

W. CHURCHILL.
Safety-Valves.

No. 140,115.

Patented June 24, 1873.

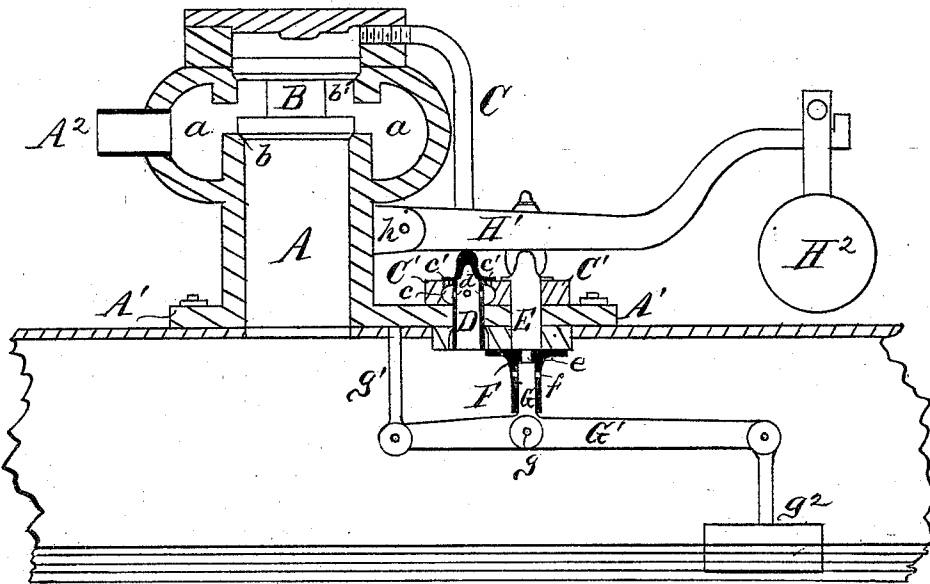


FIG. 1.

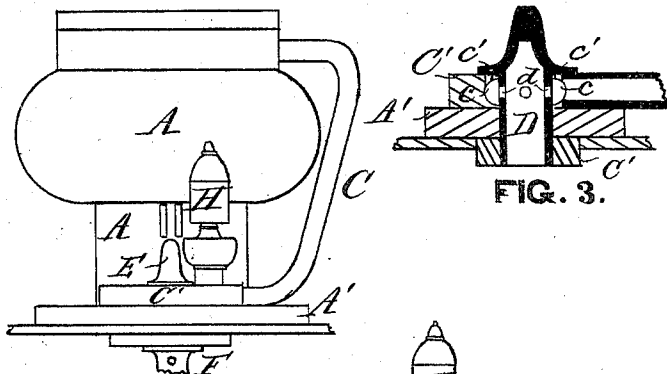


FIG. 2.

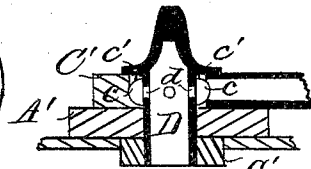


FIG. 3.

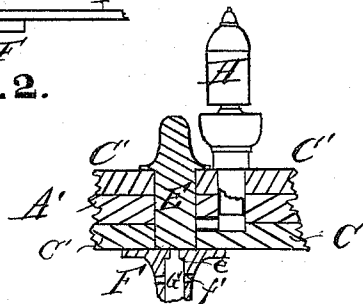


FIG. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM CHURCHILL, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. **140,115**, dated June 24, 1873; application filed March 25, 1873.

To all whom it may concern:

Be it known that I, WILLIAM CHURCHILL, of St. Louis, in the county of St. Louis, and State of Missouri, have invented an Improved Steam Safety-valve, of which the following is a specification:

The nature of this invention relates, first, to the arrangement and operation of an additional safety-valve, with a steam chamber, ports, and steam-pipe connection, to main safety-valve, to establish steam-pressure communication from boiler to top of said main valve, retaining it to its seats, but as soon as the additional valve is lifted, to permit the exhaust of steam from top of main valve, and allow same to be raised from its seats by the excess of steam-pressure in boiler, and so that said surplus steam can freely and fully escape and relieve the boiler; secondly, to the further arrangement and operation of an auxiliary safety-valve, which, when raised and in active operation, shall prevent the reseating of the main valve until the steam-pressure in boiler has been rendered harmless, or the water-level is restored, thus affording additional safety by preventing the injurious effects of oxidation, expansion, and explosion, or ill consequences arising in cases of neglect; lastly, to the peculiar combination consisting of main valve, additional and auxiliary valves and their connections, with each other, so as to effect the discharge of surplus steam from boiler, against the pressure of the atmosphere.

To enable those herein skilled to make and use my said improvements, I will now more fully describe the same, referring to—

Figure 1 as a longitudinal sectional elevation; to Fig. 2 as a part front elevation; to Fig. 3 as an enlarged detail section of the additional valve and its contiguous parts; and to Fig. 4 as an enlarged detail section of the auxiliary valve and its connections to the alarm-whistle.

