2 Sheets—Sheet 1.

W. STARKEY.

INDICATOR AND LOW-WATER ALARM.

No. 186,961 Patented Feb. 6, 1877.

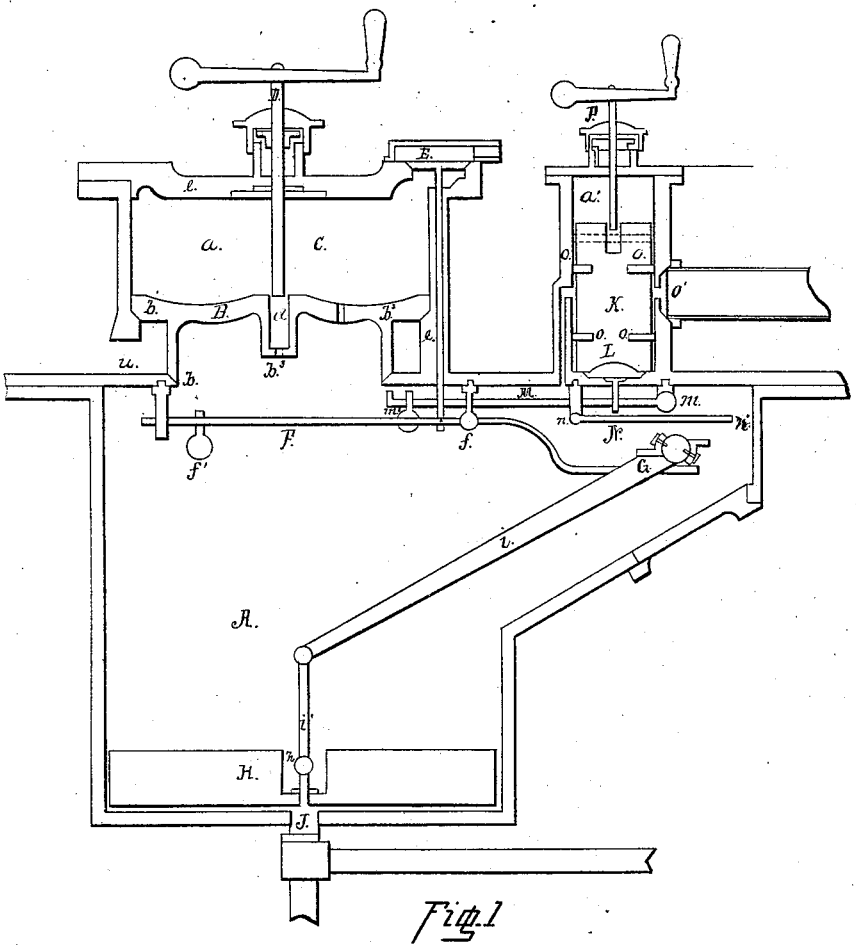

Fig. 1

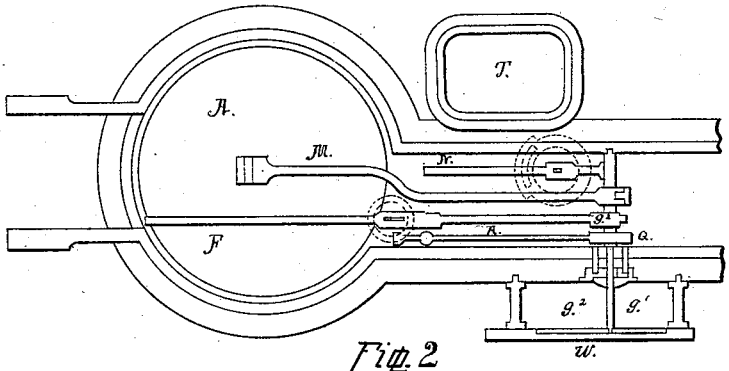

Fig. 2

Witnesses
J. H. Stevenson
A. H. Greenawalt

