

Aug. 3, 1937.

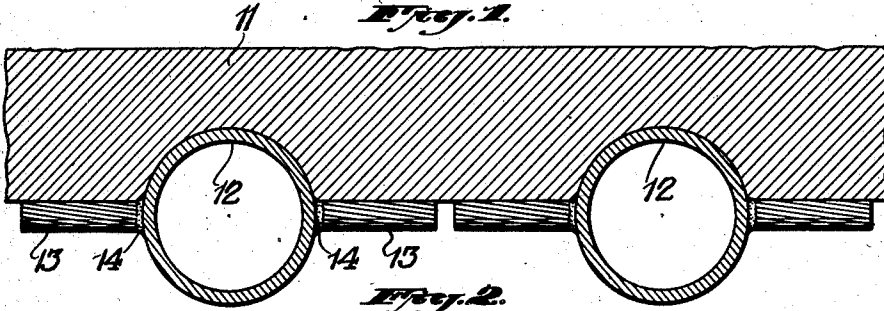
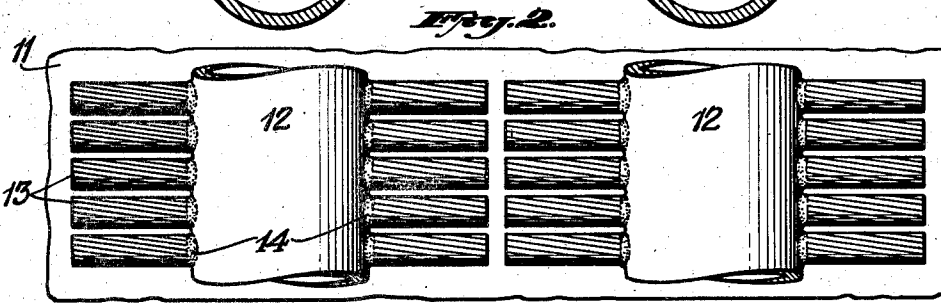
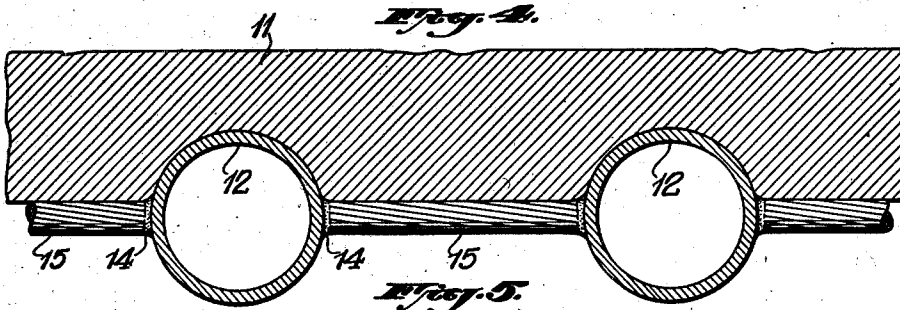
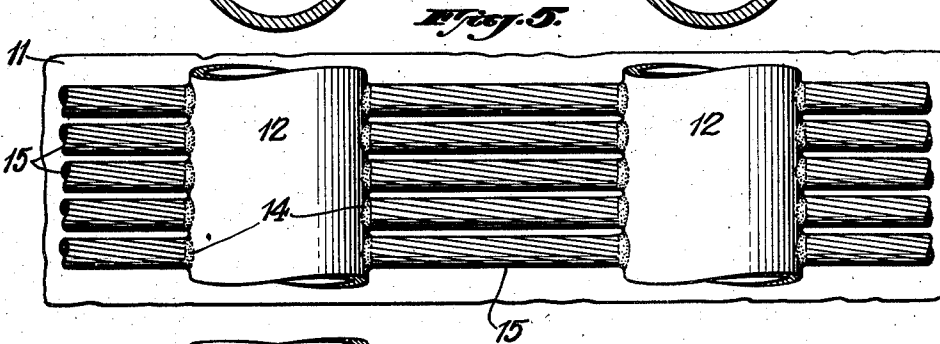
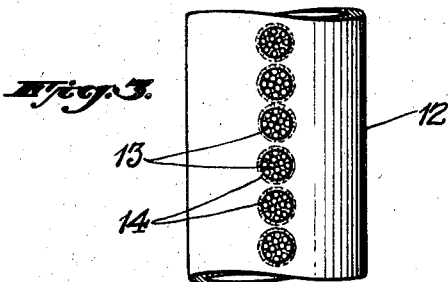
T. E. MURRAY, JR

