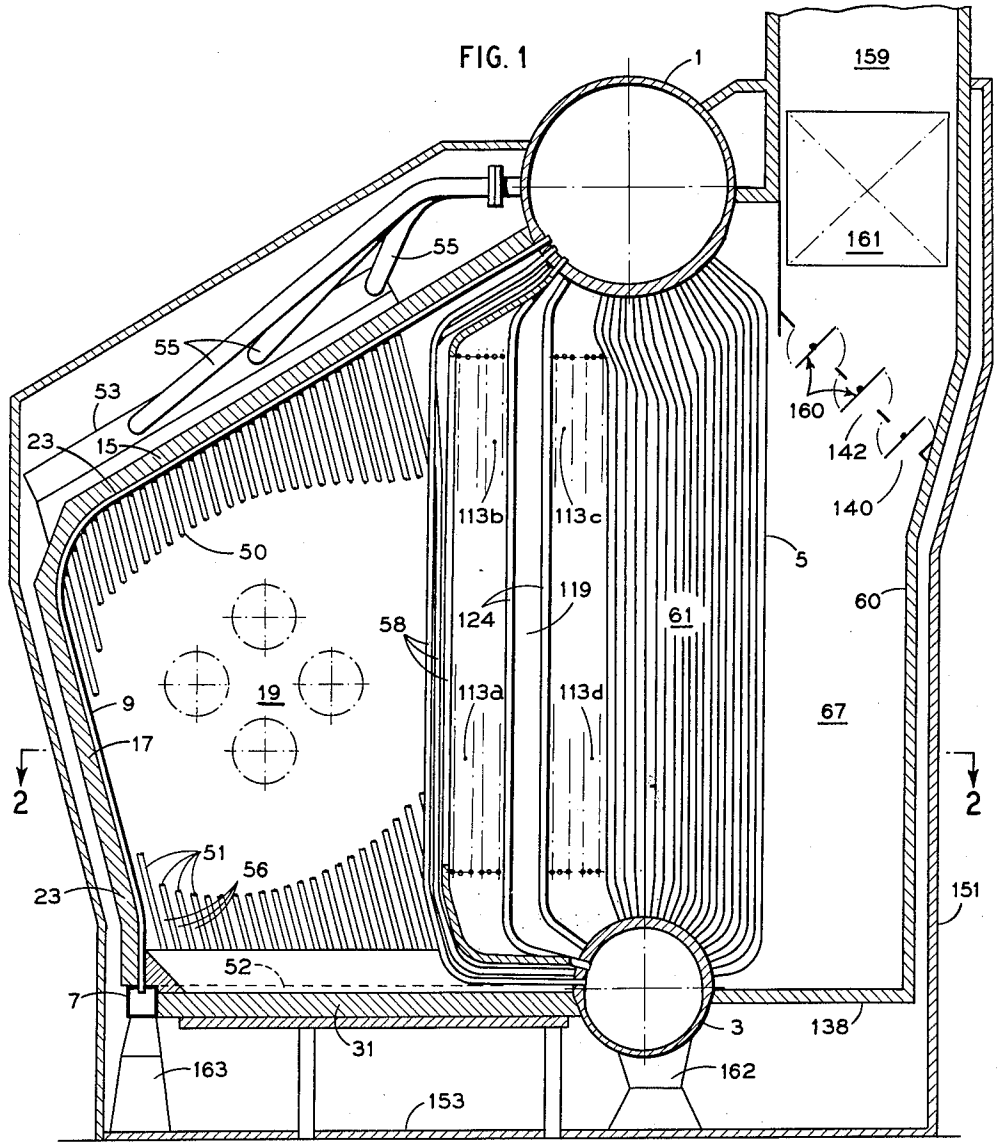
May 8, 1962 R. E. ZOLLER 3,033,179

VAPOR GENERATING UNIT

Filed Feb. 15, 1955 4 Sheets-Sheet 1

FIG. 1



INVENTOR.
RONALD E. ZOLLER

BY

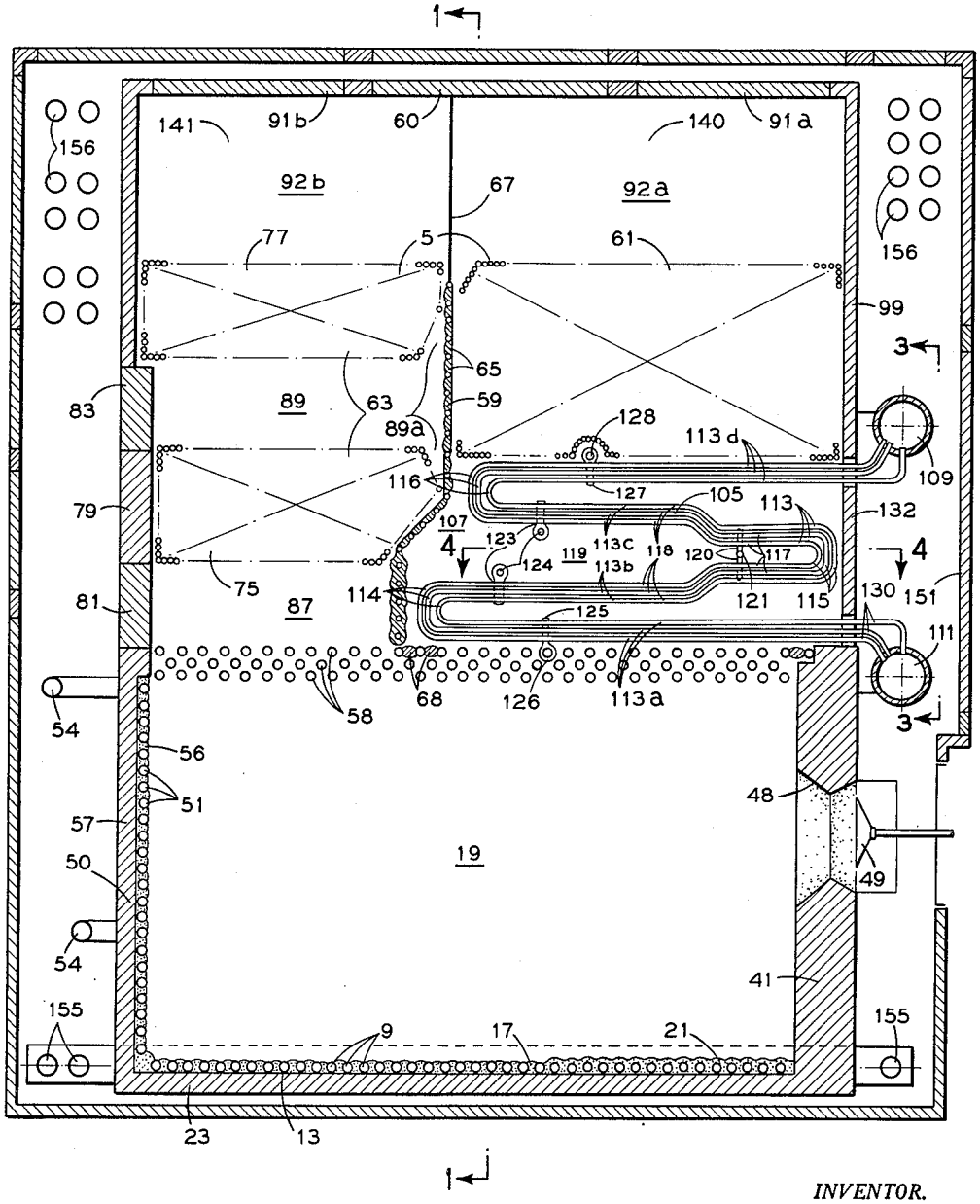
ATTORNEY

May 8, 1962 R. E. ZOLLER 3,033,179

VAPOR GENERATING UNIT

Filed Feb. 15, 1955 4 Sheets-Sheet 2