Inventor
William Starkey

2 Sheets—Sheet 2.

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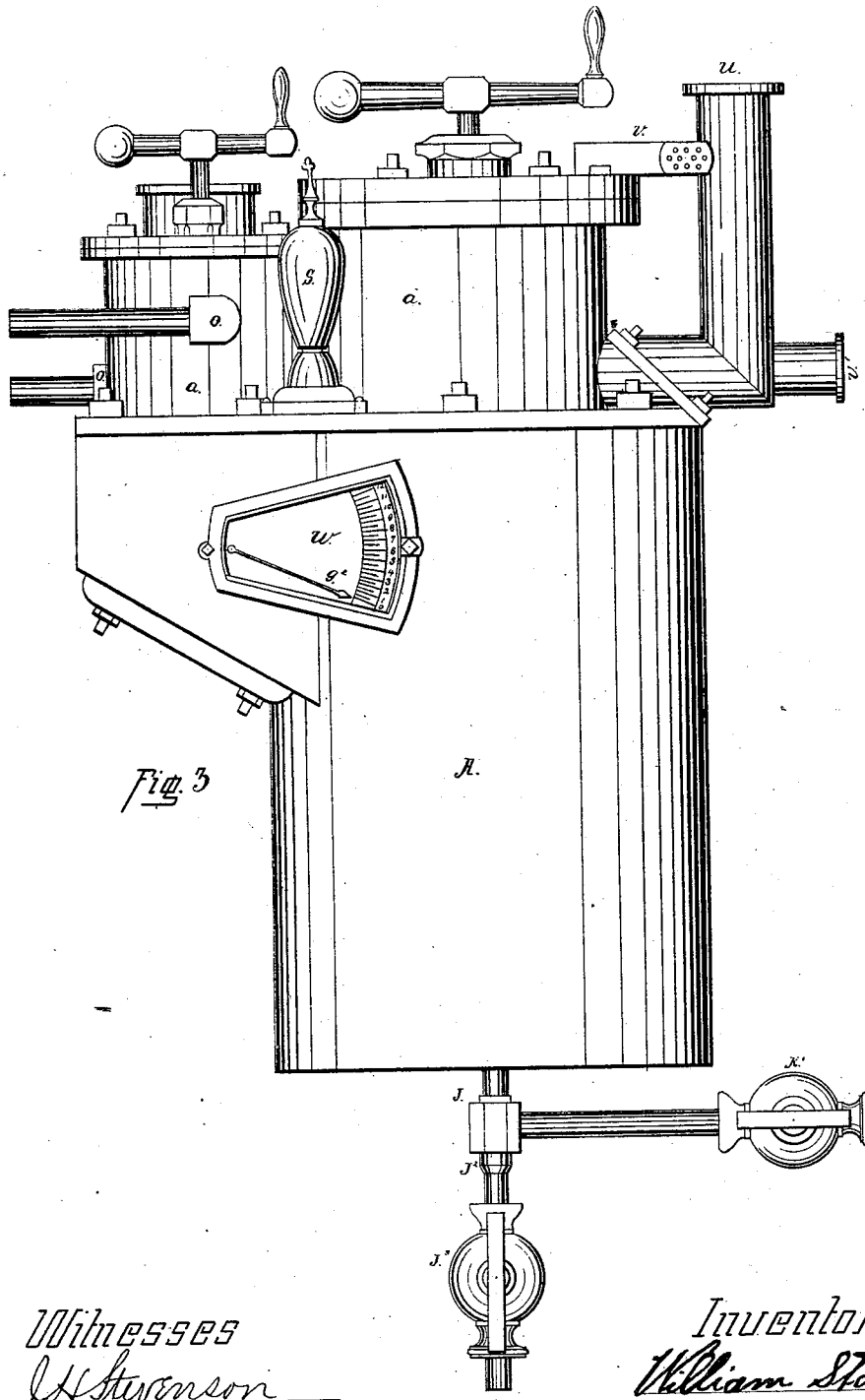

Fig. 3

Witnesses
J. H. Stevenson
A. H. Greenawalt

Inventor
William Starkey

UNITED STATES PATENT OFFICE.

