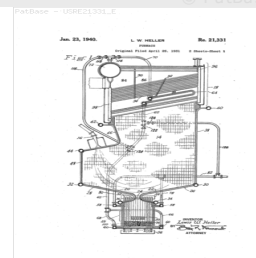


1) Family number: 24059380 (USRE21331E)

Abstract: Source: USRE21331E What is claimed is: 1. In power steam generating equipment, a boiler section, a first furnace from which combustion gases pass to said boiler section and deliver heat thereto, water walls for said first furnace, means for burning pulverized coal in said furnace, an inclined water cooled floor for said first furnace, extended portions of said floor constituting an outlet for slag flowing from said furnace, a second separately fired furnace located below said outlet to receive slag flowing from the first furnace, a wall of said second furnace formed with a slag tap outlet, means for directing burning fuel into the second furnace so as to maintain the collected slag in molten condition, a radiant type steam superheater having heat exchange elements exposed to the radiant heat transmitted from the burning fuel in said second furnace, a convection type steam superheater receiving heat from the combustion gases of said first furnace, and connections whereby steam passes in series from said boiler section through the convection- type superheater and thence through the radiant type superheater to a point of use, a slag outlet for said first furnace constituting a flue whereby the combustion gases pass from the second furnace to the first furnace. 2. In power steam supply equipment, a boiler section, a main boiler furnace, means projecting through a wall of the furnace for burning pulverized fuel therein. means at the base of the furnace forming an outlet through which slag flows therefrom, a second furnace adjacent the base of the main furnace and separately fired so as to maintain slag flowing from the first furnace in a molten condition, and a radiant type steam superheater associated with the second furnace so as to receive heat radiantly transmitted from the burning fuel therein. 3. In a power steam supply system, a plurality of separately fired furnaces, a boiler section and a convection type steam superheater in position to contact with the combustion gases passing through said furnaces. means for burning powdered coal in one of the furnaces. means for directing molten slag deposited in the coal burning furnace to the other furnace, a radiantly heated steam superheater in the other furnace, means for burning fuel in the other furnace, so as to maintain the collected slag in molten condition, and connections whereby steam generated by the boiler passes first through the convection superheater and then through the radiantly heated superheater to a point of use. 4. In a steam system. a plurality of independently fired furnaces. an inclined water cooled door for the first of said furnaces, a slag drain opening at the base of the incline formed by said floor of the second of said furnaces arranged to receive and collect molten slag flowing through said opening, a convection type steam superheater heated by the first furnace, and a radiant heat type of steam superheater in a wall of the second furnace. 5. In a power steam supply system. a boiler section, a main furnace from which combustion gases pass to heat the boiler section, means for burning pulverized fuel in the main furnace, means for directing to an outlet the molten slag deposited from the burning fuel in the main furnace. an auxiliary separately fired furnace receiving and collecting the slag flowing through said outlet, means for burning fuel in the auxiliary furnace so as to keep said collected slag in molten condition, means permitting the tapping of the auxiliary furnace to allow the collected slag to run off, means for joining the combustion gases from both furnaces, a convection type steam superheater, means for directing the combustion gases from the main furnace over said superheater, a radiant heat type of steam superheater receiving steam from the convection superheater. and means for conducting steam from the radiant superheater to a point of use, the radiant superheater having heat exchange parts receiving heat radiantly transmitted from the burning fuel in the auxiliary furnace. 6. In a device of the character described, a water wall boiler furnace of large combustion volume, and an auxiliary furnace located beneath and toward one side of the main furnace, opposite water tube walls forming the roof of the auxiliary furnace and sloping bottom walls of the main furnace, a water tube flue for the auxiliary furnace formed by intermediate portions of the walls constituting the roof of the auxiliary furnace and bottom of the main furnace, a burner for the auxiliary furnace projecting combustion currents along the surface of a pool of slag collecting in the bottom of that furnace, a burner for the main furnace projecting combustion currents into that furnace at a position adjacent said pool and a second burner for the main furnace projecting combustion currents transversely of the currents projected by the second mentioned burner. 7. In combination, a main furnace, an auxiliary furnace receiving molten slag draining from the main furnace, walls forming a throat connecting the furnaces products of combustion to pass from the auxiliary furnace to the main furnace, a first main furnace burner directing flame toward the throat, a second main furnace burner directing its flame transversely of the flame of the first burner and toward and across the throat, an auxiliary furnace burner directing its flame downwardly toward the bottom of the auxiliary furnace to maintain a slag pool, and means providing for periodically tapping slag from the pool in the secondary furnace. 8. In combination. a furnace having walls including spaced tubes connected into fluid circulation, means forming a slag pit below the furnace, spaced water tubes included in a furnace floor inclined downwardly toward a long narrow slag discharge slot communicating with the slag pit and the furnace. means for burning a slag forming fuel, said slot being arranged relative to the burner so that flames from the burner play upon a wall of the slot to prevent bridging of slag across the slot. 9. In a fluid heat exchange device, a furnace the walls of which include spaced tubes connected into fluid circulation, a furnace floor inclined downwardly toward a long narrow slot constituting a slag discharge opening, spaced floor cooling tubes extending filling a wall of UIC slot, and a burner located in a wall of the furnace facing the floor and said slot and directing the flames of a slag forming fuel directly downwardly toward the slot. 10. In a pressure vapor generator, a main furnace having a free combustion chamber of large volume, groups of parallel fluid cooled tubes defining opposite sides of said chamber with one of said groups being located at the gas outlet side. fuel burning means between said groups of tubes. an auxiliary furnace independently fired and so arranged that its gases pass through one of said sides and transmit heat to said tubes and then pass through the main furnace, a superheater in the auxiliary furnace protected by some of said tubes from excessive heating due to the radiant transmission of heat from the burning fuel in the main furnace, some of said tubes at the side of the combustion chamber opposite its gas outlet side extending in parallelism transversely of the general path of the gases lining from the auxiliary furnace to the main furnace and absorbing heat from the main furnace as well as the auxiliary furnace, a vapor and liquid separator having said tubes communicating therewith, and connections whereby vapor from the separator passes to the superheater. 11. A steam generator comprising, a main furnace having a heating gas outlet at one side thereof, a bank of steam generating tubes extending across said gas outlet, means for burning fuel in said main furnace, an auxiliary furnace opening to said main furnace at the side of said main furnace opposite said bank, a steam superheater in said auxiliary furnace, means for burning fuel in said auxiliary furnace, and means including a group of heat absorbing tubes extending along said opposite side of the main furnace and the adjacent side of said auxiliary furnace and arranged to receive heat from heating gases leaving said auxiliary furnace and to form a screen protecting the superheater from overheating due to absorption of heat radiantly transmitted from the main furnace, the tubes of said group being also arranged to form a restricted gas outlet through which the gases from the auxiliary furnace pass into the main furnace and thence over the tubes of said bank. 12. In a steam boiler, a main furnace including fuel burning means, inclined steam generating tubes connected into the boiler circulation and extending across the path of the furnace gases at the gas outlet side of the furnace, spaced tubes connected into the boiler circulation and delineating the side of the main furnace opposite its gas outlet side, and an auxiliary furnace from which the furnace gases pass between the last mentioned tubes into the main furnace, means for burning fuel in the auxiliary furnace, and a superheater exposed to the heat of the auxiliary furnace, the last mentioned tubes shielding the superheater from radiant heat from the main furnace and the fuel burning means of the main furnace being located at a position intermediate the first mentioned tubes and the second mentioned tubes.



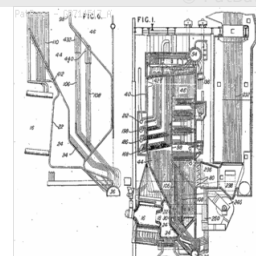
, 13. In a furnace burning a slag forming fuel, walls forming a combustion chamber, a furnace bottom sloping downwardly toward a long narrow slag discharge throat, and forming a wall, on the throat, spaced wall cooling tubes extending along the furnace bottom and the wall of the throat so as to maintain a coating of frozen slag along said throat wall and thereby prevent damage to the wall by overheating, and a burner projecting downwardly toward said throat to prevent the freezing of slag thereacross and to maintain slag flow from the furnace. 14. In a fluid heat exchange device, a furnace the walls of which include spaced tubes connected into fluid circulation, a furnace floor inclined downwardly toward a long narrow slot constituting a slag discharge opening, spaced floor cooling tubes extending along a wall of the slot, and a burner located in a wall of the furnace and directing the flow of a slag forming fuel so that they pass downwardly and toward the slot, the location of said burner with relation to said inclined furnace floor being such that a portion of the slag accumulating thereon is maintained in a molten condition to cause the same to flow along the inclined furnace floor and through the slag discharge opening. 15. A steam generator including fluid cooled walls defining a combustion chamber, means for burning a slag forming fuel in the combustion chamber, a bank of steam generating tubes extending across the gas outlet of said chamber, a fluid cooled floor portion inclined at an angle less than 45 degrees to the horizontal and discharging slag through a narrow transverse slot in the door of the furnace, the slot being bounded on both sides by a water cooled surface and establishing communication between said chamber and a slag pit, and said fuel burning means directing a stream of burning slag forming fuel downwardly into the combustion chamber and against said horizontally inclined floor portion in a direction such that a portion of the slag accumulating thereon is maintained in molten condition to cause the same to flow along the inclined furnace floor and through the narrow transverse slot to the slag pit. 16. In a steam generator, separate combustion chambers in contiguous relation, a bank of water tubes including tubes defining one side of one combustion chamber and extending across its gas outlet, a superheater subject to the heat of the other, the combustion chambers being arranged for the products of combustion from both chambers to flow between the tubes of said bank defining a side of said one combustion chamber, other water tubes between the two chambers screening the superheater from the combustion in the one chamber, and means for bringing each chamber independently whereby heat input to the superheater may be controlled with consequent control of superheat. 17. In a steam generator, adjacent furnaces with means for bringing each independently of the other, the furnaces being arranged in series with the gases of one furnace passing through the other furnace with a single flue affording the only furnace gas outlet for both furnaces, vaporizing elements including tubes presenting heat exchange surfaces arranged for the combustion products of both furnaces to traverse the surfaces in heat transfer relation thereto, and a superheater subject to the heat of one of said furnaces and including tubes so arranged that combustion products from the other furnace do not contact said tubes as they pass to said superheater, superheat being controllable by regulation of the firing rate of said one furnace. 18. In a steam boiler, a main furnace including fuel burning means, inclined steam generating tubes connected into the boiler circulation and extending across the path of the furnace gases at the gas outlet side of the main furnace, spaced tubes connected into the boiler circulation and delineating the side of the main furnace opposite its gas outlet side, and an auxiliary furnace from which the furnace gases pass between the last mentioned tubes and across the steam generating tubes, means for burning fuel in the auxiliary furnace, and a superheater including tubes exposed to the heat of the auxiliary furnace, the second mentioned tubes shielding the superheater from radiant heat from the main furnace and the fuel burning means of the main furnace being located at a position intermediate the first mentioned tubes and the second mentioned tubes. 19. A steam generator comprising a setting, a bank of steam generating tubes in the setting, a group of water tubes in the setting, a boiler furnace in the setting between the bank of steam generating tubes and said group of tubes, means for firing the boiler furnace, a superheater furnace in the setting separated from the boiler furnace by tubes of the group of water tubes, a superheater of the wall tube type in the superheater furnace, means for firing the superheater furnace, and a flue connected with the setting through which the products of combustion produced in both said furnaces now from the setting, the flue being so located that the products of combustion produced in the superheater furnace flow at all times in heat exchange relationship with the entire bank of steam generating tubes before entering the flue, said group of tubes also having a screen effect upon the superheater.

Earliest Publication Date: 19400123

2) Family number: 19489880 (GB714517A)

IMPROVEMENTS IN TUBULOUS VAPOUR GENERATORS

Abstract: Source: GB714517A 714,517. Water-tube steam boilers; steam superheaters. BABCOCK and WILCOX, Ltd. Dec. 6, 1951 [Dec. 6, 1950], No. 28635/ 51. Classes 123(2) and 123(3) A steam boiler is fired by a pair of cyclone furnaces 16, each arranged for example, as described in Specification 552,747, [Group XII], the hot gases from the furnaces passing through outlets 18 in a division wall 22 formed of refractory covered steam generating tubes into a secondary furnace 24 and then under a partition 30 and upwardly through a tubelined radiant heat absorption chamber 44 in the upper part of which are disposed platens formed of return bend radiant superheater tubes which divide the gas flow into a number of parallel paths, the tubes being connected in series by means of headers 168, 186, 198 and 212. The gases are deflected by the roof 42 of the chamber into a tube-lined downpass 46, which is divided by a vertical metallic wall into a pass locating a primary convection superheater and one locating a reheater, the gases from both passes finally discharging through a breeching 236, dust chamber 238 and air heater tubes 232. Control of superheat is obtained by proportioning the flow of gas through the downpasses by dampers 80 located at the outlet of the reheater pass and by recirculation of furnace gas which is withdrawn from chamber 238 by a fan 246 and passed into the bottom of chamber 44 through a duct 250. The steam generating tubes lining the furnaces, the chamber 44 and downpass 46 are connected between a water drum 36 and a steam and water drum 54, circulation being established through external downcomers 138. Where the tubes lining the front wall 40 of the chamber 44 cross the secondary furnace outlet they are bent to form spaced platens 34 whilst in the lower part of chamber 44, further tube platens 106 and 108 are provided to form a slag screen. A vigorous water circulation is provided through the tubes forming platens 106 and 108 and those forming the division wall 22, which are all exposed to gases at a very high temperature, by pairing tubes in the wall and in each platen and connecting each pair at the top to a single tube of larger diameter. Thus, as shown in Fig. 6, pairs of tubes 22 and pairs forming platens 106 and 108 are united by Y-connectors 412, 432 and 440 respectively and joined to larger diameter tubes 110 and 98 which continue upwards as lining tubes for the side and rear walls of chamber 44.



Probable Assignee: BABCOCK AND WILCOX LTD

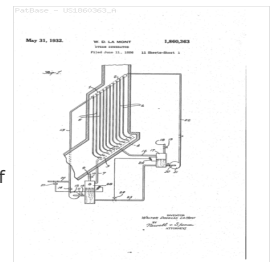
Earliest Publication Date: 19540901

3) Family number: 20049579 (US1860363A)

STEAM GENERATOR

Abstract: Source: US1860363A 1. Water and steam from the header 74 of the La Mont generator pass through the pipe 76 into the pot 77, where the steam is separated and passes on through the pipe 78 controlled by the valve 79. Water from the water space of the pot is pumped through the suction pipe 80, pump 81 and pipe 82 into the upper header 73, thus providing a separate complete circuit for the La Mont generator. Valves 83 and 84 control the speed of circulation. Feed water is introduced into the drum 63 of the Stirling boiler through the pipe and the feed is controlled by the valve 86 actuated through the water level control 87 connected to the drum 64. Water is also fed from the drum 65 through the pipe 88 into the pot of the La Mont generator and serves as make-up water to replace the steam generated in the La Mont generator. The flow through the pipe 88 is controlled by the throttle valve 89 actuated by the water level control 90. The circulation of the two boilers are separate but the feed for both boilers is carried in series through the Stirling boiler and

greatly enhances the natural convection circulation which takes place in this boiler. The advantages of series gas flow with the efficient La Mont generator in the stack are retained in this modification, which is very suitable for installations which already have bent tube boilers of the Stirling type. It is possible to mount a La Mont generator in the stack with a minimum of redesigning and rebuilding, and a large increased overall efficiency results, both from the more efficient utilization of the heat in the heating gases and from the increased circulation in the Stirling boiler which correspondingly increases its steaming capacity and improves its operation. The water discharged through the pipe 88 is usually at a temperature considerably above the boiling point corresponding to the pressure which exists in the pot 77 and therefore, a considerable amount of water is turned into steam and passes off as low pressure steam through the pipe 78. A sudden increased demand for low pressure steam, therefore, lowers the water in the pot and increases the opening of valve 89 with the result that an additional volume of steam is generated due to the partial evaporation of the water fed from the Stirling boiler. It is thus possible to take care of comparatively large fluctuations in demand for low pressure steam with a La Mont generator of small and economical size. Only a single pump is used and the system is simple and reliable in operation and lends itself to many industrial applications. A combination of a Scotch marine boiler and a separately fired La Mont generator is shown in Figure 6. The Scotch boiler which is of conventional design, consists of a shell 91 extending in the form of a leg 92 surrounding the firebox, and provided with fire tubes 93. Feed is introduced through the pipe 94 controlled by the valve 95 and steam is taken off from the steam space through the pipe 96 controlled by the valve 97. The Scotch marine boiler which may advantageously operate at a moderate steam pressure is associated with a high pressure separately fired La Mont generator consisting in an upper header 219, lower header 220 and tubes 221, the circulation being from the header 220 through the pipe 222 into the pot 223 and thence through the pipe 224, pump 98 and pipe 99 into the upper header of the La Mont generator. Valves 100 and 101 are also provided for controlling the flow. In addition to the separate circulations of the La Mont boiler and the ordinary convection circulation of the Scotch boiler means are provided for feeding water from the leg 92 of the Scotch boiler into the pot 223 by means of the pump 102 drawing water from the bottom of the leg 92 through the pipe 103 and discharging it through the pipe 104, valves 105 and 106 being provided for control purposes. A relatively clean, hot feed is thus provided for the La Mont generator which is advantageous when it is desired to generate large quantities of high pressure steam in a La Mont generator of economical size. Owing to its high heat transfer capacity it is also possible to use heat sources of great intensity without danger of burning out the tubes. Not only is a hot feed water of desirable purity assured for operation of the La Mont generator at high pressure but the circulation in the Scotch marine boiler is very greatly enhanced as the flow through this boiler is from the feed pipe 95 backward and down through the leg 92 and then out through the pipe 103 into the pot of the La Mont generator. The flow of water thus roughly is counter to the flow of heating gases up through the combustion space and through the fire tubes resulting in an effective heat transfer and decreasing the stack temperatures of the gases leaving the Scotch boiler. This counter flow can, in some cases, materially increase the efficiency of the boiler, as stack temperatures are apt to run economically high owing to the relatively short travel through the fire tubes which also are not very effective heat exchange surfaces because of their large hydraulic mean depth. The combination therefore, renders the operation of the Scotch boiler more efficient and at the same time provides for a reliable hot feed for the high pressure La Mont generator. The high heat transfer capacity of La Mont generators renders them particularly efficient as water walls or radiant heat boilers and an efficient and desirable combination of water wall boiler and conventional inclined Water tube boiler is shown in Figure 7. In this figure, the water tube boiler consisting in a drum 107, rear header 108, front header 109 and tubes 110 and baffles 111, preferably operates under moderate pressure, steam being taken off from the steam space of the drum through the pipe 112 controlled by the valve 113. The low pressure La Mont water wall boiler consists in upper header 114, lower header and pot 115 and tubes 116. High pressure water from the rear header 108 flows to the header 114 through the pipe 117 controlled by the throttle valve 118. After passing through the generating tubes 116, the mixture of steam and water is separated in the pot 115, the steam passing off through pipe 119 controlled by valve 120 and the water being pumped by the pump 121 through the pipes 122 and 123 into the Water space of the drum 107, suitable valves 124 and 125 being provided to control flow. The La Mont generator efficiently shields the walls and serves as an efficient source of low pressure steam. At the same time the circulation through the main boiler is enhanced due to the fact that water is pumped into one end of the drum and taken out from the rear header 108 at the other end of the drum. A further important advantage lies in the fact that the danger of burning out the tubes 116 is minimized due to the fact that a large volume of high pressure water is available for feeding these tubes directly and is instantly controlled by the valve 118 which is actuated by the water level control 126. There is therefore, little or no danger of burning out these tubes even with very marked and sudden variations in the temperature of the fire and in the demands for low pressure steam. If desired, the water wall can be operated as a full tube water wall instead of a film tube water wall. While full tube operation does not give the advantages of high steaming capacity which are possessed by film generators, the rapid circulation provides for ample protection of the tubes and in some cases the construction may be cheaper and where the demand for low pressure steam is not great, it may be economically advantageous to construct full tube water wall generators, instead of film tube generators. In Figure 8, a separately fired high pressure La Mont generator is shown associated with an ordinary Wickes boiler designed to generate steam at a lower pressure. The Wickes boiler consists in an upper drum 127, lower drum 128 connected by rear circulating tubes 129 and front circulating tubes 130. A baffle 131 separates the two sets of tubes. The steam is taken off from the steam space of the upper drum through the pipe 132 controlled by the valve 133 and a feed pipe 134 provided with a valve 135 is also connected to the water space of the upper drum. This feed pipe is used for auxiliary feeding, as will be described below. The separately fired high pressure La Mont generator consists in an upper header 136, lower header 137 and generating tubes 138. Water and steam from the lower header 137 pass through the pipe 139 to the pot 140 where steam is separated and part passes off through the steam pipe 141 controlled by the valve 142. Excess water from the water space of the pot is circulated through the pipes 143 and 144 by the pump 145 which forces the water into the upper header 136. Valves 146 and 147 are provided to regulate flow and feed water is introduced through the pipe 148 controlled by the valve 149, which is actuated by the water level control 158. Some of the high pressure steam from the pot 140 is passed through the pipe 150 and injector 151 where it picks up feed water from the tank 152 through the pipe 153 and injects this feed water at high velocity through the pipe 154 and nozzles 155 into the bottom of the water tubes 130 of the Wickes boiler, thereby very greatly enhancing the speed of circulation in the Wickes boiler and correspondingly increasing its steaming capacity. The amount of feed water injected into the Wickes boiler by the high pressure steam is controlled by means of the throttle valve 156 actuated from the water level control 157 associated with the upper drum of the Wickes boiler. Feed into the La Mont generator is similarly controlled by a water level control 158 associated with the pot 140. In operation the circulation through the La Mont generator is substantially independent from that of the Wickes boiler as far as the water is concerned, and high pressure steam can be generated in varying amounts according to demand. The demand for low pressure steam from the Wickes boiler produces variations in the water level in the upper drum and this in turn actuates the throttle valve 156, causing the injection of the necessary feed water by means of high pressure steam from the La Mont generator. Particularly where there is a large difference in pressures between the two boilers a very rapid, sea violent injection will take place and the naturally sluggish convection circulation of the Wickes boiler is greatly accelerated. The best results are produced when nozzles are used, so that the injected feed water at high velocity is carried directly up the main steaming tubes of the boiler, sucking with it of course, water from the lower drum. In some cases, where such a rapid circulation of water in the Wickes boiler is not necessary, a somewhat cheaper, simpler construction can be used in which the nozzles are omitted and the feed water is simply injected into the bottom of the drum below the tubes 130. This will increase the circulation due to the fact that the velocity of the injected water continues into the circulating tubes. The arrangement of a Wickes boiler with a separately fired La Mont generator is very flexible and the relative sizes of the two units can be varied within wide limits. It is also possible to operate either generator separately from the other; thus, for example, if connection to the Wickes boiler is shut off by closing the valve 156 the La Mont generator can be operated entirely independently and in the same way the Wickes boiler can also be operated independently, utilizing a separate feed through the pipe 134; controlled by the valve 135. In some cases, it may be desirable to provide a very small La Mont generator where the demands for high pressure steam are low or the La Mont generator may be run at varying loads and at times the steam production may be insufficient to inject sufficient feed water into the Wickes boiler even when the whole of the high pressure steam is used for this purpose. The deficiency can then be made up by introducing some additional feed water through the pipe 134: if desired. In general, it should be understood that control of feed water which has been illustrated as automatic in some figures and as manual in



should be understood that control of feed water which has been illustrated as automatic in some figures and as manual in others can be widely varied between the limits of full automatic control and full manual control. The combination of two La Mont Water Wall generators for high pressure steam with a lower pressure Edgemoor single pass boiler is shown in Figure 9. The front water wall consists in an upper header 159, generating tubes 160 and lower header or pot 161 and the rear Water wall similarly consists in an upper header 162, generating tubes 163 and a lower header or pot 164. The Edgemoor boiler is provided with an upper steam and Water drum 165, a lower drum 166, generating tubes 167, si, rear steam and water drum 168, a water heater 169 and a superheatur 170. The steam space of the drum 165 is connected to the steam space of the drum 168 by means of the pipe 171 and the water spaces of these two are similarly connected by the tube 17

