July 22, 1924. 1,502,590

G. A. SAGER

LOW WATER SAFETY TELLTALE

Filed March 4, 1920 6 Sheets-Sheet 1

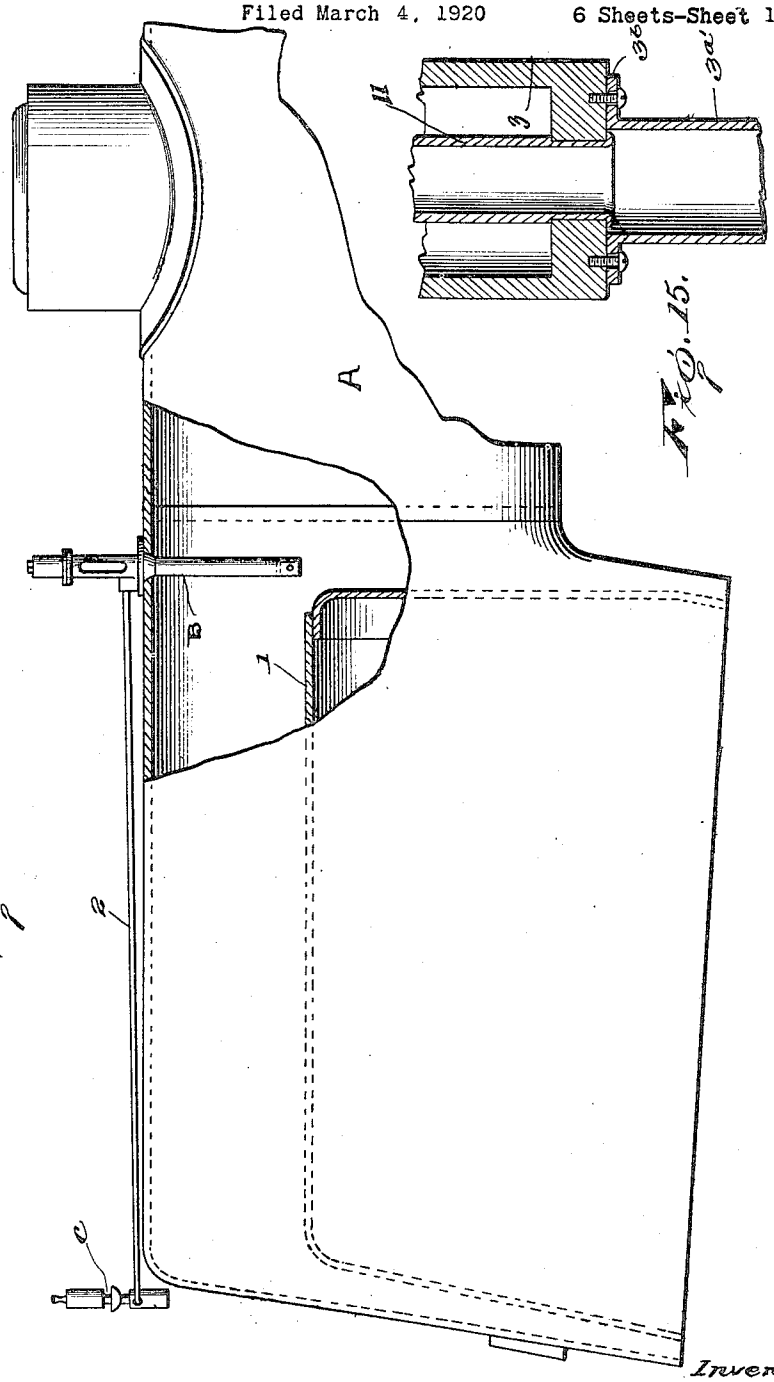


Fig. 1.

Fig. 15.

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by Lacey & Lacey, Attys.