FIG. 2



INVENTOR.
RONALD E. ZOLLER

BY

ATTORNEY

May 8, 1962 R. E. ZOLLER 3,033,179

VAPOR GENERATING UNIT

Filed Feb. 15, 1955 4 Sheets-Sheet 3

FIG. 3

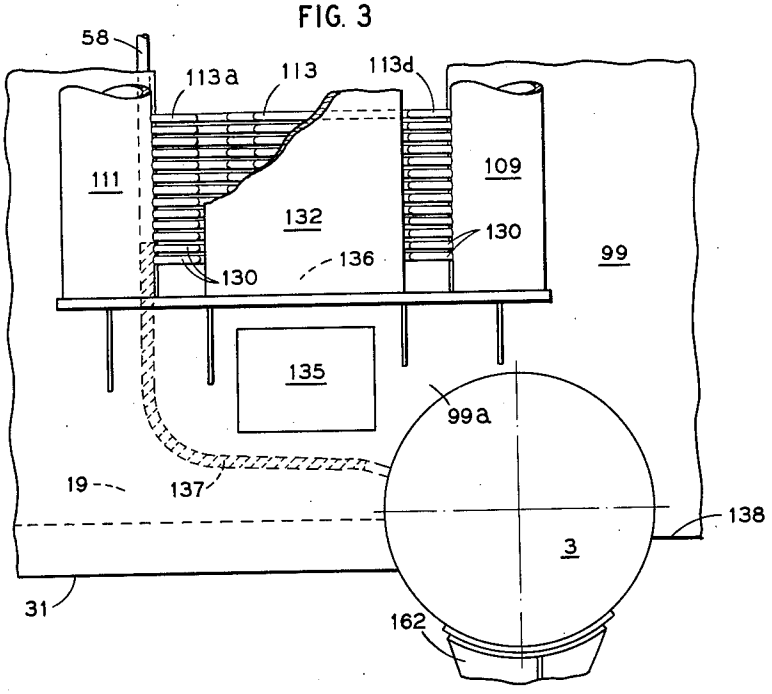


FIG. 4

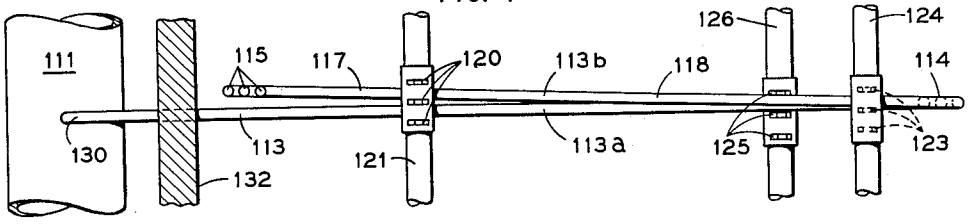
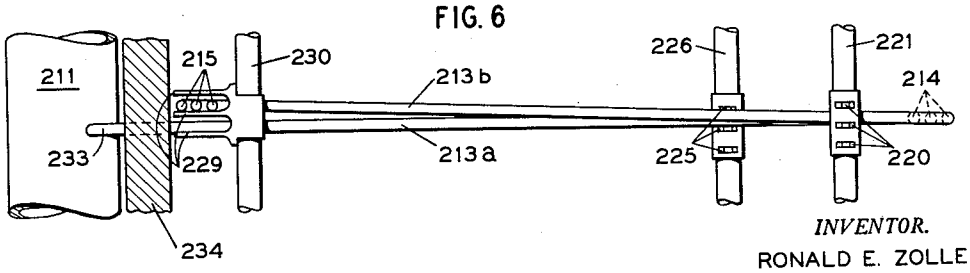


