(No Model.) 2 Sheets—Sheet 1.

J. T. HAYDEN.

LOW WATER ALARM.

No. 477,004. Patented June 14, 1892.

Fig. 1.

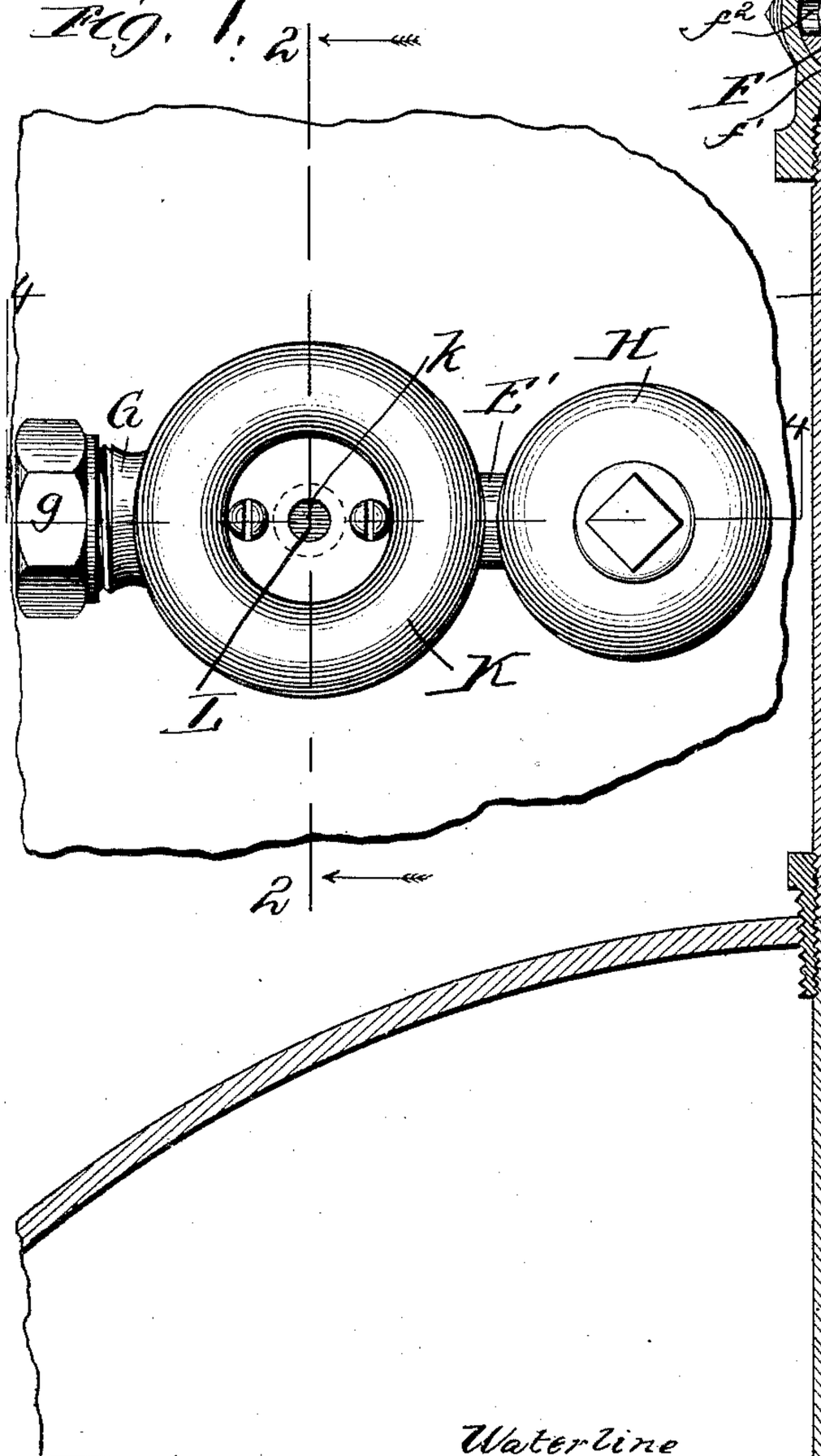


Fig. 2.