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LOW WATER SAFETY TELLTALE

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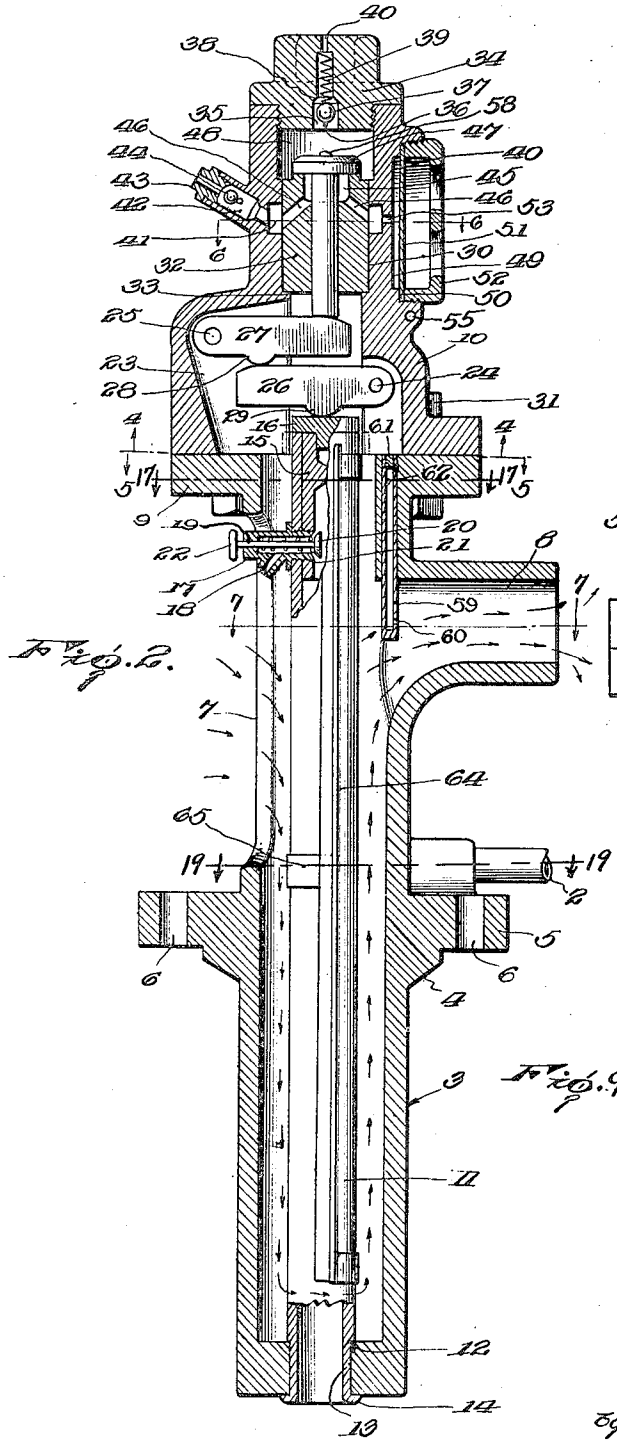


Fig. 2.

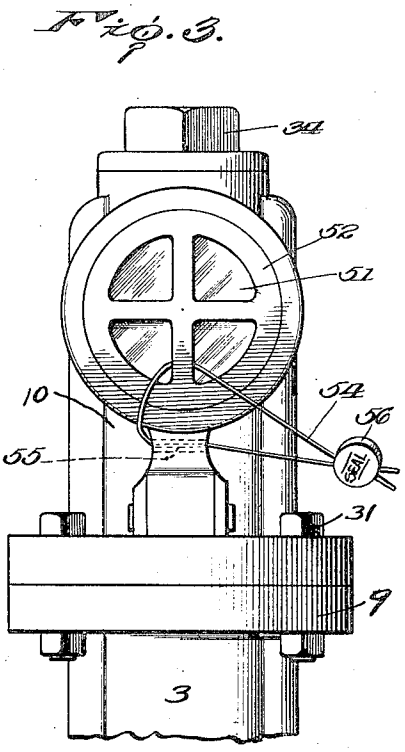


Fig. 3.

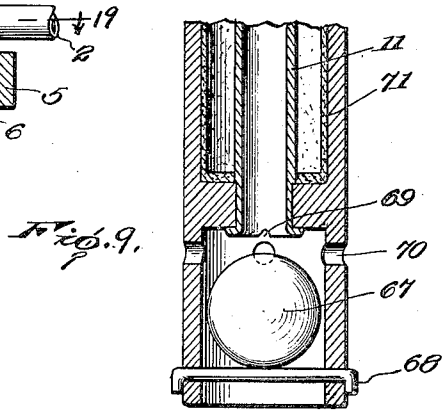


Fig. 9.

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LOW WATER SAFETY TELLTALE

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Fig. 4.

