

June 1, 1915.

DRAWING

1,122

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UNITED STATES PATENT OFFICE.

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STEAM-BOILERS AND APPARATUS TO BE USED ON BOARD OF STEAMBOATS TO PREVENT THE EXPLOSION OF BOILERS.

Specification forming part of Letters Patent No. 1,122, dated April 15, 1839; Reissued November 23, 1852.

To all whom it may concern:

Be it known that I, CADWALLADER EVANS, of the city of Pittsburgh, in the county of Allegheny, in the State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers and Steam-boats for the Purpose of Preventing the Explosion of Boilers; and I do hereby declare that the following is a full and exact description thereof.

The apparatus which I employ for the purpose of preventing explosions consists of several distinct devices intended to meet the various circumstances which are believed to be the causes of such explosions. A part of them may be omitted on board of certain steamboats, but in such as are used in our great western waters, it is believed that the whole of them will be required to insure safety.

I use the ordinary safety valve on my boilers, but I combine therewith an apparatus intended to open the said valve when the temperature of the interior of the boiler is greater than is deemed compatible with perfect safety; and this I accomplish by a new mode of using the mixture of metals known as the fusible alloy, the fusion of which will cause the safety valve to open although the pressure of the steam may not be such as to produce that effect.

Figure 1 in the accompanying drawing represents a longitudinal section of a cylindrical boiler, A being the common safety valve, resting on its seat, and held down by the weight B. The lever C, of this safety valve is extended out beyond the standard which supports it, and enters a recess or opening cut away in the weight D, and which will allow the lever C, to descend should the safety valve be opened in the ordinary way, by the pressure of the steam. The weight D, is supported on a rod, or stem, which enters a brass tube, or box E, containing the fusible alloy, upon the surface of which the foot of the stem rests. The tube or box E, may extend to the depth of five or six inches, or, if preferred, as low as to the upper sides of the flues, as shown by the dotted lines. It will be seen that the necessary result of this arrangement will be the opening of the safety valve by the pressure of the weight D, upon the melting of the fusible alloy.

A very general source of steam boiler explosions is the absolute or relative deficiency of water within them; the relative deficiency arises generally from careening, by which, when there are several boilers, side by side, operating conjointly, there will be an excess of water in the lower boilers, and a corresponding deficiency in the upper ones, although the whole quantity, if properly distributed, may be the proper amount.

To render the fact of the absolute or relative deficiency of water in the boilers known not only to the engineer but to the passengers on board of a steamboat, and to lead to the immediate correction of the evil, I employ an alarm apparatus, which by giving two different and distinctive sounds, will communicate the desired information.

I furnish the two outside boilers, in any series of boilers on board of a steam boat with a float like that shown at F, Fig 1, which is to rise and fall by the rise and fall of the water within the boiler. This float is suspended by a lever G, G and may work on a fulcrum attached to the tube or box E, or in any other convenient way. H, is a weight on the opposite end of the lever to form a suitable counterpoise to the float. A small valve *a*, the stem of which passes through a slot in the lever G, closes an opening in the tubular chamber *b*, which leads to a horn *c*, through which steam will escape should the valve *a*, be opened. When the float F, descends from a deficiency of water in the boiler, the lever G, will be brought into contact with the button *e*, on the stem of the valve *a*, which will open said valve, and the steam escaping through the horn will cause it to sound; *f*, is a bow spring intended to keep the valve *a*, up against its seat, when it is not depressed by the action of the float. To the similar apparatus on the opposite outside boiler, I attach a whistle instead of a horn, and when one or the other of these instruments gives a sound it will be known that the water in the boiler from which it proceeds, has descended below the proper level.

Should the boat be in good trim, and there should be an absolute deficiency of water in the boilers, the two instruments will sound at, or near, the same time, and the proper remedy will be at once indicated. Should the sound be produced in conse-

quence of the heeling of the boat producing a deficiency of water in the upper boiler, the passengers may at once apply the proper remedy by moving toward that side of the boat from which the sound proceeds, and thus producing an equilibrium. By uniformly placing the same instrument on the larboard and starboard sides of a boat, and by proper printed directions, conspicuously placed, this simple remedy will be readily understood, and as readily applied, by the passengers, who constitute the shifting ballast, and will thus be enabled to correct the evil which they not infrequently produce. I sometimes use a similar apparatus b^2 , for blowing off steam, should the water in the boiler be too high.

In order to render the indication of the float the more perfect I surround it by an iron casing g, g , which will protect it from the agitation to which it might otherwise be subjected by the ebullition of the water in the boiler; the manner of forming this casing, by which it will tend to prevent the agitation of the water from the cause above named will be clearly seen in Fig. 2, which is a cross section of the boiler, g, g , being the iron casing, and h, h , flues passing through the boiler.

