Nov. 24, 1953 E. C. CHAPMAN 2,660,155

STEAM GENERATING TUBULAR WATER WALL

Filed Jan. 12, 1949

Fig. 1.

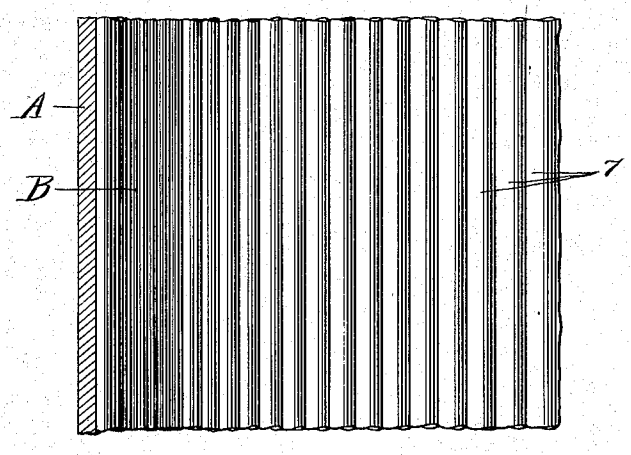


Fig. 2.

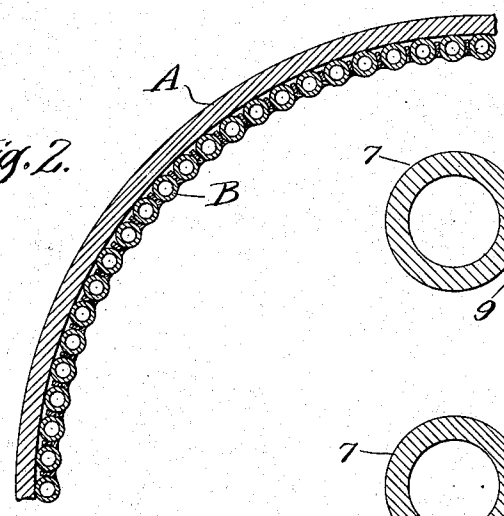


Fig. 3.

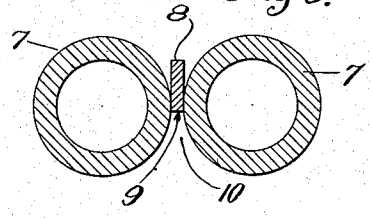


Fig. 3a

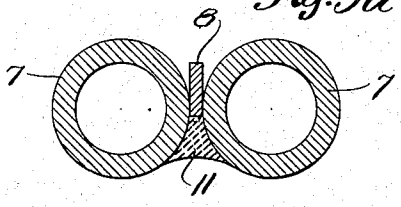


Fig. 4.

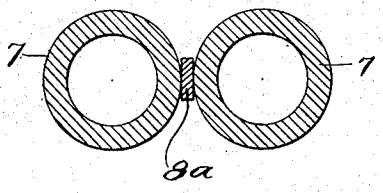
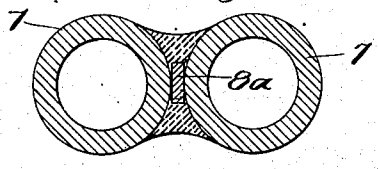


Fig. 4a



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STEAM GENERATING TUBULAR WATER WALL

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2 Claims. (Cl. 122—6)

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This invention relates to steam generating continuous tubular water walls and similar members presenting a continuous water cooled surface for the protection of adjacent parts and particularly such as have relatively thin walled closely spaced tubes, and to a method of making such a wall.

In many installations in which steam is generated, either as the direct objective or as an incident to some other operation, it has been customary to provide tubular water walls or similar parts presenting a continuous surface and designed to cool and protect adjacent parts from corrosive gases and the like. Where the tubes are relatively large in diameter with relatively thick walls, or where the tubes are relatively widely spaced from one another, no difficulty is encountered in making the wall present a continuous surface through the use of fins and/or welding and in obtaining underwriters' approval thereof.

In the case of relatively thin walled closely spaced tubes and also in the case of relatively small diametered thin walled tubes, it has heretofore been impossible, to the best of my knowledge, to provide a wall through the use of welding which meets requirements, and the primary object of the present invention is to provide a wall presenting a continuous surface which will meet the requirements.

How the foregoing is realized is illustrated in the accompanying drawings, wherein—

Fig. 1 is a partial vertical section through an installation having a circular wall embodying my invention;

Fig. 2 is a cross section through Fig. 1.