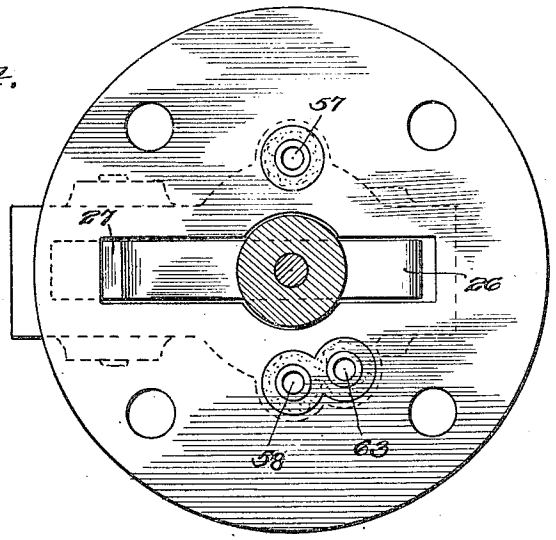
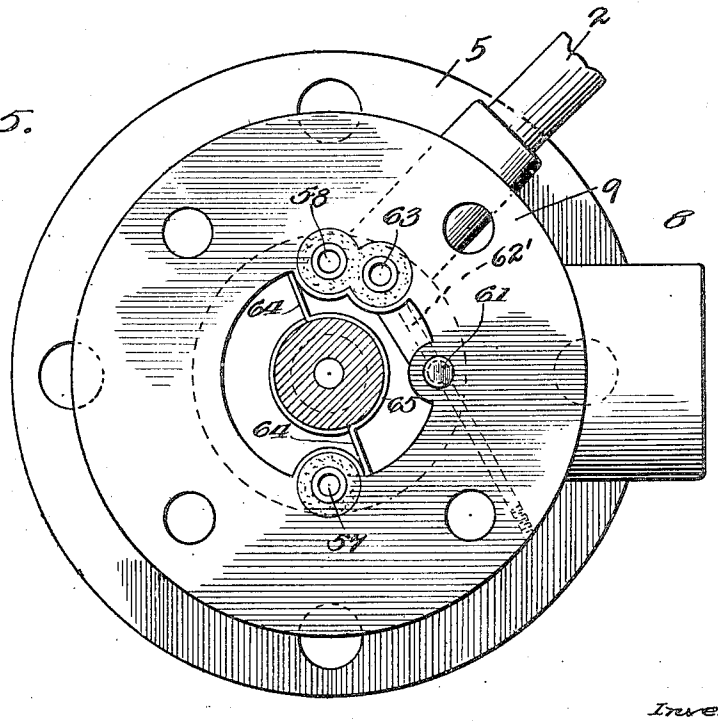


Fig. 5.



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LOW WATER SAFETY TELLTALE

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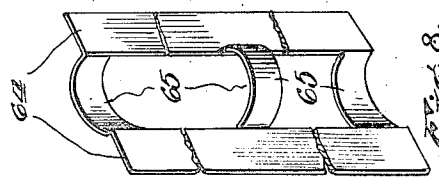


Fig. 8.

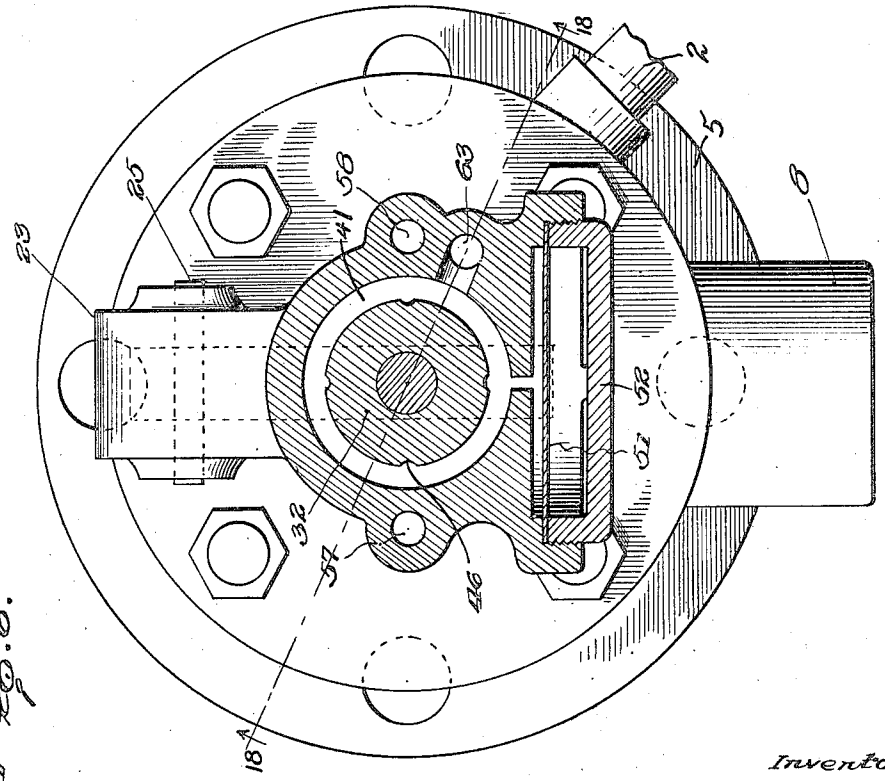


Fig. 9.