Fig. 3, represents what I denominate a water level, which is to be placed within the cabins of steamboats; and which will, upon inspection, point out to the passengers, at all times, the exact trim of the boat, and will coöperate with the indications of the horn and whistle in the last described apparatus, in making known the quantity of water in the boilers, and the deviation thereof from the proper level. In this figure H', H', H' , are five boilers, shown in cross section, having flues I, I, I , running through them. J, J, J , is a copper tube, about one inch in diameter, and long enough to extend from the center of one of the outside boilers, to the center of the other. It runs along under the cabin floor, and turns up at right angles at each end, passing through the floor, and rising as at J', J' , opens into glass tubes i, i, i, i . These tubes are furnished with graduated scales j, j . The water which is to be contained in the copper and glass tubes is intended to rise to such height as to reach the center dark line on each scale when the boat is on a perfect level. To render the height of the water perfectly conspicuous, small light balls k, k , which may be colored black, are allowed to float upon its surface. This water level is sustained by standards l, l, l , resting on the tops of the boilers, and has no support whatever from the wood work of the vessel, as the parallelism of the line which joins j, j , the center lines of the scale, with the true water line m, m , must be always preserved, or the indications of the water level would be inaccurate. This water

level will be found to be a most important auxiliary to the other means adopted by me for the prevention of explosions, as by its aid the relative height of water in the respective boilers is at all times clearly shown, and with the assistance of the horn and the whistle, its absolute height can also be determined with perfect accuracy. By observing the floating balls in the glass tube, at the time of the sounding of the horn, or of the whistle, should they be found to stand nearly on a level, it would be manifest that the water in the boilers was nearly as low as was consistent with safety while the boat was on an even keel; should the horn and the whistle both sound it would show that the water was at such a height only as sufficed merely to cover the flues, and that a fresh supply was immediately required. When the boat is out of level, and one of the instruments begins to sound, the difference in the height of the two balls will be equal to the absolute height of the water in the lower boiler above that in the upper; and as the escape of steam through the horn or whistle takes place at a known point, the absolute height of the water in the boilers when the boat is again put in trim, will necessarily be known.

In Fig. 2, and also in Fig. 4, is represented my arrangement of the apparatus for causing a stream of water to enter the furnace, and extinguish or deaden the fire, whenever the temperature rises so high as to melt the fusible alloy.

K , is a cold water cistern, to be filled by a suitable pump, and from which the boilers may occasionally be supplied with water. L , is a tube leading from this cistern into the furnace. This tube has a valve n , adapted to its upper end, which valve would be raised by the descent of the end o , of the lever to which the valve rod is attached. The weight M , is sustained by its bearing upon the fusible alloy contained in a suitable box, in the manner already described, and should this fuse the lever o , will necessarily be forced down, and the water will flow into the fire.

It is a well known fact that a very large proportion of the explosions of steamboat boilers have occurred immediately after leaving a landing place, and this, in most instances, it has been admitted has arisen from the effect of the careening of the boat, by the assembling of the passengers on one side thereof, or from other circumstances; this careening necessarily produces a diminution of water in the raised, and an excess in the depressed boilers, the sudden return of which causes the explosion. The apparatus represented in Fig. 4 is intended to guard against this accident.

N, N , is a strong upright piece of timber which is made to slide up and down by

means of a rack and pinion, operated by suitable gearing. The sliding timber is retained in its proper position by passing through mortises, or guide pieces, and may
 5 be readily forced down when the boat is at a landing, so that its lower end bearing upon the bottom of the river will effectually prevent the careening of the boat, and thus disastrous consequences resulting there-
 10 from.

Having thus fully described the manner of constructing the various devices invented and applied by me for the purpose of preventing the explosion of steam boilers, and
 15 pointed out the manner in which they operate, I claim as my invention, and desire to secure by Letters Patent,

1. The manner in which I have combined and connected the common safety valve with
 20 the apparatus which is to operate by the melting of the fusible alloy, this apparatus, being constructed, and operating, substantially in the manner set forth; by which arrangement the safety valve is left free
 25 to be opened by the pressure of steam, in the ordinary way, while it will also be opened by the safety apparatus from the influence of temperature alone independent of pressure from the elasticity of the steam.
 30 I lay no claim to the use of the fusible alloy to allow the escape of steam, but only to the combination in which I have used it, as set forth.

2. I claim the manner in which I have
 35 combined the float with the valves which it is intended to open in the outside boilers of any series, so as to cause a horn to sound on one side, and a whistle on the other, or by its escape to produce two different dis-
 40 tinctive and characteristic sounds, which shall give information when the water has descended on either side to a point as low as it can be safely allowed to descend. I

do not claim the causing of a horn, whistle, or other instrument, to sound from the es- 45 cape of steam, but only the combination and arrangement of the parts as described, so as to afford the desired information in the manner set forth.

3. I claim the manner in which I have 50 arranged the water level, or level whose indications are governed by any other fluid, adapted to the purpose, by which arrangement and combination as set forth, that is to say, the water level resting on the boilers 55 independently of the wood work of the boat, and extending up into the cabin, where it is made to show the level of the water in the boilers, by the coöperation of the apparatus last described, namely the apparatus 60 for sounding a horn or a whistle, and affording by this conjoint action, a knowledge of the height of water in the boilers respectively. I do not claim the water level alone, but only as arranged and combined by me, 65 as described.

4. I claim the particular apparatus for extinguishing the fire, as herein set forth, operating by means of the fusible alloy ap- 70 paratus, substantially as described.

5. And lastly, I claim the arrangement and application of the apparatus for preventing the careening of a steamboat at a wharf, pier, landing, or other stopping place. I do not claim the giving motion to 75 a vertical timber, or to a sliding apparatus by means of a rack and pinion gearing, this being a well known device, but confine my claim in this particular case, to the combining and employing of this apparatus, 80 with a steamboat, by which a new and important result is attained.

CADWALLADER EVANS.

Witnesses:

THOS. P. JONES,
 ALONZO G. HULL.