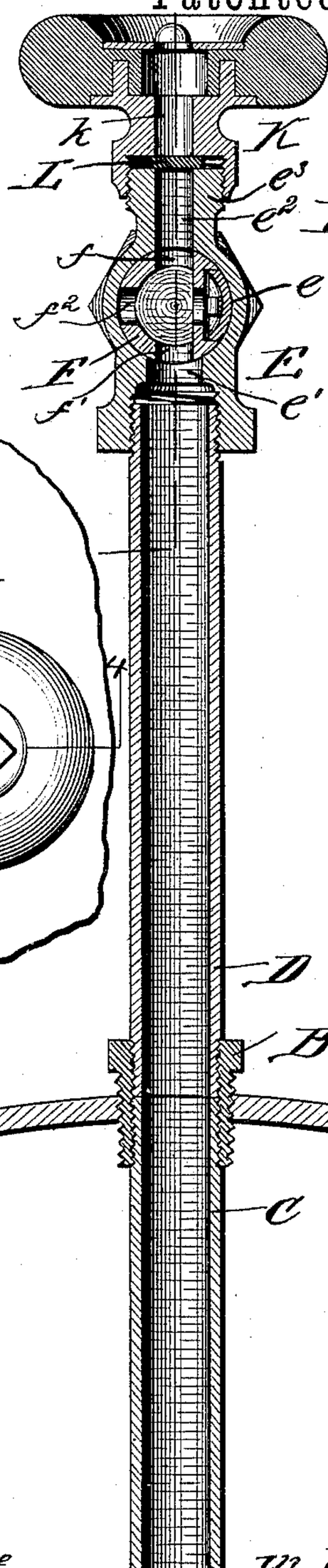
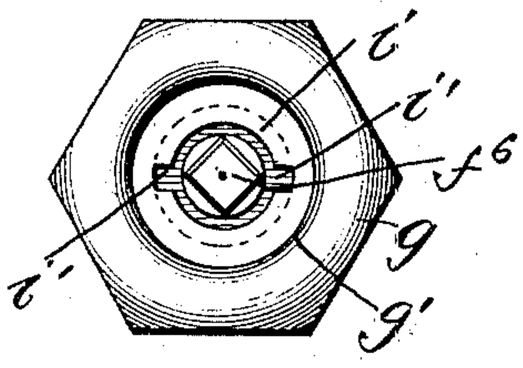


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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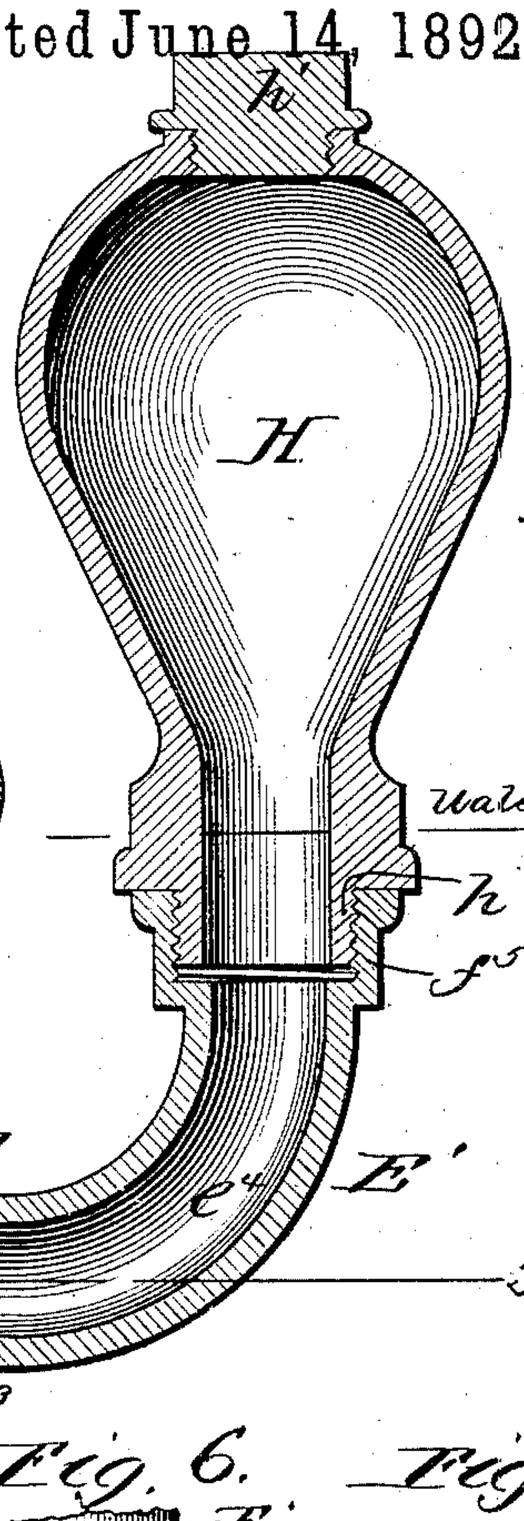


