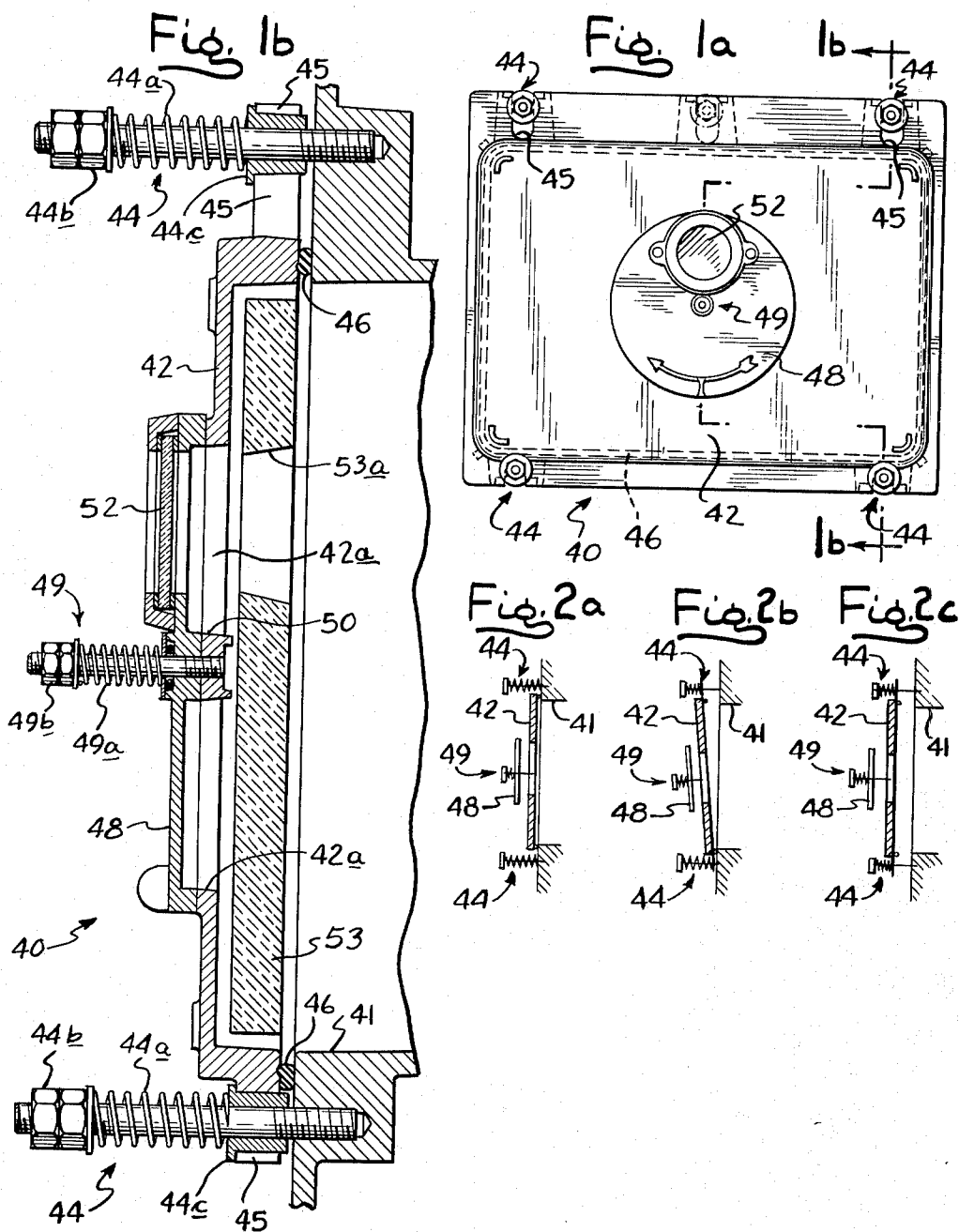


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J. G. MUELLER
BOILER CONSTRUCTION
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BOILER CONSTRUCTION

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5 Claims. (Cl. 110-173)

The present invention relates to heating equipment and, more specifically, to the construction of boilers and related apparatus.