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LOW WATER SAFETY TELLTALE

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Fig. 16.

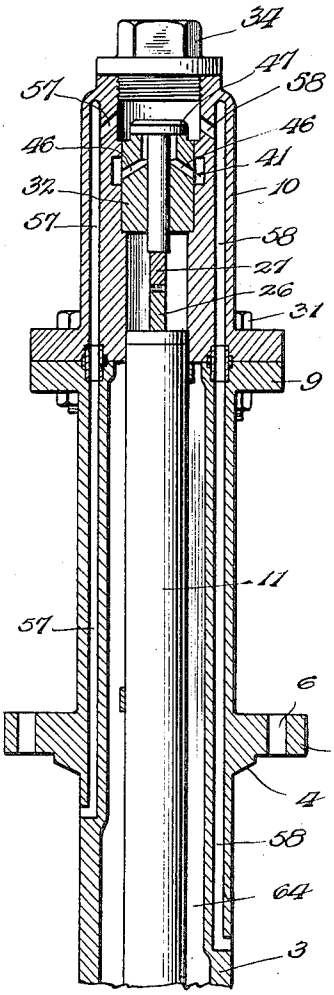


Fig. 17.

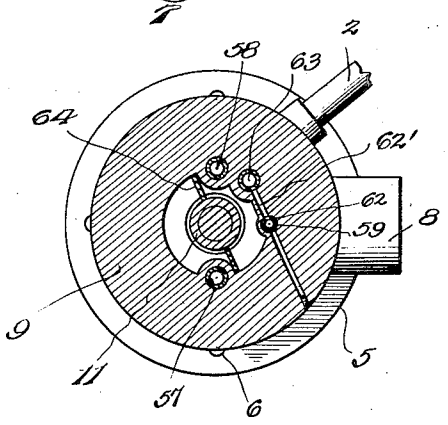


Fig. 7.

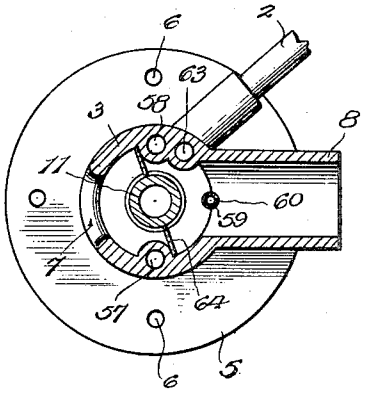
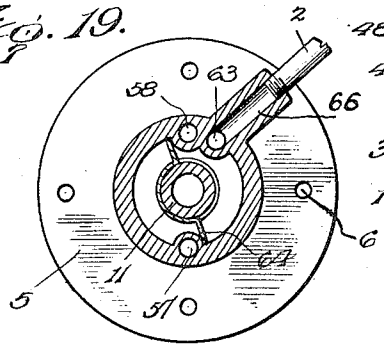


Fig. 19.



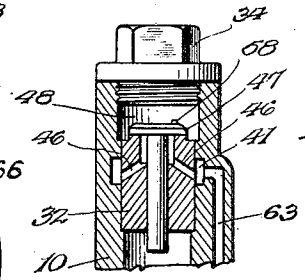


Fig. 18.

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July 22, 1924. 1,502,590

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LOW WATER SAFETY TELLTALE

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Fig. 10.

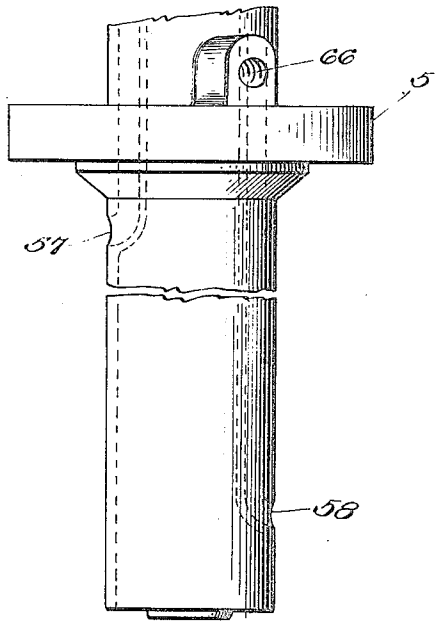


Fig. 11.