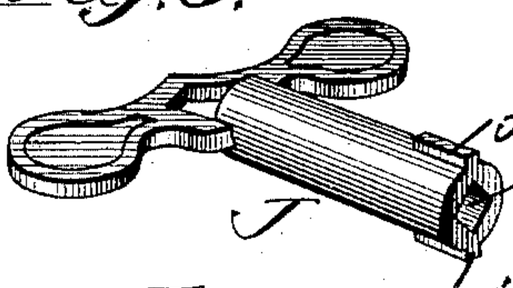
Fig. 4.

Fig. 6.

Fig. 7.

Fig. 5.

Fig. 8.



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UNITED STATES PATENT OFFICE.

JAMES T. HAYDEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CRANE COMPANY, OF SAME PLACE.

LOW-WATER ALARM.

SPECIFICATION forming part of Letters Patent No. 477,004, dated June 14, 1892.

Application filed February 2, 1892. Serial No. 420,069. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HAYDEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Low-Water Alarms, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view of my improved alarm applied to a boiler; Fig. 2, a vertical section of the same, taken on the line 2 2 of Fig. 1; Fig. 3, a detail front elevation showing the valve-stem and key-holder; Fig. 4, a detail vertical section taken on the line 4 4 of Fig. 1; Fig. 5, a detail plan section taken on the line 5 5 of Fig. 4; Fig. 6, a detail section taken on the line 6 6 of Fig. 4, looking in the direction of the arrow; Fig. 7, an elevation of the inner end of the valve; and Fig. 8 a perspective view of the valve-key.

In the drawings, Figs. 1 and 2 are upon a single scale. The remaining figures are upon another single scale considerably enlarged from the former.

My invention relates to what are known as "low-water alarms" for steam-boilers, and especially to that type of this device in which a fusible metal stopper is employed which is intended to be exposed to the action of the hot steam in the boiler when the water therein goes below a certain point whereby the stopper is fused, thus opening a blow-off and sounding an alarm. In most devices of this type heretofore used the action has been objectionably slow, because of the accumulation of vapor in the pipe below the fusible stopper considerably cooler than steam which interferes with immediate contact between the steam and stopper when the lower end of the conduit is uncovered.

It is the object of my present invention to overcome this defect; and the invention consists in certain improvements in the construction of the alarm device, whereby the contact between the hot steam within the boiler and the fusible stopper is instantaneous when the end of the pipe is uncovered within the boiler.

I will now give a description in detail of the construction and operation of the device, as shown in the drawings, which illustrate one way of carrying out my invention in practical form. The particular improvements which I believe to be new and wish to secure by Letters Patent will then be pointed out more definitely in claims.

