Dec. 29, 1931. T. E. MURRAY 1,838,105

SUPERHEATER OR THE LIKE

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Fig. 1.

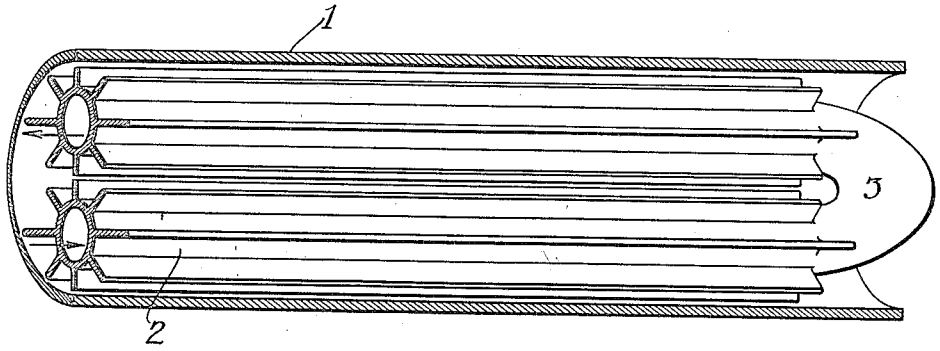
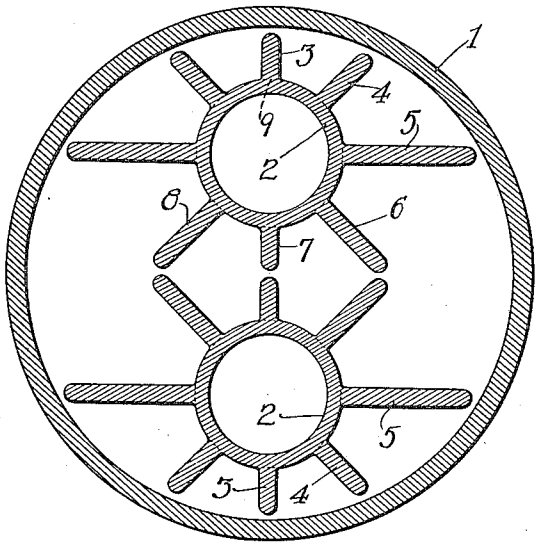


Fig. 2.



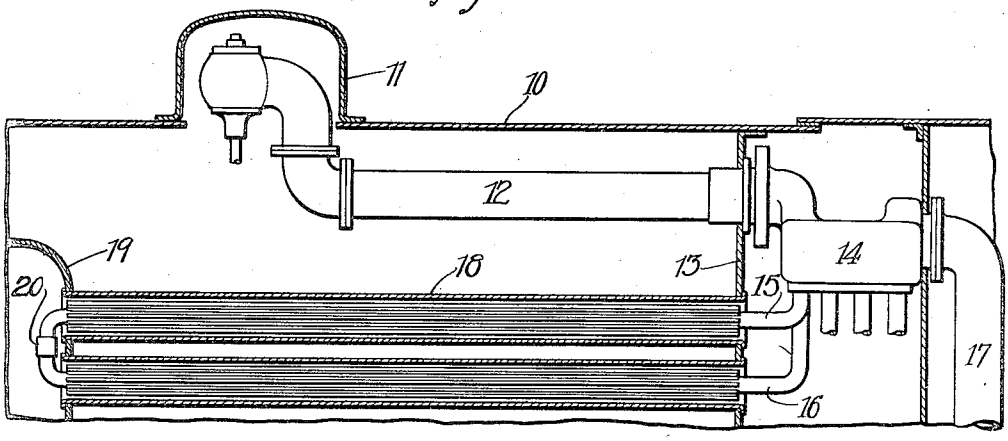
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SUPERHEATER OR THE LIKE

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Fig. 3.