Probable Assignee: LA MONT CORP

Earliest Publication Date: 19320531

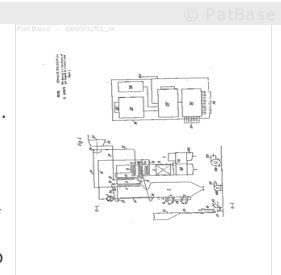
4) Family number: 20835795 (GB893251A)

IMPROVEMENTS IN AUTOMATIC CONTROL SYSTEMS FOR VAPOUR GENERATING PLANT

Abstract: Source: GB893251A 893,251. Power-generating systems. BABCOCK and WILCOX Ltd. Aug. 13, 1959 [Aug. 13, 1958; May 11, 1959], No. 26069/58 and 16134/59. Drawings to Specification. Divided out of 16134/59. Class 122 (3). [Also in Groups XXXV and XXXVIII] The starting-up, running, and closing-down of a pulverized fuel burning, super-heated steam generator, and its associated steam turbine are said to be automatically controlled by a digital computer. To this end, 15 temperature indicators, 8 tachometer generators, 7 flow-meters and 5 pressure-indicators are stated to be connected as inputs to the computer, which is said to compare their readings against programmed values, in a programmed sequence, and as a result control the positioning of 20 stop-valves, 7 linear actuators and 5 dampers, all of which signal back their condition to the computer. The locations of all these devices in an otherwise substantially conventional power station layout are shown, and a flow sheet setting out the sequence of events forming the starting-up procedure for the plant is given.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19620404



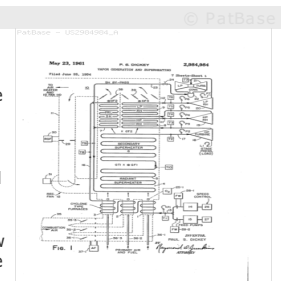
5) Family number: 22150021 (US2984984A)

VAPOR GENERATION AND SUPERHEATING

Abstract: Source: US2984984A (Claim 1) 1. The method of operatin.- a forced-flow oncethrough above-critical pressure vapor generator having a primary furnace chamber, means -for burning fuel at high heat release rates in said primary furnace chamber, a mixing charaber receiving the products of com- bustion from the primary fi-irnnce chamber as well as temperina gases recirculated from a locatioa beyond at least a port;on of the heat absorption surfaces of the unit, a tubular pressure flow path for the working medium receiving at one end liquidsubstantially above its critical pressure and discharging superheate,d fluid from its other end, the tubular flow path seially forming at least one boundary wall of the prim ary furnace chamber the _1 radiant wall por-tions of the mixing cham ber, then convection superheater surface in the gas path after the mixing chamber; which includes, regulatin.the liquid supply rate to the input end of the tubular flow path in response to fluid pressure at the exit of the path in direction tending to increase the liquid supply rate or pressure as exit fluid pressure decreases and vice ve g of the primary rsa, and controlling the firin furnace chamber i-,a response to final superheater fluid temperatlire in direction tending to increase the firing rate as final fillid temperature decreases and vice versa.

Probable Assignee: BAILEY METER CO

Earliest Publication Date: 19610523



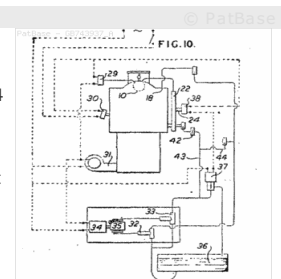
6) Family number: 20140815 (GB743937A)

IMPROVEMENTS RELATING TO STEAM GENERATORS

Abstract: Source: GB743937A 743,937. Automatic control systems for boilers. RODGERS and GEARY, Ltd. May 14, 1954 [July 2, 1953], No. 18349/53. Class 38 (4). [Also in Group XIII] In a steam generator comprising two tubulous sections, viz. a water-tube section and a separate forced flow, monotube section from which superheated steam is injected underwater into the water-tube section to evaporate water therein (see Group XIII), the steam pressure is controlled by a device 29 which is responsive to pressure variations in the steam drum 10 and is operable to maintain the, pressure at a pre-set value by making or breaking the supply circuit of a motor 31 which feeds oil to the generator furnace burners and of a motor 34 supplying water to the monotube and water-tube sections of the boiler. The water level in the water-tube section is regulated by apparatus comprising an upright standpipe 22 disposed adjacent the boiler and connected at the top and bottom respectively to the drum 10 and to the lower part of the water-tube section so that it contains water to a level corresponding with that in the section. At the water level the standpipe has a branch-pipe 24 carrying a level control mechanism 38 having electrical contacts which close when steam reaches a thermally-responsive element in the mechanism and open when the water, which is at a lower temperature, takes the place of the steam, the closing and opening of the contacts controlling the operation of a solenoid valve 37 regulating the flow of water from an auxiliary feed pump 33 which, together with the main pump 32 is driven through a gear-box 35 by motor 34. By means of the gear-box the main and auxiliary pump outputs are adjusted so that together they exceed the evaporative capacity of the burner whereas the main pump alone has an output which is less than this capacity. The main pump delivers water directly to the inlet end 18 of the monotube and, through a restrictor 42, to the watertube section. Normally, the water level in the latter is such that the contacts of mechanism 38 are open so that valve 37 remains open and pump 33 returns water to tank 36. If the level falls and steam reaches the element actuating the contacts they close to complete the circuit to the solenoid of valve 37 which thereupon closes so that pump 33 delivers water through line 43 to the water tube section and through line 44 to augment the supply of water to the monotube section. When the element is again immersed due to the rising water level valve 37 is opened to restore the previous water feed conditions. The boiler is protected against overheating due, for example, to failure of the water supply, by the provision of a thermally-responsive switch 30 connected to one of the tubes of the water tube section, the switch being operable to break the supply circuit to motors 31, 34 if an excessive temperature occurs in the tube. Specification 559,662, [Group XXIX], is referred to.

Probable Assignee: RODGERS AND GEARY LTD

Earliest Publication Date: 19560125



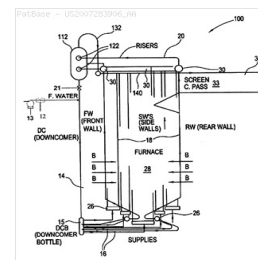
7) Family number: 40901950 (US2007283906A)

CIRCULATION SYSTEM FOR SLIDING PRESSURE STEAM GENERATOR

Abstract: Source: US2007283906A A steam generator circulation system is provided and includes a boiler feed pump for forcing water through an economizer, and through the waterwall tubes of an evaporator. A separator receives a mixture of steam and water and sends the steam to a steam utilization unit such as a superheater. A valve is provided below the separator. If the valve is open, the saturated water from the separator is mixed with feedwater and recirculated through the tubes of the evaporator. If the valve is closed, recirculation is terminated. At loads below the critical point, the valve below the separator system would be open and the boiler would operate like a natural circulation drum boiler. At loads above the critical point, the valve below the separator system would be closed resulting in a boiler that operates like a once-through boiler.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 20071207



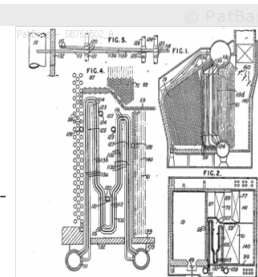
8) Family number: 19506394 (GB760502A)

IMPROVEMENTS IN OR RELATING TO VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB760502A 760,502. Water-tube steam boilers; superheaters. BABCOCK and WILCOX, Ltd. Feb. 17, 1955 [Feb. 17, 1954], No. 4653/54. Addition to 714,050. Classes 123(2) and 123(3) The water-tube steam boiler described in the parent Specification is modified in that the superheater headers are disposed externally of the superheater pass and are spaced apart sufficiently for the superheater tubes to be removed or inserted between them and in that the tubes of the superheater bank are so disposed as to provide an access space either beside or within the bank from which the tubes may be cleaned and the-baffle separating the two passes repaired. The boiler includes a tube-lined combustion chamber 19 fired by oil burners 49, the combustion gases passing laterally through a screen 58 of steam generating tubes into parallel passes 140, 141, separated by a tubulous baffle 59, the gas flow through each pass being controlled by dampers such as 160 at the respective outlets therefrom to regulate the superheat temperature. The passes locate vertical banks 61, 75, 77 of steam generating tubes arranged in staggered relation so that the baffle wall 59 is accessible for repair from one side or the other from spaces 87, 89, or 107. The superheater 105 is disposed in space 107 between screen 58 and tube bank 61. It comprises vertical headers 109, 111 disposed outwardly of the side wall 99 of the unit and a large number of horizontal sinuous tubes 113 joining the two headers, each tube consisting of four limbs 113a... 113d joined by return bends 114...116, the tubes being arranged in nested groups of three. Each tube group is supported by fingers 120, 123, 125, 127 projecting from large diameter water tubes 121, 124, 126, 128 respectively, the fingers being placed, see Fig. 5, so that each tube has a continuous downward inclination from one header to the other to allow it to be drained. The end portions of tubes 113 are bent outwardly to connect the headers 111, 109, a removable panel 132 closing the space between the headers, so that any tube group can be renewed by first cutting the tube ends and pulling the individual tubes out through the space and inserting the new tubes in the same manner. Access to the cleaning and maintenance space 107 between the limbs 113b, 113c of the superheater tubes is provided by a passage disposed underneath the superheater. In modifications, an equivalent space is arranged beside the superheater bank or between tube limbs corresponding to limbs 113b, 113c, which in that case are connected to an intermediate header disposed in the same plane as headers 109, 111.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19561031



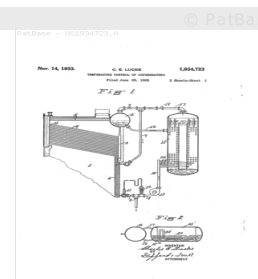
9) Family number: 23026668 (US1934723A)

TEMPERATURE CONTROL OF SUPERHEATERS

Abstract: Source: US1934723A 1. The process of controlling' the temperature of a superheater of a boiler, which comprises passing all of the steam from said boiler through said superheater, withdrawing steam from the outlet of said superheater, cooling it, and returning cool steam resulting from the cooling step to said superheater without passing through said boiler, the step of cooling the superheated steam causing generation of steam which is added to the boiler steam.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19331114



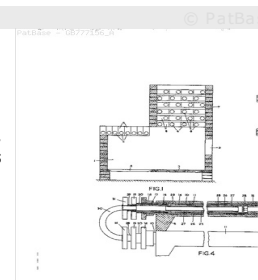
10) Family number: 20317444 (GB777156A)

IMPROVEMENTS IN FORCED FLOW, ONCE THROUGH STEAM GENERATORS

Abstract: Source: GB777156A 777,156. Pipe joints. WILLIAMS, K: W. Jan. 23, 1956 [Jan. 25, 1955], No. 2205/55. Class 99(1) [Also in Group XIII] A readily detachable, self tightening joint for connecting the tube elements of a forced flow steam boiler (s,ee Group XIII) consists in one form of a tubular plug 15 provided at its inner end with an external flange, the plug being inserted into the open end of the tube element 10. An internally-coned ring.16 of packing material such as aluminium or soft copper, an externally-coned, loose steel sleeve 17 and a cap 18 are slipped on to the plug, the cap being screwed on to the end of the tube 10. The plug is drawn outwardly to tighten the joint by a nut 19 threaded on to the outer end of the plug and abutting the cap 18 through a washer 20. The outer extremity of the plug carries an externally coned sleeve 21 which is a wedging fit in a member 22 connecting adjacent tube elements together. In another form, a U-tube 32 interconnects adjacent elements, a coned. steel sleeve 33 being welded to the end of each limb for engagement in 'an internally-coned soft metal ferrule 34 fitting into the mouth of the tube 10. This joint is tightened by means of bolts engaging flanges 35, 36 respectively threaded on to the tube 10 and fitting over the tube 32 to bear against the outer end of the sleeve 33.

Probable Assignee: KYRLE WILLIAM WILLANS

Earliest Publication Date: 19570619



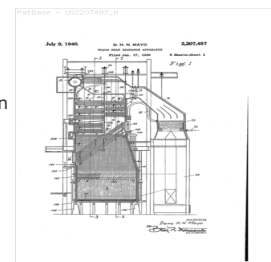
11) Family number: 21264090 (US2207497A)

FLUID HEAT EXCHANGE APPARATUS

Abstract: Source: US2207497A 1. A delayed coking unit charge heater for heating a feedstock to delayed coking temperature comprising a heating vessel having upper and lower radiant heating sections, a vertical tube bank between and spaced apart from opposite side walls of said vessel through which said feedstock is transported, said tube bank comprising a back and forth continuous path of horizontal tubing suspended generally in a first vertical plane in said vessel and extending from an inlet in said upper radiant section of said heating vessel downwardly to an outlet located in said lower radiant section of said heating vessel, and a plurality of burners located in the lower radiant section of said vessel on each side of said tube bank so as to be capable of providing and directing sheets of flame upwardly on opposite sides of said tube bank, said sheets of flame each individually lying in a plane generally parallel to the plane in which said tube sheet is suspended. ,

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19400709



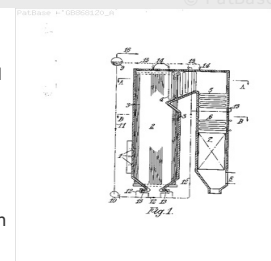
12) Family number: 20730481 (GB868120A)

IMPROVEMENTS IN AND RELATING TO STEAM GENERATORS

Abstract: Source: GB868120A 868,120. Water-tube steam boilers; superheaters. MONT INTERNATIONAL ASSOCIATION Ltd. Aug. 30, 1957 [Oct. 3, 1956], No. 30100/56. Classes 123(2) and 123(3) A water tube boiler has an upright furnace divided into two compartments 2, 19 by a vertical tubulous partition 26, each compartment being fired separately by burners 1 and being lined respectively with radiantly heated steam generating tubes 3 and with radiantly heated steam superheating tubes 17. Gases from the upper parts of the evaporating and superheating compartments 2, 19 flow through lateral passes locating respectively an evaporating tube bank 4 and a secondary superheater 29 into down-passes locating respectively another evaporating tube bank 5 and a reheater 31. The lateral passes and the upper parts of the downpasses are divided by a rearward extension 32 of the furnace partition wall, the two gas flows uniting beneath the downpass dividing wall 32 for flow through an economizer 6 and air heater 7. Steam generated in the banks 4, 5 and in the water tubes 3 is separated in a drum 9 and flows in succession through the radiant tubes lining the superheater furnace section 19 and the convection superheater bank 29. During starting- up, only the evaporating section is fired, steam being led to the superheaters when the working pressure has been attained. Firing of the superheater furnace section 19 is commenced when its lining tubes have been warmed up by the steam now and is increased slowly until the desired steam temperature is attained. During normal operation, steam temperature is controlled by adjustment of the firing rate of the superheater section. The invention is of application to forced recirculation boilers as shown in the Figure or to natural circulation boilers.

Probable Assignee: LA MONT INT ASS LTD

Earliest Publication Date: 19610517



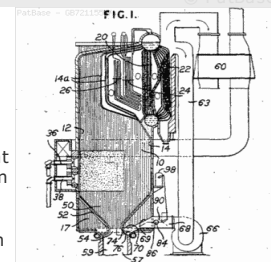
13) Family number: 19681015 (GB721155A)

IMPROVEMENTS IN OR RELATING TO STEAM GENERATING AND SUPERHEATING APPARATUS

Abstract: Source: GB721155A 721,155. Steam c. boilers; superheating. BABCOCK and WILCOX, Ltd. June 5, 1951 [June 9, 1950], No. 13301/51. Class 123 (3). A steam boiler comprises a vertical furnace chamber 10 which is lined with steam-generating wall tubes 12, 14, 17 and is fired by rows of pulverised fuel, c. burners 36, 38, the combustion gases flowing from the furnace successively through a tube screen 14a formed by extensions of the rear wall tubes 14, a convection heated superheater 24, 26, and further steam-generating tubes 20, 22 to an air heater 60, and the super-heat temperature is regulated by withdrawing relatively cool gases from the inlet duct to the said air heater and directing them by a fan 66 through ducts 63, 68, 69, 70 into the lower end of the furnace in such manner that they continue to flow in a stream between the main combustion zone and the rear wall tubes 14. A control and shut-off damper 90 is fitted within the duct 68 and is actuated by manually-operated means 98 or, alternatively, automatically in accordance with the steam temperature; the duct 68 is also fitted with an atmospheric connection 84 provided with a pressure-responsive valve 86 adapted to admit air to the duct when a tendency to reverse flow therein arises. In the construction shown the duct 70 discharges between the spaced lower ends 74, 76 of the tubes 14 throughout the whole width of the rear wall of the throat 54 of the boiler ash pit 57, but in a modification the duct 70 discharges through an intermediate portion of the front inclined wall 52 of the hopper 50 above said pit. Specifications 367,699, 504,114, 516,070, 523,870 and 540,119 are referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19541229



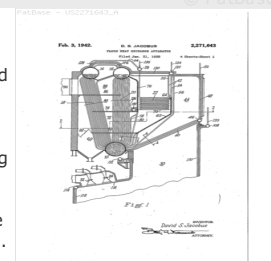
14) Family number: 19654566 (US2271643A)

FLUID HEAT EXCHANGE APPARATUS

Abstract: Source: US2271643A 1. In a water tube steam boiler, a plurality of upper drums, means forming a submerged lower chamber, banks of tubes connecting the drums with said chamber, a furnace, a superheater in front of the bank of tubes connecting the forward upper drum with said chamber and positioned-at a level intermediate the levels of the chamber and said forward drum, the furnace delivering hot gases to the space beneath the superheater, screen tubes extending across the path of furnace gases at a position between the furnace and the superheater, means for connecting the screen tubes -into boiler circulation, batties forming two separate gas paths for the travel of the-gases in parallel from a position forwardly of the superheater to a position beyond the first bank of tubes, one of said gas paths constituting a superheater by-pass and leading from the gas space beneath the superheater over some of the water tube surface provided by said tubes, and a regulator 'located rearwardly of said tube surface and at the outlet of said by-pass.

