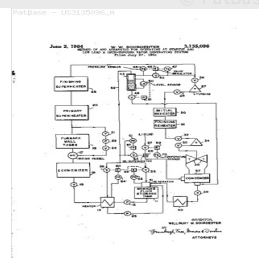
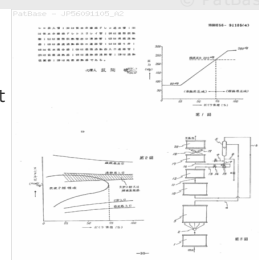
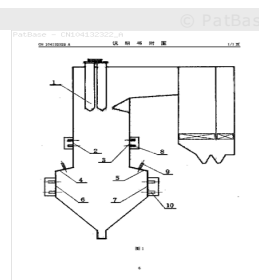


1) Family number: 20947762 (US3135096A)**METHOD OF AND APPARATUS FOR OPERATING AT STARTUP AND LOW LOAD A ONCETHROUGH VAPOR GENERATING SYSTEM**

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flow of working medium to the reheaters, the means consisting of a recirculation circuit whereby working medium is withdrawn downstream of the conversion zone and returned to the boiler upstream of this zone associated with a turbine by-pass conduit system designed for a flow of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 When starting the boiler and during low load operation working medium is withdrawn from the tube system downstream of the tubes 19 by a pump 22 and returned to the inlet of the tubes through a non-return valve 24 maintaining a safe velocity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**2) Family number: 1871609 (JP56091105A)****PRESSURE CHANGING OPERATING BOILER**

Abstract: Source: JP56091105A The name of the invention claim 1 transformer 1 [Source: operating boiler 2 claims (1) supercritical pressure subcritical pressure range from transformer operation in that the furnace wall outlet of the steam-water separator is provided, the furnace wall is a gas-phase flow outlet fluid M, 2 if this is separated into steam and water vapor of the subsequent single-phase flow, heat transfer surface along with the make up the water separated in the water vapor 2 is to some extent to the separation after superheated steam superheated so as to mix the 1 transformer operating boiler characterized here. (2+ subcritical pressure supercritical pressure region from the region in which performs variable pressure operation the furnace wall outlet of the steam-water separator is provided, the furnace wall is a gas-liquid two-phase flow outlet fluid if, thereafter it is separated into steam and water to the steam single-phase flow of the heat transfer surface as well as constituted by the water separated in the water to the separation is to some extent after the steam superheated superheated steam so as to mix, and the steam-water separator water vapor separation from the main system to be mixed with the water upstream of the throttle valve provided a transformer operating boiler, characterized in that. 6

Probable Assignee: MITSUBISHI HEAVY IND LTD**Earliest Publication Date:** 19810723**3) Family number: 57720336 (CN104132322A)****SEMI-W FLAME COMBUSTION SUBCRITICAL STEAM POCKET FURNACE**

Abstract: Source: CN104132322A The invention discloses a semi-W flame combustion subcritical steam pocket furnace, and relates to a low-nitrogen transformation method of a utility boiler which combusts anthracite or low-volatile-matter meager coal and has the W flame combustion method with the subcritical steam parameter. The semi-W flame combustion subcritical steam pocket furnace comprises a lower hearth with a front arch and a rear arch. The front arch of the hearth and the rear arch of the hearth are respectively provided with a line of weak vortex burners. The lower middle portion of a front wall of the lower hearth and the lower middle portion of a rear wall of the lower hearth are respectively provided with two lines of dual register burners. The portion, 8 m to 12 m away from the bottom of a screen type superheater, of a front wall of an upper hearth and the portion, 8 m to 12 m away from the bottom of the screen type superheater, of a rear wall of the upper hearth are respectively provided with one or two layers of separated secondary air nozzles. In each line, the burners are evenly distributed in the width direction of the furnace. On the lowermost layer, the dual register burners are start-up burners. All dual-inlet and dual-outlet steel ball grinding outlets are matched with dynamic and static separators. By means of the semi-W flame combustion subcritical steam pocket furnace, the thermal deviation of the furnace side of a lower hearth water-cooled wall pipe is obviously reduced, and water circulation reliability is obviously improved; the NOx production volume is obvious lowered; the less-oil or oil-free coal powder ignition technology is easily adopted.

Probable Assignee: ZHANG LIDAO

Earliest Publication Date: 20141105

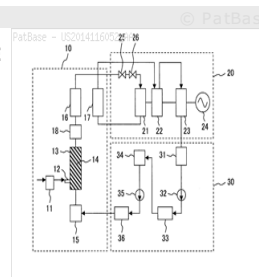
4) Family number: 56332642 (US2014116052A)

SUBCRITICAL PRESSURE HIGH-TEMPERATURE STEAM POWER PLANT AND SUBCRITICAL PRESSURE HIGH-TEMPERATURE VARIABLE PRESSURE OPERATION ONCE-THROUGH BOILER

Abstract: Source: US2014116052A A subcritical pressure high-temperature steam power plant includes a combustion boiler system, steam turbine generator system, and condensate and feedwater system and wherein the conditions of steam generated in the boiler system and supplied to the steam turbine generator system are subcritical pressure and high temperature (turbine inlet temperature of 593 degrees centigrade or more).