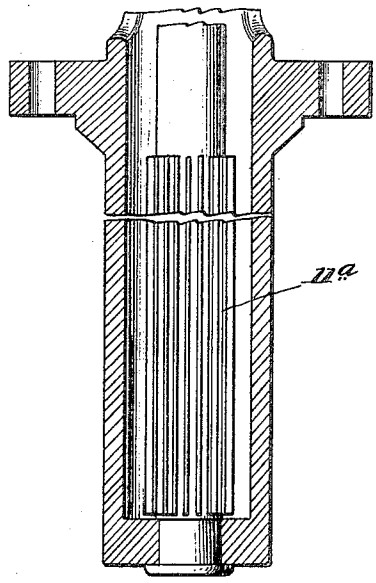


Fig. 13.

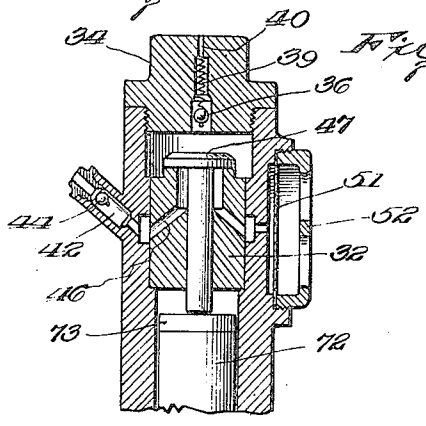


Fig. 14.

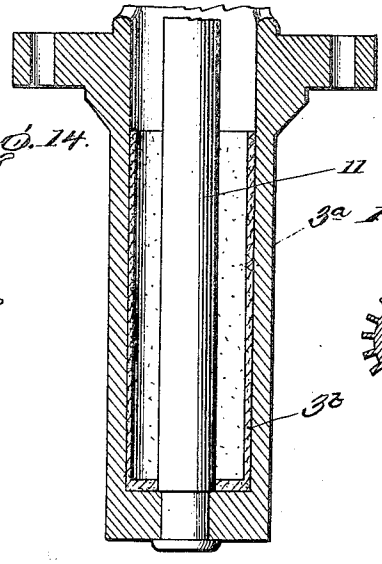
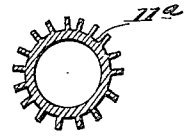


Fig. 12.



Inventor.
G. A. Sager.
By Lacey & Lacey, Attys.

Patented July 22, 1924. 1,502,590

UNITED STATES PATENT OFFICE.

GEORGE A. SAGER, OF ALBANY, NEW YORK.

LOW-WATER SAFETY TELLTALE.

Application filed March 4, 1920. Serial No. 363,206.

To all whom it may concern:

Be it known that I, GEORGE A. SAGER, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Low-Water Safety Telltales, of which the following is a specification.

This invention relates to a low water safety tell-tale, especially adapted for use on locomotive boilers to indicate and record the existence of low water during a period of service by an engineer.

I am aware that, previous to my invention, many low water tell-tale devices have been patented, but few have come into actual use due principally to the fact that the construction of these devices made them unreliable and added complication to the locomotive, and usually they depended on more or less impractical float operated means for actuating the indicating or recording mechanism.

In the present invention the operating means for actuating the indicator and recording element is so constructed and associated with the locomotive boiler that it is entirely concealed and cannot be tampered with. Furthermore its adjustment is fixed at the time of manufacture and cannot be subsequently altered.

An essential feature of the invention is that the operating means is supported at but a single point with respect to the shell of the locomotive boiler and therefore cannot become inoperative by reason of the expansion, contraction or other distortion to which a locomotive boiler is subjected by reason of the variations in steam pressure.

A further feature of the invention is the incorporation therein of a tell-tale disk for recording the existence of a low water level which disk is sealed in place and cannot be removed or replaced except by an authorized employee, thereby forming a means of detecting carelessness or negligence of the engineer.

The invention has as another object the particular arrangement of tell-tale disk whereby it is unnecessary to disturb the boiler pressure for the purpose of removing or installing such disk.

The invention also incorporates means for clearing the same of water of condensation, and means for creating a difference in hydrostatic head on certain parts of the device as will be hereinafter particularly set forth.

A further essential feature of the invention resides in the provision of thermally actuated means for opening a valve controlling a steam line from which the visible low water indicating means is operated and which, on opening, causes a draft of cool air to circulate in contact with the thermally actuated means thereby restoring such means to its normal condition and closing said valve after the visible signal means has been effected.

