

J. R. ROBINSON.

Improvement in Safety Plugs for Steam Boilers.

No. 125,692.

Patented April 16, 1872.

Fig. 1.

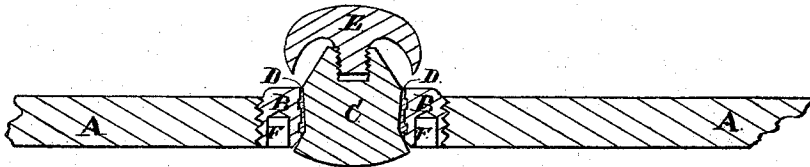
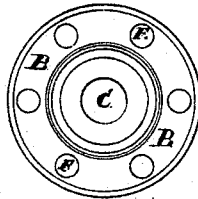
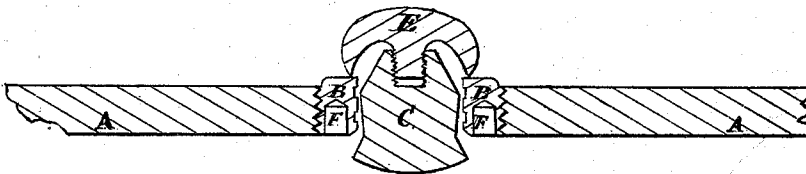


Fig. 3.



Scale, Full Size.

Fig. 2.



Witnesses:

J. B. Thomas
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J. R. Robinson

UNITED STATES PATENT OFFICE.

JAMES R. ROBINSON, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN SAFETY-PLUGS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 125,692, dated April 16, 1872; antedated March 30, 1872.

I, JAMES R. ROBINSON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Safety-Plugs for Steam-Boilers, of which the following is a specification:

The nature of my invention consists in so improving the construction of my safety-plugs, for which I did obtain Letters Patent of the United States the 30th day of April, 1861, as that they may be applied to the lower parts of boilers where the heat is most intense, to protect them from the dangers connected with the overheating of surfaces below the water, either because of the repulsion of the water from the surfaces of the boiler when the fire is strong, the heating up of the water to a temperature above that due the pressure when the fire is moderate and the water within the boiler quiet, or because of the presence of scale or heavy sediment; and also in so improving their construction as that they shall have a greater area to be acted upon by the pressure within the boiler to cause them to break than that of the opening for the escape of the contents of the boiler after the break.

Figure 1 of the accompanying drawings is a sectional view of the plug and a part of the plate of the boiler into which it is screwed, and with the conducting-rod unbroken. Fig. 2 is the same with the conducting-rod broken from the case. Fig. 3 is a view of the bottom of the plug, showing the holes by means of which it is screwed into the boiler.

A A is the plate of the boiler, into which the plug is screwed by means of a pin-wrench, which fits the holes in the bottom of the case. B B is the case, with a screw-thread on its outer edge to hold it in position in the boiler, and with a hole in it for the conducting-rod and the metal, by which it is held in place before an exposure to a temperature and pressure that shall cause it to be broken. C is the conducting-rod. D D is the metal by means of which the conducting-rod is secured to the case. E is the screw for arresting the motion of the conducting-rod when it is broken from its case, so as that the area of the opening from the boiler may, by varying the length of the screw, be reduced down to any desirable area below that of the hole in the case. F F are the holes in the case, by means of which it is screwed into and removed from the boiler. The

case B B may be made of a composition of copper, tin, and zinc, or of any other good conductor of heat; but I prefer pure copper bolt, because of its superior conducting power, and because of its low temperature of repulsion; and of such a thickness that, when its outer surface is flush with the surface of the plate of the boiler into which it is screwed, its inner surface shall come just enough through the plate of the boiler to cause the washing of its surface by the water circulating within the boiler and no further. The conducting-rod C may be made of a composition of copper, tin, and zinc, or of any other good conductor of heat; but, for the reasons given above, I prefer pure copper bolt. Its outer end is formed, as shown, larger than the hole, so as that when it is forced into the case against the beveled seat thereof, as it is when secured to the case by means of the metal D D, a blow on its outer end may be received with the least possible injury to said metal. The inner end of the conducting-rod is made to project just enough through the case to expose sufficient surface to the washing of the water within the boiler to prevent an undue elevation of temperature; not, however, so far but that it shall be covered by an accumulation of heavy sediment or scale that would cause the overheating of the boiler, or that it shall not be effected by the first act of repulsion. The conducting-rod is made so large that its area shall be such that it shall be broken from the case, by pressure, on the reduction of the strength of the metal D D by its elevation of temperature before its temperature is raised so high as to lead to any other change in its character; and that there be no change in the character of this metal other than that indicated above, and also so rapid a transmission of heat through the case and conducting-rod that the water, in case of repulsion, shall be repelled from the plugs first, so that the metal D D shall have its strength so far reduced by the elevation of temperature that the conducting-rod shall be broken from the case by the pressure before the boiler shall be endangered, the case must be so thin, and the conducting-rod between the fire and the water must be so short, and their conducting power so good, that the temperature of the metal D D throughout shall be uniform.

The conducting-rods are secured to the cases

by means of one or more of the following metals: Silver, zinc, cadmium, lead, tin, and bismuth, in such proportions that its strength shall be so reduced by the temperature due any given pressure that it shall be broken by that pressure, the strength of the metal depending upon the pressure at which the plugs are required to break and upon the areas of the conducting-rods.

The designed action of these safety-plugs is that, so long as the circulation of the water within the boiler is so good as to bring it into forcible contact with the plugs, they shall remain tight and form a part of the heating-surface of the boiler; but that the transmission of heat shall be so much greater through the plug than through the metal of the boiler, and because of the fact that the temperature of perfect repulsion for copper is lower than from iron that when, from any cause the circulation of the water around the plug shall be so defective as to endanger the boiler, the repulsion from the plug shall take place so that its temperature shall be raised and the conducting-rod broken out before the iron of the boiler shall have been raised to an unsafe temperature; and the escape of steam around the conducting-rod shall then be so slow as to let the water back with safety, and that water shall then escape through the leak onto the fire, reducing its temperature, and giving warning of the unsafe condition of the boiler; and also that before an unsafe pressure of steam is reached, even though the circulation of the

water within the boiler at the time be perfect, one or more of these plugs may be broken and the water sprayed onto the fire so as to reduce its temperature and save the boiler; or, in case of the heating up of the water to a temperature above that due the pressure, as hereinbefore mentioned, the same thing shall occur; and I also design to protect boilers by putting one or more of these plugs in the upper part of the fire-surface in the furnace, such plugs so constructed as to cause a larger leak than those in the bottom of the boiler, and being made a little stronger so as not to be broken—unless the pressure should continue to rise after the bursting of the lower plugs—till the water falls to them, but then, before an elevation of temperature that would cause the least danger to the boiler, still further reduce the temperature of the fire and cause a gradual reduction of the pressure of the steam within the boiler.

I claim as my invention, and desire to secure by Letters Patent—

A safety-plug for steam-boilers, having a greater area to be acted upon by the pressure within the boiler to cause it to break, than that of the opening for the escape of the contents of the boiler after the break, substantially as and for the purpose specified.

J. R. ROBINSON.

In presence of—

JAMES F. ROBINSON,
E. P. ROBINSON.