FIG. 6



INVENTOR.
RONALD E. ZOLLER

BY

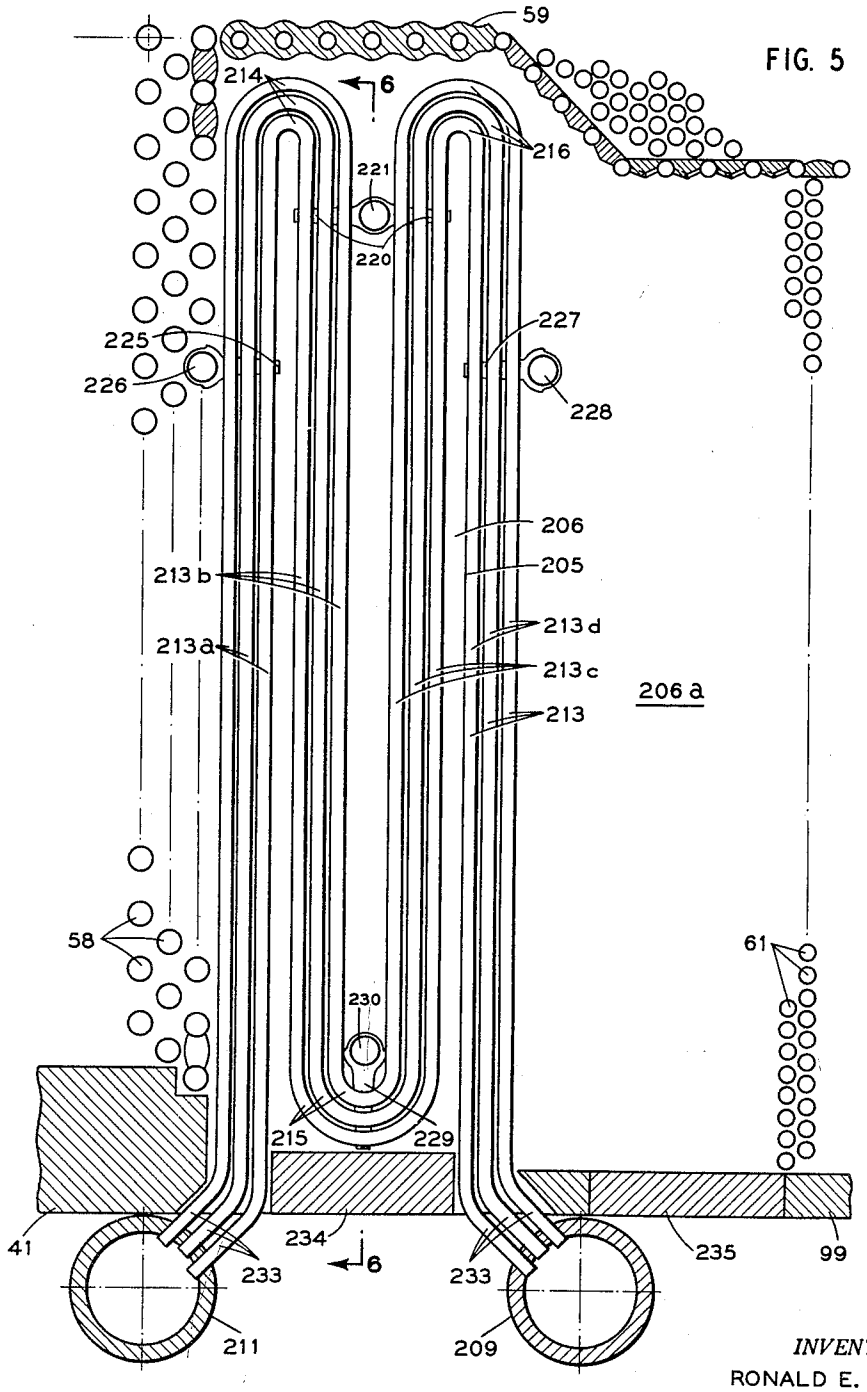
ATTORNEY

May 8, 1962 R. E. ZOLLER 3,033,179

VAPOR GENERATING UNIT

Filed Feb. 15, 1955 4 Sheets-Sheet 4

FIG. 5



INVENTOR.
RONALD E. ZOLLER

BY

ATTORNEY

United States Patent Office 3,033,179
Patented May 8, 1962

3,033,179

VAPOR GENERATING UNIT

Ronald E. Zoller, London, England, assignor to The Babcock & Wilcox Company, New York, N.Y., a corporation of New Jersey

Filed Feb. 15, 1955, Ser. No. 488,323
Claims priority, application Great Britain Feb. 17, 1954
5 Claims. (Cl. 122—510)

This invention relates to improvements in vapor generating and superheating units of the character disclosed in my prior U.S. application Serial No. 426,829, filed April 30, 1954, now Patent No. 2,988,064, i.e. vapor generating and superheating units characterized by a combustion chamber, parallel-connected gas passes leading from the combustion chamber to a single duct and each containing part of a bank of vapor generating tubes, baffle means separating the passes and presenting substantially throughout the extent thereof exposed surfaces accessible for the purpose of inspection or repair, vapor heating means confined substantially wholly to one of the passes, means for firing the combustion chamber, and damper means disposed on the side of the vapor generating tubes remote from the chamber and arranged to control the distribution of hot gases between the passes.

In units of this type, it would be advantageous if the vapor heating tubes could be renewed without disturbing the baffle wall between the gas passes. It would also be advantageous if faulty vapor heating tubes could be renewed without disturbing the associated headers. Moreover, access is desirable or necessary in order that vapor heating tube supports subject to high temperatures may be renewed and that cleaning and erection may be facilitated or made possible. Furthermore, every vapor heating tube should be drainable and desirably every tube should rise to a vent so that the tubes may be completely filled with alkaline water.

In accordance with the invention a vapor generating and superheating unit of the type described is provided wherein the vapor heating means include a bank of tubes extending horizontally or approximately horizontally across the associated gas pass towards a part of the baffle means bounding the pass, the tubes being connected at their ends to inlet and outlet headers disposed to one side of and outside the pass and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, and an access space bounded at least on one side by the vapor heating tubes is so arranged as to permit access to the external surfaces of the vapor heating tubes for cleaning purposes and to permit access to the baffle means in the vicinity of the inner ends of the tubes.