In the drawings:

Figure 1 is a side elevation of a locomotive boiler, with a portion of the shell thereof broken away to show the interior, and with the safety tell-tale installed therein;

Fig. 2 is a vertical section through the thermally controlled valve;

Fig. 3 is a side elevation showing the manner of sealing the tell-tale disk in position;

Fig. 4 is a section on the line 4—4 of Fig. 2;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a section on the line 6—6 of Fig. 2;

Fig. 7 is a section on the line 7—7 of Fig. 2;

Fig. 8 is a perspective of a portion of the air baffle;

Fig. 9 is a view of a modified form of thermally operated valve actuating means;

Figure 10 is an exterior view in side elevation showing the lower end portion of the casing of the device.

Figure 11 is a vertical sectional view through the lower end portion of the casing showing a modified form of expansion tube.

Figure 12 is a detail section of the modified form of expansion tube.

Fig. 13 is a vertical section through a modified form of valve actuating means;

Fig. 14 is a vertical central section through a modified form of feeder tube;

Fig. 15 is a view showing an extension for the feeler tube.

Figure 16 is a vertical sectional view through the thermally controlled valve at substantially right angles to Figure 2,

Figure 17 is a sectional view on the line 17—17 of Figure 2,

Figure 18 is a reduced fragmentary vertical sectional view through the thermally controlled valve on the line 18—18 of Figure 6, and

Figure 19 is a sectional view on the line 19—19 of Figure 2.

The general form which the invention may preferably take in practice is shown in Figures 1, 2, 3, 4, 5, 6, 7, and 8, in which the locomotive boiler is indicated at A and has a portion of its shell broken away to show the crown sheet 1 approximate the end of which is disposed the thermally actuated valve operating means B controlling a steam line inclusive of the pipe 2 leading to the audible signal means C. This audible signal means, however, forms the subject matter of a separate divisional application, filed June 8, 1921, Ser. No. 475,969, and will not be considered herein in detail.

With reference to the thermally actuated valve operating means B, such means consists of a casing indicated generally at 3 and provided with a seat 4 and flange 5 drilled as at 6 for attachment to the boiler shell as indicated in Fig. 1. The casing 3 is open on one side as shown at 7 and on the other side has an outlet 8. A flange 9 connects the said casing with a head 10 which will be hereinafter more particularly described.

Within the casing 3 and positioned axially with respect thereto is a tubular member 11 having a relatively high coefficient of expansion with respect to the casing 3. This tubular member 11 carries a shoulder 12 at its lower end which seats in the bottom of the casing 3 and is provided with a reduced portion 13 swaged over as at 14 to fixedly anchor the lower end of said tubular expansion member 11. The upper end of the expansion member 11 carries a reinforcing bushing 15 which is brazed or otherwise suitably secured in place and carries a hardened steel cap 16. Near the upper end of the expansion tube 11 is mounted a valve casing 17 having an outlet 18 and carrying a valve stem 19 having a valve head 20 normally maintained in the open position by a valve spring 21, said valve stem 19 having a knob 22 which may be rotated to remove any sediment from the valve or valve seat. The object of this valve is to permit the expulsion of air and steam when the boiler is initially undergoing pressure but, by reason of the compression of the spring 21 such valve will be closed as soon as any appreciable pressure within the boiler is developed.

The head 10 of the thermally actuated valve controlling means is chambered as indicated at 23 to accommodate pins 24 and 25 mounting the superposed levers 26 and 27 respectively having the fulcrums 28 and 29, thus forming a compound lever action which, by reason of the fulcrum 29 seating on the hardened steel cap 16 of the expansion tube 11 will elevate the end of the lever 27 as the expansion tube 11 lengthens due to heat.

