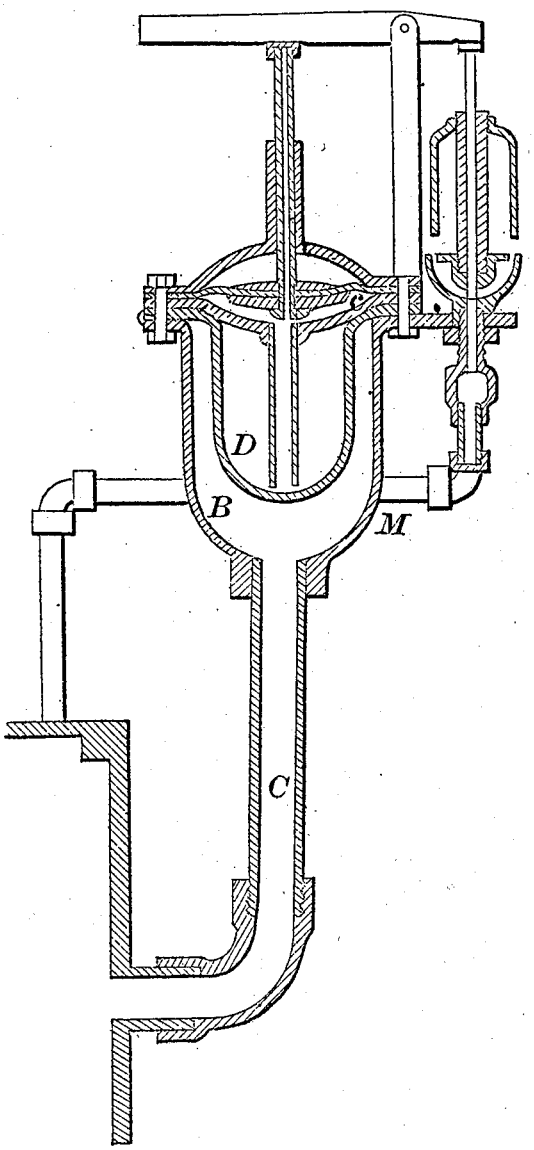
J. W. BISHOP.

LOW WATER INDICATOR.

No. 47,183. PATENTED APR. 11, 1865.



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J. W. BISHOP, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN LOW-WATER INDICATORS.

Specification forming part of Letters Patent No. 47,183, dated April 11, 1865.

To all whom it may concern:

Be it known that I, J. W. BISHOP, of New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Low-Water Indicators for Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same, when taken in connection with the accompanying drawings and the letters of reference marked thereon, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a side view; Fig. 2, a vertical central section showing my invention as connected with a steam-boiler, and in Fig. 3 a different construction of the same invention.

Similar letters indicate corresponding parts in the several figures.

My invention is designed to sound an alarm whenever the water in the boiler to which it is attached shall have fallen to a given point.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation as illustrated in the accompanying drawings.

A represents a section of a common steam-boiler; *d*, the proper water-line, and *b* low-water line. My invention, as attached to the said boiler, is constructed as follows:

B is a hollow metal vessel connected with the boiler A by a pipe, C, entering or opening into the boiler at low-water line or below high-water line. I prefer that the said vessel should be elevated a little above the boiler, as shown in Fig. 2. Within the vessel B, and supported by a rim resting on the rim of the vessel B, I set a second vessel, D, of such size as to leave a space around the inner vessel, D. The said vessel D has no communication with it surmounting vessel B. Over the second vessel D, I place a plate, E, resting on the rim of the second vessel D, and constructed so as to form the lower part of a chamber, *a*. Into the said plate E, I insert a tube, F, which extends nearly to the bottom of and opens into the vessel D, and also through the plate E opens into the chamber *a*. Over the the said plate E, I form and fix a diaphragm, *c*, of any suitable flexible material; then cover the whole with a plate, H, constructed so as to form a second chamber, *a'*, and the whole bolted together or otherwise secured steam-tight, as see Fig. 2. The second chamber, *a'*, should have one or more small openings, through which air may pass to or from the said chamber, accordingly as the diaphragm is lowered or raised, increasing or decreasing the capacity of the said chamber. To the said diaphragm I attach a hollow spindle, I, which extends up through the plate H in a suitable guide, *f*, to one arm of a lever, L. The upper end of the said spindle is closed by a cap, *i*. The lever L is supported by its fulcrum *e*. The other arm of the said lever rests upon the spindle of a common steam-whistle, N. A pipe, M, communicates with the whistle from the boiler. Thus constructed and attached to a steam-boiler, I remove the cap *i* from the spindle I and through the said spindle nearly fill the inner vessel, D, with water or other fluid, as denoted in blue, Fig. 2, first opening a vent, *n*, to the vessel D to allow the air to escape therefrom, and close the vent after the vessel is filled, replace the cap *i*, and set the lever L onto the top of the cap, as shown. This completes the indicator.

