressure is removed at another point. I so construct the gage that the steam which is used to produce a visible signal by its pressure shall also tend to open a passage-way, by means of which the pressure of steam in the boiler can be relieved after reaching a certain maximum.

N is an annular chamber, formed in a cast-

ing, N′, adapted to surround and be secured by a screw-thread to the barrel or cylinder G.

At *g g* there are perforations or apertures in the cylinder or barrel registering with the annular chamber N.

N^2 is an elbow cast or connected to the casting N′, and adapted to be coupled with a blow-off pipe, N^3, by a coupling, *n*, or otherwise. When the head or plate H rises in the barrel or cylinder G to the height of the apertures *g*, the steam will escape through said apertures and through the blow-off duct N N^2 N^3. If it is desired to vary the pressure at which the escape of the steam will occur, this can be accomplished by moving the plate or head up or down, as may be required to increase or lessen the tension of the spring I′, the movements of which can be effected, as above described, by means of the threaded thimble K.

O represents a threaded sleeve, secured to the upper end of the stem or bar I. It has a top piece, O′. The parts can be so adjusted that when the pressure has become too great, by reason of too high a heat in the furnace, the door which shuts off the draft can be closed by the stem I, the adjustable stop-piece O′, and the lever P P′. If, however, the closing of the draft in this way is not sufficient, and the pressure of the steam should, after the door is closed, still continue to increase, relief will be provided in the way above described. The gage L′ is in front of or to one side of the stem I, and is slotted throughout its central part to permit the index M to travel in front of the face of the gage, and also allow the engineer to see the adjustable piece or sleeve O, that he may accurately adjust it. Supposing the parts are so related that the point O′ of the cap comes in contact and commences to move the lever P when there are fifty pounds of steam in the boiler, and it be desired to commence shutting the damper and reduce the heat in the furnace when the boiler carries less steam, (say ten pounds less,) the engineer can accurately effect this, by reason of the relation of the parts shown, by raising the sleeve or cap past the number of spaces on the gage, indicating the difference in pressure at which it is desired the damper shall commence closing, (that is, in this case through ten spaces.)

I am aware that dampers of furnaces have been opened and closed by a piston operated by steam from the boiler, said piston moving a weighted lever connected with the damper; but when such device is employed, the damper remains entirely open until there is sufficient pressure of steam upon the piston to raise the weight, which is done suddenly and the damper closed. It remains in this position until the pressure is so reduced that it will not sustain the weight, when the weight suddenly falls and the damper is opened. This causes an irregular heating, and hence a fluctuation in the steam-pressure, both of which, however, are obviated by the use of my invention.

Q represents a brace, which may be made of a piece of round iron screw-threaded at the ends, one end being thereby adapted with a threaded supporting-plate, Q′, secured to the boiler, and at the other end with the coupling *n*. By this, together with the supply-tube B, a strong support is provided for the various parts of the gage and safety-valve.

I do not claim, broadly, an apparatus having a rising and falling rod moved in one direction by the steam-pressure and in the other direction by a spring, in combination with devices for moving the furnace draft-door; nor do I claim, broadly, the combination of a graduated scale with devices moved by the pressure of the steam, as I am aware that such combinations in various forms are old; but I believe myself to be the first to have devised an apparatus of the simple and cheap construction shown and above described, and having the parts as advantageously situated and related as are those in my case, and adapted to be secured to the boiler in the way described, and capable of fulfilling the functions which are performed by mine.

I am aware of the safety-valve shown in the patent to J. Zundorff, dated March 5, 1867, No. 62,722, and I do not claim as my invention what is therein shown. My invention, however, possesses advantages over constructions of this character. By mounting the spring directly upon the head H and within the cylinder G, in which the head works, I reduce the length of the device one-half. I also dispense with the enlarged cylinder or case in which the spring was mounted, and am enabled to locate the gage and index directly above the cylinder, which gives to the device a very neat and compact appearance.

What I claim is—

1. In a safety-valve, the combination of the cylinder G, having the apertures *g*, communicating with the blow-off pipe, the steam-passage connecting said cylinder with the boiler, the head or piston H, working in the cylinder, the spring situated within the cylinder and bearing against the head or piston to counterbalance the steam-pressure, substantially as set forth.

2. In a safety-valve, the combination of the cylinder G, having the apertures *g*, communicating with the blow-off pipe, the steam-passage connecting the cylinder with the boiler, the head or piston working in said cylinder, the spring situated within the cylinder and bearing against the head to counterbalance the steam-pressure, and devices for adjusting the pressure of the spring, substantially as set forth.