Figs. 3 and 3*a* are enlarged sections of two adjacent tubes illustrating details of the invention and the manner of welding, and

Figs. 4 and 4*a* are views similar to Figs. 3 and 3*a*, but illustrating a modification of the invention.

Referring now to Fig. 1, the reference character A indicates a casing or other part of an installation in which steam is generated, and B indicates the protecting water wall therefor. This wall is composed of relatively closely spaced steam generating or other high pressure heat transfer tubes 7, the tubes in this instance having an outside diameter of substantially 1¼" to 1½" and a wall thickness of say ⅜"±. The tubes may be composed of customary tube steel and, for illustrative purposes, the wall is shown as circular.

Referring now particularly to Fig. 3, it will be seen that in constructing the wall I arrange the

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tube in close side-by-side relation, spacing adjacent tubes by means of a longitudinally extending spacing strip or strips 8. This spacing strip is of a thickness such that the root 9 of the welding opening or space 10 is sufficiently wide as to permit of the laying of a seal weld or bead in the space 10 which will not crack. In this instance the thickness of the strip 8 is substantially ⅛", giving a ⅛" spacing between tubes, with the inner edge of the strip extending desirably slightly below a median plane, i. e., a plane cutting the centers of the adjacent tubes. It will be observed that the location of the inner edge makes for a substantially deep welding opening. Also it will be noted that the opening is substantially U-shaped as opposed to V-shaped as would be the case where the tubes were placed together without the spacing strip. By reason of the root thus provided, it is possible to have the arc reach the bottom of the weld opening and also to lay a nice uniform weld bead without fusing through the tube walls, which is particularly useful where light or thin walled tubes are employed. In Fig. 3*a* the weld bead 11 has been formed.

As thus far described, the arrangement is one in which access for welding is only had on one side. In Figs. 4 and 4*a* an arrangement is shown which is suitable for cases where both sides of the water wall are accessible for welding, and it is desirable to weld on both sides. In this case, the spacing strip 8*a* is of narrow width so as not to extend very much beyond either side of the median plane of the tubes.

It will be understood of course that the dimensions of the strip may vary, depending upon the diameter of the particular tubes employed. However, I have found that with small tubes of the general order hereinbefore mentioned, a minimum thickness of ⅛" gives the most satisfactory results. The thickness of the strip may be increased thereabove, say to as much as a ¼" or a half inch, depending either upon the size of the particular tubes employed or the number of tubes, or the number and therefore the spacing of the tubes employed, or both.

With small tubes it is impossible to have the tubes abut and lay a weld which will not crack because of the sharp V as the arc will not penetrate to the bottom of the V. The root opening or a radius at the root must be provided in order for the arc to penetrate to the bottom of the groove.

I claim:

1. In a furnace, a water wall having its inner surface exposed for heat transfer and compris-

ing: a plurality of relatively thin-walled tubes arranged in spaced parallel relation in the plane of said wall and each having portions exposed to form part of said inner wall surface; spacing strips extended between and parallel to adjacent tubes and each having edge portions respectively disposed both inwardly and outwardly of the median plane containing the central axes of the pair of tubes lying at each side of the spacing strip, the inner edge of each strip lying close to said median plane and the strip having a minimum thickness of approximately ⅛ of an inch, said location of the inner edge and said thickness of the strip cooperating to provide a substantially U-shaped opening for the laying of a weld head; and welding beads in the welding openings uniting adjacent tubes, tube-to-tube, each such bead overlying the inner edge of the spacing strip between a pair of adjacent tubes and having its inner surface lying between said median plane and the plane containing the innermost surfaces of the tubes to cooperate with the exposed portions of the tubes in completing the inner surface of the water wall.

2. In a furnace, a water wall having its inner surface exposed for heat transfer and comprising: a plurality of relatively thin-walled tubes arranged in spaced parallel relation in the plane of said wall and each having portions exposed to form part of said inner wall surface; spacing strips extended between and parallel to adjacent tubes and each having edge portions respectively disposed both inwardly and outwardly of the median plane containing the central axes of the pair of tubes lying at each side of the spacing strip, the inner edge of each strip lying close to said median plane to minimize the space between each inner side of the strip and the surface of the respectively adjacent tube whereby to provide a deep welding opening and the strip being of width sufficient to provide a relatively wide root for said welding opening; and welding beads in the welding openings uniting adjacent tubes, tube-to-tube, each such bead overlying the inner edge of the spacing strip between a pair of adjacent tubes and having its inner surface lying between said median plane and the plane containing the innermost surfaces of the tubes to cooperate with the exposed portions of the tubes in completing the inner surface of the water wall.

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