No. 848,205. PATENTED MAR. 26, 1907.

B. W. ROBINSON.

SAFETY PLUG.

APPLICATION FILED JAN. 5, 1907.

Fig. 1.

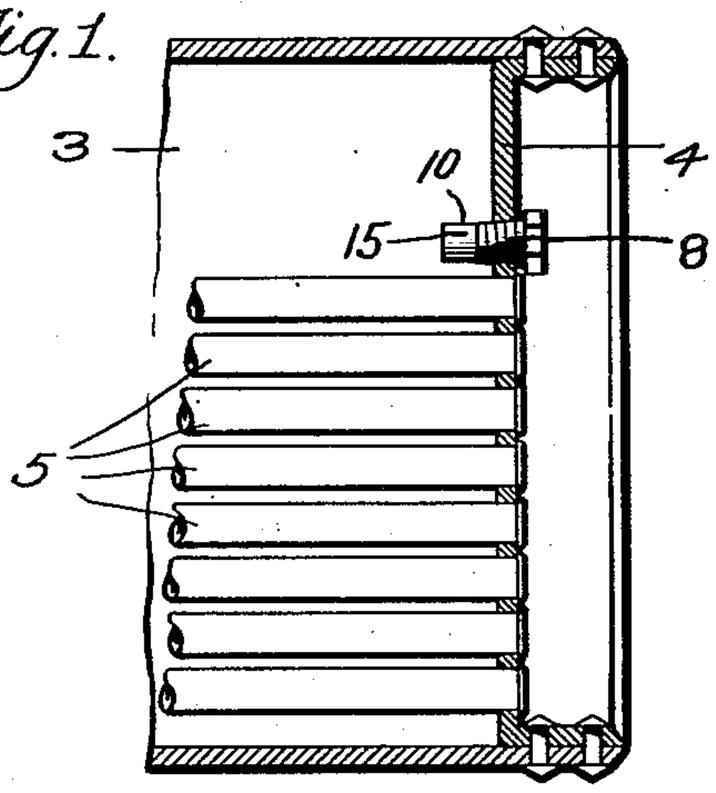


Fig. 2.

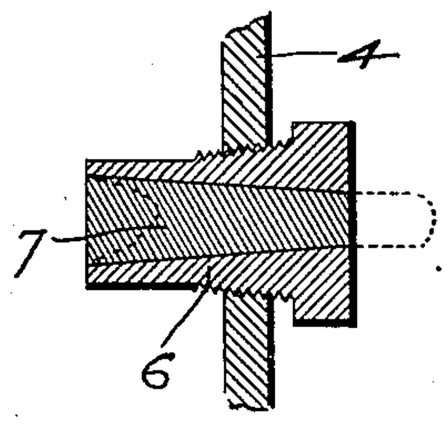


Fig. 4.

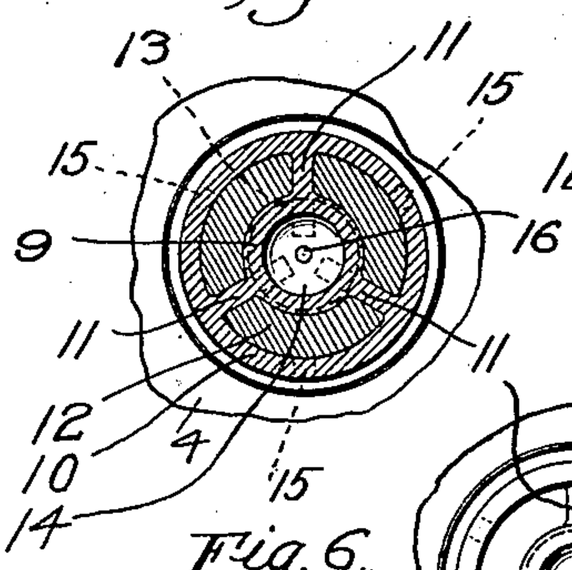


Fig. 3.