2,089,000

BOILER WALL AND TUBULAR UNIT THEREFOR

Filed Feb. 26, 1936

2 Sheets-Sheet 1



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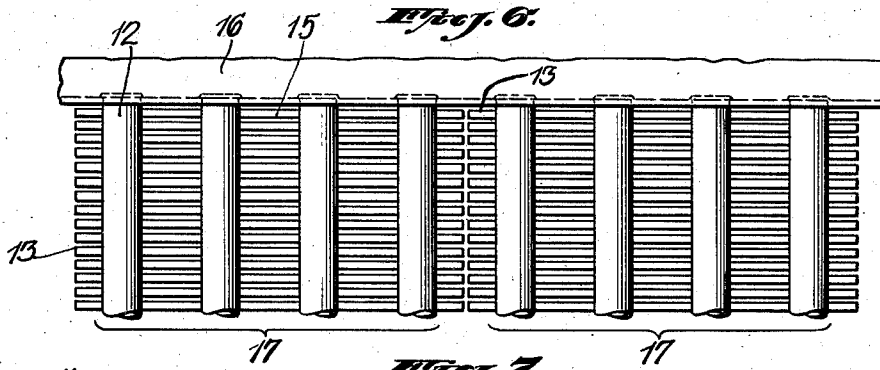
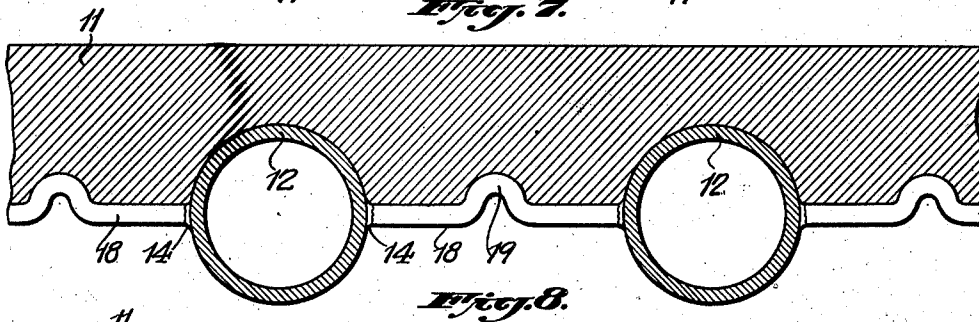
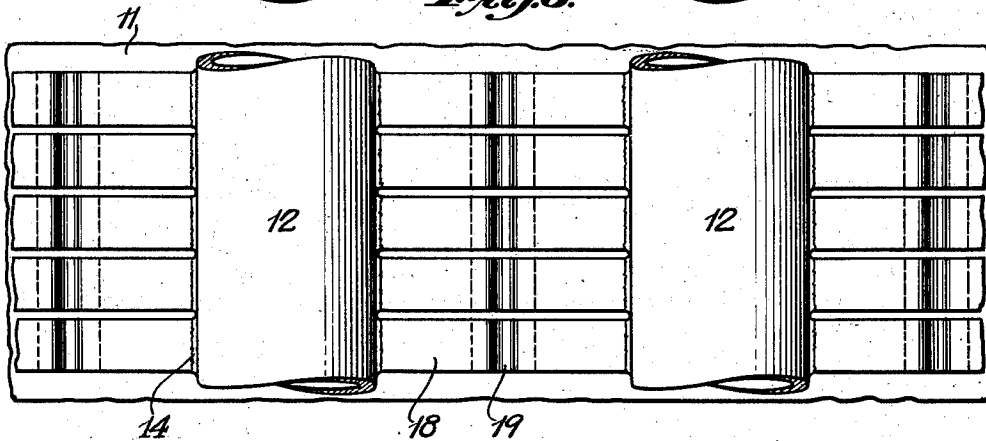
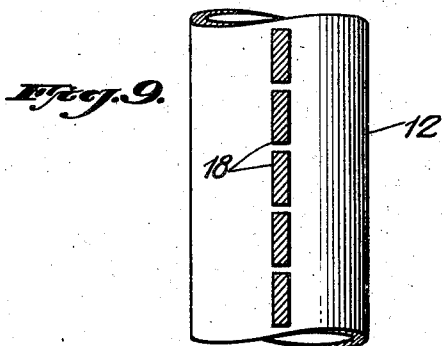
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BOILER WALL AND TUBULAR UNIT THEREFOR

