

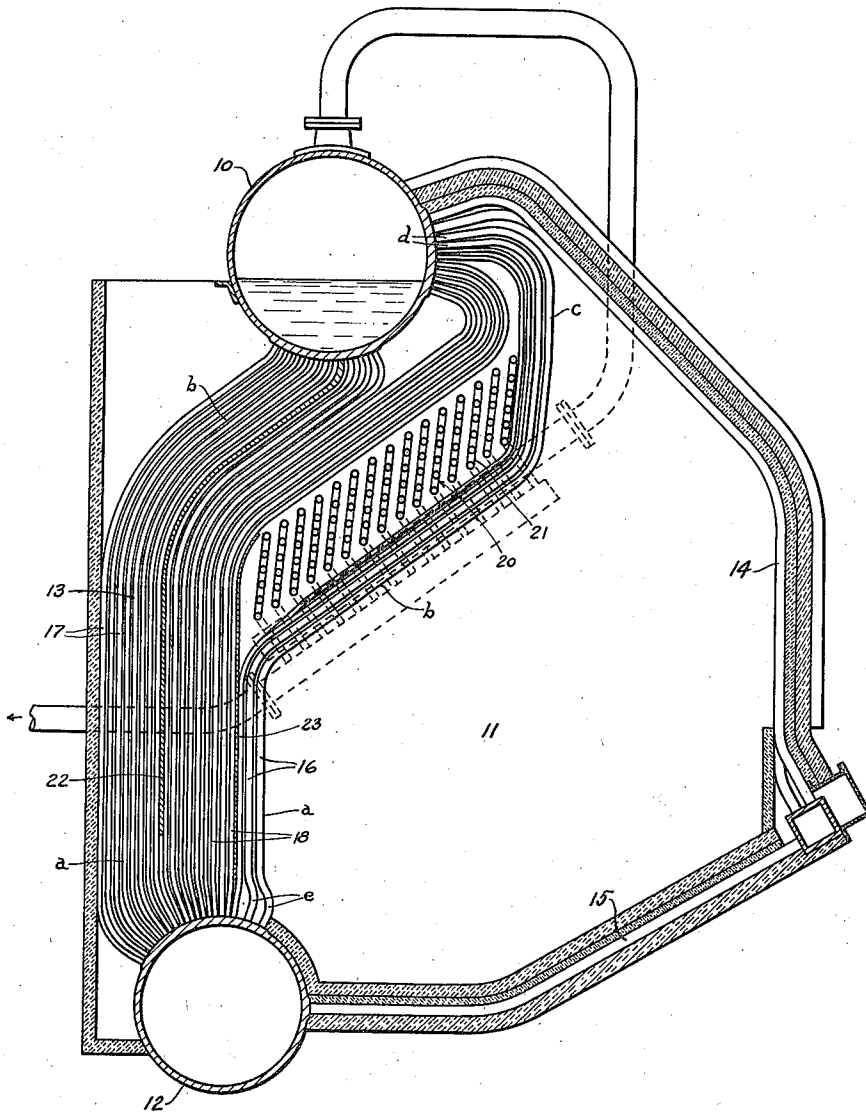
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MARINE BOILER

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MARINE BOILER

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3 Claims. (Cl. 122-478)

This invention relates to water tube boilers of the vertical type. An object of the invention is to provide a boiler of this type equipped with a superheater and of compact construction especially adapted for marine installation. Another object is to provide for an increased rate of circulation in such a boiler by means of a special arrangement of certain of the generating tubes.

The manner in which the invention is carried out will become apparent upon consideration of the following detailed description of an illustrative embodiment of the invention when read in conjunction with the accompanying drawing in which the single figure is a diagrammatic elevational view of a vertical type water tube boiler embodying the invention.

In the drawing there is shown a vertical type boiler having a steam and water drum 10 disposed above a combustion chamber 11 and at one side of the vertical center line of the combustion chamber. Steam drum 10 is connected to a water drum 12 extending parallel thereto along the lower side of the chamber by a tube bank 13 and also by tubes 14, 15 disposed on the opposite wall and bottom of the chamber 11.

The bank 13 consists of a plurality of tubes connected into tube openings disposed in rows that extend longitudinally of the drums 10, 12 and which are spaced circumferentially thereof. The lower end portions *a* of the tubes extend substantially vertically upward from drum 12 in closely spaced parallel relation. The intermediate portions *b* of the tubes are straight and inclined toward the combustion chamber 11 and the upper end portions *c* of most of the tubes are bent at an angle to their inclined portions *b* for connecting them to the steam drum 10. The portions *c* adjacent the inclined parts *b* in the inner rows 16 of tubes are, in part, also substantially vertical.

The upper ends *d* of several rows 16 of tubes lying immediately adjacent the combustion chamber are connected into the steam and water drum 10 above the water level therein so that steam may rise through these tubes unimpeded by the resistance otherwise afforded by the water head of the boiler. The lower ends *e* of the tubes in these rows 16 are connected into rows of openings in the upper central portion of the top half of drum 12. With this arrangement, steam that is generated in tube rows 17 at the other side of tube bank 13 and which passes into drum 12 may find a ready exit to the steam drum 10 through

the tubes 16 connecting into the highest portion of the water drum 12.

