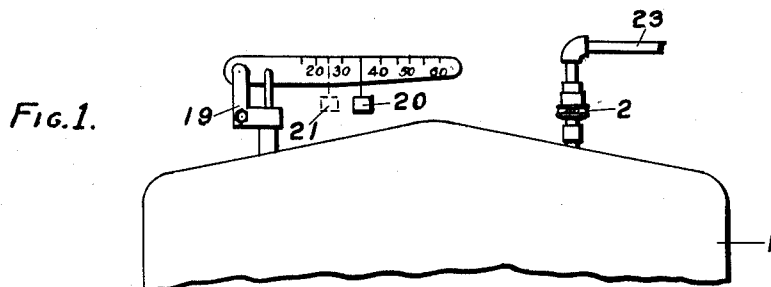
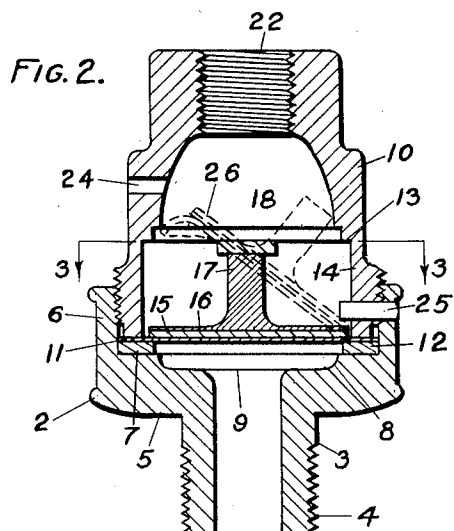
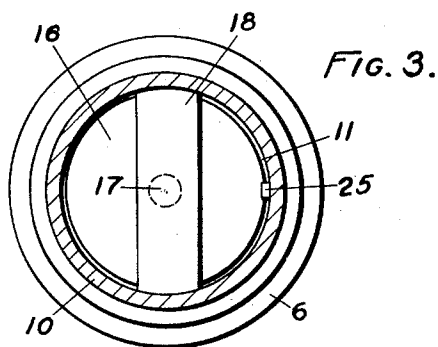
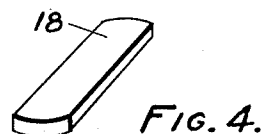
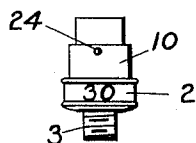
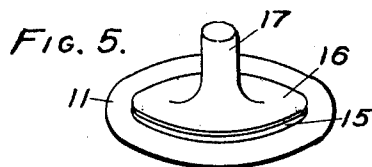


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SAFETY PLUG FOR BOILERS

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SAFETY PLUG FOR BOILERS

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3 Claims. (Cl. 220—89)

This invention relates to safety blow out plugs for heating and power boilers, range boilers, domestic water heaters, gas storage heaters, and domestic water supply systems; and more particularly to safety plugs, parts of which serve to give way at an approximately predetermined pressure slightly in excess of the conventional safety blow off valve, by which excess steam or water pressure in the boiler is relieved when the safety valve fails to function; and consists substantially in the construction, combination and arrangement of parts hereinafter set forth and pointed out more particularly in the claims.

An object of the invention is to provide safety plugs for boilers, etc., such plugs having flexible leak resisting parts and pressure resisting parts made from a comparatively brittle substance from which such parts may be supplied from certain grades of material and of a certain cross section, thus providing classified parts of approximately uniform breaking strengths, and all of which give way under substantially the same boiler pressure.

It is an important object of the invention to provide a boiler safety plug parts of which serve to yield under a boiler pressure slightly higher than the pressure required to operate the boiler safety valve to prevent destructive pressure in the boiler when the safety valve becomes corroded through inactivity or for any reason fouls or "sticks", it being understood that when the boiler pressure increases beyond the intended "pop-off" stage, and to the breaking pressure of the safety plug parts, the boiler pressure is thus relieved, the safety plug acting as a secondary safety device to prevent boiler explosions.