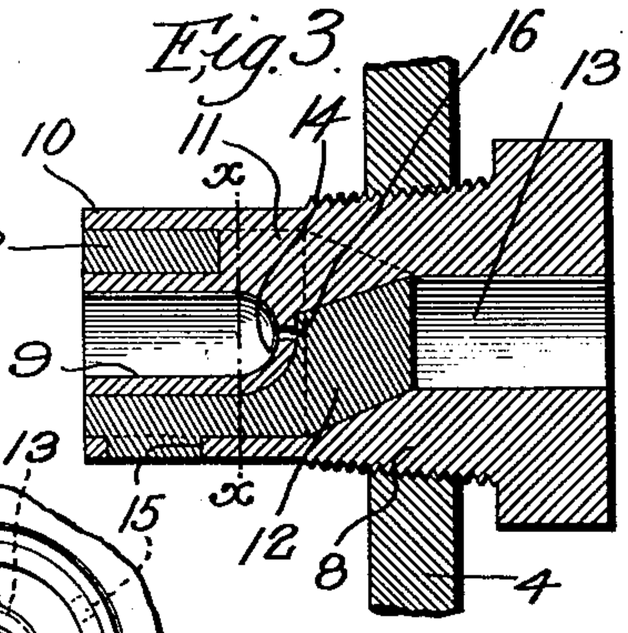


Fig. 5.

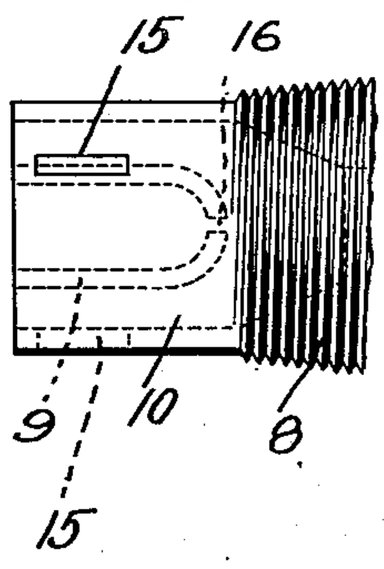


Fig. 6.

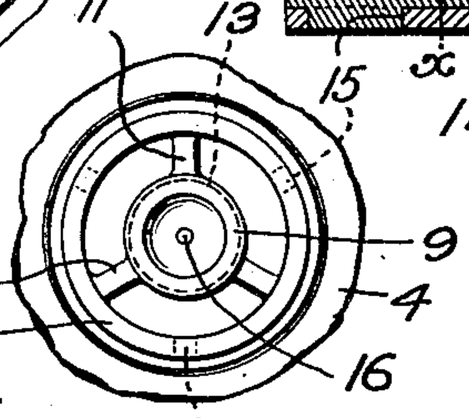


Fig. 8.

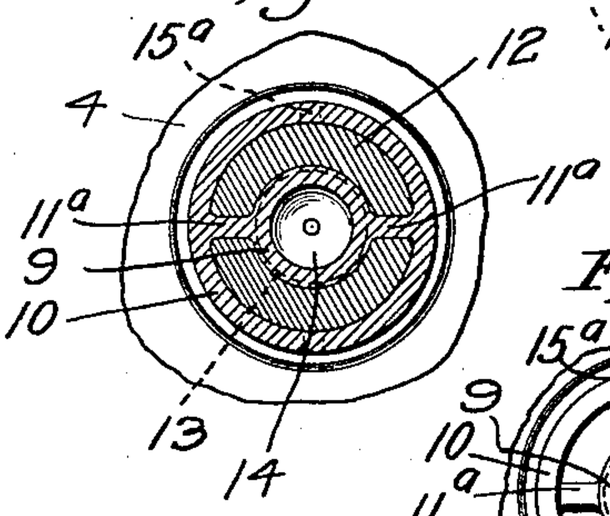


Fig. 9.

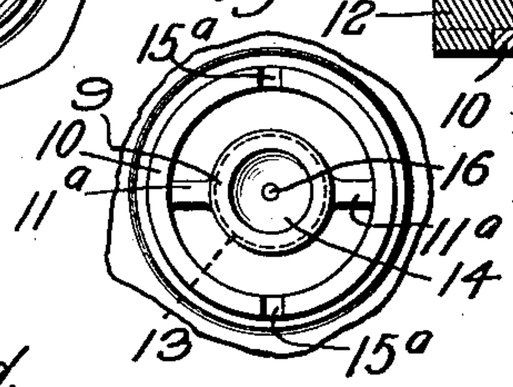
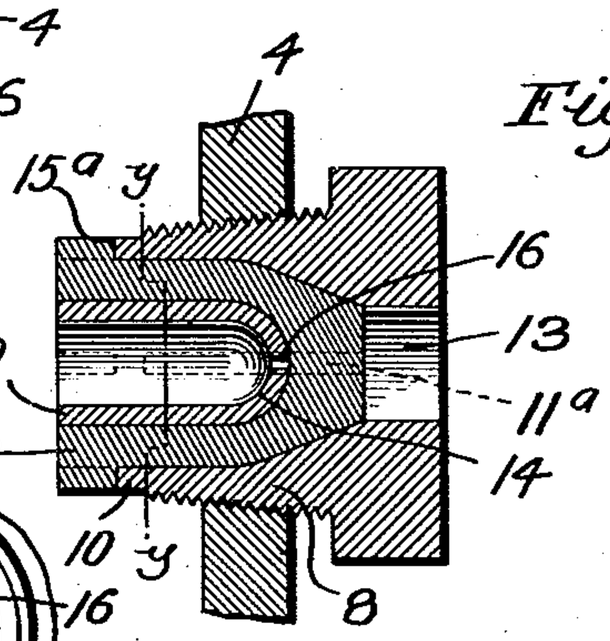