In general, this invention is concerned with improvements in the construction of boilers and related apparatus which provides for pressure relief in the face of excessive internal boiler pressure and allows visual inspection of the boiler interior. These improvements are applicable to small boilers, for example, domestic size boilers as well as large boilers utilized in heating plants for large buildings.

A primary object is to provide improved pressure relief means for boilers. More specifically, it is an object to provide improved pressure relief means for normally maintaining a gas-tight seal and for opening to relieve pressure in the face of gas puffs or excessive internal pressure in the firebox. A related object is to provide such means which allows for visual inspection of the boiler interior.

Another general object is to provide an improved boiler construction wherein the construction facilitates efficiency of operation and safety of operation.

Other objects and advantages of the invention will become apparent as the following description proceeds, taken in conjunction with the drawings, in which:

FIG. 1a is a front, elevational view of progressive pressure relief apparatus for utilization in conjunction with a boiler and related apparatus,

FIG. 1b is an enlarged cross-sectional view taken along line 1-1 in FIG. 1a; and

FIGS. 2a, 2b and 2c are illustrative of three possible positions for the pressure relief apparatus illustrated in FIG. 1.

While the invention has been described in connection with a certain illustrative embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment but, on the contrary, the invention is intended to cover the various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

For the purpose of describing a preferred environment for the present invention, it is described in connection with a sectional type boiler, that is, a boiler unit made up of a plurality of individual rectangular shaped sections which are fastened together by mechanical devices and which define a firebox located centrally in the lower portion thereof. For details of an illustrative boiler to which the present invention may be advantageously utilized with, reference is made to my copending application, Ser. No. 300,898, filed Aug. 8, 1963.

In accordance with the present invention, pressure relief means is provided for opening when the internal boiler pressure exceeds a desired limit to allow for the escape of gas "puffs" or the like. Referring to FIGS. 1a and 1b, pressure relief apparatus 40 is illustrated which is constructed in accordance with this feature of the present invention. The pressure relief apparatus is mounted at the rear of the boiler, adjacent a rectangular pressure relief opening 41 (FIGS. 1a and 1b) provided adjacent the boiler firebox.

The pressure relief apparatus 40 includes a main pressure relief plate 42 having a circular opening or port 42a

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disposed in the center thereof. In keeping with this feature of the present invention, the relief plate 42 is resiliently secured to the last boiler section so that the relief plate is normally maintained in engagement therewith and so that the relief plate is free to be driven away from the last boiler section when excessive internal pressure in the firebox is developed. In the exemplary embodiment, the main relief plate 42 is secured to the boiler by means of spring-loaded bolts 44 which extend through grooves or slots 45 in the relief plate and are threaded into the last boiler section. As may be seen, each spring-loaded bolt 44 includes a spring 44a disposed between a head portion 44b of the bolt and a collar washer 44c which engages the outer surface of the relief plate 42. Two such spring loaded washers are provided at both the top and bottom of the relief plate 42 in the exemplary embodiment (see FIG. 1a). Alternatively, a three point suspension may be utilized wherein a single spring-loaded bolt will be provided at either the top or the bottom of the relief plate at the center thereof in lieu of two spring-loaded bolts, such a third bolt being illustrated in dotted lines at the top of the relief plate 42 in FIG. 1a.

For the purpose of maintaining a positive seal, a sealing medium such as asbestos rope 46 may be disposed between the relief plate 42 and the last boiler section, the asbestos rope being compressed therebetween.

In view of the foregoing, it will be apparent that, when excessive internal pressure in the firebox is developed, a corresponding force will be applied to the top and/or bottom of the relief plate 42 so that the relief plate will be driven away from the last boiler section, to the left in FIG. 1b whereby gas may escape from the boiler interior through the opening 41. As the relief plate 42 is driven to the left, the springs 44a of the associated spring-loaded bolts 44 will be compressed between the collars 44c and the head portions 44b thereof. Subsequently, when the pressure is relieved, the springs 44a will drive the relief plate 42 back into sealing engagement with the last boiler section, to the right in FIG. 1a.