Probable Assignee: BABCOCK AND WILCOX CO

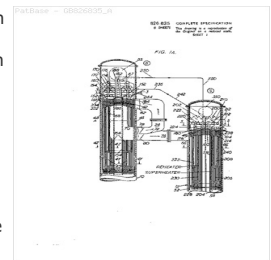
Earliest Publication Date: 19391114



15) Family number: 20727053 (GB826835A)

IMPROVEMENTS RELATING TO POWER PLANT AND TO THE OPERATION OF POWER PLANT AND TO TUBULOUS BOILERS SUITABLE FOR USE IN POWER PLANT

Abstract: Source: GB826835A 826,835. Steam and gas turbine plant. BABCOCK and WILCOX Ltd. March 8, 1956 [March 10, 1955], No. 7278/56. Class 110 (3). [Also in Groups XIII and XXIX] A binary elastic fluid power plant comprises a pressure-fired, once-through steam generating and superheating unit, a steam turbine receiving superheated steam from the unit and a gas turbine driven by the combustion gases from the unit, the pressure, temperature and rate of flow of these gases being held substantially constant over a wide range of rate of steam generation. The steam generating and superheating unit (see also Group XIII) consists of two pressureresisting casings B, S individually fired by cyclone furnaces 16. The casing B contains tubes 396 in which steam generation and some superheating occurs whilst the casing S contains in one vertical pass a final superheater 402 receiving steam from the tubes 396 through a line 398 and in another vertical pass a reheater 428. Steam from the superheater 402 flows successively through a high-pressure turbine 380, the reheater 428 and a low-pressure turbine 368. Combustion gases from the casing B are in part recirculated to the lower part of the casing by a fan 434, the remainder being passed by the fan into the lower part of the casing S wherein they mix with the fresh combustion gases from the cyclone furnace 16 of this casing and flow through the steam heating passes between which they are proportioned by dampers 200, 202 to an outlet 350. From the outlet the gases flow through a line 340 to a gas turbine 354, 442, the exhaust from which passes through a line 448 into a casing E containing an air heater 318 and an economizer 382. The steam turbines 380, 368 respectively drive electric generators 424, 440 whilst the gas turbine drives an electric generator 446 and an air compressor 314 supplying combustion air via the air heater to the cyclone furnaces 16. During starting the compressor 314 is driven by an auxiliary steam turbine 312 supplied with steam from an external source. Feed-water is pumped by a pump 360 from the main condenser 366 through bled steam heaters and the economizer 382 to the lining tubes of the furnaces 16 and thence through the evaporating section 396 of the casing B. During operation the feed-water flow is controlled to maintain a constant steam temperature at the inlet to the turbine 380. The air flow to the cyclone furnace of the B unit is controlled according to variations in steam pressure at that point. The air flow to the furnace controls the fuel supply thereto so that, for example, an increased steam demand with consequent slight drop in pressure is effective appropriately to increase the firing rate and hence the rate of steam generation in the B unit. The increased firing rate tends to increase the gas temperature in the B unit but this change immediately causes the rate of gas recirculation to the B unit to increase to restore the temperature to its predetermined value. The proportioning dampers 200, 202 are adjusted to maintain a constant reheat temperature. At all loads the gas turbines 354, 442 operate at full rating and, at boiler loads at which the air compressor 314 delivers an excess of air over that required for combustion, this excess is delivered through lines 334, 338 respectively controlled by valves 343, 342 into the furnace of the S unit. If the temperature of the gas leaving the S unit should rise above the predetermined value, about 1450° F., a valve 344 in a line 339 opens to admit sufficient air directly into the main 340 to restore the temperature to the required value. Moreover, if the gas turbine exhaust temperature rises to an abnormal value a valve 454 opens to permit a percentage of the gas flow from the main 340 to by-pass the turbine and flow directly into its exhaust line 448; the valve 454 is also responsive to overspeeding of the turbine. An increase in the gas temperature at the turbine inlet is also immediately effective to decrease the air and fuel flow to the cyclone furnace of the S unit. The control, which may be by fluid-pressure servomotors (see Group XXIX), involving the variable rate of flow of tempering gases and the control of the rate of firing of the S unit in combination with excess air variation is effective to maintain the desired conditions of gas temperature and flow at the gas turbine inlet over a wide range of power output of the steam turbine. Specifications 461,389, [Group XXIX], 598,141, [Groups XII and XIII], and 826,836, [Group XIII], are referred to.



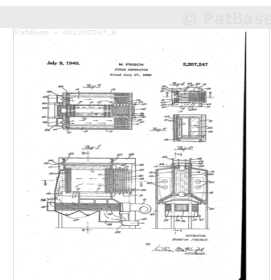
Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19600120

16) Family number: 21263150 (US2207247A)

STEAM GENERATOR

Abstract: Source: US2207247A What is claimed is: - 1. A shock wave generating apparatus comprising: source means for producing a shock wave and transmitting said shock wave to a biological body under medical examination; ultrasonic imaging means, including ultrasonic probe means to project an ultrasonic wave beam to said biological body, for producing and displaying an ultrasonic tomographic image of tissue within said biological body; probe position detecting means for detecting a slice plane position of said ultrasonic probe means with respect to said shock wave so as to produce a slice plane positioning signal for said ultrasonic probe means while an image of an article to be disintegrated located within said tissue of said biological body is being displayed in said ultrasonic tomographic image; transporting means for transporting both said source means and said ultrasonic probe means; generating means for generating a marker indicative of a focal point of said shock wave produced from said source means; and transport controlling means for controlling said transporting means so as to transport both said source means and said ultrasonic probe means along a detected slice plane of said ultrasonic probe means in response to said slice-plane positioning signal, whereby said marker is automatically coincident with said image of said article to be disintegrated. A shock wave generating apparatus as claimed in claim 1, wherein said transport controlling means includes transport control mode instruction means for instructing one of an absolute coordinate transport control mode and an ultrasonic slice plane transport control mode; transport control mode selecting switch means for selecting said absolute coordinate transport control mode or said ultrasonic slice plane transport control mode; transport mode converting means for converting said ultrasonic slice plane transport control mode into a corresponding converted absolute coordinate transport control mode when said ultrasonic slice plane transport control mode is selected by said transport control mode selecting switch means; and transport mechanism controlling means for controlling said transporting means in response to one of said absolute coordinate transport control mode and said converted absolute coordinate transport control mode, whereby said marker is made coincident with said image of said article to be disintegrated even when said ultrasonic slice plane transport control mode is selected. A shock wave generating apparatus as claimed in claim 2, wherein said transport control mode instruction means comprises an operation panel having a joy stick, and said transport control mode selecting switch means. 4. A shock wave generating apparatus as claimed in claim 2, wherein said transport mechanism controlling means controls said transporting means so as to transport both said source means and said ultrasonic probe means along a three-dimensional coordinate system defining at least an absolute coordinate system. 5. A shock wave generating apparatus as claimed in claim 2, wherein said transport mode converting means converts said ultrasonic slice plane transport control mode into said corresponding converted absolute coordinate transport control mode by utilizing a predetermined matrix. 6. A shock wave generating apparatus as claimed in claim 2, further comprising: probe rotation angle detector means for detecting a rotation angle of said ultrasonic probe means to produce actual rotation angle data, 7. A shock wave generating apparatus as claimed in claim 6, wherein said transport control mode instruction means inputs velocity data and desirable rotation angle data for said transporting means into said transport mode converting means, whereby coordinate conversion is performed therein based upon said inputted velocity data and said desirable rotation angle data with reference to said actual rotation angle data. 8. A shock wave generating apparatus as claimed in claim 1, wherein said transporting means includes threedimensional axes motors and two rotation-angle motors, 9. A shock wave generating apparatus as claimed in claim 1, wherein said source means is an ultrasonic transducer. 10. A shock wave generating apparatus as claimed in claim 1, wherein said ultrasonic probe means comprises an ultrasonic probe and wherein said apparatus further comprises; and, probe relative position detector means for detecting a relative position between said ultrasonic probe and said source means so as to produce a positional condition signal of said ultrasonic probe means. C 1 & I K



Probable Assignee: FOSTER WHEELER CORP

Earliest Publication Date: 19400709

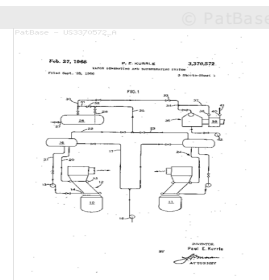
17) Family number: 589324 (US3370572A)

VAPOR GENERATING AND SUPERHEATING SYSTEM

Abstract: Source: GB1163072A 1,163,072. Water-tube steam boilers; steam superheaters. BABCOCK and WILCOX CO. 29 Aug., 1967 [29 Sept., 1966], No. 39402/67. Heading F4A. In a steam generating and superheating system, hot gases from a furnace 54 lined with vapour generating tubes, flow through two parallel-connected sections, one section containing a bank of steam generating tubes 53 arranged between upper and lower drums, and the other section containing a bank of seriesconnected U-shaped superheater tubes 90 and having its floor, ceiling and end wall 68 lined with superheater tubes 71. The superheater section has ceramic refractory walls. The proportion of gas delivered to the respective sections is controlled by dampers 81, 82 by a device 93 in accordance with the temperature of the superheated steam sensed at 94 in the outlet header 40. The gas flows are united in duct 78 and thereafter pass to a stack or a fan 80. Steam from the generating tubes 53 is passed directly, or through an optional superheater 67¹, to mix with saturated steam received from an accumulator (26), Fig. 1 (not shown), whereafter the mixture passes to the superheater tubes 90 to flow therethrough in countercurrent to the gas flow. Steam is received from the accumulator at substantially uniform flow and pressure. However, any variation in this flow is compensated by adjusting the quantity of steam produced in the generator section by adjusting the fuel flow to the furnace burner 54. Control may be effected to cause the superheated steam to be discharged at substantially uniform temperature and pressure. Steam is delivered to the accumulator via a steam and water drum (16), which steam is intermittently generated in the water-cooled hood or heads (12) of one or both of a pair of steel refining furnaces (10, 11). The steam is condensed in the accumulator and is flashed into saturated steam on discharge therefrom.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19680227



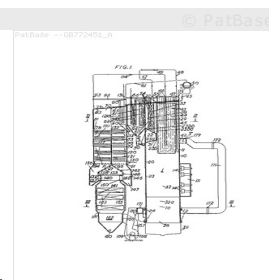
18) Family number: 20045989 (GB772451A)

IMPROVEMENTS RELATING TO TUBULOUS VAPOUR GENERATING AND VAPOUR HEATING UNITS AND METHODS OF OPERATION THEREOF

Abstract: Source: GB772451A 772,451. Controlling steam temperature in water-tube boilers. BABCOCK and WILCOX, Ltd. May 24, 1955 [May 24, 1954], No. 15303/54. Classes 123(2) and 123(3) A water-tube boiler comprises twin vertical furnace chambers 1, 1x lined with steam generating tubes and separated by a tubulous partition 2, the lining tubes and those of the partition extending between lower headers such as 12, 24 and' a steam and water drum 50 common to both halves of the unit. The furnaces 1, 1x are fired by respective pulverized fuel burner groups 14, 14x and have hopper-shaped bottom portions. An arch 21, 21x projects from the common rear wall 20 of the furnaces to define, with the front wall 10, an outlet throat for combustion gases. In the description below, since the two halves of the unit are identical only that associated with furnace 1 is referred to, reference numerals for corresponding parts in the other half being suffixed "x" in the Figures. From a level just below the gas outlet throat to the roof 27 of the unit, the side and front walls 32, 10 are lined, with radiant superheater tubes 44, 45. Above the arch 21 a lateral gas pass 28, locating a secondary superheater 53 comprising pendent tube platens widely spaced across the pass, conducts combustion gases to a turning space 70 whence they flow downwardly in parallel passes 71, 72 lined with superheating tubes, and respectively housing a primary superheater 110 and a reheater 120. The gases leave passes 71, 72 through respective openings controlled by dampers 140, 150 and unite for downward flow in a pass 141 containing an economiser 142. From the bottom 162 of pass 141 the gases flow to the stack through a duct 163. Each half of the unit is provided with a flue gas recirculation system for controlling reheat and superheat temperatures. The gas is withdrawn from the bottom of pass 141 through a duct 167 and delivered by a fan 168 to a manifold 171 whence damper-controlled ducts lead to openings on each side of the hopper bottom of the furnace chamber and a damper-controlled extension leads to a branch duct 177 disposed on the furnace front wall at the level of arch 21 and provided with openings 42 into the furnace. The boiler is designed and the dampers 140, 150 set so that at or near full load the reheat temperature is at the desired value whilst the superheat temperature is too high; under these load conditions, the superheat temperature is reduced as necessary by a spray attemperator 49. With decreasing load, when the temperatures of reheat and superheat tend to fall, the reheat temperature is maintained' by recirculating flue gas to ports 42 to increase the mass flow rates through passage 28 and hence the heat available for reheating. Both the decreasing load and the gas recirculation to ports 42 tend to cause a reduction in superheat temperature which is compensated firstly by reducing the water supply to the attemperator and, at loads below attemperation range, by recirculating flue gas to the furnace bottom portions to reduce the amount of heat absorbed by the furnace lining tubes and make more available for superheating.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19570225



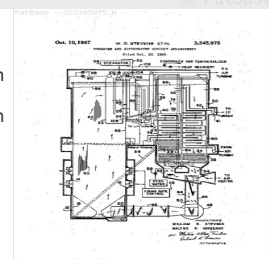
19) Family number: 699324 (US3345975A)

REHEATER AND SUPERHEATER CIRCUIT ARRANGEMENT

Abstract: Source: US3345975A ABSTRACT OF THE DISCLOSURE A forced flow once-through boiler the circuitry of which includes pendant superheater and finishing superheater sections in series flow relationship, the finishing superheater section being positioned in a convection heat transfer area of the boiler, flow bypass means for the working fluid between the pendant superheater section and the finishing superheater section bypassing the finishing superheater and turbine during start-up of the boiler, the pendant superheater being disposed with respect to the finishing superheater and relative the gas flow in front of the finishing superheater to shield the latter.

Probable Assignee: FOSTER WHEELER CORP

Earliest Publication Date: 19671010



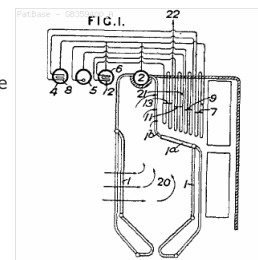
20) Family number: 18970330 (GB359400A)

IMPROVEMENTS RELATING TO STEAM GENERATORS

Abstract: Source: GB359400A 18425. [Class 123 (ii).] Steam boilers comprise furnace-heated watertubes discharging into one or more drums, a number of evaporators in one or more of which steam is directly introduced into the water space, and the rest, which may include the boiler drum or drums, are of surface-heating type and a number of superheaters between each successive pair of which in the steam circuit are disposed the desuperheating elements of the evaporators. Water-tubes 1, 1a, 1b lining the walls of a combustion chamber 20 discharge into a steam drum 2 from which steam passes to a superheater 7 at the rear of a chamber 21. The steam then passes successively through the heating element 8 of an evaporator 4 and a superheater 9 whence it is discharged into the water in a direct contact evaporator 5. Steam generated in this evaporator passes through a superheater 11, the heating element 12 of an evaporator 6 and a superheater 13 to the outlet 22. Steam generated in the indirect contact evaporators 4, 6 unites with steam from the drum 2 on its way to the first superheater. The steam flow in all the superheaters except the last is counter to that of the furnace gases. Modified boiler constructions similar to embodiments shown in Specifications 340,295, 342,361, and 343,594 are described.

Probable Assignee: KARL BAUMANN

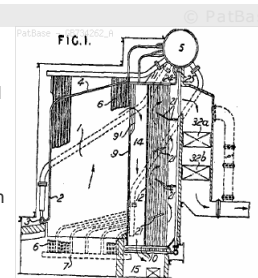
Earliest Publication Date: 19311016



21) Family number: 19820038 (GB734262A)

IMPROVEMENTS IN STEAM GENERATORS AND HOT-WATER BOILERS

Abstract: Source: GB734262A 734,262. Water-tube steam boilers; hotwater boilers. BOUELLAT ENGINEERING, Ltd., and BAUER, F. W. May 5, 1952 [Feb. 5, 1951], No. 2818/51. Classes 64 (1) and 123 (2). A water-tube steam boiler or hot-water boiler has a furnace chamber 1 with walls and roof formed by closely spaced water tubes 2, 4, 6, 9 which may be provided with heatconducting fins and which extend between distributor headers 3, 7, 10 and an upper steam or hot-water drum 5. Alternate tubes in the upper part of the furnace rear wall are offset at 91 to provide a screen through which furnace gases flow into an open downpass 14 extending the full height of the furnace. The downpass is bounded on one side by the tubes 9 and on the other by the foremost row of tubes 12 which form the convection-heated section of the boiler. The gases turn in a soot and c. chamber 15 and rise through a pass in which are disposed the remaining tube rows of the convection section, the tubes in each row extending from lower headers 10 to upper headers 11 which are connected to the drum 5 by pipes 24, 25. Baffles 21 in the convection section cause the ascending gases to flow in a sinuous path, two of the baffles having hinged portions forming dampers whereby at low loads the convection section can be by-passed by part of the gases. From the convection section the gases flow through a downpass in which is disposed an economizer 32a, 32b. In a modification, Fig. 2, not shown, the downpass 14 is divided by a vertical, tubulous partition, one part housing a superheater whilst the other constitutes a dampercontrolled superheater by-pass.



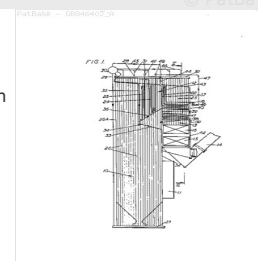
Probable Assignee: FREDERICK WALTER BAUER

Earliest Publication Date: 19550727

22) Family number: 20395662 (GB846402A)

IMPROVEMENTS IN TUBULOUS VAPOUR GENERATORS

Abstract: Source: GB846402A 846,402. Water-tube steam boilers. BABCOCK and WILCOX Ltd. Nov. 14, 1958 [Nov. 8, 1957], No. 34824/57. Class 123(2) A water-tube steam boiler comprises a vertically elongated furnace chamber 10 which is lined with water tubes and has a lateral pass 12 which accommodates secondary superheater banks 24, 25 and leads to a vertical down pass 13 which is divided by a metal plate partition 56 into main pass 9 and a lateral by-pass 19 controllable respectively by dampers 67, 68. Three nested sets 50, 51, 52 of sinuous tubes, extending upwardly from a feed header 53 across the whole of the down pass 13 between side wall portions 54, 55 of refractory material, form superposed economizer tube banks 15, 16. The tube set 50, extending upwardly from the bank 16 as side wall tubes 58 to a header 59, support the inner end of the bank 16, the lower bank 15 being supported by cross-beams 57. The tube sets 51, 52, extending upwardly from an intermediate location of the bank 16 to form respectively economizer banks 20, 21 in the by-pass 19, form wall tubes 60, 61, 62 which feed into a header 63, the tubes 60, 61 being joined together where they cross. The ends of the banks 20, 21 adjacent the partition 56 are supported by beams 64, 65. The lower portion of the rear wall 42 of the pass 13 is formed of refractory material 42, the upper portion being lined with rows 40 of down flow tubes 40 which supply steam to two seriesconnected primary superheater banks 17, 18 which extend across the main pass 9 and lead to a tube bank 22 suspended from the roof 43 of the pass 13 which is formed by the bent-over tubes 40. Steam from the bank 22 passes successively through the secondary superheater banks 24, 25 to an outlet header 49. A proportion of the rear wall tubes 32 of the furnace chamber 10 extends forwardly to form a lower surface 33 of an inwardly projecting arch 34 and some of the arch tubes extend upwardly as a screen 35 across the inlet to the lateral pass 12. The remainder of the tubes, defining the upper surface 36 of the arch 34, extend upwardly as part of a screen 37 across the outlet from the lateral pass 12. The tubes of the rear wall 32, which extend upwardly past the lower part of the arch 34, enter a horizontal header 38 from which a row of smaller tubes 39 extends upwardly to complete the screen 37. In a modification, Fig. 3 (not shown), the pass 13 is divided by two spaced partitions into a central main pass and twolateral bypasses, the economizer banks 15, 16 being formed by four nested tube sets to provide in each by-pass an arrangement of economizer tube banks similar to the banks 20, 21 in Fig. 2.



Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19600831

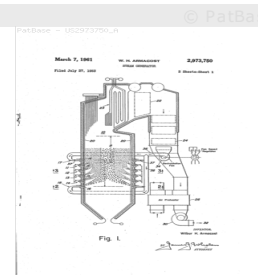
23) Family number: 20176923 (US2973750A)

STEAM GENERATOR

Abstract: Source: US2973750A (Claim 1) 1. The method of regulating -temperature of steam from a heater absorbing its heat mainly by convection from gases leaving a water tube cooled furnace com- prising; introducing fuel and air into the furnace for creating a "gas mass to radiate heat to the water tubes 'thereof;.' maintaining, for a given load, a substantially uniform rate of fuel firing; passing the gases from the furnace over the steam heater for heating steam passing 00 therethrough; adjusting the firing angles of the fuel burners for regulating the temperature of gases passing over the steam heater by changing the position of the zone of combustion with respect to portions of the water cooled furnace: walls; and as the steam temperature varies rein-05 troducing into the furnace a volume of gases that has already been passed over the superheater, the volume of recirculated gases being introduced between said gas mass in the zone of combustion and said tubes when the superheat temperature falls and directly into said gas mass iq from below said zone of combustion when the superheat temperature rises.

Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19560307



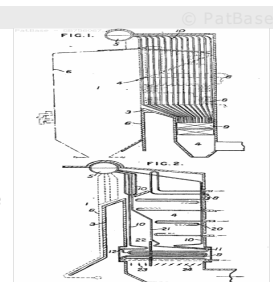
24) Family number: 19408215 (GB756067A)

IMPROVEMENTS IN AND RELATING TO VAPOUR GENERATORS

Abstract: Source: GB756067A 756,067. Water-tube steam boilers. FOSTER WHEELER, Ltd. Dec. 2, 1954 [Dec. 2, 1953], No. 33532/53. Classes 123(2) and 123(3). In a water-tube boiler having a furnace 1 lined with steam generating tubes 6 extending between lower headers and an upper steam and water drum 5 and in which combustion gases discharge from the furnace through an opening in the upper part of the rear wall 3 thereof to flow downwardly in a vertical pass 4 locating the tube banks of a superheater 8 and an economiser 9, the economiser banks are formed of U-tubes which are each connected to drum 5 by a riser 10, the risers lining the side walls or all of the walls of pass 4. As shown in Fig. 2 the economiser tubes are connected to headers 11, 12, some of the risers from header 11 being used to form a division wall 21 in the downpass 4 to provide a gas by-pass 22 for a reheater 20 disposed below the superheater 8, the gas flows through the by-pass and reheater pass being respectively controlled by dampers 23, 24.