The invention also includes a vapor generating and superheating unit of the type described wherein the vapor heating means include sinuous tubes each including four tube legs connected in series by return bends, extending horizontally or approximately horizontally across the associated gas pass towards a part of the baffle means bounding the pass, and connected at their ends to inlet and outlet headers disposed to one side of and outside the pass, the inner legs of each tube at parts thereof adjacent the outer wall of the gas pass being spaced closer together than portions thereof farther from the said outer wall, the portions adjacent to the baffle means being sufficiently spaced apart to provide an access space which permits access to the external surfaces of the vapor heating tubes for cleaning purposes and to permit access to the said part of the baffle means, and the said parts of the tubes adjacent the outer wall being supported from a common vapor generating tube disposed between the innermost tube legs.

The invention moreover includes a vapor generating

and superheating unit of the type described wherein the vapor heating means includes sinuous tubes each including four legs connected in series by return bends, extending approximately horizontally across the associated gas pass towards a part of the baffle means bounding the pass, and connected at their ends to inlet and outlet headers disposed to one side of and outside the pass and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, and the tube legs being supported so that they rise from the headers to the central return bends by supporting means including supports projecting from a vapor generating tube disposed in the space between the inner legs of the tubes in the neighborhood of the central return bends and arranged to permit disengagement of the inner tube legs from the supporting means upon movement of the tubes outwardly of the gas pass through a short distance, and an access space bounded on one side by the vapor heating tubes and so arranged as to permit access to the external surfaces of the vapor heating tubes for cleaning purposes and to permit access to the baffle means in the vicinity of the inner ends of the tubes.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of the invention.

Of the drawings:

FIG. 1 is a sectional side view of a two drum integral furnace type marine steam boiler taken on the line I—I of FIG. 2;

FIG. 2 is a sectional plan view taken on the line II—II of FIG. 1;

FIG. 3 is a sectional front elevation of part only of a boiler illustrated in FIGS. 1 and 2 taken on the line III—III of FIG. 2;

FIG. 4 is a sectional side elevation taken on the line IV—IV of FIG. 2, showing only one group of three nested tubes of the superheater;

FIG. 5 is a sectional plan view of an alternative form of superheater; and

FIG. 6 is a view similar to FIG. 4 taken on the line VI—VI of FIG. 5.