Filed Feb. 26, 1936

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,089,000

BOILER WALL AND TUBULAR UNIT THERE-
FOR

Thomas E. Murray, Jr., Brooklyn, N. Y.

Application February 26, 1936, Serial No. 65,752

11 Claims. (Cl. 122-6)

In a patent of Thomas E. Murray, No. 2,029,437 of February 4, 1936 there are described water walls for boilers, superheaters and heat exchangers generally made up of or lined with upright tubes spaced apart and provided with metal extensions into the spaces between them of such length and spacing as to form with the tubes a substantially or approximately complete metal wall. The present invention provides an improvement in such walls and in units to be used in such walls. The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a horizontal section of a wall; Fig. 2 is an inside face elevation of a part of the same; Fig. 3 is an end view of one of the units; Figs. 4 and 5 are similar views of a modification; Fig. 6 is a larger portion of wall made according to Figs. 3 and 4; Figs. 7, 8 and 9 are views similar to Figs. 1, 2 and 3 of another modification.

Referring first to Fig. 1, the outer part of wall 11 may be of insulating material such as a plastic coating applied to the outer side of the tubular wall described below, or it may consist of any usual or suitable refractory or combination of refractory and insulating materials. Lining the inner face of the refractory portion is a water wall comprising a succession of upright tubes 12 each of which is provided with a pair of diametrically opposite lines of projections 13 spaced so closely as to have the effect of a continuous flange in protecting the outer plastic portion of the wall and in absorbing the heat of the fire within. The projections 13 from two adjacent tubes extend so far toward each other as to nearly touch end to end, so as to substantially or approximately fill the spaces between the tubes.

The original boilers of this type were provided with flanges extending continuously along the tubes. In welding such flanges to the tubes it was found that certain internal stresses were produced which sometimes resulted in cracks in the tubes when put into use and which rendered the flanges more rapidly oxidizable at high temperatures. It has been proposed to substitute small projections or pins separately welded to the tube as in Patent Nos. 2,029,437 above and 1,929,444 of October 10, 1933, and these have been found to largely avoid the internal stresses referred to. According to the present invention, the projections 13 are given a certain flexibility so that they may yield and thus avoid internal strain, being stiff enough, however, to avoid extreme deformation. For this purpose, they may be made of short lengths of stranded wire as shown in Fig. 1 united to the tube 12 by butt weld-

ing 14, or it might be by other known methods of welding; the wire being of steel, copper, or other suitable metal or alloy.

The units may be set up in the wall in a variety of ways. The ends may be brought nearly together as illustrated, allowing only clearance for expansion while constituting with the tubes a substantially complete metal wall to protect the outside refractory or insulation and to absorb practically all the radiant heat of the flame, so as to generate large quantities of steam very rapidly. This metal wall may be coated on its inner face with the ash which occurs when burning powdered coal or may be initially coated with refractory material as has been sometimes proposed in order to protect the metal and to maintain an incandescent wall supposed to result in better combustion.