Probable Assignee: FOSTER WHEELER LTD

Earliest Publication Date: 19560829



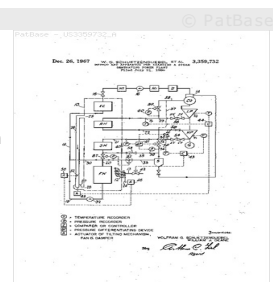
25) Family number: 22365169 (US3359732A)

METHOD AND APPARATUS FOR STARTING A STEAM GENERATING POWER PLANT

Abstract: Source: US3359732A ABSTRACT OF THE DISCLOSURE A method and apparatus for hot restarting a forced through flow stream generating power plant wherein the temperature of the start-up steam is raised to the level of the high temperature retained by critical metal parts of the turbine, while at the same time sufficient flow is provided through the furnace walls, the superheater and the reheater to protect these heating surfaces against heat damage that would otherwise be caused by the relatively high rate of fuel firing necessary to produce steam temperatures matching the temperature of critical turbine parts during hot restarts. This is accomplished through the use of a combination of tilting burner or gas recirculation arrangements with fluid recirculation and various fluid bypasses, while keeping to a minimum the heat losses to the condenser. This application is a continuation-in-part of our earlier application entitled, "Method and Apparatus for Starting a Steam Generating Power Plant," Ser. No. 494,492, filed Oct. 11, 1965, now abandoned, which is assigned to the same assignee as the present invention.

Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19670329



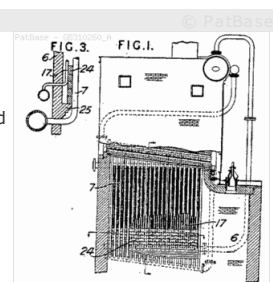
26) Family number: 18631346 (GB310260A)

IMPROVEMENTS IN OR RELATING TO STEAM GENERATORS

Abstract: Source: GB310260A Controlling and moderating superheat.-Steam generators having one or more of the furnace walls 6 equipped with a water-tube screen 7 between which and the wall a superheater 17 is located are provided with a partition 24 of adjustable, size between the water-tubes and superheater. The partition is built up of a variable number of refractory blocks upon a ledge 25 and supported laterally by the tubes so that the appropriate degree of superheat may be obtained.

Probable Assignee: SUPERHEATER CO LTD

Earliest Publication Date: 19290425



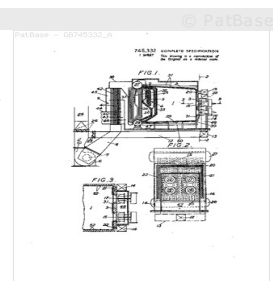
27) Family number: 20181162 (GB745332A)

IMPROVEMENTS IN TUBULOUS VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB745332A 745,332. Furnace gas recirculation. BABCOCK and WILCOX, Ltd. Dec. 18, 1953 [Dec. 26, 1952], No. 35308/53. Class 51 (1). [Also in Group XIII] In a water-tube steam boiler the front and side walls, floor and roof of the furnace chamber 1 are lined with steam-generating tubes which extend between upper and lower drums 27, 28, the furnace being horizontally fired through the front wall by burners 15, 16 (and 17, 18, not shown in Fig. 1), the combustion gases discharging through a screen of generating tubes 33 defining the rear wall of the furnace and flowing serially through a pass 4A locating a convection superheater 5, a down-pass between baffles 35, 36 in which is disposed a group of generating tubes 34 and an up pass 37 housing a group of downcomer tubes, the gases discharging from the boiler through a breeching 38 and flowing downwardly through the tubes of an air heater 9 and through a duct 8 to an induced draught fan 6 whence they pass through a duct 11 to a stack 24. Combustion air passes from the air heater through a duct 47 to a wind-box 48 around the burners. To maintain a constant temperature of superheat, especially when the steam output falls, a duct 12 is provided to recirculate flue gas from duct 11 to the furnace, the duct connecting with a transverse duct 13 positioned below the furnace front wall. From respective ends of duct 13 a duct 14 extends upwardly adjacent each front corner of the furnace, the upper ends of ducts 14 being provided with dampers 23 and being interconnected by a cross duct 19. A slot 20 and slots 21, 22 disposed adjacent and parallel to the roof and sides of the furnace respectively connect ducts 19 and 14 throughout their lengths to the furnace chamber so that when gas is being recirculated it forms a moving blanket or screen over the roof and sides of the furnace, reducing the radiant heat transmission thereto so that the heat content of the gases flowing through the superheater pass is correspondingly increased. The recirculated gas flow is controlled by dampers 25, 26 in ducts 12 and 11 respectively, whilst the dampers 23 control the distribution of the gas in the furnace. Specification 721,155, [Group XIII], is referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

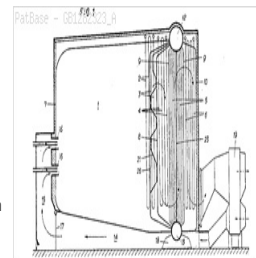
Earliest Publication Date: 19560222



28) Family number: 18063830 (GB1282323A)

IMPROVEMENTS IN STEAM GENERATORS

Abstract: Source: GB1282323A 1282323 Steam generators WAAGNEBBIRO AG 24 July 1969 [25 July 1968] 37372/69 Heading F4A A self-supporting steam generator which comprises drums 12, 13 resting on a foundation structure 18 and connected by evaporator tubes 5, has tubular heating surfaces 2, 3, 4, 6 the disposition of the tubes of which substantially repeat throughout the length of the drums in boiler cross-sections transverse of the drums, and is provided with walls 8, 9, formed by some of the tubes 5, to guide heating gases to flow upwardly and downwardly and transversely in planes of these boiler cross-sections, control tubes of the evaporator 5 being of larger diameter and of greater wall thickness than the remaining evaporator tubes. The walls 8, 9 have fins which connect to form walls extending across the width of the boiler, the fins being omitted at certain points of the walls for passage of gases therethrough. A radiation shield 26 stiffened by tubes 21 protects the final part of heating surface 2 (superheater) from the direct radiation from the furnace 1. Combustion gases pass to an air heater 19 through which incoming air passes via a space 14 to oil burners 16. The tubes of the evaporator 5 are connected by horizontal vertically spaced stays (24), Fig. 2 (not shown). Additional support for the generator is provided by a support 17.



Probable Assignee: WAAGNER BIRO AG

Earliest Publication Date: 19700305

29) Family number: 20790872 (GB877837A)

IMPROVEMENTS IN POWER PLANTS

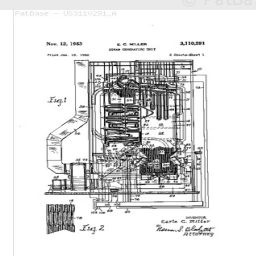
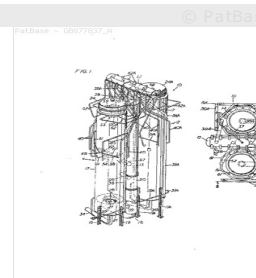
Abstract: Source: GB877837A 877,837. Generating combustion products under pressure. FOSTER WHEELER Ltd. May 28, 1959 [May 28, 1958], No. 18292/59. Class 51 (1). [Also in Groups XIII and XXVI] A combined gas and steam cycle power plant comprises two pressure-fired steam generators, one of which includes a convectively heated first-stage superheater and a convectively heated steam re-heater in addition to steam generating tubes, and the other of which includes a convectively-heated second stage superheater in addition to steam generator tubes; a gas-turbine connected to receive hot combustion gases from the steam generators and drivingly connected to an air compressor for the supply of combustion air to the steam generators, also to a useful power machine; a multi-stage steam turbine set connected to receive superheated steam from the second stage superheater and to return steam to the reheater to be re-heated between two of its stages; and an after-burner or reheater disposed in the duct through which combustion gases flow to the gas turbine, whereby the temperature of these gases can be maintained at or near a prescribed maximum value for optimum efficiency. The plant shown comprises a pair of pressure-fired steam generators 11, 12 which supply superheated steam to a steam turbine set, not shown, steam from an intermediate stage being re-heated in a reheater in steam generator 11. Combustion gases from the combustion chambers of the steam generators 11, 12 discharge through duct 15 and drive a gas turbine 91 which drives an air compressor 92 and an electric generator 93, air from the compressor passing through ducts 34, 34A to the combustion chambers of the steam generators. An after-burner 90 is disposed in the combustion gas duct 15 and fuel may be supplied thereto, also air tapped from the ducts 34, 34A through ducts 95, 96, and 98; some air may also be led into the duct 15 upstream of the after-burner 90 through duct 97. The steam generators 11, 12 are mounted vertically side-by-side with the combustion gas outlet duct 15 disposed vertically between them. The steam generator 11 comprises a cylindrical shell 17 and a refractory lining 16 within which is a lower radiant furnace section 25 and an upper convection section 26. Air under pressure, for example 75 lb. per square inch gauge, supplied through duct 34 enters the chamber 31 from which it issues through openings 32 and through openings 28 in the wall 27 into the combustion chamber 25. Fuel is supplied to the latter through burners 29. The wall of the combustion chamber 25 is lined with axially-extending tubes 35 which extend between an inlet header 36 and an outlet header 37, the inlet header being connected to the common steam and water drum 13 by way of a pair of downcomers 38 and distribution pipes 39 and the outlet header being connected to the steam and water drum by way of riser pipes 40. The upper part of the combustion chamber is formed of rectangular cross-section by means of walls 41, 42, 43, 44, a combustion gas outlet duct 46 extending through wall 41. The walls are lined with axially-extending steam generator tubes 48, 49, 50, 51 respectively, the tubes extending between inlet and outlet headers 52 and 53, 54 and 55, 57 and 59, 58 and 60 respectively. The inlet headers 52, 54, 57 and 58 are connected to the steam and water drum 13 by way of pipes 61 from the downcomers 38, and the outlet headers 53, 55, 59 and 60 are connected to the steam and water drum by way of pipes 62. Steam from the drum 13 passes to the inlet header 70 of the first stage superheater 64 by way of pipe 72, the inlet header being connected to the outlet header 71 by way of tubes 69 which have horizontally-extending portions connected by reverse-flow bends. A convectively-heated steam reheater 63 is also disposed at the upper part 45 of the steam generator 11 and comprises an inlet header 67 to which steam from an intermediate turbine stage is passed through inlet pipe 68, the inlet header 67 being connected to the outlet header 66 by way of tubes 65 which have horizontally-extending portions connected by reverse-flow bends. Re-heated steam is returned to the turbine from outlet header 66 by way of pipe 74. The tubes of the first stage superheater and the reheater are arranged so that either may be removed without interfering with the other, the upper portion 23 of the combustion chamber shell having a removable cover and being large enough to permit their removal. Steam from the first stage superheater 64 passes from outlet header 71 through pipe 73 having an expansion bend 77 to the inlet header 75 of the second stage superheater 76 which is disposed at the upper part 45A of the steam generator 12 and comprises a series of horizontally-extending tubes 81 connected by reverse-flow bends extending between inlet header 75 and outlet header 82, steam passing from header 82 to the turbine inlet through duct 84. The steam generator 12 is similar to generator 11 except that the convectively-heated second stage superheater 76 only is provided in the upper part 45A, no reheater being provided therein. Combustion gases from the steam generators discharge through outlets 46, 83 to a common pipe 15 through which gases pass to the inlet of the gasturbine 91 finally discharging through a feed water heater to atmosphere. The air compressor 92 driven by the turbine 91 supplies air under pressure through ducts 34, 34A to the combustion chambers of the steam generators 11, 12 under control of valves 103. Air may also be fed from the ducts 34, 34A through ducts 95, 96 and 98 to a reheat chamber 90 disposed in the combustion gas duct 15, the air supply being controlled by valve 100. Fuel is also supplied to the reheater chamber through a burner not shown. Air from the duct 97 may be supplied into the exhaust gas duct 15 upstream of the reheat chamber 90 under control of valve 99. A control device sensitive to pressures at the gas-turbine inlet and compressor outlet is provided to control the valve 99.

Probable Assignee: FOSTER WHEELER LTD

Earliest Publication Date: 19610920

30) Family number: 22993429 (US3110291A)

STEAM GENERATING UNIT



Abstract: Source: GB975388A 975,388. Water tube steam boilers; regulating steam temperature. RILEY STOKER CORPORATION. Jan. 14, 1963 [Jan. 16, 1962], No. 1553/63. Heading F4A. In a steam generator having an upright furnace fired by burners disposed below abutments projecting from opposed furnace walls, one of the walls having a nose on its upper portion below a lateral gas offtake whilst the other wall supports a radiant superheater, the superheat temperature is controlled by adjusting the burners or the air supply thereto in response to final steam temperature to position the flame within the furnace near to or remote from the radiant superheater, the effect being accentuated by blowing secondary air through openings formed above the abutments, the amounts of air entering from each side being varied so as to assist in directing the flame either towards or away from the radiant superheater. In the form shown, the generator has a vertical tube-lined furnace 19 divided by opposed abutments 21, 22 into a radiation chamber 24 and a lower high temperature cell 23 into which burners 25, 26 fire. Above the abutments are air openings 78, 81. A nose 27 is formed on the rear furnace wall 15 below a lateral offtake 28 which leads to two parallel downpasses 33, 34, the flows of gas through which are controlled by proportioning dampers 91, 95. Gases leave the boiler through an air heater 35 and stack 36. On the front wall 14 of the furnace is mounted a radiant superheater 47 which receives steam from a primary superheater disposed in the pass 34, the steam then flowing through a pendent superheater 49 and outlet header 51 to a turbine. Steam to be reheated flows through a primary reheater disposed in the pass 33 and a pendent reheater 53 to return to the turbine through an outlet header 54. The headers 51, 54 contain respective temperature pick-offs 72, 71, which transmit signals representative of superheat and reheat temperature to a controller 68. At high loads when the superheat temperature would otherwise tend to rise above the desired value, the controller increases the air flow to the burner 25 and that from the openings 78 whilst decreasing the flow from the openings 81. The unbalanced air injection to the burners serves to deflect the stream of hot gases away from the superheater 47, the effect being accentuated by the additional air injected at 78. This lowers the gas temperature as it enters the lateral pass by causing the stream to take a long path through the chamber 19. At low loads; the burner 26 and the openings 81 receive the major portion of air, thus deflecting the gases towards the superheater 47 and shortening their flow path in the chamber thus maintaining the correct superheat temperature. Instead of varying the proportions of the air passing to the burners to control flame placement in the furnace 24 the burners may have intertube vanes which are adjusted relative to one another to produce the same effect. Temperature correcting adjustments are simultaneously made to the dampers 91, 95 and to the rate of water injection to a interstage desuperheater 105. Depending on the load on the boiler the controller 68 also varies the proportion of air passing to the burners to that passing to the openings 78, 81 so that at low load the burner air proportion is increased whilst at high load the air flow to the openings is increased. The formation of nitrous oxide at high loads is thereby minimized whilst the air injection completely oxidizes any nitrous oxide formed.

Probable Assignee: ATEC INC

Earliest Publication Date: 19631112

31) Family number: 20107584 (GB738214A)

IMPROVEMENTS RELATING TO VAPOUR GENERATING AND SUPERHEATING UNITS AND TO THE CONTROL OF THE TEMPERATURE OF SUPERHEATED VAPOUR

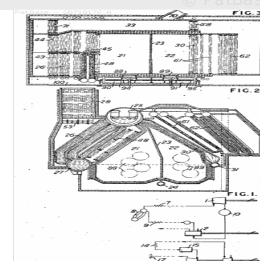
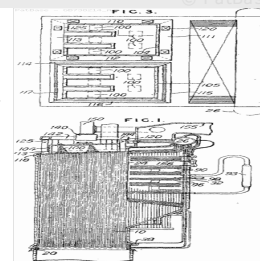
Abstract: Source: GB738214A 738,214. Steam superheaters, BABCOCK and WILCOX, Ltd. June 4, 1953 [June 4, 1952], No. 15417/53. Class 123 (3). A steam boiler comprises a furnace chamber 10 divided into two vertical compartments by a mid-partition formed of steam generating tubes, the front and side walls of the chamber being lined with generating tubes whilst the rear or baffle wall 24, which is also formed of generating tubes, serves to separate the furnace from an uppass 32 in which is disposed primary and secondary convection superheaters 90, 96 and an economizer 156. Each furnace compartment is downwardly fired by a group of pulverized fuel burners 100, the burner groups, which are enclosed in windboxes 104, 105, being spaced inwardly from the compartment walls, so that in operation, combustion gases pass down through each compartment without impinging on the walls thereof, the gases then turning laterally for upward flow through pass 32. The steam generating tubes extend between headers such as 20, 38 and a steam and water drum 26 from which steam flows through the primary superheater 90, an interstage attemperator 93 and the secondary superheater 96 to the final outlet header 98. To maintain the temperature of superheat constant over a wide load range, the attemperator 93 is used at high loadings when the superheat temperature tends to rise above the required value, whilst at low loadings when the steam temperature tends to fall, flue gas is recirculated to the furnace to reduce the radiant heat absorption therein and give a corresponding increase in the heat content of the gases entering the superheater pass 32. The flue gas is withdrawn from outlet duct 155 by a fan 150 which discharges it through ducts 140, 142, 144 and damper controlled vertical ducts such as 120, 125 into manifolds 110... 113 and 114... 117 surrounding respectively the windboxes 104, 105, the gas passing through slots 118 provided along the undersides of the manifolds to form a downwardly moving layer on each wall surface of the furnace compartments thus partly screening the lining tubes thereof from transfer of radiant heat from the combustion products passing from the burners centrally down each compartment. By operation of the dampers in the vertical ducts such as 120, 125, the flue gas layer can be formed on one or more selected surfaces whilst the flow velocity of the layer can be controlled by adjustment of the fan speed. To avoid premature mixing of the flue gas and fresh combustion gas, the flow velocity of the flue gas layer is made approximately the same as or greater than that of the stream of combustion gas. The attemperation and gas recirculation may be automatically controlled by apparatus such as that described in Specification 729,437. Specifications 367,699, 504,114, 516,070, 523,870, 540,119 and 721,155 also are referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19551012

32) Family number: 20096133 (GB718176A)

IMPROVEMENTS IN OR RELATING TO MIXED POWER PLANTS INCORPORATING TUBULOUS VAPOUR GENERATORS



Abstract: Source: GB718176A 718,176. Power plants; water-tube steam boilers. BABCOCK and WILCOX, Ltd. Oct. 8, 1951 [Oct. 9, 1950], No. 24595/50. Classes 123(2) and 123(3) A steam-boiler, Figs 2 and 3, comprises a pair of separately-fired combustion chambers 21, 22 which are separated by a refractory-covered tube wall 23, the tubes of the latter extending between a lower header 24 and an upper steam-and-water drum 25, and are bounded by steamgenerating tube banks 26, 30 through which combustion gases flow, respectively, direct to an uptake 28 and through a passage 33 at the rear of the boiler also to said uptake. The tube bank 26 is divided by a baffle wall 45 into sections 43, 44 through which gases from the chamber 21 flow in parallel under the control of dampers 53 at the respective exits of the gas flow paths, and a superheater 48 is located within the section. 43. The tube bank 30 is relatively shallow, and beyond it there is provided a two-part air-heater 61, 62. Further shallow banks 68, 71 of steamgenerating tubes extending from the drum 25 to the lower drums 27, 31 of the tube banks 26, 30 are disposed within the passage 33. The boiler 7, 8, 9, Fig. 1, is intended for a mixed power plant comprising steam and gas turbines 1, 3, the latter being supplied with gas from, and driving, an air compressor 13 which forces 'air successively through the air heater 14 (61, 62) and a chamber 15 in which a small quantity of fuel is combusted. The exhaust from the steam turbine is condensed at 10 and returned to the boiler, and that from the gas turbine provides. combustion air for the boiler burners 17 (88, 89). An internal combustion engine 2 may also be incorporated in the plant, the engine being cooled by the condensate from the steam turbine and the exhaust therefrom being discharged into the boiler passage 33 through a conduit 70. The air supply from the air turbine to the wind-boxes 90, 91 of the burners 88, 89 is controlled by dampers 94, 95 respectively, and, during operation of said turbine, a pressure is maintained within the outer wall 100 of the boiler at least equal to the pressure within the wind-boxes by means of a fan which may also be used, if necessary, for supplying air to the burners and air-heater. Specification 718,259 is referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19541110

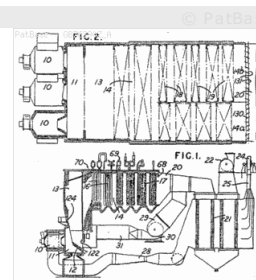
33) Family number: 19454973 (GB762902A)