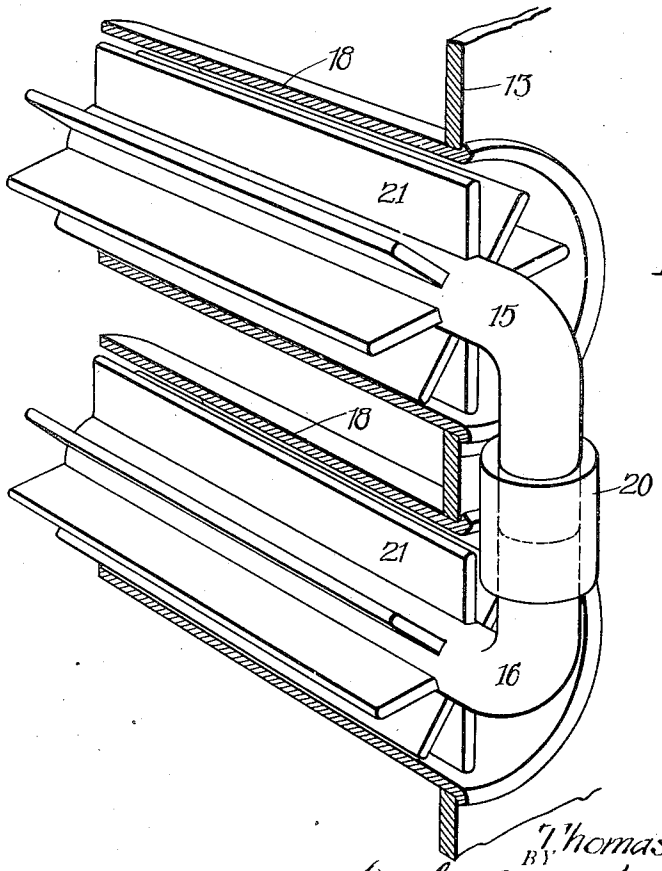


Fig. 4.

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Fig. 6.

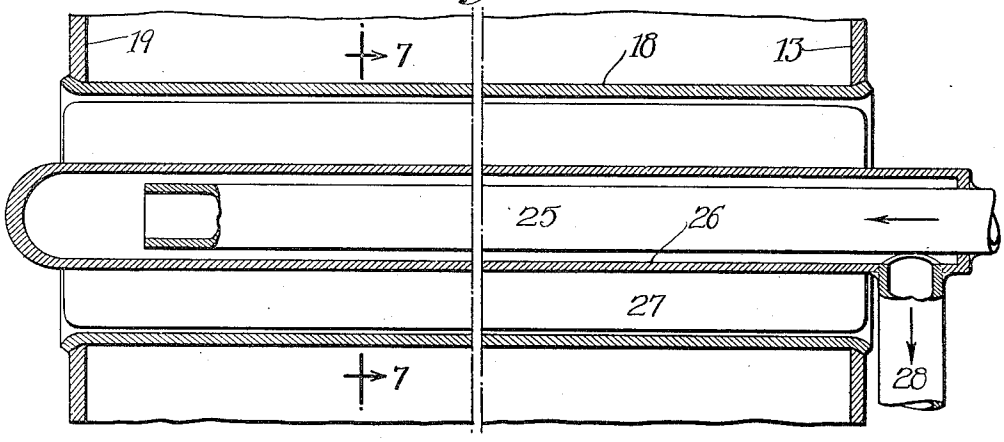


Fig. 7.

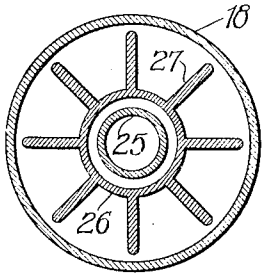


Fig. 8.