In the drawings, A represents the boiler, and *a* the usual tubes or flues therein, above which the water must stand. The usual level of the water within the boiler is somewhat above the flues, as indicated by the "water-line" on Fig. 2. In the upper portion of the boiler is set a screw-plug B, the boiler being suitably tapped for this purpose. This plug is bored out and threaded internally as well as externally. A pipe C is adapted to be fitted into the lower end of this plug and extends down therefrom within the boiler to point somewhat below the water-line, so that so long as the water in the boiler is at its usual level, and therefore the flues are covered, the lower end of this tube will be within the water and will be sealed thereby. A second pipe D, of same size as C, is adapted to be fitted into the upper end of this screw-plug, so as to extend upward outside of the boiler. This construction of the pipe in two separate pieces is preferable for convenience in attaching and detaching the device; but it is not absolutely necessary to the working of the device, and the pipe may be in one piece, if desired. The upper end of the pipe D is provided with an exterior thread, and a cap E is fitted thereto. This cap is constructed to receive a valve, and may, therefore, be called the "valve-case." It is preferably cast of any suitable metal—for instance, brass. This cap is bored horizontally to provide a circular opening *e*, which is adapted to make the seat of a circular valve F. A port e' at the bottom of the case leads into this central opening from the boiler-pipe below, and a port e^2 leads out at the upper portion of the case through a nose e^3, extending upward therefrom. The valve is a three-way valve—that is, it is provided with ports f, f', and f^2, the first two of which register so as to form a passage diametrically through the valve, while the third is at right angles thereto. At the rear end of the valve there is also an axial port f^3, and at the rear of the valve-case there is a bent arm or pipe

E′, extending outward and curving upward. This arm is preferably cast in one piece with the valve-case and is tubular, being provided with a passage e^4, with which the axial port f^3 connects. The valve-stem f^4 passes out through a stuffing-box G, which is in the shape of a screw-plug, fitting into the front opening of the valve-seat. At the upper end of the tubular arm E′ there is a bulb-chamber H, which is suitably fitted to the arm, so as to be readily detached therefrom. In the drawings this is shown accomplished by a threaded boss h on the lower end of the tube, which fits an internally-threaded cup f^5 on the arm. At the upper end of the bulb there is fitted a screw-plug h'.

In the outer end of the stuffing-box G a thimble I is fitted, the inner end of which is closed around the valve-stem, as seen at Fig. 4, while at the outer end there is a narrow inwardly-projecting flange i, which leaves an opening somewhat larger than that for the stem. Two notches i' are cut in this valve on opposite sides of the thimble and arranged to stand directly opposite each other, as seen in Fig. 3. A nut g is turned upon the outer end of the stuffing-box, being provided with a slight internal lip g', which sets over the thimble and holds it in place. The outer end of the valve-stem is of angular shape, preferably square, as seen at f^6 in the drawings, and it stands just back of the front flange of the thimble. A valve-key J is constructed with a recess j in the end thereof, adapted to fit upon the square shank of the valve-stem. The cylindrical body of this key fits the opening in the front flange of the thimble, and it is provided at its extremity with two lugs j', standing out on each side and directly opposite each other. These lugs fit the two notches in the flange of the thimble and permit the key to be thrust in upon the shank of the valve-stem; but in this position, as seen in Fig. 4, they pass in just beyond the said flange, so that upon turning the key the shoulders of the lugs pass around behind the flange and secure the key in position, so that it cannot be withdrawn.

At the rear end of the valve F there is a short projecting lug f^7, and a recess e^5 is provided in the valve-case just in rear of the valve within which this lug may vibrate; but as it is stopped at each end of the recess, as indicated in Fig. 6, the oscillation of the valve is thus limited, the arrangement of the parts being such as to permit a quarter-turn only of the valve.

The upwardly-projecting nose e^3 of the valve-case has an external thread upon which is fitted a screw-cap K, which is provided with a central perforation k, corresponding to the port e^2 of the valve-case. A button L, of fusible metal, is fitted on the top of the nose e^3, so as to close the port e^2, and is fastened in place by the screw-cap, when the latter is properly fitted, as seen in Figs. 2 and 4. On the outer end of the screw-cap there is secured a wheel M for turning the cap into place to communicate with the central aperture in the cap.