Fig. 7.



Witnesses.
W. C. Lunsford.
Joseph M. Ward.

Inventor.
Bliss W. Robinson.
By Crosby Gregory Atty's.

UNITED STATES PATENT OFFICE.

BLISS W. ROBINSON, OF BOSTON, MASSACHUSETTS.

SAFETY-PLUG.

No. 848,205. Specification of Letters Patent. Patented March 26, 1907.

Application filed January 5, 1907. Serial No. 350,887.

To all whom it may concern:

Be it known that I, BLISS W. ROBINSON, a citizen of the United States, residing in Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Safety-Plugs, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to safety-plugs, such as are commonly used in tubular or fire-tube boilers for giving indication when the water in the boiler drops below a predetermined level.

The common form of safety-plug is a cylindrical or tubular member which is filled with some suitable fusible material and which is screwed into the flue-sheet of the boiler just below the normal water-level. Usually the bore of the safety-plug is tapering, it being larger at its inner end than at its outer end. While plugs of this nature answer the purpose where the steam-pressure in the boiler is comparatively low, yet it has been found that where the boiler-pressure is comparatively high it will gradually force the fusible metal out through the outer end of the plug even while the inner end of the plug is still covered with water. This is so because the fusible metal often becomes slightly softened, owing to the extreme heat to which the flue-sheet is subjected, and when the fusible metal does thus soften slightly the pressure on the inner end of the plug is sufficient to force some of the metal out through the plug. When this occurs, the plug is unfit for further use.

The principal object of my present invention is to provide a novel form of safety-plug which will retain the fusible metal under any degree of pressure.

Another object of the invention is to provide a plug in which the fusible metal will be protected better than in plugs as usually made.

Some embodiments of my invention will first be described and then the novel features thereof will be pointed out in the claims.

In the drawings, Figure 1 shows a portion of a tubular boiler having a safety-plug applied thereto. Fig. 2 is a section through a safety-plug of the ordinary type, showing how it is affected by extremely-high pressures. Fig. 3 is a section through a safety-plug of one form embodying my invention. Fig. 4 is a section on the line $x\,x$, Fig. 3. Fig. 5 is a side view of one end of the plug. Fig. 6 is an end view thereof with the fusible metal omitted. Fig. 7 is a sectional view showing another embodiment of my invention. Fig. 8 is a section on the line $y\,y$, Fig. 7. Fig. 9 is an end view of Fig. 7 with the fusible metal omitted.

I have not shown herein a complete boiler, but only a sufficient portion thereof to illustrate my invention, and in Fig. 1, 3 designates the boiler-shell, 4 a flue-sheet therein, and 5 the flues through which the products of combustion pass. In boilers of this type it is customary to place one or more safety-plugs in the flue-sheet 4 above the flues 5, so that when the water-level drops the safety-plug will be uncovered before any of the flues.

A safety-plug of the usual form is shown in Fig. 2, and it comprises a bushing member or shell 6, having a tapering bore therethrough filled with fusible metal 7. When a plug of this form is used in a boiler carrying very high pressure, the heat to which the plug is subjected is often enough to soften the fusible metal sufficiently so that the extremely-high pressure within the boiler will force the metal out through the plug, as shown in dotted lines, Fig. 2, even though the inner end of the plug is below the water-level. When this occurs, the plug is practically useless and a new plug has to be inserted.