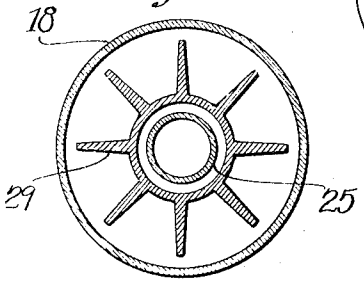
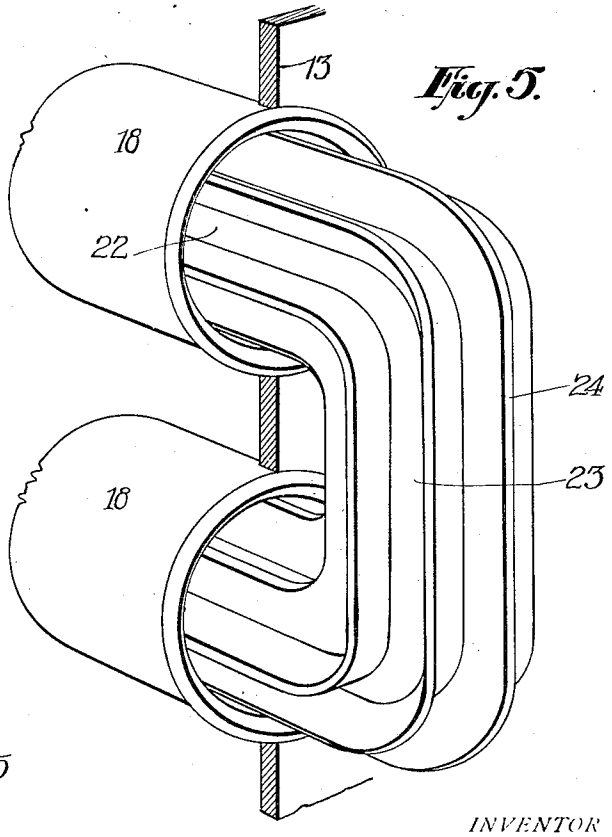


Fig. 5.



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Patented Dec. 29, 1931 1,838,105

UNITED STATES PATENT OFFICE

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SUPERHEATER OR THE LIKE

Application filed May 8, 1924. Serial No. 711,753.

In certain previous applications (Serial No. 642,725, filed June 1, 1923 and Serial No. 678,443, filed December 4, 1923) for patent, I have described the use for boilers and similar apparatus of tubes with fins or longitudinal flanges and have described numerous ways in which such fins could be applied to the tubes.

In the present invention tubes of this character are employed in a special arrangement which is particularly adapted to the superheating of steam, and is also adapted to heating fluids generally. The accompanying drawings illustrate more or less diagrammatically an embodiment of the invention.

Fig. 1 is a perspective view of part of a superheater with the outer shell in section;

Fig. 2 is a cross-section of the same;

Fig. 3 is a longitudinal section through part of a locomotive boiler illustrating an application of the invention to a locomotive superheater;

Fig. 4 is a perspective sectional view of a detail of Fig. 3;

Fig. 5 is a similar view illustrating a modification;

Fig. 6 is a longitudinal section illustrating another modification;

Fig. 7 is a cross-section of Fig. 6 on the line 7—7.

Fig. 8 is a similar cross-section illustrating a modification in the shape of the fins.

Referring to the embodiment of the invention illustrated in Fig. 1, the heating gases pass through a tubular shell 1 which may be of sheet metal. The steam passes through a tube 2 which is arranged in two or more parallel lengths connected at one end by a bend 3 so that the steam passes through the complete tube from one end to the other.

The straight portions of the tube are provided with longitudinal flanges 3, 4, 5, 6, 7 and 8 on the outside which are welded at their inner edges to the tube as at 9. The flanges may be constructed and fastened to the tubes in various other ways.

