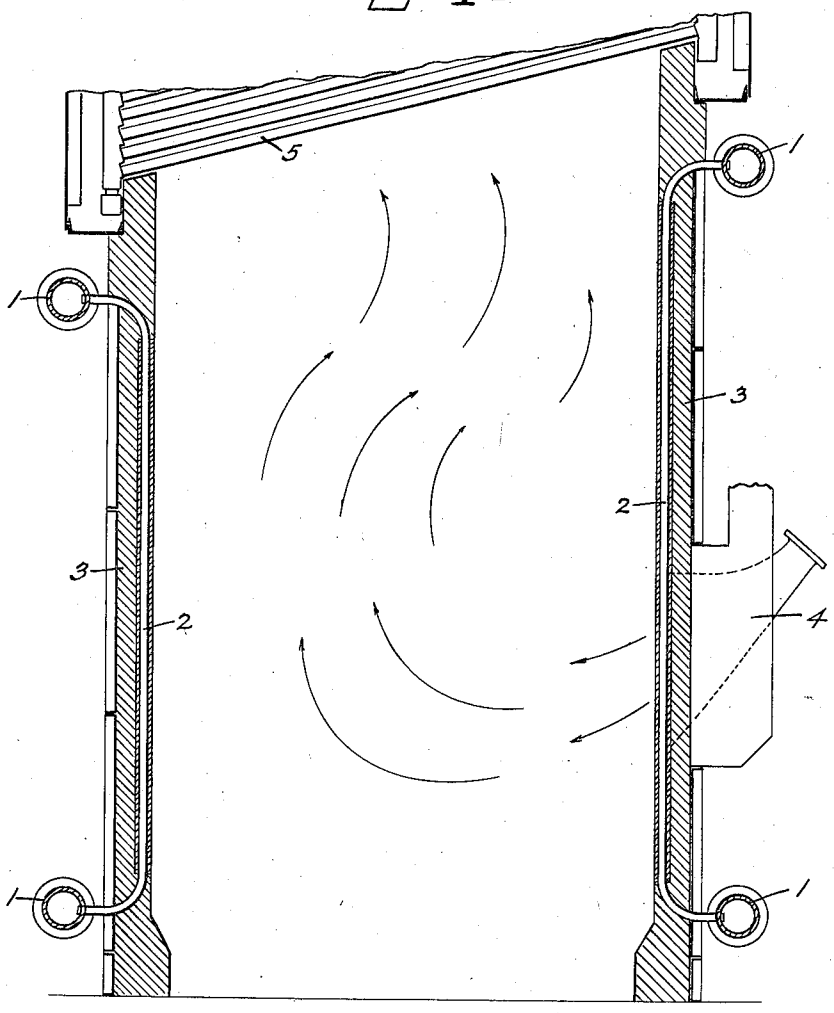
Sept. 20, 1932. H. J. KERR 1,878,242

TUBE

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Fig. 1.