The flexibility of the projections has another advantage. In large boilers fired at high temperatures there is considerable movement of contraction, expansion and warping of the individual tubes which though not very large in extent is very forceful. The tubes should be mounted with freedom of relative movement in order to avoid strain and breakage which would otherwise occur. The use of flexible projections permits of the actual joining of their ends in the spaces between the tubes as shown in Figs. 3 and 4. Practically this amounts to a series of single flexible connections of stranded wires.

They may be produced by first welding the projections on each tube separately as in Figs. 1 and 2 and then fastening their ends together by welding or otherwise (great heat conductivity being of no great importance at this point). Or, as shown in Figs. 3 and 4 they may be single lengths of stranded wire extended continuously across the space between two tubes. The welding of the ends to the tubes may be accomplished after the tubes have been erected. Or, panels or complete walls may be first assembled and welded together and then erected. Fig. 6 illustrates such an arrangement in which a header 16 has depending from it two panels 17 each comprising four tubes 12 with flexible projections 15 connecting them together. Between panels, as along the center line of the figure, we may have projections 13 merely abutted or welded or otherwise fastened together; or we may have connecting members 15 welded in situ, or we may have various other suitable constructions.

Such connections between the tubes hold them properly spaced and steady them, diminishing

vibration while permitting forceful relative movement.

The stranded wire, or any round flexible member is adapted to yield equally in all directions. But, flexible projections or connectors of other shapes in cross section may be used. And while stranded projections or ties are generally more flexible than solid, yet solid members may be made to serve the purpose by making them of special shapes, proportions and compositions. Figs. 7, 8 and 9 illustrate the use for this purpose of rectangular rods or bars 18 of steel, copper, or other suitable metal or alloy with an expansion joint formed by a kink, bend or twist such as the fold 19. The bars should be small enough in cross section in proportion to their length and sufficiently spaced to permit relative movement of the adjacent tubes vertically or transversely across the plane of the wall or toward and away from each other.

The tubes are illustrated in vertical positions. In modern boiler construction, tubes are often inclined and bent in directions which are approximately vertical and sufficiently so as to permit the high speed circulation desired. The invention is applicable to all such tubes referred to generally as upright tubes.

Various other modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:—

1. A tubular unit of the character described comprising a tube and a number of projections welded thereto, said projections being small in cross section compared with their length, and the spaces between them along the tube being so slight compared with their thickness that they constitute approximately a continuous metallic wall, said projections being separate pieces each composed of a group of wires so as to be flexible.

2. A tubular unit of the character described comprising a tube and a number of projections welded thereto, said projections being small in cross section compared with their length, and the spaces between them along the tube being so slight compared with their thickness that they constitute approximately a continuous metallic wall, said projections being separate pieces each composed of stranded wires.

3. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes both vertically and transversely.

4. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes both vertically and transversely said ties being comparatively small and being closely spaced from each other so as to constitute in effect a metallic wall between the tubes.

5. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes both vertically and transversely, in combination with insulating material covering the outside of said tubular wall section.

6. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes both vertically and transversely said ties being comparatively small and being closely spaced from each other so as to constitute in effect a metallic wall between the tubes in combination with insulating material covering the outside of said tubular wall section.

7. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes, said ties being composed of groups of wires.

8. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by metallic ties which are flexible so as to permit relative movement of adjacent tubes, said ties being composed of stranded wires.

9. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by separate rods which are flexible in all directions so as to permit relative movement of adjacent tubes both vertically and horizontally.

10. A boiler wall section comprising a plurality of parallel spaced upright tubes tied together by separate rods which are flexible so as to permit relative movement of adjacent tubes both vertically and horizontally and which are expandible so as to permit relative movement of the tubes toward and away from each other.

11. A tubular unit of the character described comprising a tube and a number of projections welded thereto in longitudinal alignment with each other, said projections being separate from each other and being each composed of a group of wires so as to be flexible.

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