For greater efficiency, I propose to make flanges of different widths and of such sizes as to occupy as much of the space within the shell 1 as is possible without interfering with each other or to greatly diminish the area for the passage of the heating gases. Thus the flanges 3, 4 and 5 extend approximately to the outer shell, and the flanges 6 and 7 as far as possible without interference. By this provision the heating surface provided is very much greater than that of the lengths of tubing alone. In fact, in the case illustrated the total heating surface is greater than would be that of four lengths of tubing as ordinarily arranged within such a shell for superheaters.

Figs. 3 and 4 show the invention in a slightly modified form, applied to a locomotive boiler. In the upper part of the boiler shell 10 there is a drum 11 in which is located the inlet end of the pipe 12 which passes through a head 13 to a steam chest 14. The usual connections are arranged in this chest so that the steam passes out to superheater tubes 15 and back by superheater tubes 16 to the chest and thence out through a pipe 17 to the engine. The heating gases pass through the usual boiler tubes 18 which are surrounded by water, these pipes having open ends mounted in the heads 13 and 19. The superheater tubes are located in the main fire tubes 18. Various arrangements may be employed, such as that shown in Fig. 1 for example. In Fig. 3 I have shown the admission tube 15 of the superheater passing through one of the fire tubes from end to end and communicating by bends and a coupling 20 at the forward end with the outlet tube 16 of the superheater which passes through another fire tube 18 in the reverse direction. The tubes 15 and 16 are both provided with fins 21 which are of uniform width and extend approximately to the surrounding tube 18 so as to be most efficiently exposed to the hot gases and to transmit the heat thereof to the superheater tubes.

Instead of using two separate tubes 15 and 16 coupled together as in Fig. 4, a single tube may be used as in Fig. 5 formed in two lengths 22 continuously connected by a bend 23 and formed with flanges 24 which also extend continuously around the bend.

Fig. 6 illustrates a form of the invention in which one of the tubes 25 of the super-

heater is a plain tube located within the other 26, the latter being provided with fins 27 and fitting within the boiler tube 18. The outer tube 26 of the superheater has its free end closed, and the inner tube 25 has its free end open. Either of these tubes may be the inlet branch and the other the outlet branch of the superheater. Assuming that the steam enters through the tube 25 it will pass out of the end of the latter into the free end of the surrounding tube 26 and back by way of the annular space between the tube and the pipe 28 which conducts steam to the entrance.

The area of the several fins should bear a determined relation to the area (or diameter) of the pipe and to the amount of work that the element is designed to do, that is, the quantity of heat which it is to receive and conduct to the steam. The area of the fins should be at least equal to that of the pipe. For example, a two inch pipe will have a circumference of a little over six inches. On such a pipe if there are two fins each should be one and one-half inches wide so that, assuming both faces of the fins exposed, the total area of the fins would be about the same as that of the tube.

For certainty in conducting the heat to the tube, the joint should be fully equal to the thickness of the fin. To make sure that this is so, it is preferable to have the joint actually wider than the average thickness of the fin. This may be accomplished as shown in Fig. 8 by using fins 29 which are tapered in thickness. Thus, in spite of any accidental imperfections in the welding, there will be a sufficient area of continuous metallic connection to equal the average thickness of the fin. Or the connection might be made in various other ways.

At the points where the superheater passes out of one boiler tube and into the next, it is exposed to a considerable extent to the direct radiant heat from the fire bed, and is generally subjected to a more intense heat than in the lengths which are enclosed within the boiler tubes. For the exposed bends, therefore, it is advisable to use a metal with a greater resistance to oxidation in high temperature, or to coat the tube with one of many coatings which are known to resist rusting under such circumstances.

Though I have described with great particularity of detail certain embodiments of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments disclosed. Various modifications may be made by those skilled in the art without departure from the invention as defined in the following claim.

What I claim is:—

A superheater comprising an outer shell through which the heating gases pass and tubing eccentrically located therein having flanges extending along the outer sides to increase the heating surface, said flanges being of varying widths and some at least of them extending substantially to the outer shell, said outer shell confining the gases to intimate contact with said flanges.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.