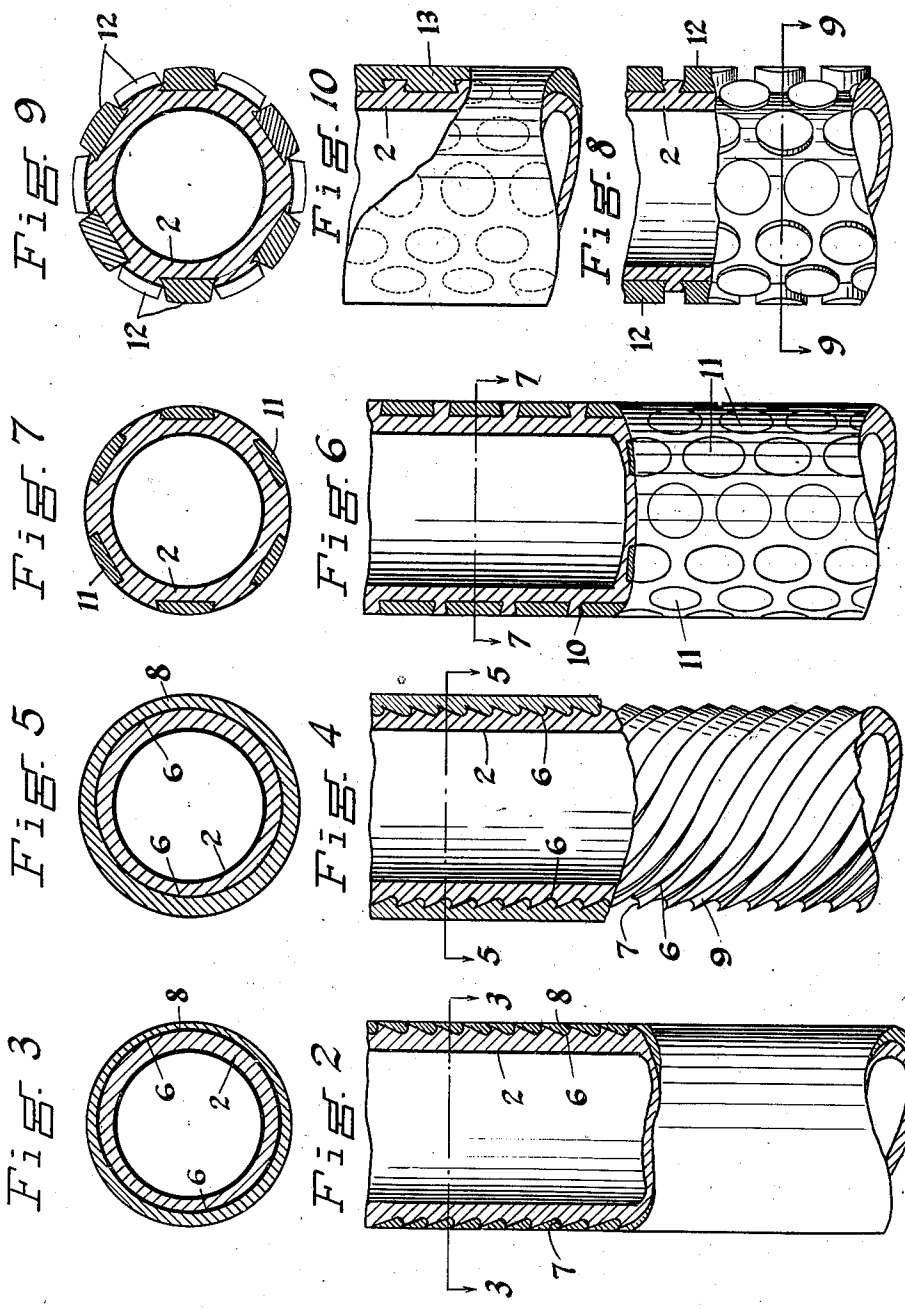


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TUBE

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UNITED STATES PATENT OFFICE

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TUBE

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This invention relates to an improved form of tube, and will be best understood from the following description, taken with the accompanying drawings, in which I have shown selected embodiments of the invention and in which:—

Fig. 1 is a vertical section through a furnace showing one place in which my improved tube may be used.

Figs. 2, 4, 6, 8 and 10 are fragmentary longitudinal views of tubes, partly in elevation and partly in section, showing different forms which the invention may take.

Figs. 3, 5, 7 and 9 are views taken on the lines 3—3, 5—5, 7—7 and 9—9 respectively, of Figs. 2, 4, 6 and 8 respectively.

In places where tubes, particularly metallic tubes, are used to receive heat at their outer surfaces and transmit this heat to a fluid passing through the tubes, it has been found that the heat can be absorbed at the outer surface faster than it can be transmitted from the inner surface to the fluid. This situation occurs for example where the heat is imparted to the tubes by hot gases coming in contact therewith, and is transmitted to steam or water flowing through the tubes.

In Fig. 1, I have shown my improved form of tube used in a radiant heat superheater comprising inlet and outlet headers 1 and metallic tubes 2, the tubes being disposed in the walls 3 of a furnace heated by a pulverized fuel burner 4. Above the furnace may be placed the boiler 5.

In order to approximately equalize the rate of heat absorption by the outer surfaces of the tubes and the rate of heat transmission by the inner surfaces to the fluid in the tubes, I decrease the extent of the outer metallic surface of the tubes. This may be done by integrally securing refractory material to the tubes.

In Figs. 2 to 10 inclusive, I have illustrated different ways in which the refractory material may be secured to the tubes.