3. In a safety-valve, the combination of the cylinder G, having apertures *g*, communicating with the blow-off pipe, the steam-passage connecting the cylinder with the boiler, the valve or piston working in said cylinder, the spring situated within the cylinder and bearing against the piston to counterbalance the steam-pressure, the loose plate L, against

which the upper end of the spring bears, and the screw-threaded plug K′, bearing against the plate L, substantially as set forth.

4. In a safety-valve, the combination of the cylinder G, having apertures *g*, communicating with the blow-off pipe, the steam-passage connecting the cylinder with the boiler, the head or piston H, working in said cylinder, the spring situated within the cylinder and bearing against the piston to counterbalance the steam-pressure, the gage, and the index actuated by said piston, substantially as set forth.

5. The combination of the head or safety-valve H, the barrel or cylinder G, the spring therein bearing against one side of the head or safety-valve, the adjustable abutment situated within the barrel or cylinder and bearing against the other end of the spring, the graduated scale, the index, the stem or rod connecting the index with the head or safety-valve H, and the escape passage-way for the steam communicating directly with the interior of said cylinder or barrel G, substantially as set forth.

6. In a safety-valve, the combination of the cylinder G, having apertures *g*, communicating with the blow-off pipe, the steam-passage connecting the cylinder with the boiler, the head or piston H, working in said cylinder, the spring situated within the cylinder and bear-against the piston to counterbalance the steam-pressure, the stem or rod connected with the piston and extending upward therefrom, the stuffing-box through which the rod passes, the index carried by the rod, and the gage, substantially as set forth.

7. In a safety-valve, the combination of the cylinder G, communicating with the blow-off pipe, the steam-pipe connecting the cylinder with the boiler, the head H, the spring acting upon the head to counterbalance the steam-pressure, the rod I, extending upward from the head and carrying the index, the plate L, against which the upper end of the spring bears, the screw-threaded thimble K, bearing upon the plate L, and the plug K′, screwed into the thimble K and operating with it to form a stuffing-box through which the rod I passes, substantially as set forth.

8. The combination of the cylinder G, the pipe connecting the cylinder with the boiler, the head or piston H, working in said cylinder, means for counterbalancing the pressure of the steam upon the head or piston, the index operated by the head or piston, and the gage L′, attached to the cylinder by means of a nut which clamps the gage between itself and the head of the cylinder, substantially as set forth.

9. The combination, with the cylinder communicating with the blow-off, the steam-passage connecting the cylinder with the boiler, the safety-valve or piston within the cylinder adapted to be moved to open the passage to the blow-off, and a spring which counterbalances the pressure of the steam upon the piston, of devices for opening and closing the damper of the furnace, and means connected with the piston or safety-valve which operate the draft-regulating devices, whereby the draft may be gradually cut off as the steam raises the piston toward the blow-off point, and opened as the piston recedes, substantially as set forth.

10. The combination, with the cylinder communicating with the blow-off, the steam-passage connecting the cylinder with the boiler, the safety-valve or piston within the cylinder adapted to be moved to open the passage to the blow-off, and a spring which counterbalances the pressure of the steam upon the piston, of devices for opening and closing the damper of the furnace, means connected with the piston or safety-valve which operate the draft-regulating devices, whereby the draft is gradually diminished as the pressure of steam increases, and adjusting mechanism whereby the damper may be closed at one adjustment by the steam at a given pressure and at another adjustment by steam at a different pressure, substantially as set forth.

11. The combination of the cylinder communicating with the blow-off, the steam-passage connecting the cylinder with the boiler, the safety-valve or piston in said cylinder, means for counterbalancing the pressure of steam upon the safety-valve, devices for opening and closing the damper of the furnace, a stem or rod operated by the safety-valve and moving the draft-regulating devices, the gage, and an adjusting device between the stem and the draft-regulating devices situated in proximity to the gage, substantially as set forth.

12. The combination of the cylinder or barrel G, the head or safety-valve H, the spring which resists the pressure of the steam on the valve, the graduate-scale, the index, the support for the index connected with the head or safety-valve H, the escape passage-way for the steam communicating directly with the interior of the barrel or cylinder G, the means for regulating the draft in the furnace, and the movable part O′, connected directly to the head or safety-valve H and adapted to operate the draft-regulating means, substantially as set forth.

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

JAMES WHITE.

Witnesses:
E. J. HART,
J. W. VARNES.