FORCED FLOW, ONCE-THROUGH, TUBULOUS VAPOUR GENERATORS AND METHODS OF OPERATION THEREOF

Abstract: Source: GB762902A 762,902. Combustion apparatus. BABCOCK and WILCOX, Ltd. June 24, 1954 [June 26, 1953], No. 18522/54. Class 51 (1). [Also in Group XIII] A forced flow, once-through steam c. boiler, especially for operation at super-critical pressures, comprises three independently operable cyclone furnaces 10, of the form described in Specification 552,747, arranged to discharge high temperature gases into a secondary furnace 11 whence the gases flow through a slag screen 12 into a vertical radiation and gasmixing chamber 13 and discharge therefrom through a lateral pass 14 in which is disposed a secondary superheater 16, the rear portion of pass 14 being divided into parallel passes 14a, 14b locating respectively a convection primary superheater 17 and high and low pressure reheaters 18, 19, the gas flow through each pass being controlled by dampers 130, 131. From passes 14a, 14b the gases flow into a common outlet duct 20 leading to an air heater 21 and an induced draft fan 22. Combustion air is supplied to the furnaces by a fan 24 which delivers the air through duct 25, the air heater and ducts 28. A regulated portion of the cooled flue gases is withdrawn from duct 20 through a conduit 29 leading to a fan 30 from which it passes through duct 31 and ports 122, 124 into chamber 13 at sufficient velocity to ensure intimate mixing with the fresh gas and in sufficient quantity to ensure that the temperature of the mixed gases at the entrance to pass 14 is such that entrained slag particles are in a solidified condition and that overheating of superheater 16 is avoided. Feed water at a pressure, for example, of 5500 pounds per sq. in., is supplied to the inlet header of the cooling tubes of one of the end cyclone furnaces and passes successively through these cooling tubes and those of the other two furnaces to an outlet header whence the heated water is conveyed to the inlet header 68 of the primary superheater 17, the furnace heating surfaces being so arranged that the transition zone occurs in this superheater. Steam from the superheater 17 passes via headers 69, 70 into a radiant superheater consisting of serially connected tube panels lining the walls of chamber 13, the final superheating of the steam being effected in the secondary superheater 16. The final steam temperature is controlled primarily by controlling the firing rate of the cyclone furnaces 10, further control suitable for operation at partial loads to raise the steam temperature being provided by varying the number of furnaces in use and by regulating the quantity of recirculated gas. Specifications 201,304, [Class 51 (i)], 206,559, [Class 122 (iii)], 398,413, [Group XIII], and 762,940 also are referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19561205



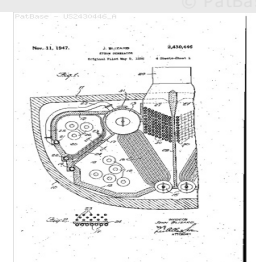
34) Family number: 22417507 (US2430446A)

STEAM GENERATOR

Abstract: Source: US2430446A 1. A steam generator comprising a setting, an upper drum and two spaced lower drums in the setting, a bank of steam generating tubes connecting the upper drum and each of the lower drums and defining between said banks, at least in part, a boiler furnace, means for firing the furnace, a superheater in the setting at one side of the furnace and separated therefrom by tubes of one of said banks, means for firing the superheater, baffle means disposed between the superheater and the boiler furnace and arranged to confine the heating gas flow from the superheater Bring means to a relatively small portion of the flow area of the boiler furnace beyond the fuel ignition zone therein, and a single. gas outlet for the setting at the other side of the furnace and separated therefrom by the other bank of tubes_

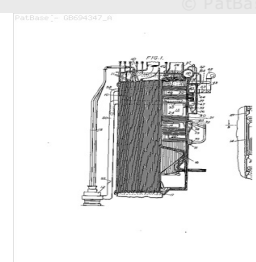
Probable Assignee: FOSTER WHEELER CORP

Earliest Publication Date: 19440926



35) Family number: 20534850 (GB694347A)

IMPROVEMENTS IN OR RELATING TO AIR HEATERS INCORPORATED IN TUBULOUS FLUID HEATERS



Abstract: Source: GB694347A 694,347. Air heaters. BABCOCK and WILCOX, Ltd. Aug. 31, 1951 [Sept. 1, 1950], No. 20589/51. Class 64 (i) A tubular fluid heater, such as a water-tube boiler, has fluid circulation tubes forming a wall defining one side of heating-gas pass, and a tubular air heater having inlet and outlet headers supported from the wall outside the gas pass, the air heater tubes extending from the headers between the tubes of the wall and to and fro across the gas pass with the reverse bends supported against the opposite tube wall. The invention is shown applied to a steam generator having a furnace lining of water tubes between the steam drum 20, Fig. 1, and header 17. The furnace is fired by burners 11 using pulverized fuel from a mill 12, the air heater being designed to vary the supply of hot air to the fuel to suit its moisture content. The hot gases from the furnace pass downwardly and then upwardly between walls 14, 21 formed by the down-coming banked water tubes, the walls defining a hot gas pass 15 in which are situated economiser tubes 26, 32, superheater tubes 24, 25 and the air heater tubes 46. The wall 21 has refractory material between its tubes. The economiser tubes coming from header 31, Fig. 2, are supported from the walls by brackets 27, 30, 34, 35, links 28, 29 and an intermediate support 36. The boiler unit is supported at the upper end by hangers 40, Fig. 1, and straps 37 so that thermal expansion is downward. Tie bars 41 welded to water tubes 22 support the tubes against horizontal lateral heat expansion. The air heater comprises inlet header 45 and banked U-tubes 46 leading to outlet header 47, both headers being outside the gas pass 15. Primary air to header 45 is provided by fan 42, Fig. 1, with control damper 53, a by-pass tube 52 with control damper 54 joining the hot air supply pipe 50 leading to the fuel pulverizer 12. The U-tubes 46 of the air heater are in rows, Fig. 3, with alternate tubes bent horizontally in opposite directions to pass at 56 between the water tubes at the same level and the U-tubes are supported by a saddle 57, Fig. 2, from the economiser tube 32a. Supporting saddles 60, 61 maintain the tubes 46 in alignment. The horizontal differential expansion between headers and wall 21 is allowed for by making the headers in longitudinal sections connected by bellows expansion joints 38 and the header sections are anchored at mid point to one of the tubes 22 to move both horizontally and vertically with the tubes as shown in Fig. 4. Upper and lower projections 63A, 63B on the header plate 63 engage lugs 62 on the tube 22. Additional supports 70, Fig. 3, similar to lugs 62, but arranged at the ends of each header section, connect the headers with the tubes but allow for horizontal heat expansion. Refractory enclosures 71, 72, 76, Fig. 1, are provided around the superheater headers 73, 74, 75, the economiser headers 33, 31 and the air heater headers 45, 47. Seal plates 82, 83, 84, Fig. 2, are also provided for the vestibule of enclosure 76. the lower end of the seal plate 84 being in horizontal and vertical sliding contact with the header 47.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19530715

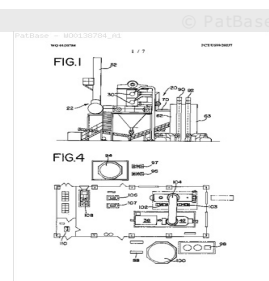
36) Family number: 15435241 (WO0138784A1)

COMBUSTION SYSTEM AND PROCESS FOR RICE HULLS AND OTHER COMBUSTIBLE MATERIAL

Abstract: An environmentally attractive combustion system and process are provided with an efficient furnace (32, fig. 3) in a boiler train (34, fig. 11) equipped with a special set of burners (30, fig. 2) to completely combust fuel comprising rice hulls or other combustible material. Desirably, the furnace is designed and arranged to prevent the rice hulls or other combustible material from impinging, corroding, or otherwise damaging the furnace walls. An air heater (46, fig. 11) provides heated air with the fuel. A primary conduit provides a scroll pattern pathway (116, fig. 8) to pneumatically convey and swirl the heated fuel about the inlets of the burners. Impellers (138, fig. 9) mix secondary air comprising another portion of the heated air with the preheated fuel about the burners. The secondary air is regulated by an air register (144, fig. 8). Advantageously, the economical combustion system and process control the combustion temperature and residence time of combustion of the rice hulls or other combustible materials to minimize the formation of abrasive crystalline silicon dioxide.

Probable Assignee: AGRILECTRIC POWER INC

Earliest Publication Date: 20010531



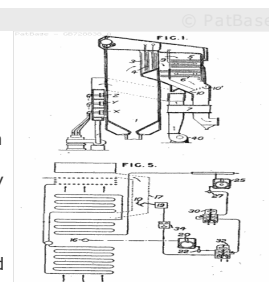
37) Family number: 19697631 (GB728838A)

IMPROVEMENTS IN OR RELATING TO VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB728838A 728,838. -Fluid-pressure servomotor control systems. BAILEY METERS and CONTROLS, Ltd. July 4, 1952 [July 5, 1951], No. 16852/52. Class 135. In a vapour generator with a superheating surface, the temperature of the vapour which has left the superheater is controlled by regulating the quantity of gas flowing through a superheater by-pass, or the quantity of cooling fluid supplied to a vapour attemperator, in accordance with a temporarily availing control impulse derived from the gas temperature in the neighbourhood of the superheating surface, the quantity of gas by-passed or the quantity of cooling fluid supplied increasing on a rise in such heating gas temperature. The invention is shown applied to a steam generator comprising a furnace 1, Fig. 1, with walls lined by the water tubes, and a gas path consisting of a tube screen 3, secondary superheater 4, primary superheater 5, economizer 6 and air heater 7. A by-pass 9 around a portion of the superheating surface is provided, and the distribution of gases between the main and by-pass paths is controlled by dampers 10, 10¹. The burners X, Y, Z are spaced along the length of the furnace, and each burner is fed with a separate supply of pulverized fuel entrained in air from an induced draught fan and with secondary air from a forced draught fan 40, this latter air flowing through the heater 7 and past regulating dampers situated just before the burner boxes. The temperature of the gas in the vicinity of the superheating surface is measured by bolometers 16, Fig. 5, or by thermo-couples and the ensuing signals are applied to a recorder-controller 20 which actuates a pilot valve 22 to apply an appropriate air-loading pressure to a relay 32. A measure of the temperature of the steam at the outlet is also obtained and, by means of a recorder-controller 25, a pilot valve 27, and a relay 30 giving a proportional and time-integral control, is applied to relay 32. The output of this latter relay is passed through a manual-automatic change-over panel 34 and applied to a power device 19 which positions a damper 10 in the gas by-pass 17. The temperature of the heating gases as detected by the bolometers 16 thus furnishes a coarse control of the final steam temperature, and the latter itself gives the fine control to its desired value. The power device 19 may consist of a diaphragm motor actuating a valve controlling the supply of cooling fluid to an attemperator positioned between the primary and secondary superheaters; The rate of firing by the individual burners X, Y, Z is selectively controlled and, as the boiler load decreases, burner X is the first to be shut-down to be followed later by burner Y. Thus the steam pressure exercises a control over all the burners, and burners Z are additionally controlled by the steam and air flow. All three of the above variables exercise a controlling influence on vanes situated in the inlet to, and on a valve which controls the speed of the forced draught fan, and such speed is also correlated with that of a hydraulic tachometer. Vanes in the inlet of the induction draught fan, and also the speed of such fan, are controlled in a similar manner by the furnace draught. An arrangement having only two banks of burners is described. The various controls are all effected through relays as described in Specification 461,389, or modifications of such relays. Specifications 425,507, 656,551, [both in Group XII]; 707,225 and 707,226, [both in Group XL (b)], also are referred to.

Probable Assignee: BAILEY METERS CONTROLS LTD

Earliest Publication Date: 19550427

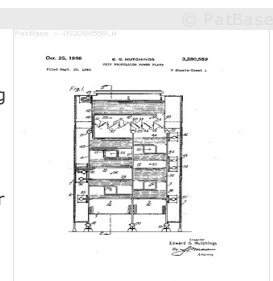


SHIP PROPULSION POWER PLANT

Abstract: Source: US3280559A (Claim 1) 1. A ship propulsion system comprising forward drive turbine means including a superheat stage and a reheat stage, astern drive turbine means including only a superheat stage, and means for selectively supplying superheated and reheated vapor to said forward drive turbine means or only superheated vapor to said astern drive turbine means including a vapor generator, said vapor generator including walls defining a furnace chamber, means for burning fuel in said furnace chamber to produce high temperature heating gases, means defining a heating gas pass connected for the flow therethrough of high temperature gases from said furnace chamber, superheater and reheater tube banks disposed in said heating gas pass, and means for preventing overheating of the tubes of said reheater tube bank when superheated steam is supplied to said astern drive turbine means.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19650329

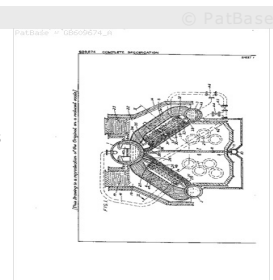


IMPROVEMENTS IN OR RELATING TO TUBULOUS VAPOUR GENERATING AND HEATING UNITS

Abstract: Source: GB609674A 609,674. Water-tube steam and c. boilers; steam superheaters. BABCOCK and WILCOX, Ltd., and ZOLLER, R. E. March 20, 1946, No. 8632. [Classes 123(ii) and 123(iii)] A marine steam and c. boiler, Fig. 1, comprises a furnace with two separately-fired furnace chambers 6, 7 divided by a wall 8 and provided with individual gas outlet passages 18, 22 between which and the said chambers respectively are located banks of steam-generating tubes 4, 5 extending between an upper steam-and-water drum 1 and lower water drums 2,3. The tube banks 4, 5 are each constituted by upper and lower sections 4a, 4b and 5a, 5b between which are defined spaces locating, in the bank 4, a first superheater section 24 and, in the bank 5, a second superheater section 30 and a reheater 31. In operation, steam is led from the drum 1 by a pipe 41 to the superheater section 24 and from thence by a pipe 42 to the section 30, some of the steam from the section 24 being, if desired, cooled by passage through desuperheating pipes 43 disposed within the water drum 3; simultaneously, steam from between stages of an associated prime mover is circulated through the reheater 31. The arrangement is such that, during ahead working, both furnaces are fired at an aggregate rate corresponding to the necessary steam output and pressure, the relative rate of firing the furnace 7 being adjusted to the required temperature of reheat and the superheat temperature being regulated by valves 44, 45 which are fitted in the pipe 42 to control the steam flow through the desuperheater 43, but during astern working, when no reheat is required, only the furnace 6 is fired so that the superheater section 30 and reheater 31 becomes ineffective. The wall 8 preferably comprises a row of studded tubes which extend from the drum 1 to a header 10 below the floor of the furnaces and are covered with refractory material applied in plastic condition; such material is also applied to the uppermost row of tubes in the lower sections 4b, 5b of the banks 4, 5 to form baffles 28, 29 and 37, 38, 39 to prevent furnace gases by-passing the superheater sections and reheater. The superheater section 24 preferably comprises two rows of looped tubes extending between headers 25, 26 at the rear of the boiler, the section 30 five rows of tubes connecting headers 32, 33, and the reheater six rows of tubes connecting headers 35, 36, these three units being secured in place by plates mounted on tube rows 27, 34 extending within the banks 4, 5 between the sections thereof. A two-part economizer 19, 23, as described in Specification 551,700 for example, may be located in the gas uptakes 18, 22. The invention may be applied to a boiler in which each of the tube banks 4, 5 has an associated upper steam- and-water drum instead of a single drum common to both banks. In a modification, the desuperheater 43 is dispensed with and the degree of superheat controlled by adjustment of a damper 53, Fig. 4, in a gas by-pass formed by a wall 50 with a metal extension 51 which divides the tube bank 4 into front and rear portions 4a<1>, 4b<1> and 4a<11> and 4b<11>, the first superheater section 24 being located wholly between said tube bank portions 4a<11>, 4b<11>.

Probable Assignee: RONALD ERNEST ZOLLER

Earliest Publication Date: 19481005

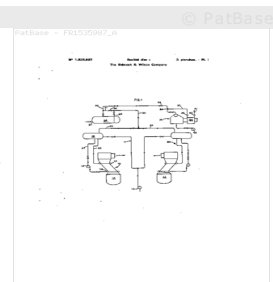
SYSTEME GENERATEUR DE VAPEUR ET SURCHAUFFEUR
GENERATOR SYSTEM OF STEAM BOILER (MACHINE TRANSLATION)

Abstract: Source: FR1535987A (Claim 1) 1. Systeme generateur de vapeur et surchauffeur comprenant une chaudiere chauffee par du combustible, comprenant un foyer, un bruleur du combustible a pouvoir calorifique eleve, un passage de convection pour les gaz de combustion divise en deux sections paralleles de circulation communiquant avec le foyer, un faisceau de tubes generateurs de vapeur dans l'une des sections, un faisceau de tubes surchauffeurs dans l'autre section, un dispositif pour proportionner le courant de gaz provenant du foyer dans les deux sections paralleles d'ecoulement, un accumulateur de vapeur, un melangeur pour melanger le courant de vapeur saturante provenant de l'accumulateur au courant de vapeur du generateur et envoyer ce melange aux tubes surchauffeurs, et un dispositif repondant a la temperature du melange de vapeur surchauffee sortant des tubes surchauffeurs pour proportionner les courants de gaz a travers les sections paralleles de circulation des gaz.

Machine translation: (Claim 1) 1. Steam generator system including a boiler and boiler heated by fuel, comprising a furnace, a fuel burner has power, heat high,. A passage: convection for gas-combustion divided into two sections parallel circulation contacting the home, a tube bundle steam generators in one of the sections, a superheater tube bundle in the other section. a device for proportioning the current, gas from the furnace in the two sections of parallel flow, steam accumulator, a mixer for mixing the saturated vapor stream from the accumulator to the vapor stream from the generator and send the mixture to the tubes superheaters, and un.dispositif replying to the temperature of the mixture of superheated steam leaving superheater tubes for: proportioning gas streams through the sections parallel circulation des.gaz.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19680809

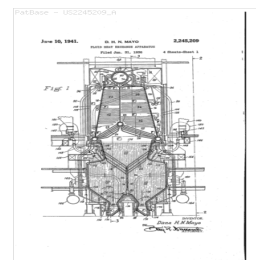


FLUID HEAT EXCHANGE APPARATUS

Abstract: Source: US2245209A 1. In a water tube steam boiler, a furnace fired by two sets of burners positioned on opposite sides thereof and divided between said sets by a row of water tubes, walls forming a plurality of gas passes arranged in parallel and receiving the furnace gases, a superheater in one of said passes at one side of the boiler, and an economizer in another pass, one of said sets of burners being disposed at the superheater side of the furnace and the other set at the economizer side.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19410610



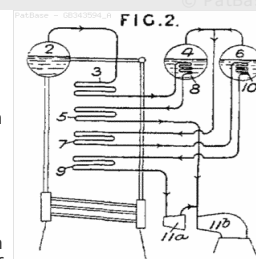
42) Family number: 18873344 (GB343594A)

IMPROVEMENTS RELATING TO STEAM GENERATORS

Abstract: Source: GB343594A 37091/30, 37092/30, 37093/30, 37094/30, and 37095/30. Divided on 340,295. [Class 123 (ii).] A water-tube boiler has two or more superheaters 3, 5, alternating in the steam circuit with heating elements 8 in the water space of one or more separate evaporators 4, 6, and optionally in the boiler drum or drums 2 and the steam from the evaporators is passed in a separate circuit through one or more superheaters 7, 9, and optionally through heating elements 10 in the evaporators and drums. Steam circuits operated at different pressures may supply high and low pressure stages 11a, 11b of a mixed pressure turbine or the like. Boiler constructions consisting of water-tube furnace walls part of which are arranged to shield an upper superheater chamber from furnace radiation may be employed and the superheaters may be located so that the first is exposed to the cooler gases and its steam flow is counter to the gas flow whilst a second superheater is exposed to hotter gases and its steam flow is in the same direction as the gas flow. A superheater chamber may be provided on both sides of the space above the furnace or may consist of an upper bottleshaped extension of the furnace space.

Probable Assignee: KARL BAUMANN

Earliest Publication Date: 19310223



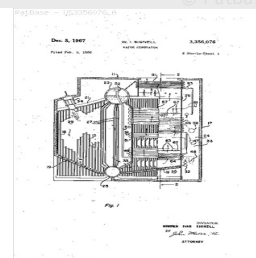
43) Family number: 23009409 (US3356076A)

VAPOR GENERATOR

Abstract: Source: GB1179441A 1,179,441. Water tube boilers; preventing overheating of reheater tubes. FOSTER WHEELER CORP. 1 Feb., 1967 [2 Feb., 1966], No. 4833/67. Heading F4A. A marine water tube boiler 10 is fired by roof burners projecting into a front tube lined furnace combustion chamber (Fig. 1, not shown). The exhaust gases pass over a bank of steam generating tubes extending between upper and lower drums 26, 28 respectively, and into a rear upright convection pass 14 through lower opening 40. A fin tube wall 42 divides the pass 14 into main and by-pass passages 46, 44 respectively, the main passage containing the secondary part 52 of a two part superheater 48 through which steam flows in parallel to the exhaust gases, and a reheater 54 through which the steam flows in counterflow to the exhaust gases. The by-pass passage contains economizer section 64. The gases from both passages then pass over economizer section 81 in flue 74. An opening 58 extends through the partition wall 42 to allow gas to pass from below the main passage 46 to the by-pass passage 44 after passing over the primary part 51 of superheater 48. The primary superheater part 51 is itself by-passed by an additional by-pass passage containing a further economizer section 62 and control dampers 60. During normal operation, steam superheat and reheat temperature control is effected by regulation of dampers 60, 66 in the by-pass passages. On going astern, when vapour flow through reheater 54 is stopped, damper 66 is opened wide and shut off dampers 70 in main passage 46 closed to prevent gas flow therethrough. The combustion gases then pass through opening 58 to the by-pass passage 44. As damper 70 is closed, damper 79 linked to it by shaft 80 is simultaneously opened to allow cooling air or other gas from wind box 75 to pass over the reheater tubes 54. Variation of damper 60 continues to regulate the superheater steam temperature.

Probable Assignee: FOSTER WHEELER CORP

Earliest Publication Date: 19671205



44) Family number: 731274 (US3504655A)

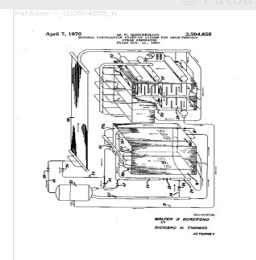
NATURAL CIRCULATION START-UP SYSTEM FOR ONCE-THROUGH STEAM GENERATOR

Abstract: Source: US3504655A ABSTRACT OF THE DISCLOSURE

A once-through vapor generator including means for operating the generator during start-up by natural circulation subsequently converting to forced circulation during high pressure normal operation of the generator.