My improved safety-plug is provided with the usual screw-threaded portion 8, which is screwed into the flue-sheet 4 and is also provided with a central bore 13, extending therethrough, and in order to produce a plug in which the fusible material will be retained regardless of the pressure in the boiler I make my plug with a resistance member which is situated to cover, and thus take the pressure from a portion of, the fusible material at the inner end of the plug. In the present embodiment of my invention this member is in the form of an inner wall 9, which is situated within the bore 13 at the inner end of the plug and which is spaced from the outer wall 10 of the plug, but is connected thereto by suitable webs or fins 11. The space between the inner and outer walls 9 is filled with the fusible metal 12, and this metal fills the space

around the fins and extends into the bore 13 as far as desired. The metal forming the inner walls 9 closes or substantially closes the end of the chamber inclosed by said walls, as indicated at 14. The outer walls 10 may, if desired, have one or more apertures or perforations 15 therein, into which the fusible metal extends, the metal which enters said apertures serving to anchor the body of fusible metal in place. With this construction it will be seen that the area of fusible metal on which the steam-pressure in the boiler is exerted is simply that of the annular space between the walls 9 and 10 and that the portion 14 of the inner walls 9 takes the pressure on the center of the plug. With this construction the pressure on the fusible metal will not be sufficient to cause the metal to flow out through the bore 13 even if the pressure in the boiler is an extremely-high one, because this steam-pressure is largely taken by the inner wall 9 and only a portion of it comes directly on the fusible metal. Furthermore, the presence of the fins 11 act to hold the metal in place and prevent it from being forced out through the bore 13. The number of fins 11 employed in the plug is not essential to the invention.

In practice I prefer to place one of the apertures 15 on the under side of the plug, so that when the water-level drops below the plug and the plug blows the melted fusible metal will run out of the lower aperture 15 as well as being blown through the bore 13.

In Figs. 7, 8, and 9 I have shown a plug of a little different construction—that is, one having only two webs or fins 11^a, which connect the inner and outer walls. In this form of the invention the slots or apertures 15^a extend clear through to the inner end of the plug. In other respects, however, the plug shown in Figs. 7, 8, and 9 is similar to that shown in Figs. 3, 4, and 5. If desired, the portion 14 of the wall may be provided with an aperture 16, although this is not essential.

From the above it will be seen that a plug embodying my invention has such a construction that the metal will not be forced out through the bore 13 even when subjected to extremely-high pressure, the shape of the plug being such as to relieve the fusible metal largely from the pressure within the boiler.

The shape herein shown for the protecting or resistance member 9 is not essential to my invention, although I prefer the form shown, because it forms within it a water-chamber that serves to give added protection to the fusible metal.

Upon referring to the drawings it will be seen that the water not only surrounds the plug, but also fills the chamber formed therein, and thus a much greater area is exposed to the water than with the ordinary type of plug. The result of this construction is that the fusible metal will not melt or become sufficiently softened to run so long as the water covers the end of the plug. When, however, the water drops below the level of the plug, the fusible metal will fuse very quickly, because it is largely situated in an annular space. A plug having this construction is therefore a very sensitive one as well as one which will withstand considerable pressure.

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

1. A safety-plug comprising a body of non-fusible material provided with a bore containing fusible material, and means to cover a portion only of the fusible material at the inner end of the plug.

2. A safety-plug comprising a body of non-fusible material provided with a bore containing fusible material, and means within the bore to cover a portion only of the fusible material.

3. A safety-plug having a bore containing fusible material, and a member forming an integral part of the plug and situated within the bore to cover a portion of the fusible material.

4. A safety-plug having at one end longitudinally-extending inner and outer walls spaced from each other, and fusible material filling the space between said walls.

5. A safety-plug having at one end longitudinally-extending inner and outer walls spaced from each other, and fusible material filling the space between said walls, the space surrounded by the inner wall constituting a water-space.

6. A safety-plug having at one end annular inner and outer walls rigidly connected together by fins, and fusible material filling the space between said walls.

7. A safety-plug having at one end an inner and an outer wall spaced from each other, and fusible material filling the space between said walls, said outer wall being perforated.

8. A safety-plug having a bore containing fusible material and provided at its inner end with a water-chamber.

9. A safety-plug having a bore containing fusible material and provided at its inner end with an axially-extending water-chamber.

10. A safety-plug comprising an outer exteriorly-screw-threaded member provided with a bore, an inner annular resistance-wall 9 at the inner end of the member 8 and forming with said inner member an annular space, and fusible material filling said annular space.

11 A safety-plug comprising an annular

exteriorly-screw-threaded member 8 provided with a central bore and having an annular resistance-wall 9 within the bore at the inner end thereof and connected to the member 8 by fins 11, and fusible material filling the bore around the resistance-wall 9.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

B. W. ROBINSON.

Witnesses:
LOUIS C. SMITH,
EVANGELINE C. BROWN.