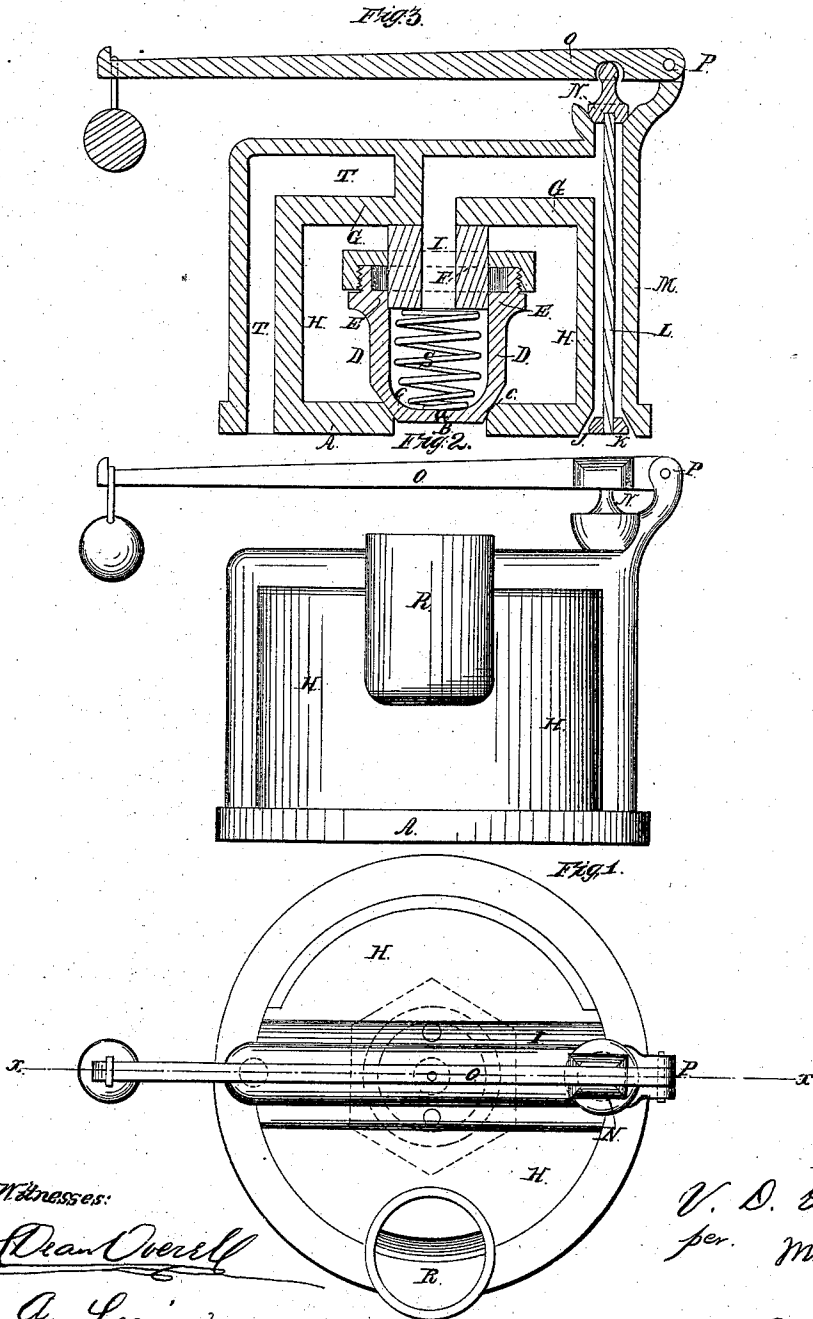


V. D. Green,

Steam Safety Valve.

N<sup>o</sup> 54,716.

Patented May 15, 1866.



Witnesses:

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# UNITED STATES PATENT OFFICE.

VIRGIL D. GREEN, OF WATERTOWN, WISCONSIN.

## IMPROVED SAFETY-VALVE FOR STEAM-GENERATORS.

Specification forming part of Letters Patent No. 54,716, dated May 15, 1866.

*To all whom it may concern:*

Be it known that I, VIRGIL D. GREEN, of Watertown, in the county of Jefferson and State of Wisconsin, have invented a new and Improved Arrangement of Safety-Valves for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

The object of the present invention is to enable a large safety-valve to be used for the escape of steam from a boiler, while at the same time the use of a long lever or heavy weights or rigid and stiff springs are dispensed with; and it consists in arranging upon the boiler, in a suitable aperture thereof, a hollow cup-shaped valve opening outward and having an inside diameter greater than the diameter of the said aperture, which valve, by its open end, plays steam-tight upon a fixed center-plug or piston, having through its center a passage formed leading to and opening into the boiler, for the steam to pass from the boiler into the said valve, in the end of which steam-passage, communicating with the boiler, is arranged a valve opening inward, and so connected through a suitable stem with another valve of said steam-passage, but opening outward, that when one is open the other is closed, the latter valve being held down by means of a weight, spring, or any other suitable device properly adjusted to the degree of pressure which it is desired the steam in the boiler should not exceed. By this arrangement it is obvious that so long as the pressure of steam within the boiler does not exceed the downward pressure upon the weighted valve the passage of steam from the boiler to the interior of the cup-shaped valve is free and uninterrupted, consequently producing sufficient pressure upon the inside of such valve, as its surface there exposed to the pressure of the steam is greater than its end fitting in the aperture of the boiler and subject to the direct action of the steam therein to firmly hold it to its seat in the boiler, the valve at the boiler end of the steam-passage leading to the hollow-valve being then open, and consequently the weighted valve closed. In this relative position the several valves remain until the pressure of the steam in the boiler has sufficiently increased above that of the weighted valve to raise or open it, conse-