In Figs. 2 and 3, I have shown a tube 2 provided with a helical groove or recess 6 which may have at least one wall 7 undercut as shown, to firmly hold the refractory material 8 in place. If desired, this wall may be made without the undercut feature, but this arrangement forms a convenient means for holding the parts together. If desired, the wall or walls of the groove may be roughened as indicated at 9, to aid in binding the refractory material to the metal of the tube. In this form of the invention, the refractory material is preferably put on in a plastic condition, although it may be previously prepared in sections and cemented to the tube.

In Figs. 2 and 3, the refractory material is shown as approximately filling the groove, so that its outer surface is substantially flush with the normal outer surface of the tube. In Figs. 4 and 5, a similar arrangement is shown, but one in which the refractory material is made thicker, so as to form, with the metal of the tube, a thicker wall. This arrangement may be preferable for some situations.

In Figs. 6 and 7 is shown an embodiment in which the outer surface of the tube is provided with a plurality of spaced recesses which are substantially round in cross-section. These recesses are preferably formed, as shown, so that the metal not removed in making them constitutes continuous circumferential projections. The wall of each recess may be substantially cylindrical, or may be undercut, as shown. This wall may also be provided with the roughened portions 10, if desired. The refractory material may be placed in the recesses in a plastic condition or may be preformed and cemented in place. In either case, it will be seen that the result is a plurality of buttons 11 of refractory material forming a part of the outer surface of the tube, with portions of the metallic surface therebetween, the surface of the buttons being substantially flush with that of the metallic outer surface of the tube.

In Figs. 8 and 9 are shown buttons 12, similar to the buttons 11, except that they project outwardly from the metallic surface of the tube and thus form a relatively greater surface of refractory material with respect to the metallic surface.

In Fig. 10 is shown a modification of the arrangement of Figs. 8 and 9, the buttons being united to form a substantially continuous outer surface 13 of refractory material.

In this form, the material is preferably put in place in a plastic condition. While I have shown a continuous outer surface, it is to be understood that if desired, a tube may be provided for a portion of its surface with the arrangement of Figs. 8 and 9, and for another portion with the form of Fig. 10.

I claim:—

1. A metallic tube having outer and inner surfaces and adapted to receive heat at the outer surface and transmit it to a fluid passing through the tube, said outer surface having a plurality of spaced substantially cylindrical recesses therein, and buttons of refractory material disposed in said recesses.

2. In a tubular heat exchanger adapted as a part of a furnace wall to transmit to a contained fluid the heat received radiantly from fuel burning in the furnace; said tubular heat exchanger having a metallic inner part in contact with the contained fluid; and a composite outer structure exposed to radiant heat from the burning fuel; said outer structure comprising a continuous body of metal projecting from the inner part and constituting circumferentially arranged metallic spacers, and refractory materials contacting with the inner part and located between the spacers, said refractory materials being of greater thermal resistance than the material of the remaining structure, thereby preventing overheating of the exchanger metal and contributing to higher furnace temperatures.

3. In a tubular heat exchanger adapted as a part of a furnace wall to transmit to a contained fluid the heat received radiantly from fuel burning in the furnace; said tubular heat exchanger having a metallic inner part in contact with the contained fluid; and a composite outer structure exposed to radiant heat from the burning fuel; said outer structure comprising a continuous body of metal projecting from the inner part and circumferentially arranged with reference to the inner part and constituting metallic projections; and refractory material contacting with the inner part and located between the projections, said refractory material being of greater thermal resistance than the material of the remaining structure, thereby preventing overheating of the exchanger metal and contributing to higher furnace temperatures.

4. In a tubular heat exchanger adapted as a part of a furnace wall to transmit to a contained fluid the heat received radiantly from fuel burning in the furnace; said tubular heat exchanger having a metallic inner part in contact with the contained fluid; and a composite outer structure exposed to radiant heat from the burning fuel; said outer structure comprising a circumferentially arranged continuous body of metal projecting from the inner part and constituting metallic projections, and refractory material contacting with the inner part and located between the projections, said refractory material extending over the projections and being of greater thermal resistance than the material of the remaining structure, thereby preventing overheating of the exchanger metal and contributing to higher furnace temperatures.

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