It is the primary object of the invention to construct a boiler safety plug having a housing like frame adapted to be communicated with a boiler, a pressure resisting element which is preferably constructed of brittle metal, serving as the principal resistance to the boiler pressure up to a certain number of pounds per inch, a leak resisting diaphragm, a pressure concentrating element between said diaphragm and said pressure resisting element, said diaphragm being constructed of comparatively thin sheet material preferably lead, coated with a rust-proof and corrosion proof substance, although rubber or the like may be used, and serving to seal the plug against casual leakage, said diaphragm being constantly forced against the pressure concentrating element over a comparatively large area by the boiler pressure and being adapted to bear at against the pressure resisting element at a central point and

thus serve to break said pressure resisting element when the boiler pressure is excessive; and to provide a means for causing the spacer to take a non-obstructive position in the plug after the diaphragm and pressure resisting element give way.

It is also a very important and primary object of the invention to provide for replacing the pressure resisting element when broken and construct and place the spacer between the diaphragm and the element so as to transfer and concentrate the pressure from the diaphragm to a given point on the element, causing same to first break at such point, by which arrangement the replaced elements will break at more nearly uniform pressures.

It is a further object to secure the edges of the diaphragm in a steam and water tight joint but to cushion and confine the pressure resisting element somewhat loosely to avoid internal strains in same which would vary the pressure breaking point thereof.

It is also an object to provide different ones of said plugs with pressure resisting elements having different cross sections for use with different boilers having safety valves which "pop-off" at different pressures, respectively, thus enabling the selection of different plugs from a supply to suit different requirements, and to place on the exterior surface of each of such plugs, a numeral indicating the number of pounds steam pressure at which the element therein will give way.

The above and other objects are attained by the structure illustrated in the accompanying drawing, in which:

Figure 1 is a fragmentary illustration of an ordinary boiler and safety valve with which the invention is embodied;

Fig. 2 is an enlarged sectional view of the invention;

Fig. 3 is a sectional view taken in the proximity of lines 3—3, of Fig. 2.

Fig. 4 is a detail view of the pressure resisting element;

Fig. 5 is a detail view of the spacer, and diaphragm; and,

Fig. 6 shows the invention as supplied for certain requirements as will be understood.

Similar characters of reference designate similar parts throughout the different parts of the drawing.

Referring to Fig. 1 the numeral 1 designates a conventional boiler to which the safety plug 2 is applied. Referring to Fig. 2 the numeral 2 designates the base of said plug, the lower portion of

which forms a hollow stem 3 with conventional male pipe threads 4 which serve to be threaded through the boiler shell, or otherwise be communicated with the boiler, as for example with a T connection in the boiler return line, or at any point, preferably, above the boiler. Said base member is flared outwardly at the upper portion of the stem and forms a somewhat horizontal web 5 which terminates in an upwardly extending female threaded coupling 6. At the juncture of said web and coupling an elevated horizontal surface 7 is formed on said web within said coupling, the inner circular edge of said web being the upper termination of a somewhat cylindrical inner wall surface 8 which merges with the upper surface 9 of the web proper, said cylindrical surface, upper web surface and the inner wall surface of the stem 3 forming a somewhat funnel-shaped interior for the base 2.

A dome 10 is threaded into said coupling, a leak resisting flexible diaphragm 11 and washer type gasket 12 being tightly confined under said diaphragm between the extreme skirt edge of said dome and the horizontal base surface 7, and thus forming a leak proof joint. A horizontal shoulder surface 13 is formed within said dome, and is spaced directly from said horizontal base surface, said shoulder surface extending outwardly to the somewhat extensive cylindrical surface 14 of said dome which extends from said shoulder surface to said diaphragm.