WILLIAM STARKEY, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF THREE-FOURTHS OF HIS RIGHT TO H. PULLIAN, JEREMIAH S. COOPER, AND THOS. S. HUTCHINSON, OF SAME PLACE.

IMPROVEMENT IN INDICATORS AND LOW-WATER ALARMS.

Specification forming part of Letters Patent No. **186,961**, dated February 6, 1877; application filed July 24, 1876.

To all whom it may concern:

Be it known that I, WILLIAM STARKEY, of Pittsburg, Pennsylvania, have invented a new and useful Improvement in Method of Preventing Boiler-Explosions, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

Similar letters of reference indicate corresponding parts.

My invention consists of an automatic safety attachment for steam-boilers.

The object of my invention is to afford greater security to life and property from the explosions of steam-boilers; and consists in a cylindrical-shaped vessel constructed of suitable material for sustaining steam-pressure, and is placed at a convenient distance from the boiler or battery of boilers, as the case may be, and mounted in such position that the bottom of the vessel will be in line with the bottom of the boiler or boilers, to which it is attached by means of a water-pipe at the bottom of the boiler and a steam-pipe from the steam-drum. Placed within the main body of the vessel is a float, which is made to descend from the water-line downward to the bottom as the water recedes. Attached to the float is a system of levers and valves, the uses of which will be hereinafter fully explained in detail. By the operation of the float levers and valves the condition of the water in the boiler is shown on a dial-plate, and when the water gets below the proper line of safety the valves will be opened by the lowering of the float, thus giving vent to the steam, and by the same operation an alarm will be sounded by a whistle, the pump or injector of the boiler will be put in motion, supplying water to the boiler, and a stream of water will be discharged upon the fire, reducing the same.

I will now proceed to describe the different parts of the invention and its operation.

In the accompanying drawings, Figure 1 is a vertical sectional view of my safety attachment. Fig. 2 is a top sectional view of the same, and Fig. 3 (on Sheet 2) is a side elevation.

A is the main body of the vessel. *a* and *a'* are cylindrical-shaped valve-chambers. B is a valve, which is held firmly in the seats $b^1 b^1$ by its own gravity and the steam-surface of the top part of the valve. The steam is allowed to pass up into the space C, between the top of the valve and the shell C, through holes in the valve at b^2 and a hole beneath the valve-stem at b^3, the end of the valve-stem being slotted to allow the passage of the steam to the opening C. The valve-stem D is not attached to the valve, but inserted into the square opening *d*, for the purpose of revolving the valve, and for grinding in the seat and freeing the same of sediment. At the top of the valve-chamber C is a weighted valve, E, having a stem, *e*, attached by pins to the lever F, which latter is suitably pivoted at *f*, and a weight, *f'*, at or near one end of the same, and at the other end it is so placed as to engage with an adjustable arm upon the shaft G at the desired point. The shaft G is made to work in journals, so as to turn with the movements of the float H. Attached to this shaft rigidly is a float arm or lever, *i*, at one end, and at the other end of the lever *i* is fastened, by a loop-joint, a vertical arm, *i'*, which is also attached to the float H by a loop-joint at or near the lower side, within the notch *h*.

Through the shell of the main vessel, in the bottom of the same, is an opening, into which a pipe, J, is inserted, communicating with the water at the bottom of the boiler or boilers, to which my device is attached, the water being let on or shut off, as desired, by means of the valve K'. Connected with the same opening are the vertical pipe J^2 and the valve J^3, for the purpose of letting off water from my device when in danger of freezing, or for purposes of testing the operations and mechanism of my invention. Placed within the chamber *a'* is a cylindrical-shaped valve, K. Beneath the valve K, at the bottom of the chamber *a'*, is a valve, L, the stem of which is attached by a suitable fastening to the weighted safety-lever M. One end of the lever M is secured to the main shell of the vessel at *m*, and to the other end is suspended a weight, *m'*. Immediately below the end of the valve L is a lever, N, attached to the main shell of the

