

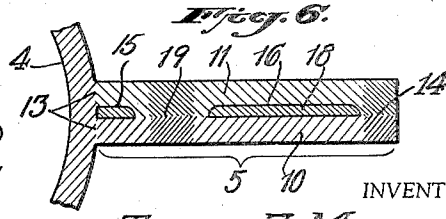
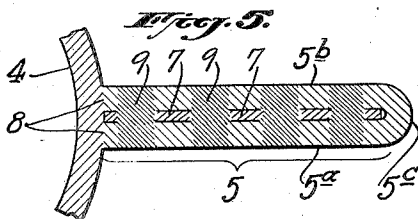
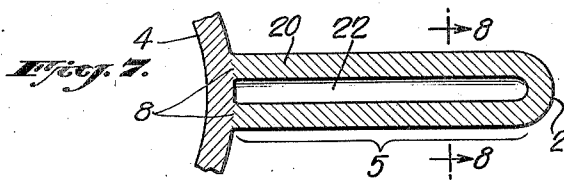
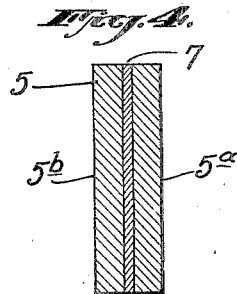
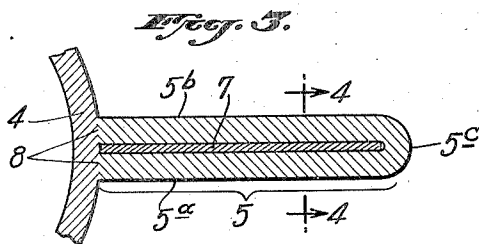
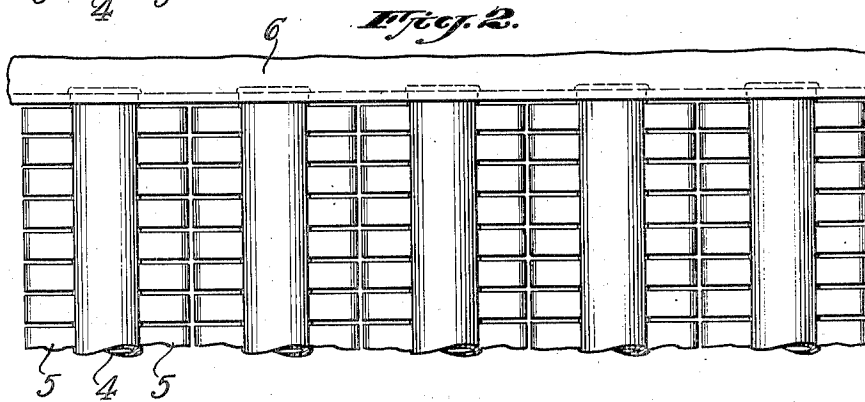
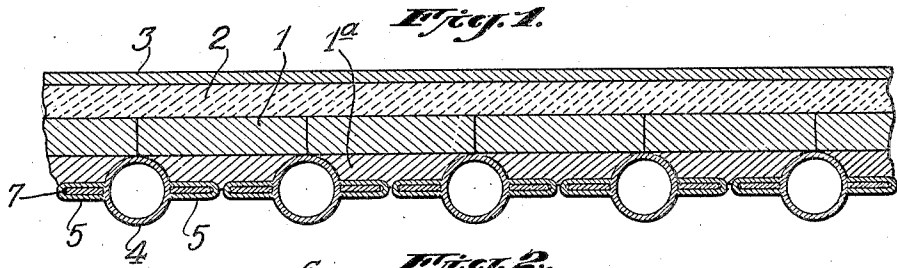
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2,167,901

TUBULAR ELEMENT FOR BOILER WALLS

Filed Feb. 29, 1936



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TUBULAR ELEMENT FOR BOILER WALLS

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1 Claim. (Cl. 257—262)

In a certain prior patent, 1,746,711, dated February 11, 1930, there is described a hollow wall for boilers comprising upright tubes spaced apart and having fins extending over the intermediate spaces continuously from top to bottom. In the welding of such fins to the tubes, it has been found that internal stresses are produced which some times occasion breaks in the tubes when they are put to use under extreme high temperature conditions; and similar stresses in the fins which tend to cause oxidation at high temperatures.

In other patents, and in application No. 550,903, filed July 15, 1931, (Patent No. 2,029,437 of February 4, 1936) it is proposed to use a line of short straight segments instead of a continuous fin. But with boilers generating steam at high speed and operating at very high temperatures, it is difficult to make these simple flange segments of the desired radial length and to maintain them so in use.

The present invention provides a wall construction of the above character but improved in that the projections are adapted to be made longer (in the radial direction of the tube) and to maintain such greater length in use.

In boilers of this type, particularly when working with coal dust or similar fuel burned in suspension, the ends of the projections or fin segments tend to oxidize or burn off, this action continuing until such a short length is arrived at that the end of the projection is maintained by a balance between the cooling and hardening effect of the water rushing through the tube and the external heating effect. This circumstance limits the spacing of the tubes, assuming that the projections are intended to substantially span the spaces.

The present invention aims to increase the limit of such spacing by increasing the available length of the projections. Longer projections also mean a greater area for collecting heat.