Probable Assignee: FOSTER WHEELER CORP

Earliest Publication Date: 19700407



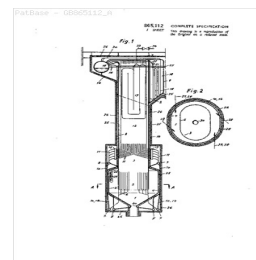
45) Family number: 20719580 (GB865112A)

IMPROVEMENTS IN OR RELATING TO BOILERS FIRED WITH PULVERISED FUEL

Abstract: Source: GB865112A 865,112. Pulverized fuel fired boiler furnaces. KOHLENSCHIEDUNGS-G.m.b.H. April 9, 1957 [Feb. 16, 1957], No. 11624/57. Class 51 (1). [Also in Group XIII] In a pulverized fuel fired tube lined boiler furnace comprising a tangentially fired combustion chamber 1, Fig. 1, a gas outlet channel 3 and a radiation chamber 2, the horizontal cross - sections of the chambers and the channel are approximately elliptical. The fuel and combustion air are blown into the combustion chamber through respective nozzles 27, 28, Fig. 2, additional air being supplied through nozzles 29. The chamber has a molten slag outlet 30 and, in operation, slag particles are centrifuged against the chamber walls, the rate of particle separation from the gases being increased, if necessary, by the use of sound generators which may be incorporated in the nozzles. The chamber 1 may be of circular cross-section and the ratio of the major axis to the minor axis of the horizontal cross-section of the channel 3 may equal, or be greater than, the similar ratio of the combustion chamber. The horizontal crosssection of the radiation chamber 2 may either remain unchanged up to the boiler roof or be of rectangular section in the upper part.

Probable Assignee: KOHLENSCHIEDUNGS GMBH

Earliest Publication Date: 19610412



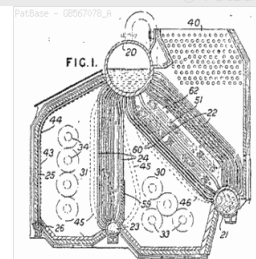
46) Family number: 19143786 (GB567078A)

IMPROVEMENTS IN THE CONSTRUCTION AND OPERATION OF TUBULOUS VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB567078A 567,078. Steam generators. BABCOCK and WILCOX, Ltd. June 7, 1943, No. 9095. Convention date, July 15, 1942. [Classes 123 (ii) and 123 (iii)] A steam generator comprises an upper steam and water drum 20 and two lower water drums 21, 23 with two banks 22, 24 respectively of interconnecting water tubes, a main furnace chamber 30 fired by liquid-fuel burners 33, an auxiliary furnace chamber 31 fired by burners 34, a common flue 40, and a superheating unit in the form of a plurality of single-loop horizontally extending nested tubes 51 located in a space 62 between the large diameter screening tubes 60 of the bank 22 and the remaining relatively small diameter tubes. A baffle 59 formed of refractory material and extending upwardly on the side of the tube bank 24 adjacent the furnace 30 is provided to deflect heating gases from the furnace 31 away from the burner area of the furnace 30, and the side of the furnace 31 opposite to the tube bank 24 may be protected by a row of water tubes 25 which are covered with refracting material 43 and interconnect the drum 20 and a lower water heater 26. The arrangement is such that, by suitable adjustment of the burners 33, 34, effective control of superheat temperature is possible over a wide load range, and adequate protection of the superheater may be ensured at starting-up and during low load periods. The headers (not shown) of the superheating tubes 51 are located between double walls at the back of the boiler setting and are arranged parallel to the tube bank 22; the double walls at the back, and those at the front, also locate downcomer tubes 44, 45, 46 leading from the drum 20 to the header 26 and drums 23, 21 respectively. In addition to the usual steam outlet (not shown) leading, from the drum 20 to the superheater, a second outlet may be provided for the direct withdrawal of saturated steam.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19450126



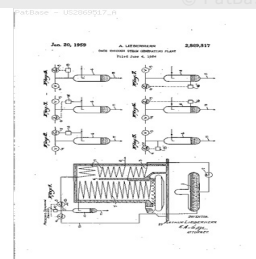
47) Family number: 29750537 (US2869517A)

ONCE THROUGH STEAM GENERATING PLANT

Abstract: Source: GB746733A 746,733. Steam-raising in forced flow boilers. SULZER FRERES SOC. ANON. Sept. 20, 1954 [Sept. 26, 1953], No. 27218/54. Class 123(2). In a forced flow, once through steam boiler comprising a feed pump 2 which supplies water from a hot well 1 through a preheater section 3 to a vaporizer section 31 from which wet steam passes into a separator 4 whence saturated steam flows through a superheater 7 to an outlet pipe 8, the vaporizer section is cooled during the warming-up period of the boiler by a flow of water delivered from pump 2, the water recirculating to the hot well 1 through a pipe 10. During this period, a valve 5 in the line to the superheater is closed, the superheater being screened from radiation by a wall 6, and a valve 9 in pipe 10 opened. The valves 5, 9 are actuated manually or automatically, for example by a regulator 12 sensitive to pressure at the valve inlets, so that valve 5 is opened and valve 9 closed when sufficient steam is being generated in section 3.

Probable Assignee: SULZER AG

Earliest Publication Date: 19560319



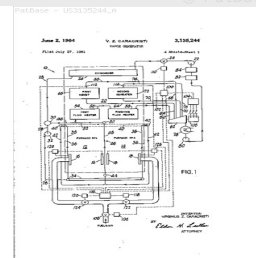
48) Family number: 31445648 (US3135244A)

VAPOR GENERATOR

Abstract: Source: GB1008792A 1,008,792. Forced flow steam boilers; regulating steam temperature. SULZER FRERES S.A. July 27, 1962 [July 27, 1961], No. 29026/ 62. Heading F4A. In a forced-flow, once-through steam boiler operating with reheat and at subcritical or supercritical pressure and having two independently-fired furnaces the outer walls of which are lined with parallel-connected heat exchange tubes and which are separated by a tubulous partition of parallel-connected heat exchange tubes, the furnaces discharging gases into a common pass, the wall lining tubes and partition tubes and further heat exchange surfaces in the gas pass are serially connected for flow of the working medium and the or each reheater is exposed primarily to the gases produced in one of the two furnaces. As shown in Fig. 1 the boiler has a pair of furnaces 12, 14 respectively fired by tangential tilting burners 16, 18 and discharging gases into a common gas pass 20. Water is supplied by a pump 22 through a regulator valve 24 to an economizer 26 in the gas pass. From the economizer it flows through a mixing vessel 30, a recirculating pump 32 and a lower header 34 to enter the tubes 38 lining the outer walls of the furnaces. The tubes are diametrically finned and welded together. Steam or steam-water mixture flows from the tubes into a header 40 and thence through lines 42 and a header 44 to enter the partition tubes 48 which may also be welded together or may be contiguous and unwelded. From these tubes steam flows serially through superheaters 54, 58 to a turbine 62. First and second stage reheaters 66, 72 are disposed in the gas pass 20 so as to be substantially wholly in the flow of gases from the furnaces 12 and 14 respectively. Reheat temperature is controlled by independently adjusting burner tilt in or gas recirculation to the two furnaces and the range of control may be extended by differentially firing the furnaces. When starting or at low loads when the flow velocity in the wall lining tubes 38 and partition tubes 48 is below a critical value, a recirculation of working medium through these tubes is superimposed on the through-flow system by starting the pump 32. In a modification, Fig. 9 (not shown) there is a single stage of reheat, the reheater being aligned with the gas flow from the furnace 14. In this installation the major portion of the superheater is aligned with the gas flow from the furnace 12.

Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19630809

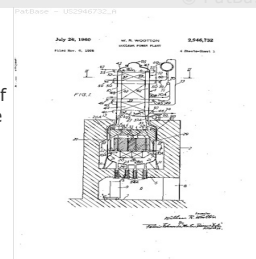


NUCLEAR POWER PLANT

Abstract: Source: US2946732A 803,382. Steam boilers combined with nuclear reactors. BABCOCK and WILCOX. Ltd. Nov. 8, 1956 [Nov. 11, 1955], No. 32300/55. Class 123(2) [Also in Group XL(a)] A steam generator having as a source of heat a nuclear reactor is housed with the reactor in a common pressure vessel. In the form shown in Fig. 1, the complete steam generator 1 is supported by a massive, cylindrical, concrete structure 2 part of which serves as a biological shield for a nuclear reactor 3, the structure having a thick transverse floor 5 covered with steel plates and below which is disposed a fuel element handling room 6 in which operates a handling vehicle 6. The generator 1 includes a pressure vessel 10 of circular cross section having a lower part 10A of larger diameter than the upper part 10B, an upper part 13 of the structure 2 extending inwardly above the part 10A whilst a thickened part of the structure is provided around the upper section of the part 10A in the region of maximum radiation from the reactor. The nuclear reactor, which is of the graphite moderated, carbon-dioxide gas cooled, natural uranium type, is formed with a large number of vertical holes 15 in which are disposed fuel elements in such manner that annular gas flow passages are provided thereabouts and is supported on a grillage 20 mounted on brackets 21 welded to the pressure vessel wall. A biological shield 26 built up from hollow steel blocks filled with concrete is arranged above the reactor so as to leave an annular gas flow space 30 between the shield periphery and the inner surface of the pressure vessel part 10A, the space 30 having an annular downward continuation 30A between an apron 31 surrounding the reactor and the vessel wall. The shield 26 is formed with gas channels 33 of chevron form to ensure effective screening of the upper part of the pressure vessel and has about its upper periphery a shield ring 36 from which a sheet metal baffle 37 extends upwardly coaxially with the pressure vessel part 10B, the cross section of the baffle changing from a circle at the ring 36 to a square within the part 10B wherein it forms a central gas pass 39. The stream of gas flowing up within the pass 39 is reversed in a space 40 and flows down outside the baffle in opposite segmental passages 41, then passing into and through the spaces 30, 30A and upwardly through the reactor to re-enter the pass in a heated condition. The gas is circulated by axial flow fans 91 which withdraw it from the upper part of each of the passages 41 and deliver it into the lower part thereof. Within the pass 39 are tube banks forming a superheater 44, a steam generating section 48 and an economizer 52, feed-water being supplied to the latter through a pipe 67. The heated feed-water is delivered from the economizer into a steam and water drum 69 whence it is withdrawn by a pump 71 which circulates it through the steam generating section 48 and back to the drum wherein steam is separated. The steam flows from the drum through the superheater 44 to the final outlet header 46. A louvred tray 95 connected to a header 98 is provided under the superheater 44 to collect and drain any condensate falling from the tube banks when the boiler is being started up. In a modification, the pressure vessel is of spherical form and contains a generator of the once-through type. In either form the biological shield may be located wholly within the pressure vessel.

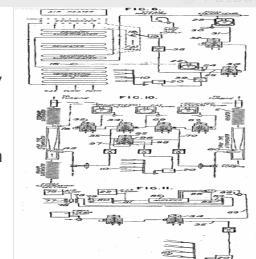
Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19570316



IMPROVEMENTS IN OR RELATING TO VAPOUR GENERATING AND VAPOUR HEATING UNITS

Abstract: Source: GB756842A 756,842. Liquid, gas and pulverulent fuel fired furnaces. BAILEY METERS and CONTROLS, Ltd. June 27, 1952 [June 29, 1951], No. 16304/52. Class 51(1). [Also in Groups XIII and XXIX] In a vapour generating and vapour heating unit, the temperature of the vapour is controlled from a determination of the heating gas temperature. In an embodiment, the temperature of the gas in the vicinity of steam superheaters is measured by a bolometer 16, Fig. 6, and applied to a recorder-controller 22 which actuates a pilot valve 24, as described in Specification 425,507, to give a fluid pressure in line 25 corresponding to the gas temperature. The final steam temperature is also measured and applied to a recorder-controller 28 which actuates a pilot valve 30 to give a fluid pressure in line 31 corresponding to the steam temperature. The pressure in line 31 is applied through a relay 32 to a relay 34 to which the pressure in line 25 is also applied. The output from relay 34 is applied through manual-automatic selector valves 38, 39 to fluid-actuated driving devices 19, 20 which actuate, respectively, a throttle valve 18 in a gas by-pass around the superheater and tilting, tangentially-firing burners 10 by means of which the combustion zone can be moved over the tubes of the generating section of the boiler towards or away from the gas outlet. The fuel and air supplies are controlled in accordance with the pressure of the steam at the outlet. The control may be such that the valve 18 is not actuated until the burners have been tilted to the limit position. In a modification, the gas by-pass is replaced by a spray attemperator, as disclosed in Specification 656,551, and the drive 19 actuates a valve controlling the supply of water to the attemperator. In a modification of this last arrangement, the flow of the water passing to the attemperator is measured by passing it through a restriction and applying the pressure at the two sides thereof to a meter. The latter then actuates a pilot valve to give a fluid pressure which is passed to a relay where it is combined with the other pressures controlling the valve in the attemperator water supply line. When the steam generator supplies a turbine, a further, reheater, section 5, Fig. 10, for steam returned from the turbine, or supplied from another source, may be included and both superheater and reheater sections has each its own attemperator 42, 60, respectively. The controlling variables in this modification are the gas temperature taken at the point 16, the temperature of the superheated steam, and the temperature of the reheated steam, these temperatures being applied through recordercontrollers, and pilot valves, to relays 32, 34, 67, 69. The resulting fluid pressure corresponding to the main steam supply temperature is, after passing through relay 32, combined in relay 34 with the fluid pressure corresponding to the gas temperature, and, similarly, the output pressure from relay 69 corresponds to the combined gas and reheater steam temperatures. The output pressures from the combining relays 34, 69 control the water supplies to the spray attemperators 42, 60 as previously described and they are also applied to a relay 95 which selects the lower of the two pressures to control the amount of tilt of the burners 10. This last effect is obtained by feeding the input pressures in lines 35, 70 to the opposite sides of a diaphragm 96 and selecting, by means of valves 97, 98 actuated by diaphragm 96, the appropriate one of these pressures for application to the drive 20 of the burners. As the non-controlling steam temperature would then rise above its desired value, it is reduced by the action of the appropriate attemperator. Where a control according to the total heat available on a rate basis is desired, the air flow, as measured by a meter 75, Fig. 11, positions a movable core 76 of a transformer 77 fed with alternating current. The secondary coils 78... 80 of the transformer, of which 79 and 80 are in opposition, are shunted by potentiometers 81, 83, and the movable contacts of the potentiometers are connected through an amplifier 85 and are positioned by a gas temperature controller 22 and a reversible motor 86, respectively. When the network is driven from its normal balanced condition, the unbalanced signal is amplified and drives the motor to position contact 84 to rebalance the network and also actuate a pilot valve 88 which gives a control pressure in line 89. This pressure is combined in relay 34 with a pressure corresponding to the final steam temperature to give an output pressure in line 35 which actuates the driving device 20 to tilt the burners 10. The gas temperatures may be determined by the thermocouples instead of bolometers. The various relays are the same as, or modifications of, the relay described in Specification 461,389 [Group XXIX]. The vapour generator and vapour heating units may be fired by pulverized fuel, by gas or by atomized oil. Specifications 654,976 [Group XXXVII], 683,696 [Group XXIX], 707,225, 707,226 [both in Group XL(b)] and 756,919 [Group XXIX] also are referred to.



Probable Assignee: BAILEY METERS CONTROLS LTD

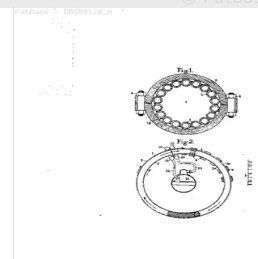
Earliest Publication Date: 19560912

IMPROVEMENTS IN APPARATUS FOR SIMULTANEOUSLY PRODUCING STEAM AND GAS

Abstract: Source: GB689126A 689,126. Steam generators. SOC. DE CONSTRUCTIONS MECANO-THERMIQUES C.O.M.E.T. Oct.31,1950 [Dec.2,1949], No. 26602/50. Class 123 (ii) [Also in Group XXIX] A steam generator comprises one or several hot gas passageways 1 receiving the hot gases from a boiler firebox 5 fired by burners 6 (not shown) each passageway 1 consisting of a ring of small diameter tubes 2 welded side by side to form the passageway and strengthened by support hoops 3 and 12. The water or other liquid flows inside each of the small tubes 2 from a larger ring of tubes 7 also welded together to form the wall of the firebox 5. The hot gases flowing from 5 to 1 may then flow through a superheater composed of similar ring of small superheater tubes 2a Fig. 3, to supply the superheat after which the gases may pass through an economiser of similar construction. The successive sections although welded together as at 10 may be unwelded at a thinner part 11 of the weld. Coupling bolts 9 allow inspection of the weld. The ring of tubes 2 flares out into a cone 8 where the individual tubes are joined to the corresponding tubes 7 of the furnace 5. The tubes 7 then join up with other converging tubes 8a near the burners 6. The inside of the furnace 5 is under gaseous pressure or forced draft to counteract the pressure inside the tubes 7. The furnace 5 has a partial refractory lining 13. In Fig. 2 the water tubes 2 are arranged helically around a steam separator wall bored to form tubular ducts therein. Pressure control. A relay system Fig. 9 operating the fuel supply valve when the steam pressure rises beyond working pressure, and controlled stop valve 45 is arranged in the hot gas outlet. The pressure of the furnace gases at 36 and the steam tube pressure at 37 adjust a common piston rod 33 whereby an attached arm 38 moves piston valves 39 of a pressure oil relay supplied with pressure oil at 43 passing through pipes 40, 40a, 41, 41a to control the fuel supply valve 45. The relay oil flows out at 44 to return to the relay system. Balancing springs 48, 48a tend to keep the control arm 38 at position for normal working pressure. The thickness of the tubes of these boilers can be thinner than boilers where the tubes are not joined together and so do not strengthen each other. Further the pressure of the hot gases on the ring of tubes counteracts the bursting pressure inside each tube. Such possible thinness of tube facilitates heat transfer from the hot gases to the water. Two or more fluids may be circulated through separated groups of pipes 2 and such fluids may be heated to different pressures (through larger or smaller total exposed areas of tube) so that such boilers may supply different steam pressures.

Probable Assignee: CONST MECANO THERMIQUES C O M

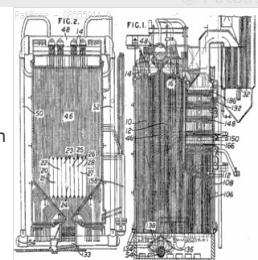
Earliest Publication Date: 19530318

**IMPROVEMENTS IN OR RELATING TO TUBULOUS VAPOUR GENERATORS**

Abstract: Source: GB555911A [Class 51 (i)] [Also in Group XIII] A water-tube steam or vapour generator comprises combustion chambers 10, 12 having watertube walls and separated by a water-tube partition wall 46. The combustion chambers are separately fired at the top by pulverized fuel burners 14, 16 and the lower parts of the combustion chambers and of an extension thereof below a convection pass are inclined downwardly towards an opening leading to an ashpit 133. The gases from the combustion chamber 10 pass through openings 20 ... 28 in the partition 46 formed by bending the tubes out of the plane of the partition, enter the lower part of the combustion chamber 12 and flow to the convection pass with gases from the combustion chamber 12. After passing over steam superheater and economizer elements in the convection pass the gases pass to an air heater 32 communicating by ducts with the burners 14, 16. The tubes of the partition wall 46 are connected to a lower water drum 54 and an upper steam-and-water drum 48 which is connected to the lower drum by downcomer pipes 50, 52. The vertical tubes extending over the side and front walls and hopper shaped chamber at the base of the generator are connected to upper and lower headers and to the upper and lower drums 48, 54. Tubes 106 which pass over the rear wall 108 are bent at 112 to form a screen below the convection pass and then pass upwardly to form a partition between the combustion chamber 12 and convection pass before entering a header communicating with the drum 48. The tubes of the partition 46 situated at 134, 136 within the ashpit are protected by blocks 138. Steam from the drum 48 after passing through superheaters 148, 150 is led to an attemperator 158 and then to a superheater 166 from which it is led to a point of use. Feed water is fed to economizers 186, 192 and thence to the drum 48.

Probable Assignee: BABCOCK AND WILCOX LTD

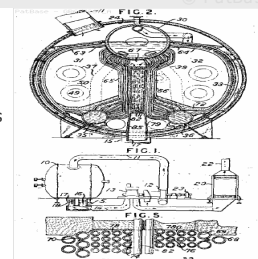
Earliest Publication Date: 19430913

**IMPROVEMENTS IN AND RELATING TO VAPOUR GENERATORS**

Abstract: Source: GB667267A 667,267. Steam and c. boilers; superheaters. FOSTER WHEELER, Ltd. Feb. 19, 1948 [Feb. 19, 1947], No. 4921/48. Classes 123(ii). and 123(iii) A steam and c. boiler 10, Fig. 2, comprises an upper steam-and-water drum 30, lower water drums 35, 36 connected to the latter respectively by banks 65, 66 of steam generating tubes having associated separately-fired furnaces 31, 32, and a superheater 82 disposed in a passage 67 disposed between said tube banks. As shown in Fig. 5 each tube bank comprises two rows 68, 69 of spaced and staggered tubes and four further rows 76, and the spaces between the tubes of the row 69 and of the innermost row 76 are fitted with welded-on closing strips 70, 74 to form baffles, the strips 70 extending from the bottom 72 of the furnace chamber to a point short of the drum 30 and the strips 74 between points short of the drum 30 and of the drums 35, 36. The two rows 69 and innermost rows 76 thus define the superheater passage 67, which terminates in a hopper-shaped conduit 85 having an outlet 17 fitted with a damper 18, Fig. 1, and two side passages 78, 78a, the latter enclosing part of the tube banks 65, 66 and opening into a space 79 which surrounds the conduit 85 and has an outlet 15 also fitted with a damper 16. The arrangement is such that part of the gases from the furnace chambers 31, 32 respectively will flow through the associated tube bank 65 or 66 to the outlet 15 and part through the common superheater passage 67 to the outlet 17, the relative quantities being regulated by the dampers 16, 18 to control the final superheat temperature. The furnace chambers are defined by a wall 33 lined with steam-generating tubes 63, 64, and downcomers 37, 39 are provided between the drum 30 and drums 35, 36. The boiler is preferably housed within a spaced cylindrical casing 24 having an inlet 11 for the supply of compressed air to burners 49 which are enclosed in damper-controlled housings 50 on the front wall of the boiler. Fig. 1 shows a complete installation in which the combustion air conduit 11 is coupled to an air compressor 12 which is driven, during normal operation, by a gas turbine 13 and, at starting, by an auxiliary steam turbine or electric motor 23, the gas turbine 13 itself being driven by combustion gases which are led thereto by a conduit 14 communicating with the boiler outlets 15, 17 and are then directed to an economiser 20 and flue 22.