vessel at n, and in such position that it engages with an adjustable arm, n', upon the shaft G. By the operation of these levers the valve L is opened, forcing upward the valve K to the top of the chamber, and bringing the ports O and O′ in line with each other, which ports communicate with pipes to the pump and boiler. The stem P of the valve K is not attached to the valve, but inserted into a square opening in the top of the valve, for the purpose of operating the same to relieve it from sediment and grinding the seat. That part of the stem that is inserted into the opening of the valve is grooved vertically to allow water to escape up through the same. Attached also to the float-shaft G is an arm, Q, in such position as to engage with a weighted lever, R, operating a valve within the whistle S. T is a communicating steam-pipe from the steam-chest of the boiler, to which my device is attached. One end of the float-shaft G, at g^1, extends through the main shell of the vessel, to which is attached a hand, g^2, communicating with a dial-plate, for showing the state of the water in the boiler.

It will be seen that as the water recedes from the main chamber, the float H is carried with it, and by means of the arm i a rotary movement is imparted to the shaft G, bringing the arm g in contact with the lever F, drawing down the end of the same. By this means the other end of the lever is made to ascend, forcing up the stem of the valve E, thus giving greater vent to the steam in the chamber C than can be supplied by the holes b^2 and b^3 through the valve B, and releasing the pressure on the top of the valve B, and by the overpowering lower pressure upon the same the valve B is forced upward and opened, allowing the steam and water to pass off at the opening U to the fire beneath the boiler, or the openings V and V′ in the open air. In like manner the arm n' engages with the lever N by the same operation of the float H; the end of the lever N is forced upward, engaging with the stem of the valve L of the chamber a', the stem of the valve L being secured to the weighted lever M.

The gravity of the float H operating on the arm n' and lever N, in addition to the steam-pressure within the vessel, the weight m is overcome, and the valve L opened, allowing the steam to escape to the opening below the valve K, forcing the valve K to the top of the chamber a', when the ports O and O′ are brought in line with each other, allowing steam to escape through the port O, communicating with the pump, to set it in motion, and in this way supplying the boiler with water through the port O′. Also, by the same movement of the float H, the arm Q engages with the whistle-lever R, sounding the whistle S, and giving an alarm; or, when desired, the whistle may be made to give an alarm, or the pump started at any stage of the water desired, before it becomes necessary to give the boiler vent to avoid explosions.

It will also be seen that the motion of the float H in the vessel will be communicated to the hand on the dial-plate by means of the arm i and shaft G, and by this means the engineer will always have in full view the state of the water in the boiler.

As an explosion may occur by an undue pressure of steam in the boiler when the water is at its proper line, the different valves and their weighted levers of my attachment are arranged so as to be adjusted with reference to the proper standard of safety of the boiler; and in order to prevent these safety-valves from being weighted down or tampered with, they are placed within the shell of the vessel, beyond reach of the engineer, and in this way securing a perfect lock-up safety-valve.

Having thus described my invention, and the object to be obtained by it, what I claim is—

1. In combination with the vessel A and chamber a, the valves B and E, lever F, arm g, shaft G, arms i and i', and float H, combined and arranged substantially as described and shown, and for the purpose set forth.

2. In combination with the vessel A and chamber a', the valves K and L, levers M and N, arm n', shaft G, arms i and i', and float H, substantially as described and set forth.

3. The combination of the float H, arms i' and i, arm Q, lever R, and whistle S, substantially as described and set forth.

4. In a safety attachment for steam-boilers, the combination of the vessel A, chambers a and a', the pipes J and J^2, valves K and K′, all combined and arranged as described, substantially.

WILLIAM STARKEY.

Witnesses:

JAMES SIMS,

J. H. STEVENSON.