In FIGS. 1 to 5 of the drawings, the steam boiler includes a horizontally arranged upper steam and water drum **1**, a lower water drum **3**, and a bank **5** of vertical vapor generating tubes connecting the drums. A header **7** parallel to drum **3** is connected by aligned bent wall tubes **9** to the upper drum **1**, the intertube spaces being filled by refractory material **13** to define the roof **15** and side wall **17** of a combustion chamber **19**. The tubes **9** near the front or firing end of the combustion chamber have their lower parts, covered with refractory **21**. The outside of roof **15** and wall **17** is covered with heat insulating material **23**. The floor **31** of combustion chamber **19** is of any suitable construction.

The front end wall **41** of combustion chamber **19** is formed by fire-resisting brickwork and heat insulating material and provided with ports **48**, fitted with oil burners **49** arranged to discharge along the combustion chamber **19** towards the rear wall **50** of the chamber. Considerable gas flow spaces are provided both above and below the group of burners for the return flow of gases towards the front of the combustion chamber. Rear wall **50** comprises a row of spaced tubes **51** connected at their lower ends to an inlet header **52** and at their upper ends to an outlet header **53**, the headers **52** and **53** being connected respectively by downcomers **54** and connectors **55** to the drum **1**. The spaces between the tubes **51** are closed by

refractory material 56 backed with heat insulating material 57.

The arrangement of the various tubes which constitute the tube bank 5 may be seen most clearly from FIGS. 1 and 2. The tube bank includes a screen 58 extending along one side of the combustion chamber from front wall 41 to rear wall 50 and formed by three staggered rows of relatively large diameter tubes which are, for the most part, vertical. Beyond this screen, a baffle wall 59 extending from the screen 58 transversely of the drums 1 and 3 to a side wall 60 of the boiler setting serves to divide the remainder of the tubes of the tube bank into two sections 61 and 63 respectively nearer the front wall 41 and the rear wall 50.

Baffle wall 59 includes vertical stud tubes 65 forming part of the tube bank 5, these tubes being spaced apart with refractory material closing the intertube spaces so as to provide, together with a shaped sheet metal baffle 67 suitable secured to the end tube of the baffle wall 59 and to adjacent setting wall 60, a continuous baffle between the setting side wall 60 and the screen 58. The spaces between certain screen tubes 58 are closed by refractory material 68 to form a lateral extension of the wall 59 extending partway towards the front wall 41.

The vapor generating tubes of section 63 of the tube bank 5 are arranged in two groups, 75 and 77, spaced apart and spaced respectively from the tube screen 58 and from the setting side wall 60 as shown in FIG. 2. Each of these tube groups extends from the baffle wall 59 to a setting rear wall 79, which itself extends from side wall 60 to the rear wall 50 of the combustion chamber 19 and is provided with access doors at 81 and 83 to permit access to the spaces 87 and 89 respectively between the screen 58 and tube group 75 and between the two tube groups. The setting wall 60 is provided with two access doors 91^a and 91^b one on either side of the baffle 67, to permit access to the spaces 92^a, 92^b respectively between the bank sections 61 and 63 and the setting side wall 60. At the inner end of the access space 89 the tubes of the groups 75 and 77 adjacent that space are spaced from the baffle wall 59 to provide sideward extensions 89^a of the space 89, facilitating access to the baffle 59.

The inclined vapor generating tubes of section 61 of the tube bank 5 are arranged as a single group which extends from the baffle 59 to a setting front wall 99, which itself extends from side walls 60 towards front wall 41 of the combustion chamber but terminates short of wall 41. Tube section 61 is arranged with that of its transverse rows of tubes which is nearest the screen 58 in alignment with the transverse row of tubes of the tube group 75 which is farthest from the screen 58; and with that of its transverse rows of tubes which is farthest from the screen 58 in alignment with the transverse row of tubes of tube group 77 which is farthest from the screen 58.

Between setting front wall 99 and the adjacent end of the front wall 41 of the combustion chamber is provided an opening closed by a removable panel 132 through which a superheater 105 may be inserted and removed. When in position the superheater lies in space 107 between the tube bank section 61 and the tube screen 58.

The superheater 105, as shown in FIGS. 2 and 4, comprises two vertical headers 109, 111 disposed outwardly of the plane of the wall 99 and a large number of small diameter sinuous tubes 113 joining the two headers and forming the actual heat-exchange surface. Each tube 113 includes four legs 113^a, 113^b, 113^c and 113^d, which extend approximately horizontally towards the wall 59, legs 113^a and 113^b being connected in series by a return bend 114 disposed adjacent the baffle wall 59, legs 113^b and 113^c being connected in series by a return bend 115 disposed adjacent the plane of wall 99 and legs 113^c and 113^d being connected in series by a return bend 116 disposed adjacent the baffle wall 59. The inner legs 113^b and 113^c of each tube at outer parts 117 thereof are spaced closer together than inner parts 118 thereof further from the wall 99, the parts 118 bounding an access space 119 provided therebetween. The said outer parts 117 of the tube are supported by metal fingers 120 mounted on a common vapor generating tube 121 disposed between the innermost legs at the said outer parts 117 thereof. The inner legs of the tube are supported near the baffle wall 59 on metal fingers 123 mounted on two vapor generating tubes 124 disposed in the access space 119 and the outer legs of the tube are supported from other vapor generating tubes, the leg 113^a being supported on a finger 125 mounted on a tube 126 of the tube screen 58 and the leg 113^d being supported on a finger 127 mounted on a large tube 128 incorporated in the tube bank section 61. The tubes 121, 124, 126 and 128 are all connected at their upper and lower ends respectively to the drums 1 and 3.