A secondary pressure relief plate 48 is provided for sealing the circular opening 42a in the main relief plate 42. Likewise, in keeping with this feature of the invention, the secondary relief plate 48 is resiliently secured to the main relief plate 42 so that it is free to be driven away from the main relief plate. As illustrated, it is secured thereto by means of a spring-loaded bolt 49. The spring-loaded bolt 49 is substantially identical to the spring-loaded bolts 44 and includes a spring 49a disposed between the outer surface of the relief plate 48 and the head portion 49b of the bolt. The bolt 49 extends through an opening in the relief plate 48 and is threaded into a supporting rib member 50 extending across the circular opening 42a in the main relief plate 42, the ends of the rib member engaging the inner surface of the relief plate 42. Thus, the relief plate 48 is driven into sealing engagement with the main relief plate 42 by the spring 49 which urges the plate toward the right as viewed in FIG. 1b. It is to be understood that a desired sealing medium is provided for preventing the escape of gas between the bolt 49 and the opening 48a, i.e., for maintaining the boiler interior positively sealed, though the details of such sealing medium will not be set forth.

In view of the foregoing, it will be apparent that, when excessive internal pressure in the firebox is developed, a corresponding force will be applied to the inner surface of the relief plate 48 so that the relief plate will be driven away from the relief plate 42 (to the left as viewed in FIG. 1b) whereby gas may escape from the boiler interior through the opening 42a in the relief plate 42. As the relief plate 48 is driven to the left, the spring 49a

will be compressed between the relief plate 48 and the head portion 49b. Subsequently, when the pressure subsides, the spring 49a will drive the relief plate 48 back into sealing engagement with the relief plate 42, to the right in FIG. 1b.

It follows that the springs 49a and 44a may be selected such that the relief plate 48 will be driven to the left in FIG. 1b in the face of less pressure than the relief plate 42. For example, the spring 49a may be selected such that the relief plate 48 will be driven to the left when the internal pressure in the firebox exceeds $\frac{1}{2}$ " H₂O. Conversely, the springs 44a may be selected such that the main relief plate 42 will be driven to the left when the internal pressure in the firebox exceeds a value of approximately 1" H₂O. Accordingly, the secondary relief plate 48 will allow for pressure relief in the face of minor pressure increases such as created by gas "puffs" or the like, whereas the main relief plate 42 will allow for pressure relief in the face of large, excessive boiler pressures.

For the purpose of providing a better understanding of the various pressure relief positions with the illustrated arrangement, reference is made to FIGS. 2a-1c. In FIG. 2a, the pressure relief apparatus 40 is illustrated in a first position wherein the secondary relief plate 48 is opened, whereas the main relief plate 42 is still closed. Such would be the case when a small excessive internal pressure is created. Subsequently, if the internal pressure increases even more, the main relief plate 42 may be partially opened and the secondary relief plate 48 fully opened such as illustrated in FIG. 2b wherein the main relief plate is in a "tilted" position, this representing a second relief apparatus position. Such would be the case when a moderately excessive pressure is created within the boiler. Finally, should the pressure within the boiler become unusually excessive, both the secondary relief plate 48 and the main relief plate 42 will be fully opened as shown in FIG. 2c, so that maximum relief is provided, this representing a third pressure relief position.

Turning again to FIGS. 1a and 1b, it may seem that a circular translucent observation port 52, constructed of glass or the like, is provided in the relief plate 48 so that the interior of the boiler may be viewed during operation thereof. Additionally, as may be seen, the pressure relief plate is backed with insulation 53 having an opening or port 53a therein which with the relief plate in the position shown in FIG. 1b is in alinement with the glass plate 52 to allow for viewing of the interior. Since the opening 53a is provided only in the upper portion of the insulation, it will be apparent that the relief plate 48 may be rotated to a position wherein the interior of the boiler is no longer observable through the glass plate 52, the latter being out of alinement with the opening 53a in the insulation. Such rotation is possible since, as previously mentioned, the relief plate 48 is resiliently mounted on the relief plate 42.

In view of the foregoing, it will be seen the invention provides a boiler construction which provides for pressure relief and provides for viewing the interior of the boiler during operation thereof.

