May 27, 1941. H. E. KLEFFEL 2,243,427

TUBE COVERING

Filed June 18, 1938

Fig. 1.

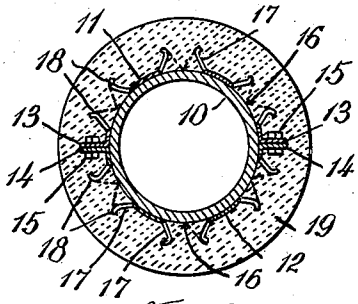


Fig. 2.

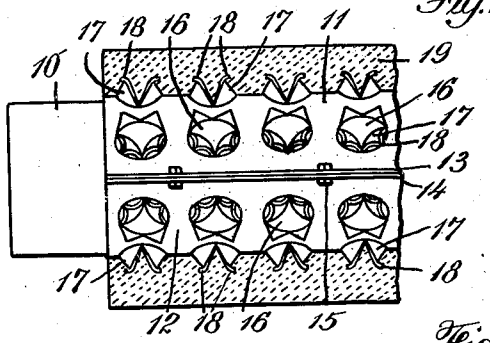


Fig. 3.

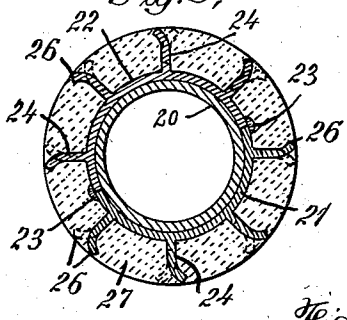


Fig. 4.

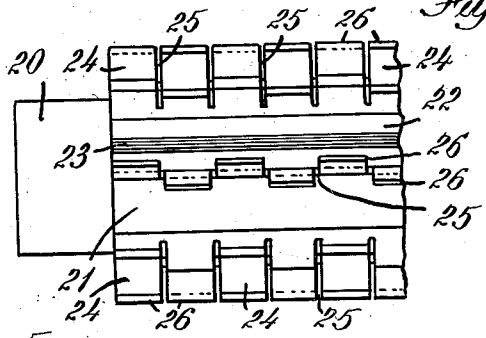
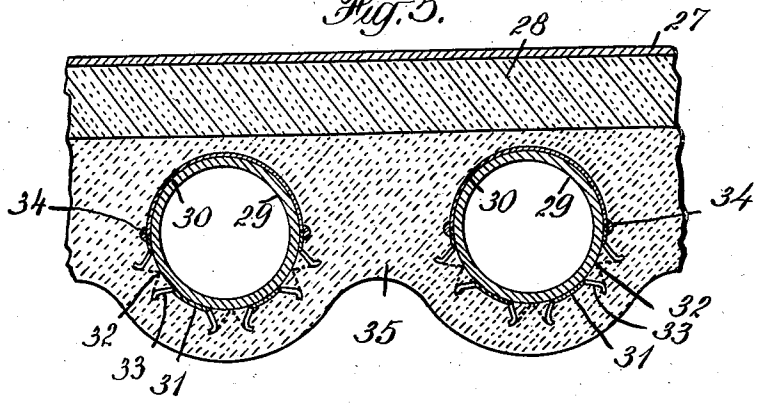


Fig. 5.



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TUBE COVERING

Harrison E. Kleffel, Brooklyn, N. Y.

Application June 18, 1938, Serial No. 214,506

1 Claim. (Cl. 257—262)

This invention relates to boiler furnaces and is concerned more particularly with a novel covered tube which may be advantageously used in constructing the walls, floors, partitions, and arches in such furnaces. The tubes of the invention may also be employed in a bank lying within the furnace chamber in the path of the burning gases and ahead of the bare heating surface, examples of the use of covered tubes in this manner being disclosed in my Patents 1,884,741 and 1,884,742. In such a bank of tubes, the spacing is such that the tubes create turbulence in and promote the combustion of the gases, and the tubes are provided with heat insulating or refractory coverings so that their contents may be prevented from abstracting heat from the gases in excessive amount. Another example of the use of covered tubes within the burning zone of a furnace chamber is disclosed in my copending application Serial No. 77,909, filed May 5, 1936, now Patent No. 2,141,917 of which the present application is a continuation in part.

The tube of the invention is provided with a covering which includes a layer of heat insulating or refractory material and a simple and effective means by which this material may be held in place on the outside of the tube. The tube covering protects the tube against direct flame impingement and oxidation, strengthens the tube and protects it against bursting and bending, and also limits the amount of heat absorbed by the tube contents.

For a better understanding of the invention, reference may be had to the accompanying drawing, in which:

Fig. 1 is a cross-sectional view of a tube provided with one type of covering made in accordance with the invention;

Fig. 2 is a longitudinal view, partly in section, of the tube shown in Fig. 1;

Fig. 3 is a cross-sectional view of a tube provided with a modified type of covering;

Fig. 4 is a view in side elevation of the tube shown in Fig. 3 with the heat insulating or refractory material removed; and

Fig. 5 is a cross-sectional view through a furnace wall or the like formed of tubes provided with coverings embodying the invention.

The covered tube of the invention, illustrated in Figs. 1 and 2, comprises an inner metallic tubular water shell 10 of conventional form which is enclosed and tightly embraced by a sleeve formed of arcuate sections 11 and 12 provided with radial edge flanges 13, 14 secured together in any convenient manner, as by bolts 15 passed through the flanges. The sleeve sections are preferably made of sheet metal shaped to semi-cylindrical form with an inner radius corresponding to the outer diameter of the tube on which they are mounted and they are held in tight contact with the surface of the tube so as to obtain good heat transfer between the sleeve and the tube. In addition, the tightly fitting sleeve stiffens and strengthens the tube so as to protect it against bursting or bending.