The vertical portions *a* of the tubes in the row or rows 16 closest to the combustion chamber are somewhat shorter than the vertical portions *a* of the tubes in the adjacent rows 18 so that the inclined portions *b* of the tubes in rows 16 are spaced substantially from the corresponding inclined portions *b* of the tubes in rows 18 to provide space for an auxiliary heat absorbing device. This parallelogram shaped space may be varied in size, as desired, by providing tubes 16 of different length in their vertical portions *a* and *c*. As illustrated herein, this space is utilized to accommodate a superheater 20 having its heat absorbing elements 21 extending substantially horizontally along the rows of tubes in the space between the tube rows 16 and 18. This parallelogram-shaped space, being of substantially uniform height and width, is particularly adapted to accommodate a superheater made up of similar units arranged in side by side relation, i. e. one wherein the units each consist of a like number of serially connected tubes as illustrated in the drawing. Thus it is possible to substantially fill the space so that no voids or lanes are left at the sides of the superheater as occurs when the tubes of a bank are merely spread or bowed away from each other to open the bank to provide room for a superheater. If a larger superheater is required, the parallelogram-shaped space may be enlarged by replacing the tubes 16 with others having shorter vertical portions *a* and longer vertical portions *b*. This results in increasing the height of the space so that units made up of a greater number of tubes may be installed.

A baffle 22 extends from drum 10 along the inclined portions *b* and vertical portions *a* intermediate rows of tubes in the outer part of the bank and terminates short of drum 12. Another baffle 23 extends upwardly from drum 12 along the vertical portions *a* of the innermost row 18 of tubes and terminates adjacent the inclined portions *c* of the innermost row 18 near the top of the outer end of the superheater. These baffles form a down-pass and an up-pass, the former communicating at its upper end with chamber 11 and with the up-pass at its lower end so that gases flow transversely across the superheater elements 21, and along the generating tubes outwardly thereof in directions opposite to the fluid flow therein.

It may be seen from the foregoing description that the connection of the lower ends *e* of the

inner rows 16 of tubes into the upper portion of water drum 12 permits steam generated in the outer tubes of the bank to readily pass from the steam space in the upper part thereof to the steam drum 10 through the tubes 16; furthermore, the connection of the upper ends of these tubes to drum 10 above the water line therein allows the steam to flow therethrough unimpeded by the water head of the boiler. These arrangements result in increasing the rate of circulation in a boiler of the vertical type.

It should also be noted that the inclination and spacing of the intermediate portions of certain rows of tubes provides room for a superheater while retaining a compact tube spacing arrangement. The shape of the wall and roof of the combustion chamber opposite the tube bank adapts it for ready installation in a ship along the side wall of a fire room and its compact construction particularly adapts it for installation in such a location where transverse space is at a premium.

What we claim is:

1. In a vertical type water tube boiler; a combustion chamber; a steam and water drum positioned above said chamber at one side thereof; a water drum extending parallel to said steam and water drum along the lower part of said chamber at said side thereof; a tube bank connecting said drums comprising rows of circulating tubes having their lower portions extending substantially vertically in closely spaced parallel relation and connected into longitudinal rows of openings spaced circumferentially of the upper part of said water drum, a plurality of rows of tubes adjacent said combustion chamber having their intermediate portions inclined inwardly across the upper portion of said chamber and the said intermediate portions of the tubes of several of said plurality of rows closest to said chamber being spaced substantially from the corresponding portions of the adjacent rows of tubes to provide a parallelogram-shaped space of substantially uniform height and width for a superheater within said bank; a superheater in said space having the heat absorbing elements thereof extending through said space along said rows of tubes and substantially filling said space; and baffle means arranged in said bank for directing the gases from said combustion chamber to flow over the heat absorbing elements of said superheater, in a downward direction along the rows of circulating tubes adjacent thereto and upwardly along the outer rows of circulating tubes.

2. In a water tube boiler; a combustion chamber; a steam and water drum disposed above said chamber at one side thereof; a water drum extending parallel to said steam drum along the lower part of said chamber at said side thereof; a bank of tubes connecting into longitudinal rows of openings spaced circumferentially of said

drums and having their lower portions extending substantially vertically upwardly from said water drum and disposed in closely spaced parallel relation with their intermediate portions straight and inclined toward the combustion chamber and their upper end portions bent angularly with respect to their inclined portions for connection to said steam drum, the vertical portions of one or more inner rows of tubes immediately adjacent said combustion chamber being shorter than those of the outer rows of tubes of said bank and their inclined portion being spaced substantially from the inclined portions of said outer rows in parallel relation thereto for providing a parallelogram-shaped space of substantially uniform height and width within said bank to receive a superheater or the like.

3. In a water tube boiler; a combustion chamber; a steam and water drum disposed above said chamber at one side thereof; a water drum extending parallel to said steam drum along the lower part of said chamber at said side thereof; a bank of tubes connecting into longitudinal rows of openings spaced circumferentially of said drums and having their lower portions extending substantially vertically upwardly from said water drum and disposed in closely spaced parallel relation with their intermediate portions straight and inclined toward the combustion chamber and their upper end portions bent angularly with respect to their inclined portions for connection to said steam drum, the vertical portions of one or more inner rows of tubes immediately adjacent said combustion chamber being shorter than those of the outer rows of tubes of said bank and their inclined portions being spaced substantially from the inclined portions of said outer rows in parallel relation thereto for providing a parallelogram-shaped space of substantially uniform height and width within said bank to receive a superheater or the like; a superheater having the heat absorbing elements thereof extending through and substantially filling said space; a baffle extending downwardly intermediate certain of said outer rows of tubes along the inclined and vertical portions thereof and terminating short of said water drum; and a baffle extending from said water drum along the vertical portions of the outermost row of said inner rows of tubes and terminating adjacent the upper and outer end of said superheater, said baffles causing the gases from said chamber to flow transversely across the upper portions of said inner rows of tubes and of said superheater elements downwardly along those portions of said center rows of tubes which are located beyond said superheater and positioned inwardly of said first baffle, and upwardly along the rows of tubes positioned outwardly of said first baffle.

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