quently at the same time closing the valve in the steam-passage from the boiler to the cup-shaped valve, and thus stopping the passage of steam through it, through which weighted valve the steam in such passage, as well as in the cup-shaped valve, then escapes to the open air, thereby relieving the inside pressure upon such valve, by which it is held to its seat, when the steam-pressure within the boiler, immediately raising such valve from its seat, opens it to the escape of the steam from the boiler, which continues so long as the boiler-pressure is above the pressure of the weighted valve, or sufficiently so to hold it open, but is immediately stopped the instant the pressure is reduced below such amount by the falling or closing of the weighted valve, and consequent opening of the boiler-valve in the steam-passage to the cup-shaped valve, whereby the steam-pressure again acts upon the inside of the cup-shaped valve, bringing or forcing it to its seat, where it remains until the boiler-pressure again exceeds the amount of pressure on the weighted valve, when the same relative movements of the several valves again take place as above explained, and so on at each and every increase of boiler-pressure.

In accompanying plate of drawings my improvements are illustrated, Figure 1 being a plan or top view, Fig. 2 a side elevation, and Fig. 3 a central vertical section taken in the plane of the line *x x*, Fig. 1.

Similar letters of reference indicate like parts.

A in the drawings represents, for instance, the top plate of a steam-boiler, which may be made of any of the ordinary constructions of such boilers, in which boiler-plate an aperture or opening, B, is formed with its edge flared or beveled outward. In the flared portion of this opening B fits the beveled or flared lower end, C, of a hollow cup-shaped valve, D, playing steam-tight by its open and upper end, E, over a fixed piston or plunger, F, secured to the under side of the top plate, G, of the chamber or box H surrounding the said valve D. Through the center of this fixed piston or plunger F extends a passage, I, leading therefrom to the top of the boiler, with the interior of which it communicates through a flared aperture or opening, J, having a valve, K, arranged in it opening inward. This valve K is secured to the lower end of a vertical rod or stem, L, extending upward through the cen-

ter of the portion M of the steam-passage I, having upon its upper end another valve, N, opening outward, on which rests a lever, O, hung at one end upon a fulcrum, P, and at the other properly weighted to the degree of pressure beyond which it is not desired to raise the steam in the boiler, the weighting of this valve N being the same as in ordinary safety-valves.

From the above description of the arrangement of the two valves K and N, attached to a common stem, L, it is obvious that when one is open the other will be closed, and vice versa, the steam, when the valve K is open, passing through the steam-passage I leading from the boiler directly into the hollow cup-shaped valve D, the internal diameter of which is intended to be sufficiently in excess of the boiler-aperture, in which it fits or comes to a seat, that the inside pressure of steam will more than balance the direct pressure of the steam within the boiler upon its lower end, and thus firmly hold it down and to its seat, where it remains until the steam-pressure in the boiler exceeds the amount to which the valve N is weighted, which it consequently then raises and opens, at the same time closing the valve K, stopping the passage of steam through steam-passage I, from which, as well as the interior of the cup-valve D, the steam then escapes through said open valve N, relieving the inside pressure upon the valve D, which then, by the action of the boiler-pressure upon the lower end, immediately rises and opens, giving a vent to the steam from the boiler through its aperture B into the chamber H, from which it escapes to the open air at R, said valve D, as soon as the boiler-pressure has thus become reduced to the desired amount, falling and closing, while at the same time the weighted

valve N closes, (the valve K of course opening,) and the steam communication is again established with the interior of the cup-valve D, which so remains until the boiler-pressure again exceeds the amount to which the weighted valve N is adjusted or set. By this arrangement of the valves K, N, and D so as to operate with regard to each other, as explained, it is manifest that a small weighted valve may be used, while at the same time a large vent is obtained for the steam to escape from the boiler in case it should exceed the amount of pressure desired, the importance of which arrangement is apparent to all conversant with steam-boilers.

In order to assist the closing of the cup-valve D, I use upon its inside a light coiled or spiral spring, S, resting at one end upon the valve D and at its other bearing against the lower end of the fixed plunger F, around which the valve fits steam-tight.

T is a steam-passage around valve-chamber H and upon the opposite side to steam-passage I, for the equalizing of the expansion of the said chamber-plate.

a is a small opening through bottom of cup-shaped valve to allow condensed steam in it to escape.

I claim as new and desire to secure by Letters Patent—

The combination of the cup-shaped or hollow valve D, steam-passage I, and weighted valve N, and boiler-valve K, connected to a common stem, L, when arranged so as to operate together substantially as herein described, and for the purpose specified.

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Witnesses:

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