The fingers 120, 123, 125 and 127 project radially from the supporting vapor generating tubes and extend in a direction parallel to the direction of gas flow over the superheater, the common vapor generating tube 121 having fingers 120 which project from it in opposite directions. As shown in FIG. 4, the fingers are so disposed axially of the tubes on which they are mounted that the axis of each of the tubes 113 is inclined upwardly from header 109 and from header 111 to the central return bend 115. The fingers are cast in groups of three and are mounted in a readily removable manner on the vapor generating tubes, the mounting means including projections (not shown) welded to the tubes and serving to locate the fingers against movement axially of these tubes.

End portions 130 of the outer legs 113^a, 113^d of the tubes 113, which legs are longer than the inner legs and extend beyond the plane of wall 99, are inclined outwardly to the headers 111, 109. The panel 132 closes the space between the outer tube legs.

The headers 109 and 111 terminate above the level of the drum 3 (see FIG. 3), and an access door 135 in an extension 99^a of the wall 99 permits passage of a man under the tubes 113 through a space 136 into the access space 119. The intertube spaces between lower parts of certain of the tubes of screen 58 are closed by refractory material 137 so separating the space 136 from the furnace chamber 19.

With the described arrangement of the tube bank 5 and superheater 113, substantially all parts of the stud tube baffle wall 59 are readily accessible for inspection and for repair and for cleaning the tube bank and superheater.

A suitable floor 138 joins setting side wall 60 to lower water drum 3, to complete the boundaries of two parallel arranged gas passes 140 and 141 extending from the combustion chamber 19 respectively through the tube bank sections 61 and 63 upwardly to two damper controlled outlets 142 (see FIG. 1).

The complete boiler is enclosed in a sheet metal casing 151, spaced outwardly from the walls 17, 41, 50, 60, 79 and 99, the floors 31 and 138 and the roof 15. This casing is sectionalized and panels may be removed to permit access to the boiler where desired. Cooling air enters the casing at the rear of the boiler and passes either under the floor 31 through a duct 153 or through the spaces between the side walls 17 and 60 and the casing 151 to the front of the boiler where it is used as combustion air for the burners 49. Disposed within the casing 151 are the superheater headers 109 and 111, the downcomers 54 and groups of downcomer tubes 155, 156 respectively connecting the water space of the drum 1 to the header 7 and to the drum 3.

The passes 140 and 141 join in a common duct 159 extending upwardly from above the outlets from the passes, the pass 140 being provided at its outlet 142 with dampers 160 for regulating the flow of gases through the pass and similar separately operable dampers being provided for the pass 141. Duct 159, which leads to the ship's smoke stack, contains an economizer 161.

Cradles 162 and 163 associated respectively with water drum 3 and with header 7 and suitably mounted on the

structure of the vessel serve to support the weight of the drums and of the tubular parts of the boiler.

Many details unessential to an understanding of the invention have been omitted from the above description of an integral furnace type marine boiler, such as the provision of means for separating steam from water in the steam and water drum **1**.

During normal operation of the boiler described above, oil fuel supplied to the burners **49** is burned in the combustion chamber **19** and the hot products of combustion pass laterally partly through pass **140** containing the superheater **105** and the tube bank section **61** and partly through pass **141** containing the tube bank section **63** to the damper controlled outlets and thence to the economizer and the smoke stack.

Normally, the dampers controlling the flow of gases from the combustion chamber over the superheater will be kept closed until steam is generated in the boiler. This steam passes from drum **1** through the superheater and thence to its point of use, and once such a flow of steam has commenced, the damper controlling the flow of hot gases over the superheater may be opened to a suitable extent. The degree of superheat imparted to the steam may be varied by adjustment of the two sets of dampers controlling the gas flows respectively through pass **140** and through pass **141**.

As a result of the upward inclination of the axis of each tube **113** from the headers **109**, **111** to the central return bend **115**, proper drainage of each tube is insured when the headers **109**, **111** are emptied, despite the upright disposition of the headers. Individual superheater tubes may be readily removed and new tubes inserted, since the end portions **130** of the tubes **113** are inclined outwardly to the associated headers **109**, **111** and by cutting through the said end portions the tubes may be released from the headers and withdrawn through the space between the headers. In the embodiment shown, there are three tubes in each nest, and if necessary tubes may be withdrawn three at a time in order to effect tube renewal. The arrangement of the fingers which support the tubes **113** is such that upon a short outward movement of any tube **113** it disengages from the fingers **120** and the return bend **115** is free to fall somewhat, so facilitating withdrawal of the tube.