The sleeve sections are formed with a plurality of perforations 16 and projections 17 extending outwardly around each perforation, and such projections may conveniently be formed by piercing the sheet metal of the sections and forcing the metal outwardly, after which the ends of the projections are turned over slightly, as indicated at 18, in a rosetting operation. Enclosing the sleeve is a covering of heat insulating or refractory material 19 which is preferably applied in plastic condition, so that it will enclose or cover the perforations and the projections will be embedded in it. When the covering material becomes hard, it is firmly held in place by the rosetted projections embedded therein.

For convenience in installation, the sleeve sections 11 and 12 are preferably of relatively short length so that the tube may be completely covered by mounting a number of such sections on it end to end, and by using short sections, the manufacture thereof may be standardized and the mounting of such sections to cover tubes of different lengths is a relatively simple operation. In the construction shown in Fig. 1, the tube is wholly enclosed by a pair of sections, which are of semi-cylindrical shape, but, if desired, more than two sections may be employed, such sections together completing a cylindrical sleeve.

In the construction shown in Figs. 3 and 4, the tube 20 is enclosed by a covering including a pair of arcuate sections 21, 22 which are cast, rolled, or drawn in arcuate form with an inner radius of curvature corresponding to the outer diameter of the tube, so that a sleeve made up of the sections may fit the surface of the tube snugly. These sections are secured edge to edge to produce a cylindrical sleeve in any convenient way, as by means of the edge flanges shown in Fig. 1, or by lines of welding 23, illustrated in Fig. 3. When the sleeve sections are installed by welding, the sections are held in place and the edges welded together, and upon completion and cooling of the welds, they contract and draw the sections

together so that the sections have a substantially shrunk fit on the tube.

The sections **21** and **22** are provided with longitudinal fins **24** extending radially outward, and these fins may be formed integrally with the main portions of the sections or they may be separate parts attached in any convenient manner, as by welding. The fins are slotted, as indicated at **25**, to divide them into sections of relatively short length, and the outer ends of the sections are bent laterally alternately in opposite directions to provide tongues **26**. The heat insulating or refractory covering **27** is then applied over the sleeve and held in place by the fins and their bent ends. The bending of the fins alternately in opposite directions insures that the layer of covering material will be securely held in place and the slotting of the fins, as at **25**, permits thermal expansion.

In Fig. 5, there is illustrated a cross section of a furnace wall, floor, or arch in which water tubes are employed, the tubes being spaced at relatively close intervals with the spaces filled with and the tubes covered by a refractory or heat insulating material. In this construction, the wall includes a metal casing **27** faced with a layer of insulating material **28** in front of which lie the tubes **29**. Each tube is provided with a sleeve made up of a plain semi-cylindrical section **30** on the side toward the insulation and another semi-cylindrical section **31** covering the front side of each tube, the section **31** being provided with means for anchoring refractory or heat insulating material thereon. In Fig. 5, the section **31** shown is similar to one of the sections shown in Fig. 1, being provided with a plurality of perforations **32** and rosetted projections **33** surrounding each perforation. The sections **30** and **31** are secured together by lines of welding **34** and, after the sleeves are in place on the tube, a layer of heat insulating or refractory material **35** is applied so as to enclose the tubes and fill the spaces between them and between each tube and the insulating layer **28**. The material **35** is held in place partly by the tubes and partly by the projections **33** embedded within the material.

In all forms of the invention, the water tube is enclosed within a tightly fitting sleeve over which is placed the layer of heat insulating or refractory material, and the sleeve is made up of sections, at least one of which is provided with projections which are embedded in the refractory or insulation to hold the latter in place. The two forms of sleeves illustrated provide satisfactory anchorage for the covering material and the sleeves not only afford good support for that material, but also stiffen and strengthen the tube to a substantial degree. By the use of refractory or insulating material of the proper type and in the necessary thickness, the amount of heat absorbed by the covered tubes may be varied as desired. The covered tubes of the invention may thus be employed in furnace chambers for ordinary purposes, such as for walls, floors, etc., and may also be employed in a bank lying within the stream of burning gases and acting to promote turbulence therein and combustion thereof without reducing the gas temperature to an undesirable degree.

While I have referred to the new covered tube as including a water shell and being employed in boiler furnaces, etc., it will be apparent that the tube may also be used in oil heating furnaces for cracking purposes. In such use, the covering performs all the functions previously mentioned, namely, protecting the liquid shell against flame impingement and oxidation, limiting the heat absorption, and stiffening and strengthening the shell against bursting. Accordingly, in the appended claim, reference to a "water shell" is intended to include any shell suitable for containing a fluid.

I claim:

In a boiler furnace installation including a tube containing a heat absorbing medium and enclosed in a layer of heat insulating material, a metallic sleeve enclosing the tube and lying beneath the layer, the inner surface of the sleeve tightly engaging the outer surface of the tube throughout the length of the sleeve, whereby the sleeve strengthens the tube against bursting and bending, the sleeve comprising a plurality of sheet metal sections of arcuate form having parallel longitudinal edges in opposition, lines of welding connecting said edges throughout their length, and integral tongues struck from at least one of the sections and extending outwardly and embedded in the layer of heat insulating material to hold the latter in place, the sleeve being of such dimensions that, at atmospheric temperature, the sections thereof and the lines of welding are under circumferential tension.

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