Probable Assignee: BABCOCK HITACHI KK

Earliest Publication Date: 20140430



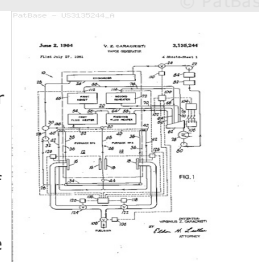
5) Family number: 31445648 (US3135244A)

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



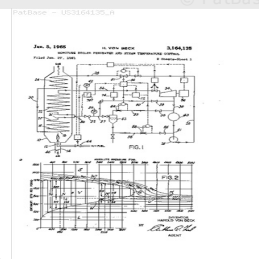
6) Family number: 23023626 (US3164135A)

MONOTUBE BOILER FEEDWATER AND STEAM TEMPERATURE CONTROL

Abstract: Source: GB929856A 929,856. Fluid-pressure servomotor control systems. SULZER FRERES S.A. Jan. 25, 1962 [Jan. 27, 1961], No. 2884/62. Class 135. [Also in Group XIII] In a forced-flow, once-through steam generator for plant at supercritical temperature and, at least, critical pressure and comprising vaporizing and superheating sections 16, 22 fed by a pump 26 through a conduit 28. feed valve 67 and economizer 24, control of the fuel supply to the furnace or, as shown, of the feed water supply is effected by taking a sample of steam from the point 50, reducing its pressure to a subcritical value to form a two-phase mixture of liquid and vapour and effecting control in response to the proportions of liquid and vapour in the mixture. One method of control consists in allowing the mixture, the pressure of which is maintained constant by valves 52, 56 under control of a pressure sensor 54, to flow into a separator 62, measuring the separated steam and water flows by instruments 64, 68, and comparing these flows in a comparator 72 which provides a signal to control the feed regulator 66. A second method consists in the use of a wetness detector 74 which provides a signal for the regulator 66. As shown, a fuel valve 44 and air damper 46 are controlled by an instrument 42 responsive to the temperature of the steam at the outlet of the superheater 22, and the regulator 66 is subject to a correction by a device 76 responsive to the temperature of the steam at the point 50. In a modification, the regulator 66 also controls a valve by which water is injected at a point between the vaporizing and superheating sections, and this valve may also be controlled by the temperatures between the vaporizing and superheating sections and at the outlet from the latter.

Probable Assignee: COMBUSTION ENG

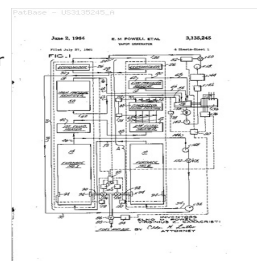
Earliest Publication Date: 19620616



7) Family number: 192299 (US3135246A)

TWIN FURNACE UNIT AND METHOD OF OPERATION

Abstract: Source: GB1007738A 1,007,738. Forced flow steam boilers; regulating steam temperature. SULZER FRERES S.A. July 27, 1962 [July 27, 1961 (2)], No. 29052/62. Heading F4A. A forced flow, once through steam boiler operating at subcritical or supercritical pressure has at least two combustion chambers, parallelconnected wall lining tubes of the chambers being connected for series flow of the working medium from chamber to chamber. Thus as shown in Fig. 1 the boiler comprises two units A, B with respective combustion chambers 10A, 10B from which lead flue gas passes 12A, 12B. A feed pump 16 forces water through parallel-connected economizers 22A, 22B disposed one in each pass to a mixing vessel 28 whence the water passes successively through a conduit 30, the tubes lining the chamber 10B, a conduit 32 and the tubes lining the chamber 10A, generated steam flowing through a conduit 34 to parallel-connected superheaters 38A, 38B located one in each of the passes 12A, 12B and thence through a line 42 to a turbine 44. The installation operates with double reheat, the first stage consisting of a reheater section 46 in the pass 12B followed by a larger section in the pass 12A whilst the second stage consists of a single reheater section 56 situated wholly in the pass 12B. The combustion chambers are independently fired by tangential tilting burners 86 and the lining tubes are diametrically finned and welded together to form substantially continuous inner wall surfaces. To protect the tubes if the flow velocity of working medium therethrough falls below a critical value, as may occur at low loads or when starting up, a recirculating system is imposed on the through flow system, the medium being withdrawn from the conduit 34 by a pump 80 which forces it through a non-return valve 82 into the mixing vessel 28. The recirculating pump may alternatively be located in the conduits 30 or 32, a bypass then being provided for the working medium flow during normal operation. Superheat and reheat temperatures are controlled at reduced loads by differentially adjusting the burner tilt in the chambers 10A, 10B. Alternatively control may be effected by recirculation of cooled flue gas to the chambers. At a certain low load further control is obtained by differential firing of the chambers. In a modification, Fig. 9 (not shown) sections of the superheater are located in each gas pass and are serially connected whilst the first and second stage reheaters each consist of single sections located one in each pass. Superheat temperature is controlled by attemperation whilst reheat temperature is controlled by adjusting burner tilt or by gas recirculation and then by differential firing of the burners. In a further modification, Fig. 12 (not shown), there is a single stage of reheat the reheater being disposed wholly in the gas pass 12A. The chambers 10A, 10B are differentially fired and burner tilt or gas recirculation used to control reheat temperature.



Probable Assignee: COMBUSTION ENG

Earliest Publication Date: 19621201