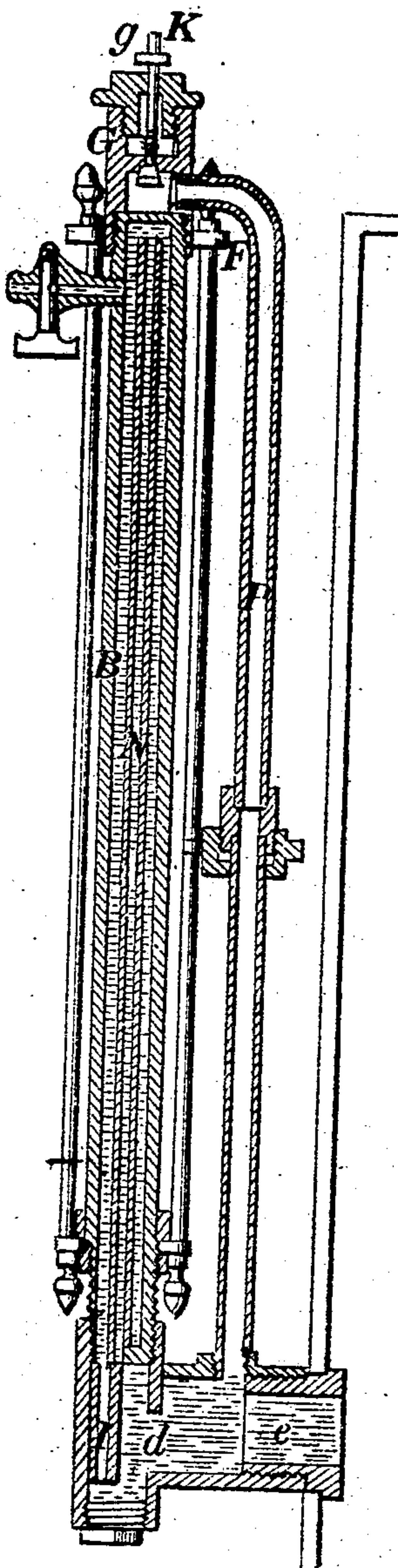


G. W. BLAKE.

LOW WATER DETECTOR FOR STEAM BOILERS.

No. 33,067.

PATENTED AUGUST 20, 186



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GEO. W. BLAKE, OF NEW YORK, N. Y.

LOW-WATER DETECTOR FOR STEAM-BOILERS.

Specification of Letters Patent No. 33,067, dated August 20, 1861.

To all whom it may concern:

Be it known that I, GEORGE W. BLAKE, of the city, county, and State of New York, have invented certain new and useful Improvements in Low-Water Detectors for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a front view of a detector with my improvements partly in section; and Fig. 2, a vertical section of the same at right angles to Fig. 1, showing its application to a boiler.

Similar letters of reference indicate corresponding parts in both figures.

My invention relates to that class of low-water detectors in which the valve of a steam-whistle is opened by the expansion of a tube which is filled with water when the water in the boiler is up to the desired level, and with steam when the water is below that level.

It consists in an improved arrangement of steam and water circulation-pipes in connection with each other and with the said tube and the openings communicating with the boiler; also in an improved arrangement of a steam-pipe in combination with the said tube, the whistle, and the openings of communication with the boiler; and further in a certain arrangement of levers for opening the valve of the whistle, in combination with the whistle, the expanding-tube and a fixed support.

To enable others to make and use my invention, I will proceed to describe its construction and operation.

A, is a T-shaped socket fitted and secured to a tubular orifice *e'* in the head of the boiler, with the top of its neck, *e*, at a level a little above that at which the alarm is desired to be given.

l, is an opening between the horizontal neck *e* and upright head, *k*, of the T-shaped socket, having its upper part from a quarter to half an inch lower than the top of the neck *e*.

B, is the expanding-tube screwed in an upright position into the top of the head *k* of the socket A, and having attached to its upper end the valve-box, G, of the steam-whistle, C, and having firmly secured to its lower part a plate, D, to which there is

firmly attached by upright rods, E E, a second plate, F, in which there is an opening large enough for the upper part of the said tube or the lower part of the valve-box G to pass freely through it.

H, is the whistle-valve, of the puppet kind, arranged in the box G, over the center of the expanding-tube B, and closing in an upward direction, having a spring, *b*, applied to its upright stem, *a*, to keep it closed when the pressure of the steam is insufficient for that purpose, and having its stem protruding through a stuffing-box, *c*, at the top of the valve-box G.