A resilient disc-like cushion 15 lies on said diaphragm, being preferably secured thereto as by gluing, the edge of said cushion preferably overlapping the inner edge of the washer 12, a plate 16 lies over said cushion being conveniently secured in place thereon, said plate conforming in size and shape to said cushion. At a medial point on the upper surfaces of said plate, the stem 17 is formed thereon and extends upwardly therefrom. A boiler pressure resisting bar 18 is somewhat loosely disposed over and across the upper end of said stem, the ends of said bar somewhat loosely abutting the cylindrical surface 14 and being diametrically disposed in relation to said cylindrical surface. The ends of said bar underlap the shoulder surface 13, said bar being thus loosely confined between the upper end of the stem 17 and said shoulder surface.

From the foregoing, it will be understood that said diaphragm and the gasket 12 form a steam and water tight joint between the base 2 and the dome 10, and that the cushion 15 and plate 16 against which said diaphragm is held by the boiler pressure prevents the diaphragm from bursting until the boiler pressure reaches a sufficient number of pounds per square inch to break the bar 18, said cushion and plate being held in place by the bar 18 by contact with the stem 17. In other words, the bar predetermines the approximate pressure at which said diaphragm is permitted to blow out, while the diaphragm serves as a seal against casual leakage. By this arrangement, it is convenient to retain said bar without rigidly binding same at any point, which would cause internal strains in same making it more easily broken by boiler pressure. This internal strain condition would be more pronounced in some cases than others, so that by thus constructing a safety plug, it would be impossible to manufacture a supply of plugs which would respond to a satisfactorily uniform breaking pressure.

In Fig. 1, the numeral 19 designates a conventional boiler safety valve of the beam and weight

type. It is understood that spring operated safety valves (not shown) are used to a great extent and that this particular safety plug may be applied to a boiler using any kind of safety valve. It is thought, however, that the type illustrated will serve to readily explain the relation of the plug to the boiler safety valve. The plugs are constructed and supplied to suit different requirements, it being feasible to make plugs in certain installations to respond to higher breaking pressure than in others and different plugs are therefore manufactured to blow out at different predetermined pressures. The breaking point of each plug is designated by a numeral placed on the outer surface of same indicating the number of pounds per square inch at which it will blow out.

Referring again to Fig. 1, it will be noted that the weight 20 is placed at the thirty-five pound pressure. The safety plug 2 which is used in this particular illustration is constructed with a bar 18 which will break at a steam pressure approximately forty pounds on the diaphragm 11. It will thus be understood that if through corrosion or inactivity or for any reason the safety valve 19 fails to "blow off" at thirty-five pounds per square inch, that the safety plug will blow out if and when the boiler pressure goes beyond thirty-five pounds per square inch to approximately forty pounds; and the boiler will thus be protected from dangerous steam or water pressure.

Referring to Fig. 6 a safety plug is shown upon which appears the numerals 30 indicating that said plug will blow out at approximately thirty pounds per square inch. This plug is used in instances where the operating pressure of the safety valve is about twenty-five pounds per square inch, the weight 20 being in a position indicated by the dotted lines 21, in Fig. 1, and when the boiler pressure per square inch goes beyond twenty-five pounds to approximately thirty pounds, the plug will blow out. From this it will be understood that said safety plugs may be manufactured to blow out at approximately any given number of pounds per square inch above the blow off pressure of the safety valve.

The dome 10 has a threaded outlet 22 to provide for connecting piping 23 to carry away the steam or water which comes through the device, to any desired place.

The hole 24 is provided through the wall structure of said dome, so that if by mistake the invention is installed the wrong way, as when the outlet 22 is inadvertently connected directly with the boiler, the mistake will be immediately known by the leakage of steam or water from the boiler through said hole.

To lock said dome to the base 2, a pin 25 is disposed through the coupling 6 and said dome. Said pin also serves as a precaution in view of workmen who, in threading the stem 3 into a boiler, might do so by engaging a wrench with said dome and screw same too far into said base, which might change the status of the diaphragm 11, gasket 12, the cushion 15, etc. Said pin further serves to prevent tampering with the inner parts of the device by removal of said dome.