The head 10 is provided with an axial bore 30 aligning with the axis of the expansion tube 11 when the head 10 is mounted on the flange 9 and secured in place by bolts or studs 31, and said bore 30 receives a valve seat 32 carried by the shoulders or counter-bore 33 within the said head 10, the upper end of said bore 30 being closed by a screw plug 34 having a recess 35 which is crossed by a pin 36 retaining a ball valve 37 within said recess and which cooperates with a ball valve seat 38, said ball valve normally being held open by the spring 39 and venting to the atmosphere as indicated at 40. The head 10 is chambered at 41 and provided with a nipple 42 having a threaded head 43, such nipple receiving a ball valve element 44 which, when the valve 47 seats and the pressure in the chamber 41 is relieved, drops to admit air to the chamber so that said chamber and all passages between the chamber and the pipe 2 including said pipe may freely drain. The valve seat 32 is counterbored as at 45 and provided with passages 46 communicating with the chamber 41 of the head 10. A valve 47 closes the counterbore 45 with respect to the space or chamber 48 thereabove. The head 10 is counterbored at one side as at 49 and shouldered as at 50 to receive a frangible disk 51 which is retained in place by the spoke member 52, a chamber thus being formed behind the said disk and which communicates with the chamber 41 by means of a minute steam passage 53 so that pressure within the chamber created behind the disk 51 will cause the fracture or rupture of the same and thus record an operation of the valve 47 as will be hereinafter described. The spoke member 52 is sealed against removal by any suitable means such as a wire 54 passing beneath one of the spokes and through a hole 55 in the head 10 and the ends of which wire are united by a permanent lead seal 56. Communicating with the chamber 48 and extending the length of the head 10 and well down toward the end of the casing 3 are passages 57 and 58 one of which terminates,

as shown in Figure 16, approximate the joint 4 and the other nearly at the end of the casing 3. These passages supply steam at boiler pressure to the chamber 48 and, by reason of the difference in level of the terminal points thereof a difference in hydrostatic head results which, should condensation accumulate within the said chamber 48 the longer passage would have sufficient influence over the shorter passage to relieve the chamber 48. This construction is also of advantage in the event that the boiler is subjected to hydrostatic test.

Inserted through a suitable bore in the casing 3 and extending down to approximately the center line of the opening 8 is a tube 59 having an opening 60, said tube being closed at the upper end by a plug 61 and having an opening 62 which, as shown in Figure 17, communicates with a passage 63 in the said head through a plugged bore 62′ in the flange 9. The passage 63 leads, as shown in detail in Figure 18, directly to the chamber 41 so that on entrance of steam to the chamber 41 a jet of steam will be expelled through the opening 60 forming a visible signal indicating operation of the valve 47 and at the same time causing a circulation of air around the tube 11 which has vertical baffle members 64 supported by members 65 whereby air drawn in at the open side 7 of the casing 3 passes downwardly as indicated by the arrows on one side of the expansion tube 11 and upwardly on the other side thereof and out through the opening 8, which thus assists contraction of the tubular expansion member 11 when the water level within the boiler is finally raised. The passage 63 forms a steam line in combination with the pipe 2 which connects with said passage 63 at the opening indicated in Figure 19 at 66 so that when the valve 47 is opened steam will flow through said pipe for actuating the audible signal.

In the modifications of the device as shown in Figs. 11 and 12, the expansion tube 11^a is fluted or vertically ribbed to provide heat dissipating means thus effecting more rapid contraction than would otherwise be the case. In the form shown in Fig. 14 the casing 3^a contains an asbestos lining indicated at 3^b which, where a relatively short feeler tube is required, forms a means of retarding radiation and convection from the expansion tube 11.

In the modification shown in Fig. 9 a construction is indicated which may be employed in extremely short ranges, a float 67 being disposed in the end of the casing and held in place therein by a pin 68, said float being of spherical form. The end of the expansion tube is notched at one or more places as indicated at 69 and the chamber is open on the sides at several points on a line with the low water level as indicated at 70. By means of this construction the interior of the expansion tube is partially closed, thereby retarding natural circulation of the hot water and permitting the said expansion tube to become much cooler than would otherwise be the case and resulting in a greater range of expansion when the water does become low and the heat increases. An asbestos lining 71 for the casing may also be employed in this construction.

In some instances it may be possible to employ an expansion element of such length that it is practicable to associate the same with the valve 47 for direct operation, thus omitting the compound leverage formed by the combination of levers 26 and 27. In such construction, as indicated in Fig. 13, the expansion element 72 is extended upwardly and capped as at 73 so that the surface of the cap 73 lies within a few thousandths of an inch of the end of the valve stem of the valve 47 and thus, as the expansion tube 72 lengthens it contacts with the stem of the valve 47 and raises the latter off its seat. In this construction the cap for the head is indicated at 34 and the valve seat at 32, since the construction of these related parts is identical with the construction shown in Fig. 2.

Reverting to Fig. 2, it is to be particularly noted that the insertion of the expansion tube 11 within the interior of the boiler results in positive action of the mechanism. Also attention is particularly directed to the fact that when the boiler is under pressure the outer casing 3 remains constantly expanded with the exception of slight variations due to changes in steam pressure, therefore the entire action of the mechanism including the valve 47 and compound leverage system for moving the same is obtained through the medium of changes in length in the expansion tube 11 when its lower end is exposed to steam; when its lower end is sealed by water (the external surface of the tube 11 being exposed to the atmosphere) the tube 11 contracts but the outer tube or casing 3 remains set thereby rendering the action of the expansion tube 11 positive and powerful due to the fact that there is no appreciable elasticity to any portion of the apparatus.