The support fingers **120**, **123** on the tubes **121**, **124** may readily be renewed from within the access space **119** and the support fingers **125** on the tube **126** of the tube screen **58** may be reached from the furnace chamber by cutting away a few of the screen tubes **58**. The remaining support fingers **127** are in a cooler zone and are less likely to require renewal.

Referring now to the embodiment of the invention shown in FIGS. 5 anl 6, the superheater **105** of FIGS. 1 to 4 is replaced with a superheater **205** disposed in a space **206** between the tube bank section **61** and the screen **58** which is somewhat deeper than the corresponding space **107** in the embodiment of FIGS. 1 to 4, the superheater occupying only the part of the space **206** which is adjacent the screen **58**, so leaving a part of the space unoccupied by tubes to provide an access space **206^a**.

The superheater **205** comprises two upright headers **209** and **211** disposed outwardly of the plane of the wall **99** and a large number of sinuous tubes **213** joining the two headers and forming the actual heat exchange surfaces. Each tube **213** includes four legs **213^a**, **213^b**, **213^c**, **213^d**, which extend approximately horizontally towards the wall **59**, legs **213^a** and **213^b** being connected in series by a return bend **214** disposed adjacent the baffle wall **59**, legs **213^b** and **213^c** being connected in series by a return bend **215** disposed adjacent the plane of wall **99**, and legs **213^c** and **213^d** being connected in series by a return bend **216** disposed adjacent the baffle wall **59**. The inner legs **213^b** and **213^c** of each tube are parallel to one another throughout their lengths in this embodiment, and the tubes **213** are nested in groups of three, as shown in FIG. 5. With the arrangement shown, the innermost of the tube legs **213^b** and **213^c** of the different tubes are spaced from one another by short horizontal distances only.

In the region of the baffle wall **59**, the inner legs **213^b** and **213^c** of each tube **213** are supported by metal fingers **220** mounted on a common vapor generating tube **221** disposed between the innermost legs. The outer leg **213^a** is supported on a finger **225** mounted on a tube **226** of the tube screen **58** and the outer leg **213^d** is supported on a finger **227** mounted on a large tube **228** located in the access space **206^a** both the tube **226** and the tube **228** being positioned farther from the baffle wall **59** than the tube **221**. The inner legs **213^b** and **213^c** are also supported at a location adjacent the plane of the setting wall **99** by a finger **229** mounted on a tube **230** and engaging the return bend **215**, the tube **230** being disposed between the legs **213^b** and **213^c**. As shown in FIG. 6, the fingers **220**, **225**, **227** and **229** are so disposed axially of their respective tubes **221**, **226**, **228** and **230** that the axis of each of the tubes **213** is inclined upwardly from headers **209** and **211** to the central return bend **215**. The tubes **221**, **226**, **228** and **230** are all connected at their upper end lower ends respectively to drums corresponding to the drums **1** and **3** of FIG. 1.

The fingers **220**, **225**, **227** and **229** project radially from the supporting vapor generating tubes and, apart from the fingers **229**, extend in a direction parallel to the direction of gas flow over the superheater, the common vapor generating tube **221** having fingers **220** projecting from it in opposite directions.

End portions **233** of the outer legs **213^a**, **213^d** of the tubes **213**, which tube legs are longer than the inner legs and extend beyond the plane of wall **99**, are inclined outwardly to the headers **211**, **209** and a removable panel **234** closes the space between the outer legs. The setting front wall **99** is provided with a removable panel **235** to permit access of an operator to the access space **206^a**.

Individual superheater tubes can be readily removed and new tubes inserted, since the end portions **233** of the tubes **213** are inclined outwardly to the associated headers **209**, **211** and by cutting through the said end portions the tubes can be released from the headers and withdrawn through the space between the headers. There are three tubes in each nest, and if necessary tubes may be withdrawn three at a time in order to effect tube renewal. The arrangement of the fingers which support the tubes **213** is such that upon a short outward movement of any tube **213** it disengages from the fingers **220** and **229**, and the return bend **215** is free to fall somewhat, so facilitating withdrawal of the tube.

While in accordance with the provisions of the statutes I have illustrated and described herein the best forms of the invention now known to me, those skilled in the art will understand that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention covered by my claims, and that certain features of my invention may sometimes be used to advantage without a corresponding use of other features.

What is claimed is:

1. A vapor generating and superheating unit comprising a housing including a furnace chamber and vertically extending baffle means cooperating with said housing to define a plurality of side-by-side parallel gas passes arranged to receive heating gases from said furnace chamber, a bank of vapor generating tubes in each of said gas passes, a bank of nested sinuous vapor superheating tubes arranged to receive the vapor generated in said vapor generating tubes and each including four tube legs connected in series by return bends extending substantially horizontally across one of said gas passes towards a part of said baffle means bounding said pass, inlet and outlet headers connected to said outer tube legs and disposed at one side of and outside the housing and spaced apart a sufficient distance for the tubes to be removed or inserted

through the space between the headers, means at opposite sides of said bank of vapor heating tubes for releasably supporting the outermost tube legs, a common vapor generating tube disposed between the innermost legs and adjacent said housing and arranged to support the parts of the vapor superheating tubes adjacent said housing, and each of the vapor superheating tubes arranged with its axis in successive ascending planes such that the tubes will drain to both of said headers.