Probable Assignee: FOSTER WHEELER LTD

Earliest Publication Date: 19520227

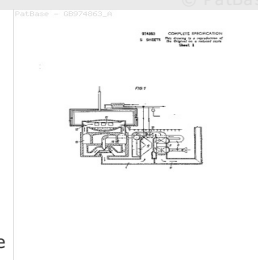


IMPROVEMENTS RELATING TO INDUSTRIAL FURNACES

Abstract: Source: GB974863A 974,863. Heating air; heating steam boilers by waste gases. WAAGNER-BIRO A.G. Dec. 1, 1960 [Dec. 1, 1959; Dec. 4, 1959; Nov. 18, 1960], No. 41306/60. Headings F4A and F4S. An industrial furnace of the regenerative type, for example a Siemens-Martin furnace or a glass-melting furnace, is provided with a separate waste heat recovery unit through which waste gases from the regenerators are passed and wherein heat recovered from the waste gas is applied to preheat combustion air to be supplied to the regenerators, to preheat feedwater and to generate steam therefrom. In the apparatus shown in Fig. 1, waste gases from a Siemens-Martin furnace 11 flow alternately through regenerators 13 and thence to a heat-recovery unit containing boiler tubes 4 in an up-pass and air-heating surfaces 2 in an adjoining down-pass. Combustion air flows through the heater 2 and is conveyed by a duct 5 to the appropriate regenerator 13. Steam is superheated at 15. In Fig. 4 the air-heating surfaces 2 and boiler surfaces 4, 15 are located side-by-side in a single vessel 1, the waste gas flow being controlled by a damper 16. In Fig. 3 (not shown), the unit consists of a waste gas main spaced along which are chambers containing the airheating and boiler surfaces, gas being diverted through the chambers by dampers disposed in the main. Fig. 6 shows a furnace 11 heated partly by burners 12 and partly by the combustion of low calorific value gas which is preheated in the outer regenerators 13. Waste gases from these regenerators and the inner air preheating regenerators 13 flows through an upright vessel containing a large superheater 15 and boiler surfaces 2. Air is heated in an adjoining vessel by indirect contact with steam superheated at 15. In a final modification, Figs. 7-10 (not shown), the waste heat unit consists of an upright vessel located beside the furnace stack and containing a bank of airheating tubes above a bank of steam generating tubes. A stack damper diverts gases through the vessel which is surmounted by an exhaust fan delivering cooled gases into the stack. Large doors providing access to the tube banks are disposed on one side of the vessel.

Probable Assignee: WAAGNER BIRO AG

Earliest Publication Date: 19620510

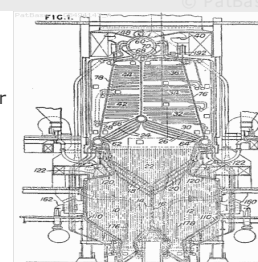


IMPROVEMENTS IN TUBULOUS VAPOUR GENERATORS

Abstract: Source: GB494147A 494,147. Pulverulent and gaseous fuel furnaces. BABCOCK and WILCOX, Ltd. Jan. 19, 1937, No. 1614. Convention date, Jan. 31, 1936. [Class 51 (i)] [Also in Group XIII] In a steam boiler providing means for preventing excessive superheat temperatures, pulverized coal burners 122 and gas burners 160, 162 on opposite sides of the furnace discharge into spaces 10, 12 separated by fluidcooled tubes 14, 16 and leading through a secondary combustion chamber 22 to parallel dampered gas passes 28, 30 across the entrances to which extend steam generating tubes 24, 26. Economizer sections 26, 42, 44 and superheater sections 32, 34 are arranged in the gas passes. The tubes 24, 26 which constitute a slag screen extend between drums 62, 64 and drum 66, respectively connected to an elevated steam and water drum 60 by wall tubes 78, 76, and 68, 70, of the gas passes. Other generating tubes comprise furnace wall tubes 110, 120 and the tubes 14, 16 which diverge upwardly to form slag screens 18, 20. Control of superheat is effected by independent operation of the different sets of burners to vary the relative temperature of the gas streams in the two passes and also by dampers 40, 48 controlling the quantity of the gases. Elongated openings 176, 178 in the furnace walls provide spaces for withdrawal of superheater or economizer elements. The tubes 68, 70 may be supported from drum 60 by means of short tube sections 192 carrying depending lugs to which are bolted upstanding lugs welded to the tubes. In a modification, the tube screens 24, 26 are replaced by tubes extending between headers.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19381019

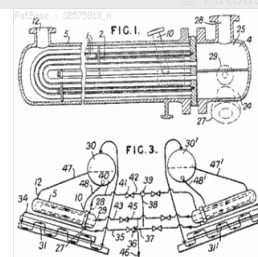


IMPROVEMENTS IN OR RELATING TO MARINE STEAM PROPULSION PLANT

Abstract: Source: GB575918A 575,918. Steam boilers; superheaters. BABCOCK and WILCOX, Ltd., and ZOLLER, R. E. April 24, 1944, No. 7564. [Classes 64 (iii) and 123 (iii)] The temperature of steam from a boiler, or boilers, of a marine propulsion plant including ahead and astern prime movers is controlled by a de-superheater or heat-exchanger which is associated therewith and is maintained at a temperature sufficiently high to permit its immediate use when superheated steam is required for astern working. The de-superheater preferably comprises an enclosed casing 5, having an inlet 10 and outlet 12 connected respectively by a downcomer 48 or 48<1> and riser 47 or 47<1> with the steam and water spaces of the steam and water drum 30 or 30<1> of the boiler, and locating main and auxiliary banks 1, 2 of U-shaped tubes which open into, a head 4 at the one end thereof. This head 4 is divided by walls into a steam inlet chamber 24 with port 27, a main steam outlet chamber 25 with port 28 and an auxiliary steam outlet chamber 26 (not shown) with port 29, the inlets and outlets of the main tubes 1 opening into the chambers 24, 25 respectively and the inlets and outlets of the auxiliary tubes into the chambers 25, 26 so that steam will flow from the port 27 through the chamber 24 and tubes 1 to the chamber 25, from which it may pass through the port 28 or flow through the tubes 2 to the chamber 26 and port 29. As shown, the inlet port 27 leads from piping 34, 35, 37, 38 between superheaters 31 or 31<1> and a common main 39, the port 28 is connected to the steam main 39 through pipes 40, 42, and the port 29 by pipes 43, 45 to a pipe 46 supplying auxiliary apparatus, for example, oil heaters and atomizers requiring steam at a temperature below normal superheat temperature. The arrangement is such that the continuous flow of steam from the superheater to the auxiliary pipe 46 through the de-superheater 5 will maintain normal circulation through the latter of water and steam from the downcomer 48 to the riser 47, and, therefore, normal temperature during ahead working of the plant when the de-superheater is by-passed by shutting a valve 41 in the pipe 40; for astern working a valve 36 in the pipe 35 is shut and the valve 41 opened. The auxiliary tubes 2 and chamber 26 may be dispensed with, in which case the port 29 opens from the main steam outlet chamber 25; alternatively the tubes 2 may be associated with a separate inlet chamber, as well as the outlet chamber 26. The temperature of the de-superheater may also be maintained by locating it in a by-pass parallel with the main leading to the ahead turbines, or by associating it with the wall cooling tubes or the boiler furnace.

Probable Assignee: RONALD ERNEST ZOLLER

Earliest Publication Date: 19460311

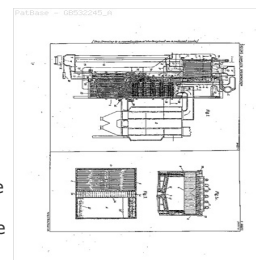


IMPROVEMENTS IN OR RELATING TO TUBULOUS VAPOUR GENERATORS

Abstract: Source: GB532245A 532,245. Pulverulent-fuel furnaces; water-tube boilers. BABCOCK and WILCOX, Ltd. July 17, 1939, No. 20721. Convention date, July 15, 1938. [Class 51 (i)] [Also in Group XIII] A steam generator plant comprises a furnace 1 fired with pulverized fuel from burners 2 and having fluid cooled walls and means for discharging molten slag at the bottom. The gases from the furnace enter the upper end of a pass M with fluid cooled walls which retain molten non-combustible matter from the gases thereon in a sticky condition for the adhesion of additional gas-borne material and then pass downwardly to the lower end of a convection pass N containing steam generating and steam superheating tubes separated by a vertical partition and travel upwardly under the control of dampers 40 to a flue leading to an air preheater 13. Water from the separator C and feed water are supplied by pumps to a header 16 from which they flow through pipes 15 arranged below the convection pass N to vertical tubes 5 lining the wall 9 separating the passes M and N and extending over the roof of the furnace 1 to a header 14. Water from the header 14 passes to headers 17 and through the tubes lining the bottom and side walls of the furnace 1 to upper headers 18 and thence to the separator C. Further supplies of water pass from the header 14 to headers 19, 21, 23 to tubes lining the walls of the passes M, N and to top headers 20, 22, 24 communicating with the separator C. The pass M is divided by water-tube partitions 34 supplied at their lower ends by headers 35 communicating with the headers 14 and connected at their upper ends to headers and to the separator C. The pass N is divided by a vertical partition into small and large compartments, the small compartment having steam generator tubes connected at their lower ends to a header receiving water from the header 14 and at their upper ends to a header leading to the separator C. The larger compartment contains steam superheater tubes receiving steam from the separator C and header 38 and discharging through a header 39 to a high-pressure turbine or the like. Slag from the furnace passes into a hopper O and after being quenched falls through a shoot R into a hopper T which also receives quenched slag from the hopper 26. In a modification the lower ends of the walls of or below the pass N are lined with tubes for re-heating steam. The slag outlet 26 at the base of the plant below the passes M, N may be arranged at the centre or towards either side of the base. Specification 497,718 is referred to.

Probable Assignee: BABCOCK AND WILCOX LTD

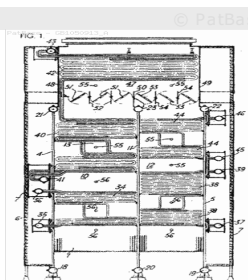
Earliest Publication Date: 19410121



58) Family number: 23107040 (GB1050913A)

WATER-TUBE STEAM BOILERS.

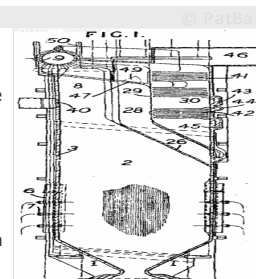
Abstract: Source: GB1050913A 1,050,913. Water-tube steam boilers. BABCOCK and WILCOX Ltd. Sept. 25, 1964 [Sept. 26, 1963], No. 38030/63. Heading F4A. In a reheat steam boiler of a ship's propulsion power plant the reheater tubes are protected from overheating during astern operations when there is insufficient or no steam circulating in the reheater tubes. The steam boiler comprises a furnace chamber 9 (Fig. 2, not shown) formed by front and side tube walls 2, 4 and 5 and an intermediate transverse tube wall 8 that is spaced at a distance from the rear tube wall 3 to form a vertical gas up-flow passage 10 adjacent the furnace chamber 9. The latter is down fired by oil burners 14, the combustion gases flowing through a screen 24 to pass upwardly through the passage 10. Fig. 1 shows a vertical transverse section through the passage 10 which is divided by a tube wall 11 to form first and second passes 12 and 13 respectively in which heating surfaces are arranged. Feedwater enters header 45 and passes through an economiser 44 in the first pass to header 46 from where it is led to a separator drum 28. Steam from the separator drum 28 is fed into header 35 and passed through the primary superheater 34 in the second pass to header 36 from where it is led via header 37 to the secondary superheater 38 and header 39 in the first pass and passed to the first stage of a turbine engine. Expanded steam from the first stage of the turbine engine is fed into the header 43 and passed through reheater tubes 42 and 40 to header 41 from where it is led to later stages of the turbine engine. At the top of each gas pass are arranged control dampers 51 and 53 which are used when astern operation are being carried out to direct the flow of most of the combustion gases through the first gas pass 12. The heat absorbed by the primary superheater 34 in the second gas pass and the secondary superheater 38 and the economiser 44 in the first gas pass prevents overheating of the reheater tubes 40 and 42 during the operations. In modifications all the reheater tubes may be inside the second pass beneath the dampers 51; combustion air heating tubes and further economiser tubes may be arranged above the dampers 51 and 53; additional gas passes containing further heating surfaces may be provided and/or the gas passes may be arranged on different sides of the furnace chamber with or without controlling dampers; the reheater may be positioned downstream of the dampers; and an attemperator to cool the vapour between or after the superheating stages may be used.



59) Family number: 19506921 (GB654347A)

IMPROVEMENTS IN VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB654347A 30380. [Classes 123(ii) and 123(iii)] [Also in Group XII] In a steam generator of the type disclosed in Specifications 532,245 and 534,279 secondary air inlets and burners 7 are so disposed in the corners of the combustion chamber 2 as to produce a rotary turbulent flame along the axis of said chamber, inlets 40 are provided in the upper narrowed part 8 of said chamber for the injection of tertiary air or cooled combustion gases, and a gas passage 28 lined with water tubes 26, 29 leads downwardly to a vertical convection pass 30 containing superheater tubes 41 42. The upper super heater tubes 41 are connected directly to a drum 9 disposed at the top of and in line with the front wall 3 and to an outlet header 43, the lower superheater tubes being connected to upper and lower headers 44 and 45 respectively. The roof of the combustion chamber 2 is provided with a series of dampers 47 whereby waste gases can be diverted to a gas conduit 46 bypassing the gas passage 28 and the convection pass 30. The drum 9 with the front wall 3 is supported from the boiler framework by slings 50 and each bank of tubes defining inner and outer walls are suspended at the same level.

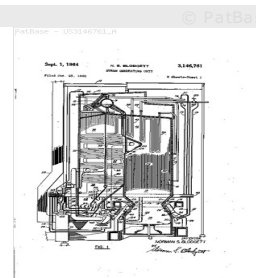


Probable Assignee: WILLEM FREDERIK CAREL SCHAAP

Earliest Publication Date: 19510613

60) Family number: 22477281 (US3146761A)

STEAM GENERATING UNIT



Abstract: Source: GB998317A 998,317. Controlling steam temperature in boilers. RILEY STOKER CORPORATION. Jan. 14, 1963 [Jan. 23, 1962], No. 1555/63. Heading F4A. In a steam generator having an upwardlyfired, vertically elongated furnace discharging gases into a convection section, superheat and reheat temperatures are controlled by combining the effects of flue gas recirculation and flame placement in the furnace, flue gas being gathered from two spaced locations so that its temperature may be regulated and introduced into the furnace at upper and lower locations thereof whilst the burners are provided with means whereby the main stream of combustion gas may be positioned relative to the front and rear walls of the furnace. In the form shown the generator furnace 11 is lined with water tubes which extend between lower headers and a drum 31 and is fired by burners 26, 27 located on the lower surfaces of opposed abutments 19, 23, the burners being provided with vanes whereby the flames therefrom can be directed downwardly or upwardly into a high temperature cell 28, an upward and downward inclination respectively of the vanes of the burners 26, 27 causing the main stream of combustion gases to flow upwardly against the rear wall 15 of the upper part 29 of the furnace and vice versa. Above a nose 41 is a lateral offtake 42 leading to parallel downpasses 37, 38, the gas flow through which is controlled by dampers 51, 44. Gases leave the boiler through an air heater 56 and stack 57. Steam from the drum 31 flows successively through a primary convection superheater 33 located in the downpass 38, a desuperheater 116, a radiant superheater 30 located on the front wall 14 of the furnace and a pendent final superheater 34 to a turbine through an outlet main 59 from which signals representative of temperature and flow are transmitted from respective pickoffs 76, 128 to a main controller 49. A convection reheater is located in the pass 37 and is connected to a pendent section 43 whence steam returns to the turbine through a main 58 having a temperature pick-off 78 transmitting reheat temperature signals to the controller. Recirculated gas is withdrawn from the downpass 35 at 106 above an economizer 96 from a point below the dampers 51 through ducts 105, 68 by a fan 67 and delivered through a duct 97 to the interior of the nose 41 whence it enters the furnace 29 through openings 104 and also through a duct 65 to manifolds 61, 62 whence it flows into the cell 28 through openings disposed between the burners 26, 27, these openings being provided with gas directing vanes. At low load, when the superheat temperature tends to be below the desired value, the burner vanes are set by the controller 49 to cause the hot gases to rise adjacent the front wall of the furnace in contact with the superheater 30, their residence time in the furnace being shortened so that more heat is available for convection superheating. Simultaneously, the damper 107 is opened and the damper 95 closed and the fan 67 draws flue gas at the highest temperature through the duct 105, the dampers 70, 98 being opened so that most of the flue gas enters the furnace through the nose openings 104, the effect being further to raise the superheat temperature. At high loads when the superheat temperature tends to be too high the flame is directed against the rear furnace wall 15, the amount of recirculated gas is low and it is all withdrawn through the lower offtake so that its temperature is the minimum. Furthermore, most of the gas is introduced at burner level. At loads exceeding 100 percent the desuperheater is used to reduce the steam temperature and at all loads the controller 49 adjusts the dampers 44, 51 to maintain the desired relationship between superheat and reheat temperatures. Specifications 765,298 and 998,316 are referred to.

Probable Assignee: ATEC INC

Earliest Publication Date: 19640901

61) Family number: 190928 (US3202138A)

VAPOR TEMPERATURE CONTROL METHOD

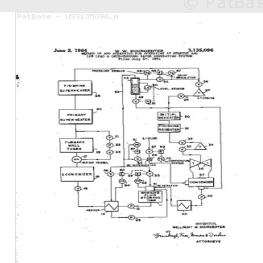
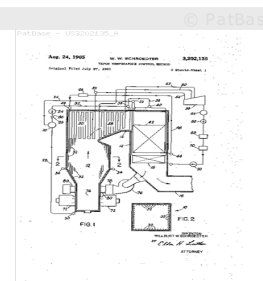
Abstract: Source: GB1008793A 1,008,793. Critical pressure boilers; regulating steam temperature. SULZER FRERES S.A. July 27, 1962 [July 27, 1961], No. 29028/ 62. Heading F4A. In a supercritical forced-flow, once-through vapour generator having a reheater 58 heated mainly by convection, the reheat temperature is controlled under varying load conditions by controlled recirculation of the working medium through the heating surfaces disposed in a combustion chamber 10 in conjunction with other means which increase the heat available in the combustion gases for the reheater. A feed pump 20 forces the working medium in series through an economizer 18, furnace lining tubes 32 and superheating sections 42, 50 to a turbine 56. At part load a recirculating pump 84 draws part of the working medium from a header 36, being the outlet header for the tubes 32, and delivers it to a mixing vessel 26 where it mixes with the fresh feed from the economizer 18. The effect of recirculation is to increase the average temperature of the medium in the tubes 32 thereby decreasing the heat transfer to these tubes and increasing the heat available in the combustion gases as they pass over the reheater 58. In conjunction with recirculation of working medium flue gases are recirculated by a fan 76, being introduced into the combustion chamber by ducts 80 to provide further control of the reheat temperature. The recirculated gases may be introduced at the base of the chamber 10, Fig. 5 (not shown) or together with the fuel and air, Fig. 6 (not shown). As an alternative to recirculation of the fluegases the positions of the combustion zone may be raised or lowered-by the use of tilting burners, Fig. 3 (not shown) in conjunction with recirculation of working medium. Measurement of the reheat temperature at a point 85 may be used through known control means to regulate the recirculation of working medium and flue gas or the alternative means for positioning the combustion zone in order to control the reheat temperature. Specifications 552,747, 598,141 and 1,008,795 are referred to.

Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19621201

62) Family number: 20947762 (US3135096A)

METHOD OF AND APPARATUS FOR OPERATING AT STARTUP AND LOW LOAD A ONCETHROUGH VAPOR GENERATING SYSTEM



Abstract: Source: GB957371A 957,371. Steam raising in forced flow boilers. SULZER FRERES S.A. July 27, 1962 [July 27, 1961], No. 29030/62. Heading F4A. In a forced flow, once through steam boiler operating at sub-critical or super-critical pressures means are provided whereby the boiler can be started without the need for by-passing the superheater or providing a cooling flow of working medium to the reheaters, the means consisting of a recirculation circuit whereby working medium is withdrawn downstream of the conversion zone and returned to the boiler upstream of this zone associated with a turbine by-pass conduit system designed for a flow of working medium not exceeding 30 percent of the full load flow of the boiler, the conduit system including in succession an expansion valve and a separator whence water passes to a condenser and steam passes to a deaerator and/or a feedwater preheater and excess flow valve to the condenser. In the form shown a pump 12 draws water from a storage tank 11 and forces it through a preheater 14 and control valve 15 into the boiler. The water flows through an economiser 16 and furnace wall tubes 19 wherein conversion occurs and steam flows through superheaters 20, 25 to a turbine stop valve 26. At normal load the steam flows through a high pressure turbine 27, reheaters 30, 31 and intermediate and low pressure turbines 34, 36 to a condenser 37. A pump 39 extracts water from the condenser and passes it through a heater 40 to a deaerator 41 whence it returns to the storage tanks. When starting the boiler and during low load operation working medium is withdrawn from the tube system downstream of the tubes 19 by a pump 22 and returned to the inlet of the tubes through a non-return valve 24 maintaining a safe velocity of medium in the tubes. Furthermore during starting the stop valve 26 is closed until the steam temperature has reached a level where water will not be formed in the turbine, the working medium during the starting period flowing through a turbine by-pass conduit system, the furnace being fired to provide a heat input which is less than 30 percent of full load firing. In the conduit system the medium is first expanded through a valve 42, to subcritical pressure when the boiler is operating at super-critical pressure, the steam-water mixture passing into a separator 44 in which a constant water level is maintained by a valve 49. Water flows from the separator to the condenser 37. Steam flows through a line 52 which divides into three branches, the first to the preheater 14 under control of a valve 56, the second to the deaerator 41 under control of a valve 55 which valves are respectively set according to pressure in the preheater and deaerator and the third to the condenser 37 under control of a valve 54 set according to pressure in the line 52, this branch also including a desuperheater 66. The three pressure sensing devices 61, 62, 64 respectively controlling the valves 57, 59, 56 are set so that with rising pressure the valve 55 opens first at a preset pressure admitting steam to the deaerator. Then this valve partially closes to maintain the deaerator pressure constant this action causing a signal to be transmitted to the valve 56 which opens to admit the excess steam to the preheater 14. The device 64 controls the valve 56 so as to maintain the preheater pressure constant. At a higher pressure the valve 54 opens to allow steam in excess of the deaerator and preheater requirements to flow to the condenser. When the live steam temperature is sufficiently high the turbine valve 26 is opened and the valve 42 is automatically set to provide only sufficient steam for deaerating and preheating, the excess flow valve 54 then closing. Finally the feed and firing rates are increased to the required load, the recirculation valve 21 is closed when the flow velocity in the furnace wall tubes is adequate and the by-pass valve 42 is closed, preheating and deaerating steam then being supplied by bleed lines, not shown, from the turbine.

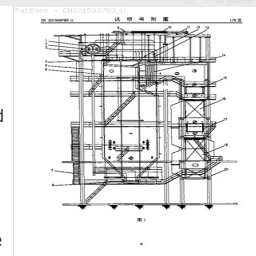
Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19621201

63) Family number: 47095218 (CN201599783U)

FIRED SUPERHEATED STEAM GENERATOR (MACHINE TRANSLATION)

Abstract: Source: CN201599783U The utility model discloses a coal-fired superheated steam generator, with a hearth surrounded by the Wall on its stand, Wall is connected with the drum, the drum is provided with a separator, is connected to the furnace flue, Flue including horizontal and vertical flue section communicating flue segment, vertical flue section provided with an air preheater and economizer, horizontal flue section is provided with a single-stage superheater, the single-stage superheater on through a pipe connected to a separator of the steam outlet, the outlet in the single-stage superheater is connected to spray desuperheater. The utility model is provided by the furnace flue single stage superheater existing wet saturated steam superheating, so enthalpy steam to further increase and improve the steam in the super heavy oil wells flooding effect; superheater rear connector spray desuperheater superheated steam so that the temperature control is very convenient, additional auxiliary oil or gas burners can be achieved raw coal or coal, oil and gas co-firing, boiler wider range of applications.



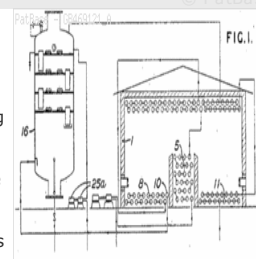
Probable Assignee: SURVEY AND DESIGN INST SINOPEC HENAN PETROLEUM EXPLORATION BUREAU

Earliest Publication Date: 20101006

64) Family number: 19024777 (GB469121A)

A METHOD OF AND APPARATUS FOR PURIFYING STEAM DERIVED FROM SALINE WATERS

Abstract: Source: GB469121A 2344. [Class 123 (ii)] In generating purified steam from saline waters, feedwater is passed through continuous coils 5, 8 in a firebox 1, the heat supplied being so controlled that the steam generated is in equilibrium at the pressure prevailing at the outlet 10 with a concentrated but not saturated solution, the foul steam being passed through a de-salineator 16 in which it is washed by a counter-current of water supplied by a pump 25a. The purified steam may be superheated in furnace coils 11. A throttle valve at the generator coil outlet may maintain a slightly less concentrated solution at an excess pressure in the coil in order to avoid deposit in the coil. Liquid passing the throttle flashes to steam and a slightly more concentrated solution. The de-salineator has bubble trays and caps, or packings, e.g. Raschig rings, clay shapes, dephlegmator pans, or distribution baffles. In a modification the steam is washed by reflux condensed on a bank of feedwater tubes at the top of the de-salineator. Pressure in the de-salineator is caused to control the feedwater pump speed and a temperature control instrument of potentiometer type is preferably employed at the generator coil outlet.



Probable Assignee: IVOR GRAY NIXON

Earliest Publication Date: 19370720

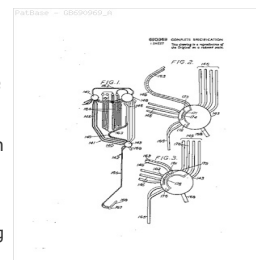
65) Family number: 20378059 (GB690969A)

IMPROVEMENTS IN TUBULOUS NATURAL CIRCULATION VAPOUR GENERATORS

Abstract: Source: GB690969A 690,969. Water-tube steam boilers and c. BABCOCK and WILCOX, Ltd. April 24, 1951 [April 25, 1950], No. 9485/51. Class 123 (ii) In a natural circulation steam boiler having parallel steamgenerating circuits with dissimilar thermo-syphon flow characteristics, for example groups of riser tubes 145, 149 respectively, extending from a low water drum 143 to upper steam-and-water drums 147, 148, the drum 143 is provided with a perforated baffle 173 adapted to control the flows through one or both of said tube groups. The invention is shown applied to a boiler having a furnace chamber with wall tubes such as 165 extending from a header 167 to the drum 143 and down-comers 146, 168, the former connecting the drums 148, 143 and the latter the drum 143 and header 167, in which case the drum 143 is also fitted with an imperforate partition 171 which divides the drum into riser and downflow paths 172, 172¹. The arcuate wall 174 of the baffle 173 is adapted to be replaceable, and the perforations thereof are staggered with respect to the inlets of the tubes 145. In a modification the partition 171 extends over some of the tubes 146, when these serve as risers, and the partition 171 is formed with a radial rib to divide the interior space into two separate chambers opening to the inlets of the riser tubes 145 and 149 respectively.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19530429



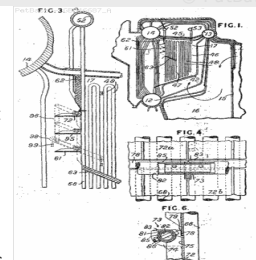
66) Family number: 19588956 (GB646687A)

IMPROVEMENTS IN OR RELATING TO VAPOUR GENERATING AND SUPERHEATING UNITS

Abstract: Source: GB646687A [Class 123(iii)] In a steam c. generator comprising, for example, a lower drum 12 and upper drums 13, 14, which are interconnected by tubes disposed in the path of heating gases discharged from primary and secondary furnace chambers 15, 16 respectively, and a convection superheater 47, preferably in the form of upright tubes 48 depending from inlet and outlet headers 52, 53 and arranged in aligned groups horizontally spaced throughout the width of a space 46 which is defined by the opposite side walls 17 of the generator, the roof 45 and a baffle 42, regulation of the degree of superheat is effected by adjustable dampers 61 located at the gas outflow side of the superheater between spaced baffles 62, 63. The dampers 61 in the form of blades 72, which may be made in sections 72a, 72b, are each supported at 73 from tubes of the rearmost row 68 of the superheater tubes at intervals along its length, preferably between the sections thereof and at its ends. Each support 73 comprises a bearing bracket 74 which is welded at 75 to a tube 68, and at 79 to a horizontal bar 78 adapted to retain the tubes in alignment, and is provided in its upper edge with a notch 81 adapted to support a hollow trunnion 82 which is retained therein by a welded-on strap 83 and is engaged by the end of a pipe or sleeve member 85 on the corresponding damper section, the telescoped end of the parts 82, 85 being separately connected by diametral bolts 86. The dampers may be opened and closed separately, but preferably they are operated in unison by means of crank arms 95 which are rigidly secured to extension shafts, not shown, at one end of the dampers and are interconnected by a link bar 96, one of the said extension shafts also being provided with an operating lever 98 having for example, a chain 99 connected thereto at opposite ends.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19501129



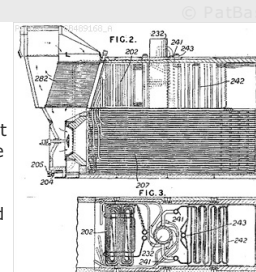
67) Family number: 29642332 (GB489168A)

IMPROVEMENTS IN FORCED-FLOW STEAM AND OTHER VAPOUR GENERATORS

Abstract: Source: GB489168A [Class 123 (ii)] In a forced-flow boiler having a number of parallel connected long small bore evaporating tubes 207 discharging into a separator 232, the steam is led from the separator through a superheater consisting of a number of parallel connected horizontal tubes 242 at different levels between upright headers 241, 243. At starting, all the tubes are filled with water and the burners lit, and when pressure steam discharges through a vent on the outlet pipe of the superheater, the vent is closed and a stop valve in the pipe is opened to supply steam to an auxiliary turbine driving the feed and fuel pumps. Water is supplied in excess of the quantity evaporated and the excess is continuously withdrawn from the separator. The evaporating tubes are fed from a collector 204 through resistors 205 and they are so arranged horizontally along and around the walls of the combustion chamber that they are equally heated. The gases from the combustion chamber flow horizontally over the superheating tubes 242, feedheating tubes 202 and through an air heater 282 to the uptake. The superheating tubes are coiled to protect the walls of the gas passage.

Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19380718



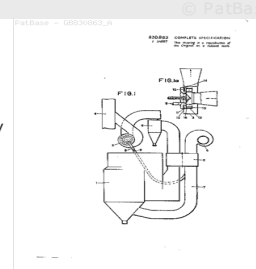
68) Family number: 20771472 (GB830863A)

IMPROVEMENTS IN AND RELATING TO FURNACES

Abstract: Source: GB830863A 830,863. Centrifugal fans. KONINKLIJKE MACHINENFABRIEK GEB. STORK and CO., N.V. Feb. 25, 1958, No. 6040/58. Class 110 (1). [Also in Group XII] A fan 3 extracting flue gases from a furnace 1 has hollow impeller blades 13 provided with one or more discharge openings for a pressure fluid entering the blades and supplied by a conduit 8 branched off from the conduit 7 supplying the furnace with combustion air between the furnace and the air heater 2. Auxiliary blades 11 attached to the outside of the impeller and enclosed by an annular wall 14 may be provided for raising the pressure of the air which is supplied through an annular chest 12. A control valve 9 is provided in the conduit 8.

Probable Assignee: KONINK MACHF GEB STORK AND COMP

Earliest Publication Date: 19600323



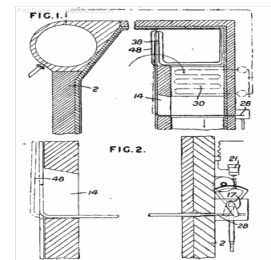
69) Family number: 19113829 (GB561153A)

IMPROVEMENTS RELATING TO THE CONTROL OF STEAM SUPERHEATERS AND THE LIKE HEAT EXCHANGERS

Abstract: Source: GB561153A 561,153. Steam superheaters. DALIN, D. Oct. 24, 1942, No. 14950. [Class 123 (iii)] Shutters controlling the flow of hot gases through an inlet opening 38 to a superheater chamber 30 and the flow bypassed through an opening 14 consist of looped water tubes 48 forming an extension of tubes lining the boiler furnace, groups of looped tubes being movable away from fixed intermediate water tubes. Bars 28 on the ends of the movable tubes and extending through a boiler wall 2 are engaged by a lever 17 operated by hand or by relay mechanism 21 controlled in accordance with the steam temperature or pressure.

Probable Assignee: DAVID DALIN

Earliest Publication Date: 19440508



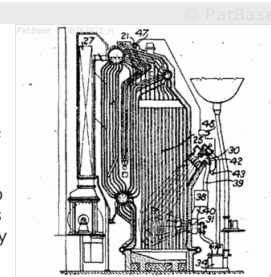
70) Family number: 19615776 (GB767871A)

STEAM GENERATING APPARATUS

Abstract: Source: GB767871A 767,871. Pulverized fuel-fired furnaces. RILEY STOKER CORPORATION. Dec. 14, 1954 [Dec. 22, 1953], No. 36119/54. Class 51 (1). [Also in Group XIII] A steam generator is fired by two pulverized fuel-fired burners one, 30, being of a type which produces a long thin flame adjustable with respect to its angle of inclination to the horizontal, whilst the other, 31, is of a type which produces a short fat flame, the burners being so mounted that their flames intermingle. The burners 30, 31 (see Specifications 765,298 and U.S.A. Specification 2,158,521) are mounted in the front wall of the combustion chamber 25 and are fed with solid fuel from the pulverizer 34, preheated air being fed to the burners through conduits 39, 40 from a duct 38 which is connected to an air preheater 27 arranged in the gas passes of the generator. Vanes 42 in the burner 30 control the angle of the flame issuing therefrom, the vanes being actuated by an electric motor 43 the operation of which is effected from a controller 45 dependent upon the responses of a thermostat 47 located in a steam header 21.

Probable Assignee: RILEY STOKER CORP

Earliest Publication Date: 19570206



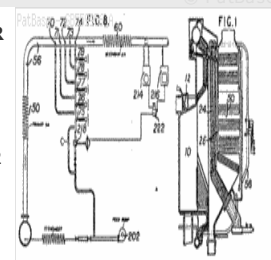
71) Family number: 19108180 (GB559956A)

IMPROVEMENTS IN ATTEMPERATING APPARATUS FOR CONTROLLING THE TEMPERATURE OF STEAM OR OTHER VAPOUR

Abstract: Source: GB559956A 559,956. Fluid-pressure servomotor-control systems. BABCOCK and WILCOX, Ltd. Sept. 9, 1942, No 12702. Convention date, Oct. 10, 1941. [Class 135] [Also in Groups XIII and XII] The flow of cooling water from the feed pump 202, Fig. 8, of a steam generator to a number of desuperheating jets 70-74 in an attemperator pipe 56 between primary and secondary superheaters 50, 60 is controlled by a valve 218 operated through a servomotor 222 by a steam flow meter 214 and a steam temperature responsive device 216. Valves 75-79 controlling the water flow to the respective jets open in turn with a rise in the difference between the pressure of the spray water beyond the valve 218 and the steam pressure in the attemperator pipe 56, and close in turn with a fall in the difference of pressure. Each valve is operated by a solenoid which is switched in and out of an electric circuit by a differential pressure operated device. The attemperator pipe is provided with a liner spaced from the wall of the tube, and the tubular stem of each jet is surrounded by a sleeve forming an annular heatinsulating space around the stem. The sleeve has external heat-radiating fins. The primary superheater 50 is arranged in an upflow pass of a steam generator having a water-tube lined furnace 10, Fig. 1, fired by burners 12. The secondary superheater 24 is arranged in a down pass between the furnace and the superheater 50, the rear wall of the down pass being defined by further steam heating tubes 26.

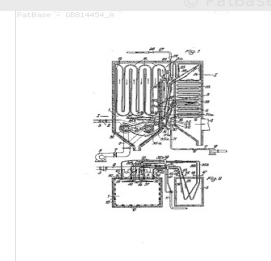
Probable Assignee: BABCOCK AND WILCOX LTD

Earliest Publication Date: 19440313



72) Family number: 20443405 (GB814454A)

IMPROVEMENTS IN APPARATUS FOR DETERMINING THE PERFORMANCE OF HEAT-GENERATING PLANT, SUCH AS BOILERS, FURNACES AND ATOMIC REACTORS



Abstract: Source: GB814454A 814,454. Combustion apparatus. EULE, M. Aug. 23, 1955, No. 24263/55. Class 51 (1). Apparatus for ascertaining the performance of a steam generator, steel furnace or atomic reactor by measuring the heat transferred from the working fluid of the generator and c. to heat exchangers disposed at different positions in the generator includes means for passing fluid through such exchanger at a constant rate, means for controlling independently the flow through each exchanger, and means for indicating the difference in temperature at the inlet and outlet of each exchanger whereby the rates of heat transfer at the different positions may be directly indicated and readily compared. In a water-tube boiler having a combustion chamber 1, Figs. 1, 2, lined with generating tubes 18 and heated by burners 4, 4a, supplied with gas and combustion air through valved pipes 2, 6 respectively, and a flue 8 containing an economizer 14, generating and first stage superheater tubes 23 and first stage superheater tubes 25, the heat exchangers 35... 39, each in the form of a tube coil or loop, are connected in parallel between a distributor 32 and a collector 34 connected to the feed water supply pipe 11 on opposite sides of an orifice plate 30. The exchangers 35, 36, 37 are disposed in recesses in a wall of the combustion chamber and are subject mainly to radiant heat while the exchangers 38, 39 are opposed to the gases passing through the flue 8. The temperature differentials between the inlets and outlets of the heat exchangers are recorded by pairs of thermo-couplers 40, 41... 48, 49, Fig. 3, connected electrically to indicators 55... 59. The flow through the exchangers is regulated by valves 50... 54 on the inlet sides thereof, the valves being set so that the relation between the rate of flow and the surface area of each exchanger is such that the temperature difference is a measure of the heat exchange. Fig. 4 shows the invention applied to a smelting furnace heated by gas burners 75, 75a supplied with oil by a pump 79 and preheated air forced by a fan 76 through a heater 73 in the furnace flue and a duct 77, 78 to a chamber 97, the air supply to the burners being controlled by dampers 82. The heat exchangers 83, 84, 85 are supplied with air from a distributor 98 connected to the duct 77 upstream of a restriction 86 and discharge respectively into the duct 78, the chamber 97 and the duct 77. The exchangers are provided with temperature-measuring devices 90, 91... 94, 95 and the temperature differentials are indicated as described with reference to Fig. 3. In another arrangement, in which steam is generated by the heat evolved in an atomic reactor, the heat is transferred from the reactor through a primary circuit containing liquid sodium and including a pump 102, a heat-absorbing coil 104 in the reactor and a heating coil 106 in an evaporator 105, to a secondary circuit containing liquid and including a pump 108, a container 110, the evaporator 105 and a heating coil 113 in the generator, vapour evolved in the evaporator being condensed in the coil 113. Feed water is supplied by a pump 114 through a container 116 to the generator. In this arrangement, heat transfer coils 120, 121 and 122 are supplied with liquid from a distributor 124 and discharge to a collector 125. The coils are provided with temperature-measuring devices and the temperature differentials are indicated as described above.

Probable Assignee: MARTIN EULE

Earliest Publication Date: 19590603

73) Family number: 22864424 (US3060903A)

VAPOR GENERATOR

Abstract: Source: GB956474A 956,474. Regulating steam temperature in boilers; recirculating combustion gases. BABCOCK and WILCOX CO. Jan. 20, 1961 [Jan. 25, 1960], No. 2401/61. Headings F4A and F4B. In a high capacity high pressure and temperature natural circulation boiler including upright vapour generating wall tubes 18, 22, 27 lining a furnace chamber 12A, 12B, 12C low temperature gases, e.g. to control slanging and regulate steam temperature, are introduced into the radiation section 12A of the furnace chamber through a duct 52 the front face of which is defined by water-cooled rear wall tubes 22 which, at places, are displaced outwardly and laterally within the duct 52 to form low pressure drop outlet passages 56A, 56B and provide a shield which protects the inner face of the duct against radiation. Groups of adjacent tube parts 22A-22H are located, at spaced intervals, longitudinally of the duct 52 and as shown in Figs. 2, 3 the tubes of each group comprise tube sets 22A-22D and 22E- 22H which fan outwardly in a curve from opposite sides of a centre port 56 baffles 59, e.g. closely spaced flat studs 60 welded to the tubes and appropriately shaped plates, closing the spaces 58 between the tubes 22A-22H to form the streamlined outlet passages 56A, 56B. A retractable soot blower 61 is located at each port 56 the groups of which may be located at any desired position in the furnace chamber walls. The low temperature gases are withdrawn from a down pass 14 through a duct 49 leading to a blower 50 which discharges into the duct 52. Superheater tubes, lining the roof and walls of the downpass, are connected to a primary superheater 39 arranged upstream, gaswise, of an economiser 46 in the downpass 14 and connected to a secondary superheater 43 arranged in a horizontal pass 13 in front of a reheater bank 70. Cyclone furnaces 20, 20A, arranged at different levels and having their barrel portions defined by steam generating tubes, discharge into the section 12B of the furnace chamber. Other burners may be used for firing the unit. Specification 552,747 is referred to.

Probable Assignee: BABCOCK AND WILCOX CO

Earliest Publication Date: 19621030