In the modification shown in Fig. 15, to avoid the necessity of providing different lengths of feeler tubes for different sizes of boilers an extension body $3^{a'}$ with a flange $3^{b'}$ may be secured to the end of the feeler tube by screws or the like, as shown.

Also it is desired to call attention to the fact that while the device is herein described as particularly adaptable to locomotives, it is nevertheless, equally well adaptable to stationary boilers and es-

pecially is this true of the delay type of mechanism.

I claim:

1. In a thermally operated tell-tale, a valve including a seat, a casing supporting said valve and seat, a thermally expansible valve operating element carried by said casing for expansion and contraction to control the opening and closing of said valve, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

2. In a thermally operated tell-tale, a valve including a seat, a casing supporting said valve and seat, a lever system carried by said casing, a thermally expansible valve operating element carried by said casing for expansion and contraction to move said lever system to open said valve and control closing thereof, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

3. In a thermally operated tell-tale, a valve including a seat, a casing supporting said valve and seat, a thermally expansible valve operating element carried by said casing for expansion and contraction to control the opening and closing of said valve, means recording the initial opening of said valve, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

4. In a thermally operated tell-tale, a valve including a seat, a casing supporting said valve and seat, a lever system carried by said casing, a thermally expansible valve operating element carried by said casing for expansion and contraction to move said lever system to open said valve and control closing thereof, means recording the initial opening of said valve, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

5. In a thermally operated tell-tale, a valve including a seat, a casing supporting said valve and seat, a thermally expansible valve operating element having radiating fins, said element being carried by said casing for expansion and contraction with respect thereto to open said valve and control closing thereof, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

6. In a thermally operated tell-tale, a valve including a seat, a lever system, a casing supporting said valve, seat and lever system, a thermally expansible lever system operating element having radiating fins, said element being carried by said casing for expansion and contraction with respect thereto to operate said lever system to control the opening and closing movement of said valve, and means rendered operative by the opening of said valve for assisting contraction of said thermal element.

7. A thermally operated tell-tale including a valve, a thermally operable element controlling the opening and closing of said valve, means operatively supporting the valve and said element, and means for releasing steam to set up a flow of a cooling medium about said element upon opening of said valve.

8. A thermally operated tell-tale including a valve, a thermally operable element controlling the opening and closing of said valve, means operatively supporting the valve and said element, and an aspirating nozzle controlled by the valve and operable for inducing a flow of air about said element.

9. A thermally operated tell-tale including a casing, a valve carried thereby, a thermally operable element within the casing controlling the opening and closing of said valve, and means controlled by the valve for releasing steam to set up a flow of air through the casing.

10. A thermally operated tell-tale including a casing, a valve carried thereby, a thermally operable element within the casing controlling the opening and closing of said valve, the casing being provided with an opening and with an outlet, and means controlled by the valve for releasing steam adjacent said outlet whereby to induce a flow of air entering the casing at said opening and discharging at said outlet.

11. A thermally operated tell-tale including a casing provided with a head, a valve seat in said head, a valve cooperating with said seat, and a thermally operable element within the casing controlling the opening and closing of said valve, the valve seat, head and casing being provided with communicating passages for releasing steam to set up a flow of air through the casing upon opening of the valve.

12. A thermally operated tell-tale including a valve, an expansible element operable for opening the valve, and means operatively supporting the valve and said element and provided with a steam chamber normally closed by the valve, said supporting means embodying companion means supplying steam to said chamber and having steam passages of unequal length.

13. A thermally operated tell-tale including a valve, an expansible element operable for opening the valve, and means operatively supporting the valve and said element and provided with a steam chamber normally closed by the valve and with passages of unequal length supplying steam to said chamber.

14. A thermally operated tell-tale including a casing closed at its lower end by an

end wall and provided in spaced relation to said end thereof with a flange for connecting the casing with a boiler to support the casing in position projecting at its lower end portion into the boiler, an expansion tube freely received within the casing and anchored at its lower end to said end wall, the lower end of the tube being open, and a valve carried by the casing, the tube being expansible for opening said valve and the casing being provided with an opening exposing the upper end portion of the tube to the atmosphere.

In testimony whereof I affix my signature.

GEORGE A. SAGER. [L. S.]