This invention relates to thimble tube boilers and has for its object to obtain a more uniform and efficient distribution of heat from the gases to the water contained in the boiler.

In the thimble tube boiler according to the invention, the central space between the tube ends is occupied by a series of spaced discs which extend transversely to the direction of flow of the gases and offer a progressively increasing obstruction to the direct passage of the gases through the central space aforesaid. The result is that part of the gas by-passed by the first disc is unable to pass the greater obstruction offered by the second disc and is accordingly deflected outwardly towards the thimble tubes in the neighborhood of the second disc, the same action taking place at each succeeding disc, until the whole of the by-passed gas is eliminated from the centre space into the heating surfaces before leaving the boiler.

The spaced discs are conveniently of the same size and formed with holes, the total area of the holes decreasing progressively from disc to disc in the direction of travel of the gases. Preferably the sole connection between the discs is a central rod, so that the gases between the discs are in direct thermal contact with the tips of the thimble tubes.

A practical embodiment of the invention will now be described in detail, by way of example, with reference to the accompanying drawing, in which——

Fig. 1 is a cross-section through the boiler and Figs. 2, 3 and 4 are sections taken respectively along the lines III—III, IV—IV, and V—V in Fig. 1.

Like reference numerals indicate like parts throughout the drawing.

The boiler is constituted by a central tube plate 10 from the inner surface of which projects a nest of thimble tubes 11. These tubes project inwardly from the whole inner surface of the tube plate 10 but for the sake of clarity only a few of the tubes are shown in the drawing.

The tube plate 10 is disposed centrally within the cylindrical boiler 12 which contains the water to be heated. The gases enter the tube nest through an aperture 13 at the bottom and, after flowing up through the tubes and surrendering their heat escape by means of the outlet pipe 14.

If the whole of the entering gases were permitted to impinge upon the tubes at the bottom of the boiler far more heat would be communicated to these tubes than to those at the top of the boiler with the result that the lower tubes would become worn out and need to be replaced while those at the top of the boiler were practically unaffected by use. The employment of a gas distributor according to the invention is designed to overcome this disadvantage and to give a more uniform heat transmission to the thimble tubes.

The distributor is constituted by a series of flat discs 30, 31, 32 carried on a central rod 33 suspended from brackets 34 in the outlet pipe 14. The distributor plates 30, 31, 32 extend transversely to the direction of flow of the gases and, as may be seen from Figs. 2-4, are provided with holes 35 of any desired shape, the total area of the holes decreasing progressively from disc to disc in the direction of travel of the gases. Thus in the example shown the lowermost disc 30 has eight circular holes, the middle disc 31 has only four holes of the same shape, whilst the top disc 32 has no holes at all. The effect of this is that part of the gas by-passed centrally through the lowermost disc 30 will be unable to pass through the intermediate disc 31 and will be deflected into the intermediate heating surfaces, whilst the by-passed gas passing through the intermediate disc 31 will be deflected by the uppermost disc 32 to the upper rows of thimble tubes. The total area of the holes in each disc will of course be varied to suit the needs of each case and will depend on the quantity and temperature of the hot gas or products of combustion available, whilst the number of discs used will be determined by the length of the centre passage between the top and bottom rows of thimble tubes.

An advantage of the arrangement shown is that the ends of the thimble tubes will be thoroughly scrubbed by virgin gas at entry temperature passing up through the central aperture in the tube nest, which is important since it is at the tips of the tubes that the steam is generated. The arrangement shown is inexpensive to install and is light in construction and can consequently be easily handled when it is desired to remove it for inspection and cleaning purposes. It has the further advantage that it ensures complete silencing of the portion of the gas passing through the discs. Moreover owing to the fact that the by-passed column of gas passing up through the centre of the tube nest is not cut off from the tube ends a higher heat transmission is obtained from the tube ends since these are heated not only by convection from the non-by-passed gas but also by convection and radiation from the by-passed portion of the gas at initial temperature. The result is that for the same efficiency the boiler may be made of reduced...
size, as compared with a boiler in which the centre space is cut off from the tube ends, which is of considerable practical importance.

The thimble tube boilers according to the invention may be used either as waste heat boilers or may be fired by oil burners, or solid fuel. Where they are used as waste heat boilers the discs may be made of mild steel throughout owing to the low temperatures of the gases used. Where, however, oil burner firing is employed it is preferred to make the bottom disc of high grade refractory fire brick and to make the other discs of cast haematite heat resisting iron. These thimble tube boilers are particularly suitable for marine use on vessels fitted with Diesel engines.

In this case the boiler is generally fired by waste heat but an auxiliary oil burner may be provided which can be operated to fire the boiler when the engines of the vessel are slowed down or stopped, e.g. when sailing in fog or when in port.

What I claim as my invention and desire to secure by Letters Patent is:-

1. A thimble tube boiler, comprising in combination an annular boiler to contain the water to be heated, thimble tubes projecting inwardly from the inner wall of the boiler into the central gas space of the boiler, means for passing a current of hot gas through the said gas space, and, located within the gas space, a gas distributor constituted by a series of spaced discs, which extend transversely to the direction of flow of the gases and are constructed and arranged to offer a progressively increasing obstruction to the direct passage of the gases through the gas space afore-said and thereby to deliver a portion of the entering gas without substantial loss of its initial heat among the thimble tubes near the gas exit.

2. A thimble tube boiler, comprising in combination an annular boiler to contain the water to be heated, thimble tubes projecting inwardly from the inner wall of the boiler into the central gas space of the boiler, means for passing a current of hot gas through the said gas space, and, located within the gas space, a gas distributor constituted by a series of spaced discs extending transversely to the direction of flow of the gases, said discs being of equal size and formed with holes, the total area of which holes decreases progressively from disc to disc in the direction of travel of the gases.

3. A thimble tube boiler as claimed in claim 2, having a central rod as the sole connection between the discs, so that the gases between the discs are in direct thermal contact with the tips of the thimble tubes.

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