The operation is as follows: When the device is applied to a boiler, as illustrated in Fig. 2, the hot water in the boiler will of course rise in the pipe under the pressure of steam in the boiler. It will be seen that the pipe is always in communication with the bulb-chamber H, for if the valve is turned so as to shut off communication with the upper port e^2 there is still communication with the bulb through the ports f^2 and f^3, and when the valve is turned so that the ports $f\,f'$ stand vertically, as seen in Fig. 4, and so a passage is opened from the pipe through the valve to the fusible button the passage to the bulb still remains open, as will be seen from the said Fig. 4. Now the bulb provides a chamber for the air which may be in the pipe and also for air or any vapor which may gather above the water in the pipe. As the water drops in the pipe with the lowering of the water in the boiler there will always be more or less air and other vapor in the pipe above the water-column and if there were no provision for the escape thereof it would interfere with the immediate contact of steam with the fusible button when the water in the boiler dropped below the end of the pipe, so as to open it to the steam even though the valve be open, as seen in Fig. 4 of the drawings. This vapor accumulating in the upper part of the pipe would prevent the steam from coming into instant contact with the fusible button, and hence the alarm would be somewhat slow in action. The bulb-chamber furnishes a perfect remedy for this defect. The vapor passes into this chamber and when the pipe is uncovered at its lower end the water drops out and the steam rushes immediately up the pipe, driving any vapor remaining therein before it out into the chamber and so will come instantly into contact with the fusible button and melting the latter the alarm will be sounded immediately.

When the boilers are in use and it is desired to have the device in operative position, the valve must of course stand open—that is, with a clear passsage to the fusible button, as seen in Fig. 4—and if then the water in the boiler falls below the line of safety, the metal button will be fused by the contact of hot steam and an escape for the latter is provided out through the outlet-port and an alarm is sounded by the escaping steam. The arrangement of the key-holding device is such that when the valve-stem is in position for the application of the key, as seen in Fig. 3, the valve will always be opened. The key is then applied, as already described, when upon making a quarter-turn, the valve may be closed and at the same time the key is turned into position so that it cannot be removed from the valve-stem. It follows from this arrangement that the key cannot be removed without opening the valve, hence if the key is not

present on the device, it will be known that the latter is in operative adjustment, because the valve is opened, and when the key is applied and the valve closed, it cannot be removed without leaving the valve open. This is only an adjunct, however, of the main feature of my improvement and may be used or not.

The main improvement is the supplementary chamber for the reception of the air and other vapors which may accumulate in the main pipe above the water, and the particular construction and arrangement of this part of the improvement may be varied from that herein described and shown, as well as the valve device which is used in connection therewith.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a low-water alarm, the main pipe extending into the boiler, in combination with a valve-case mounted thereon and provided with an outlet for the escape of steam, a button of fusible metal closing said outlet, a supplementary air-chamber arranged at one side of the valve-case and connecting therewith, and a valve seated within the said case and constructed and arranged to control the outlet therefrom and to provide a constant communication between the supplementary chamber and the boiler, substantially as described.

2. In a low-water alarm, the main pipe connecting with the boiler, in combination with a valve-case E, mounted thereon and provided with outlet-port e^2, the three-way valve F, seated therein and provided with a rear port f^3, the supplementary air-chamber H, connected with said rear port, and a fusible button L, secured in a position to close the said outlet-port, substantially as described.

3. In a low-water alarm, the main pipe connecting with the boiler, in combination with the valve-case E, mounted thereon and provided with escape-port e^2, the supplementary air-chamber H, connected with the valve-case, the valve F, provided with ports f, f', f^2, and f^3, the fusible button L, applied to the escape-outlet, and the perforated screw-cap K, securing said button in place, substantially as described.

4. In a low-water alarm, the main pipe connecting with the boiler, in combination with the valve-case E, mounted thereon, the oscillating three-way valve F, seated therein and provided with an angular shank on its stem, the thimble I, surrounding said shank and provided with flange i, having notches i', the valve-key J, provided with side lugs j', and a valve-stop arranged to limit the movement of the valve to a quarter-turn, substantially as described.

JAMES T. HAYDEN.

Witnesses:
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