I claim as my invention:

1. In apparatus for sealing a pressure relief opening to a boiler or the like, the combination which comprises, a pressure relief plate adapted to be mounted adjacent the pressure relief opening and having an observation port, and spring-loaded means for rotatably aligning the relief plate observation port with the relief opening and for resiliently seating the relief plate in sealing relationship with the boiler so that the relief opening is sealed and the relief plate is free to be driven away from the boiler when the internal firebox pressure exceeds a desired level and when said central port and said observation port are out of alinement, the observation port allowing for visual inspection of the boiler interior when said central port and said observation port are in alinement.

2. In pressure relief apparatus for a boiler or the like, the combination which comprises, a main pressure relief plate adapted to be mounted adjacent a pressure relief opening and having a central port provided therein, a secondary pressure relief plate adapted to be mounted adjacent the central port, spring-loaded means for aligning the main relief plate with the relief opening and for resiliently locking the main relief plate in sealing relationship with the boiler so that the relief opening is sealed and the main relief plate is free to be driven away from the boiler when the internal fire box pressure exceeds a desired level, and spring-loaded means for aligning the secondary relief plate with the central port and for resiliently locking the secondary relief plate to the main relief plate so that the central port is sealed and the secondary relief plate is free to be driven away from the main relief plate when the internal firebox pressure exceeds a desired level, the spring-loaded means having selected sealing forces which are so related that one of the relief plates is affected at a lower internal pressure level than the other.

3. In pressure relief apparatus for a boiler or the like, the combination which comprises, a main pressure relief plate adapted to be mounted adjacent a pressure relief opening and having a central port provided therein, a secondary pressure relief plate adapted to be mounted adjacent the central port, heat resistant flexible rope disposed around the inner surface of the main relief plate at the periphery thereof, means including a spring-loaded bolt for aligning the secondary relief plate with the central port and for resiliently seating the relief plate to the main relief plate so that the secondary relief plate is free to be driven away from the main relief plate when the internal firebox pressure exceeds a desired level, and means including spring-loaded bolts disposed in selected spaced positions around the periphery of the main relief plate for aligning the main relief plate with the relief opening and for resiliently seating the relief plate to the boiler so that the rope is compressed therebetween whereby the relief opening is sealed and so that the main relief plate is free to be driven away from the boiler when the internal firebox pressure exceeds a desired level, the spring-loaded bolts having sealing forces such that the secondary relief plate is affected by a lower pressure than the main relief plate.

4. In pressure relief apparatus for a boiler or the like, the combination which comprises, a main pressure relief plate adapted to be mounted adjacent a pressure relief opening for sealing thereof and having a central port provided therein, means including a plurality of spring-loaded bolts for seating the main relief plate to the boiler, each bolt including a head portion and a spring which is disposed between the head portion and the main relief plate so that the relief plate is thereby driven into resilient sealing relationship with the boiler and is free to be driven away from the boiler when the internal firebox pressure exceeds a desired level, a secondary pressure relief plate adapted to be mounted adjacent the central port for sealing thereof, and means including a spring-loaded bolt for seating the secondary relief plate on the main relief plate, the spring-loaded bolt including a head portion and a spring which is disposed between the head portion and the secondary relief plate so that the secondary relief plate is thereby driven into resilient sealing relationship with the main relief plate and is free to be driven away from the main relief plate when the internal firebox pressure exceeds a desired level.

5. In pressure relief apparatus for a boiler or the like, the combination which comprises, a main pressure relief plate adapted to be mounted adjacent a pressure relief opening to the boiler and having a central port formed therein, a secondary relief plate adapted to be mounted adjacent the central port and having a translucent observation port formed therein, means including spring-loaded bolts for aligning the main relief plate with the relief open-

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ing and for resiliently seating the main relief plate in sealing relationship with the boiler so that the relief opening is sealed and the relief plate is free to be driven away from the boiler when the internal firebox pressure exceeds a desired level, and means including a spring-loaded bolt for rotatably aligning the secondary relief plate observation port with the central port and for resiliently seating the relief plate to the main relief plate so that the secondary relief plate is free to be driven away from the main relief plate when the internal firebox pressure exceeds a desired level and when said central port and said observation port are out of alinement, the observation port allowing for visual inspection of the boiler interior when said central port and said observation port are in alinement.

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