The pin 25 extends within the dome 10, the inner end of said pin overhanging the edge of the plate 16, by which arrangement the adjacent edge portion of said disc is retarded by said pin when the stem 17 is released by the bar 18 from boiler pressure on the diaphragm 11, and said plate and stem are thus forced into an angular position as indicated by the dotted lines 26 to give

freedom of movement to the escaping steam or water, said pin thus serves to prevent the plate 16 from being blown upwardly in a horizontal position against the shoulder portion 13 which would obstruct the interior of the dome 10.

As indicated above, the diaphragm 11, cushion 15 and plate 16 are secured together, conveniently by pasting together with suitable glue, whereby the three parts may be handled as a single unit in assembling the device.

The diaphragm 11 is preferably constructed from lead sheeting and is provided with a corrosion-proof and rust-proof coating.

While the description and drawing illustrate in a general way certain instrumentalities which may be employed in carrying the invention into effect, it is evident that many modifications may be made in the various details without departing from the scope of the appended claims, it being understood that the invention is not restricted to the particular examples herein described.

What we claim is:

1. A safety plug for boilers having a yielding flexible diaphragm means to seal said plug against leakage, a plate positioned outwardly of said diaphragm means, in close proximity thereto, to resist the boiler pressure on said diaphragm means, said plate having an elevated portion which terminates outwardly to a surface of considerably reduced area, and a brittle bar disposed across said reduced area of said elevated portion, said bar being loosely confined at its extremities and being of suitable strength and proportion to be broken by an approximately predetermined boiler pressure on said diaphragm means, the boiler pressure being transmitted and multiplied from said diaphragm means through said plate to a space of comparatively small area on said bar, an inlet connection on said plug for communicating with the boiler with which it is used, and an outlet head connection on said plug serving to carry away the steam or water which escapes through said plug and serving to enclose said diaphragm means, said plate and said bar, and prevent same from being blown from the plug.

2. A blow-out safety plug for boilers, comprising a body having a hollow interior which contains the blow out parts of the plug and prevents the same from being blown therefrom by excessive

pressure within the boiler, a yielding flexible diaphragm means serving to seal said plug against leakage, and a plate facing said diaphragm means in close proximity thereto, said plate being positioned outwardly thereof, said plate serving to resist the boiler pressure against said diaphragm means, said plate having an outwardly extending portion which terminates in a considerably smaller area than the area facing said diaphragm; and a brittle bar of uniform cross section throughout its length disposed across said smaller area of said elevated portion, said bar being loosely confined at both its extremities and serving to give way between its extremity confinements under pressure exerted against said plate at an approximately predetermined boiler pressure on said diaphragm means against said plate, the total boiler pressure against said diaphragm being differentiated through said plate to an increased pressure per square inch at a midway point of said bar, contacted by the outwardly extending portion of said plate.

3. A blow-out safety plug for boilers, comprising a body having a hollow interior which contains the blow-out parts of the plug and prevents the same from being blown therefrom by excessive pressure within the boiler, a yielding flexible diaphragm means serving to seal said plug against leakage, and a plate facing said diaphragm means in close proximity thereto said plate being positioned outwardly thereof, said plate serving to resist the boiler pressure against said diaphragm means, said plate having an outwardly extending portion which terminates in a considerably smaller area than the area facing said diaphragm; and a brittle bar disposed across said smaller area of said outwardly extending portion, said bar being loosely confined at both its extremities and serving to give way between its extremity confinements under pressure exerted against said plate at an approximately predetermined boiler pressure on said diaphragm means against said plate, the total boiler pressure against said diaphragm being differentiated through said plate to an increased pressure per square inch at a midway point of said bar, contacted by the outwardly extending portion of said plate.

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