The tube B is entirely closed at the top, as shown at *j*, Figs. 1 and 2; and is closed at the bottom, as shown at *l*, except that it has inserted therein the circulation-pipes N and I (Fig. 2), the latter of which extends downward nearly to the bottom of the socket A, and the former upward nearly to the top of the expansion-tube. The pipe N need not extend below, or the pipe I above, the bottom *l* of the expanding tube B; and the said pipes, being open throughout, combine with the expanding tube B to form a siphon.

P, (Fig. 2) is the pipe for conveying steam to the whistle, connected at its lower end with the neck *e* of the socket A, and at its upper end with the valve-box G, above the expanding-tube B, and provided with an expansion-joint, *m*.

J, is a plug, closing the bottom of the head *k* of the socket A, made movable to provide for the cleaning out of the said socket and the pipes N I.

Q, is a cock attached to the upper part of the expanding tube B, to provide for the escape of the air from the said tube previous to its being set in operation.

K, is a lever which is attached by one end to a fixed fulcrum-pin, *f*, in a standard, L, (Fig. 1) secured to the plate F. This fulcrum-pin constitutes the fixed support for the said lever. It is connected by a link, *g*, with one end of a shorter lever, M, which is arranged to work on a fixed fulcrum, *h*, secured to the same plate F. The other end of the lever K is situated over the valve-stem *a*; and the other end of the lever M enters a notch, *i*, in the adjacent side of the valve-box G.

To set the apparatus in operation when attached to the boiler as represented in Fig. 2, the cock Q is opened, and when the boiler

has been filled and a sufficient pressure of steam has been generated, it forces water upward from the boiler through the pipes I and N, into the tube B, and the air is expelled from the said pipes and tube through the cock Q. When the air has all been expelled and water commences to issue from the cock Q, the latter is closed and remains so until air has been again admitted to the tube B, by emptying the boiler or from any other cause.

While the level of the water in the boiler remains above the top of the opening *d*, the tube B remains full and the water in the said tube remains comparatively cool; and in this condition of the said tube the top of the valve-stem *a* remains at a little distance from the lever K, as shown in the drawing, and the valve H remains closed; but when the water in the boiler gets below the top of the opening *d*, the water in the socket A and that in the pipes N, I, and tube B, being *in equilibrio*, a natural circulation by gravitation is permitted in the said tube, pipes, and socket, and so the quantity of water contained in the pipe N, and portion of the socket A above the opening *d*, quickly flows back into the boiler, and steam then rushes up the pipe N, into the upper part of the tube B, and fills the said tube as the remainder of the water which is contained therein descends through the pipe I. The tube B, then becoming heated, quickly expands longitudinally in an upward direction and raises the valve-box and valve-seat, while at the same time the rise of the valve-box moves up the adjacent end of the lever M, and so throws down the other end of the said lever, which, by means of the link *g*, draws down the lever K, toward and upon the valve-stem with a multiplied movement, and so depresses and opens the valve by a very slight expansion of the tube B, and allows steam supplied through the pipe to rush through the whistle and cause the detection of the condition of the water. When the water rises again in the boiler above the neck *e* and shuts off the pipes N, and I, and tube B, from the steam in the boiler, the steam left in them is soon condensed by the cooling of the tube by the surrounding air, and water rushes from the boiler through

the pipes to fill the vacuum which has thus been produced in the tube B, and pipe N.

The cooling of the tube causes its contraction and the descent of the valve-box and consequent movement of the seat toward the valve, while the descent of the valve-box causes the lever M to raise the portion of the lever K above the valve-stem, and so permit the valve to move upward and close. The double movement of the valve and seat and the multiplied movement obtained by the lever K enable the valve to be opened by a very slight amount of expansion, and as the circulation in the tube B and pipes N I is almost instantaneously resumed and suspended with variations in the level below and above the upper edge of the opening *d*. The upper part of the neck *e* being above the upper edge of the opening *d*, provides for the continued escape of steam by the whistle, while the water is rising above the opening *d*, and so gives time for the valve to close before the water reaches the pipe P, and so prevents any water from being blown through the whistle in the interval between the shutting off of the opening *d* to the steam and the closing of the valve H. The pipe P, while the water in the boiler is above the neck *e*, will become filled with water by the condensation of steam in it, after it has remained for some time at rest with the valve H closed; and when the valve is first opened, a portion of this water may be blown through the whistle.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. The combination of the steam-pipe P, the valve-box G, the opening *d*, and passage *e*, with the siphon tubes B N and I, substantially as and for the purpose herein described.

2. The arrangement of the two levers M K, and their connection *g*, in combination with the expanding-tube, valve-box and valve-stem, and with a fixed support F, substantially as and for the purpose herein specified.

GEO. W. BLAKE.

Witnesses:

M. M. LIVINGSTON,
JAMES LAIRD.