The accompanying drawing illustrates embodiments of the invention. Fig. 1 is a horizontal section of a side wall of a boiler. Fig. 2 is an inside elevation of an upper portion of the same. Fig. 3 is an enlarged horizontal section through one of the fin segments. Fig. 4 is a cross-section of the segment on the line 4—4 of Fig. 3. Fig. 5 is a modification of Fig. 3. Fig. 6 is another modification of the same. Fig. 7 is a horizontal section of another modification. Fig. 8 is a section of Fig. 7 on the line 8—8.

Referring to Fig. 1 there is an outer wall structure of refractory bricks or blocks 1 and 1^a, a

plastic insulating medium 2 and a retaining shell 3 of sheet metal. Within this is a lining or wall of water tubes 4 spaced apart and provided with fin segments or projections designated as a whole by the numeral 5. The upper ends of the upright tubes 4 may enter a header 6 (Fig. 2) and their lower ends a similar header, through which they are connected in any one of various combinations into the circulation of the boiler.

The fin segments or projections 5 are spaced along each tube at diametrically opposite points and separately welded thereto so close to one another as to constitute an approximately or substantially unbroken wall. The fin segments extend into the spaces between two adjacent tubes so as to practically cover the width of the space between them so that with the tubes they constitute a substantially unbroken metal wall exposed to the heat within the furnace on one side, protecting the non-metallic outer portion of the wall from the fire and presenting an increased heating surface (compared with plain tubes) for collecting and conducting the heat to the water, steam or mixture of the two within the tubes. This causes a very rapid upward circulation and a considerable cooling effect extending from the tubes through the segment. But with high temperature boilers, fired for example with coal dust or other fuel burned in suspension, there is an oxidation of the outer ends of the segments when they are not kept below critical temperatures by the cooling effect from the tubes.

According to this invention the maintainable length of the projections is increased by making it of a combination of different materials united and arranged in any one of various ways.

According to Figs. 3 and 4 each projection is made of a strip of one metal folded over and enclosing a strip of another metal. The tube 4 may be a regular seamless boiler tube of soft steel of 3 to 4 inches diameter. The dimension of each projection lengthwise of the tube is shown to be considerably less than the diameter and such as to avoid not only excessive strain on the welded joint of the fins to the tubes, as explained in the aforesaid Patent 2,029,437, but also excessive cumulative strains tending to separate the copper and steel or other two metals of different expansive coefficients of which the projections are composed. The projection, proportioned to the tube as in Figs. 1 and 2, is made from a strip of similar steel folded over so as to have a front portion 5^a and a rear portion 5^b and a rounded outer end 5^c enclosing a strip 7 of copper or other high conductivity metal. The

steel at 5^c thus protects the other end of the copper 7 from direct exposure to the fire and the highly conductive copper conveys the cooling effect of the water to the end 5^c of the projection so as to increase its resistance and its durability. The ends of the parts 5^a and 5^b are welded at 8 to the tube and the copper strip may also be welded if desired.

Fig. 5 illustrates a similar combination of steel strip and copper enclosed thereby. In addition, the parts are held together throughout their length by spaced welds 9 of metal deposited in openings extending through the parts.

Fig. 6 illustrates a fin segment made of separate front and rear portions 10 and 11 respectively. Their inner ends are welded to the tube at 13 and their outer ends welded to each other at 14. The meeting face of the rear member is shaped to enclose a space 15 at the tube end and a larger space 16 near the outer end. This arrangement may represent a number of different combinations; a front plate of copper or the like backed by a plate of cast iron or of cast or rolled steel with air spaces between them; or front and rear plates of steel or iron with copper 18 filling the space 16, or both spaces 15 and 16; and so forth. Generally it is intended to weld the plates together along the intermediate contact areas 19 as well as the end contact areas 14, both of which extend vertically from top to bottom of a segment.

According to Figs. 7 and 8 each projection or segment comprises a tube 20 of steel or iron or other metal with its closed end 21 outward and its open end welded at 8 to the boiler tube 4. A filling 22 of copper or other high-conductive metal may be carried within the hollow projection. In fact where such a closed space is provided the insert may be a low boiling point material liquid at ordinary temperatures such, for

example, as diphenol oxide, mercury and the like such as would not cause excessively high pressures at the temperatures encountered. Similar filling materials could be used with the previously described segments by welding them together along the top and bottom edges to prevent the loss of the filler.

By combining copper or other highly conductive material with steel, we facilitate the rapid conduction of heat from the ends of the fin segments or projections and thus keep the latter cooler for any given set of conditions, so they may be made and maintained of greater length than if made of steel alone. At the same time the steel strengthens and also cheapens the segment as compared with one made of copper alone. The welding of steel to the tube is also a much simpler job than would be the welding of copper or other metals.

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

What I claim is:

A tubular unit of the character described adapted to form a wall exposed on one side only to high temperatures, said unit comprising a tube for the heating and circulating of water or other fluid and having a series of separate projections on its exterior forming extended heating surfaces and being spaced so closely as to provide a substantially unbroken wall, said projections each comprising a combination of steel and a material of high conductivity, the steel being a hollow member closed at its outer end and at the sides, top and bottom and welded at its inner end to the water tube and the material of high conductivity being carried in said hollow member and being liquid at ordinary temperatures.

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