A represents the valve-cylinder; A^1 its base. The valve-cylinder A is formed as indicated, so as to have an annular steam-chamber, a . In communication with the steam-chamber a is the escapement-pipe A^2 , for the egress of the surplus steam. In the cylinder A I provide a main safety-valve, B; this is of the constructive form shown, having a

larger area at top. (See Fig. 1.) The main valve B is doubly seated on the seats b b' , and when raised establishes open steam communication from boiler to the steam-chamber a , from thence out of escapement. On top the cylinder A is closed by a suitable cap, which also limits the up-stroke of the main valve when operating. The main valve B is retained to its seats by steam-pressure from boiler, acting on the top of said valve, and is released from pressure at the required times to accomplish its rising action by the arrangement of the additional safety-valve and its connections as follows: C is a steam-pipe, which discharges top of the main valve B, and at bottom said pipe connects to a steam-chamber, c , which is formed in the valve-seat C' . (See Figs. 1 and 3.) The valve-seat C' is fitted in the base A^1 , partly extending therefrom, and bolted at top. From the steam space, or chamber c , outward to top of valve-seat C' , the same has one or more exhaust-ports, c' , (see Figs. 1 and 3;) thus from said chamber the exhaust is effected when said ports are open. D is the additional safety-valve. This consists of a hollow cylinder closed at top by its flanged cap. The valve D fits loosely in a cylinder-space in the seat C' . Holes or ports d are bored in the sides of the valve D, so that when same is seated steam connection is established from boiler, through said ports, to the steam-chamber c . The flanged cap of the valve D, when in its seat, closes the exhaust-ports c' and the exhaust takes place when said valve is raised. When, therefore, the valve D is seated, (see Fig. 1,) the steam from boiler enters through ports d into the steam-space c , from thence through steam-pipe C, and discharges top of the main valve B. Sufficient steam-pressure is thus obtained to retain the main valve B to its seats as long as no undue or excess of pressure exists in the boiler. As soon, however as the valve D is lifted the exhaust immediately takes place, returning through the pipe C into steam-space c ; from thence out of exhaust-ports c' . The main valve is thus relieved, and can freely be raised to effect the escape of the surplus steam from boiler. E represents an auxiliary safety-valve arranged in line with the valve D. The valve E is

solid, and similar in outer construction to that of D. The valve E is seated on a valve-seat, *e*, formed in the socket-guide F, which is bolted to bottom of the valve-seat C'. (See Figs. 1 and 4.) Below the seat *e* are provided side-ports *f*, to admit steam to raise the valve E. In order to shut off or admit from boiler steam through the ports *f*, there is operating in the socket-guide F a valve-stem, G, which is pivoted at *g* to a lever, G'. The lever G at one end is pivoted to a stem, *g*¹, and at its other end has suspended therefrom a float, *g*², as shown in Fig. 1. The float *g*² resting upon the water-line, as soon as the water in the boiler falls below its required level, the float drops, and in doing so the lever G', following its movement, actuates the valve-stem G to drop and open the ports *f*, through which the steam rushes and raises the auxiliary valve E. Here it will be observed that the valve E assists the valve D to maintain the raised or open communication for the main valve B, and that not until said auxiliary valve returns to its seat can either of said valves automatically return to their seats. The boiler is thus not only permitted to effect or blow off its surplus steam, but, further, all undue effects of heating, expansion, or dangerous causes producing explosion are thus entirely and practically guarded against, as the auxiliary safety-valve will not be seated as long as steam operates the same, or until the water level has been restored. A whistle, H, can be provided alongside of the valve E, so that as soon as same rises the whistle is sounded to indicate the alarm of a lack of water. The valves D and E are held to

their seats by the lever H¹, which is journaled at *h*, and is kept in horizontal position, when not acted on, by the weight H².

My improved safety-valve can be locked in a suitable case, to prevent the consequences resulting from undue tampering; can be provided with a spring-balance connection to its lever; can have its area of effecting discharge increased, and can otherwise be adapted as a safety apparatus for steam locomotive-boilers, or steam-generators in general.

Having thus fully described my said improvements, what I claim is—

1. The arrangement of the additional safety-valve D having ports *d*, valve-seat C' having steam-space *c*, exhaust-ports *c'*, and steam-pipe C, to operate as and for the purpose set forth.

2. An auxiliary valve E, arranged to operate in combination with valve D, to prevent the reseating of the main safety-valve B, in the manner and for the purposes set forth.

3. The combination of the safety-valves D E B, to effect the discharge of the surplus steam from boiler and relieve same, in the manner and for the purpose set forth.

4. The combination of cylinder A, main valve B, steam-pipe C, valve-seat C', steam-space *c*, exhaust-ports *c'*, valve D, its ports *d*, valve E, seat *e*, socket-guide F, its ports *f*, valve-stem G, lever G', float *g*², and top lever H¹, to operate as and for the purposes set forth.

In testimony of said invention I have hereunto set my hand.

Witnesses: WM. CHURCHILL.
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