When the boiler is filled to the line *d* or higher, the lower part of the pipe C will also be filled, and when the water in the boiler is expanded or steam generated in the boiler to press upon the surface of the water it will ascend the pipe C before it shall have become heated to any extent, and, entering, fill the vessel B around the vessel D, and the water thus forced into the vessel B will remain there at so low a degree of temperature as not to affect the fluid in the vessel D until the water in the boiler from the generation and consumption of steam therefrom shall have sunk below the opening into the pipe C, as denoted by the line *b*. The cool water from the vessel B will by its own gravitation now fall into the boiler, and instantly be replaced by hot steam from the boiler, which will quickly generate steam in the vessel D, from which the steam cannot escape, consequently will force the fluid in the vessel up through the tube F, fill the chamber *a*, and force the diaphragm *c*, with the spindle thereto attached, up, raising the lever L and depressing the spindle of the whistle to open the valve thereto, sounding the alarm.

When the boiler is again supplied with water, the vessel B will be again filled with

water as before, and the steam in both vessels condensed, the lever will force the diaphragm by the action of a spring, *s*, or otherwise, and so remain until from the same or other cause the water is displaced in the vessel by hot steam.

I have represented the inner vessel, D, as filled with water or other fluid; but if simply filled with air perfectly confined its expansion would accomplish the same object, but I prefer water or other fluid, as described.

The tube F and the plate E are not essential to the operation of my invention, as the steam or expanded air might act directly upon the diaphragm, but as I prefer to form the diaphragm of rubber or similar material, the action of steam or hot air upon such material is more or less injurious thereto, but by the introduction of the plate E, with the tube F, the water within the tube with which the chamber *a* is filled is comparatively cool, or of so low a degree as not to be injurious to the diaphragm. Thus I bring into action the force of steam generated in a close vessel to act upon the alarm, while in most of the indicators, if not all, the operation of the alarm depends upon the expansion of a metal by the heat of steam only, which is always so little as to render the indicator very doubtful of action, and consequently comparatively useless. The chamber in which the diaphragm is placed may be at a distance from the vessel generating the steam to operate upon it, as shown in Fig. 3, in which construction a pipe, W, runs from the vessel D to the chamber *a*, and curved so as to contain water sufficient to fill the chamber *a* When steam is generated in the vessel D, as before described, it will pass into the pipe W, forcing the fluid therein (always cold) into the chamber *a* below the diaphragm to operate the alarm, as before described. This last construction entirely precludes the possibility of injuring the diaphragm, yet from my experiments, I prefer the first-described construction, never having found the fluid in the chamber to become heated sufficiently to injure a common rubber diaphragm.

Having therefore fully described the construction and operation of my invention, what I claim therein as new and useful, and desire to secure by Letters Patent, is—

1. The combination of the two vessels B and D, arranged as described, with a diaphragm *c*, or its equivalent, in the manner and for the purpose substantially as herein set forth.

2. The combination of the vessels B and D and diaphragm *c*, or its equivalent, with a steam-boiler, when arranged to operate an alarm, substantially as and for the purpose specified.

J. W. BISHOP.

Witnesses:
JOHN E. EARLE,
RUFUS SANFORD.