2. A vapor generating and superheating unit comprising a housing including a furnace chamber and vertically extending baffle means cooperating with said housing to define a plurality of side-by-side parallel gas passes arranged to receive heating gases from said furnace chamber, a bank of vapor generating tubes in each of said gas passes, a bank of nested sinuous vapor superheating tubes arranged to receive the vapor generated in said vapor generating tubes and each including four tube legs connected in series by return bends extending substantially horizontally across one of said gas passes towards a part of said baffle means bounding said pass, inlet and outlet headers connected to said outer tube legs and disposed at one side of and outside the housing and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, means at opposite sides of said bank of vapor heating tubes for releasably supporting the outermost tube legs, a common vapor generating tube disposed between the innermost legs and adjacent said housing and arranged to support the parts of the vapor superheating tubes adjacent said housing, and the tube legs of each vapor superheating tube being so supported that they rise from the associated headers to the return bend adjacent said housing.

3. A vapor generating and superheating unit comprising a housing including a furnace chamber and vertically extending baffle means cooperating with said housing to define a plurality of side-by-side parallel gas passes arranged to receive heating gases from said furnace chamber, a bank of vapor generating tubes in each of said gas passes, a bank of sinuous vapor superheating tubes arranged to receive the vapor generated in said vapor generating tubes and each including four tube legs connected in series by return bends extending substantially horizontally across one of said gas passes towards a part of said baffle means bounding said pass, inlet and outlet headers connected to said outer tube legs and disposed at one side of and outside the housing and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, the portions of the inner legs of each tube adjacent to the baffle means being sufficiently spaced apart to provide an access space which permits access to the external surfaces of said vapor superheating tubes for cleaning purposes and to permit access to the adjacent part of said baffle means, a common vapor generating tube disposed between the innermost legs and adjacent said housing and arranged to support the parts of the vapor superheating tubes adjacent said housing, and the inner legs of each vapor superheating tube at parts thereof adjacent said common vapor generating tube being spaced closer together than portions thereof adjacent to said baffle means.

4. A vapor generating and superheating unit comprising a housing including a furnace chamber and vertically extending baffle means cooperating with said housing to define a plurality of side-by-side parallel gas passes arranged to receive heating gases from said furnace chamber, a bank of vapor generating tubes in each of said gas passes, a bank of sinuous vapor superheating tubes arranged to receive the vapor generated in said vapor generating tubes and each including four tube legs connected in series by return bends extending substantially horizontally across one of said gas passes towards a part of said baffle means bounding said pass, inlet and outlet headers connected to said outer tube legs and disposed at one side of and outside the housing and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, the portions of the inner legs of each tube adjacent to the baffle means being sufficiently spaced apart to provide an access space which permits access to the external surfaces of said vapor superheating tubes for cleaning purposes and to permit access to the adjacent part of said baffle means, a common vapor generating tube disposed between the innermost legs and adjacent said housing and arranged to support the parts of the vapor superheating tubes adjacent said housing, and each of the vapor superheating tubes being arranged with its axis in an inclined plane such that each tube will drain to both of the headers to which it is connected.

5. A vapor generating and superheating unit comprising a housing including a furnace chamber and vertically extending baffle means cooperating with said housing to define a plurality of side-by-side parallel gas passes arranged to receive heating gases from said furnace chamber, a bank of vapor generating tubes in each of said gas passes, a bank of sinuous vapor superheating tubes arranged to receive the vapor generated in said vapor generating tubes and each including four tube legs connected in series by return bends extending substantially horizontally across one of said gas passes towards a part of said baffle means bounding said pass, inlet and outlet headers connected to said outer tube legs and disposed at one side of and outside the housing and spaced apart a sufficient distance for the tubes to be removed or inserted through the space between the headers, the portions of the inner legs of each tube adjacent to the baffle means being sufficiently spaced apart to provide an access space which permits access to the external surfaces of said vapor superheating tubes for cleaning purposes and to permit access to the adjacent part of said baffle means, a common vapor generating tube disposed between the innermost legs and adjacent said housing and arranged to support the parts of the vapor superheating tubes adjacent said housing, the vapor superheating tubes being arranged in nested groups, and each of the vapor superheating tubes being arranged with its axis in an inclined plane such that each tube will drain to both of the headers to which it is connected.

References Cited in the file of this patent

UNITED STATES PATENTS

1,475,924	Nelis	Nov. 27, 1923
2,048,039	Stillman	July 21, 1936
2,231,016	Langvand	Feb. 1, 1941
2,420,647	Boland	May 20, 1947
2,762,635	Lorber	Sept. 11, 1956

FOREIGN PATENTS

752,635	France	July 24, 1933
893,994	France	Dec. 11, 1944
771,052	France	Sept. 29, 1934