

[54] FRAMELESS WATER PIPE BOILER

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[58] Field of Search.....122/338, 494, 510

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[57] ABSTRACT

Self-supporting water pipe boiler with two or more co-axially arranged cage heating surfaces each of which comprises vertical pipes and upper and lower headers or reversing bends while the individual cage heating surfaces are differently designed as evaporator, superheater, or feed water preheater or hot water generator or one and the same cage comprises different heating surfaces, in which the inner cage defining the fire box and, if provided, other cages of the same temperature have their lower end resting on a foundation while to the upper end of said cage or cages there are connectable the remaining cage heating surfaces of said boiler as well as the flue chamber mantle with insulation, the water-steam separating vessel and a walk-on platform with accessories thereon including the burner system.

10 Claims, 5 Drawing Figures

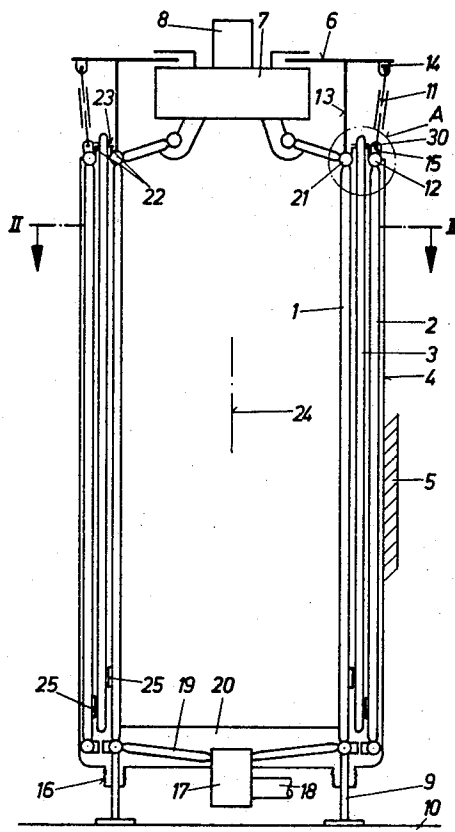
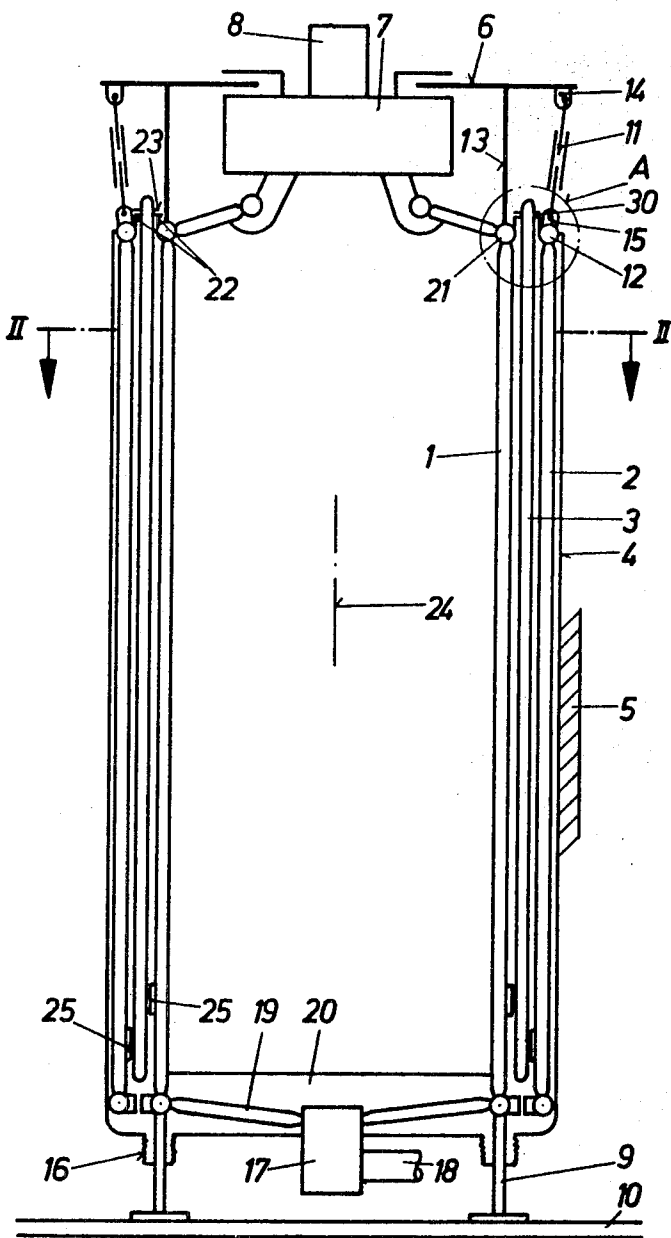


Fig. 1



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Fig. 2

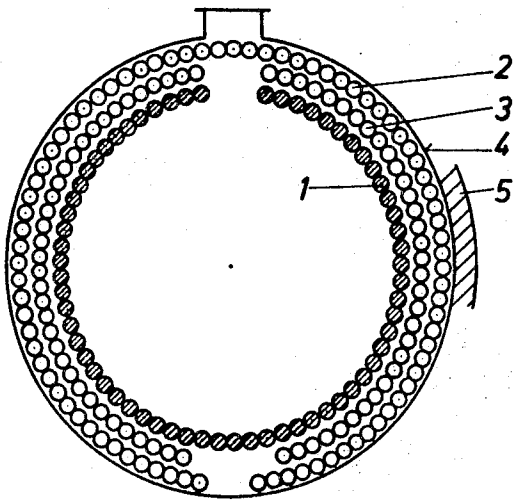
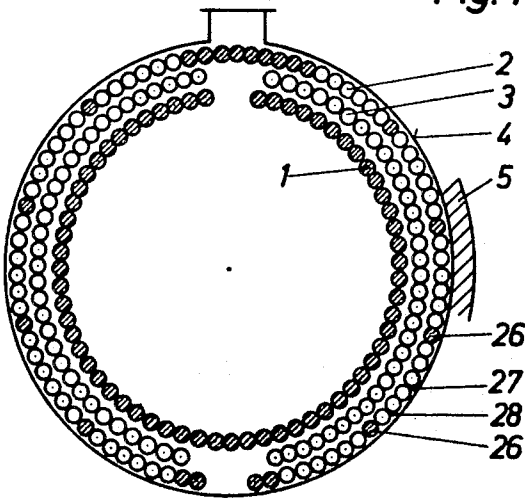


Fig. 4

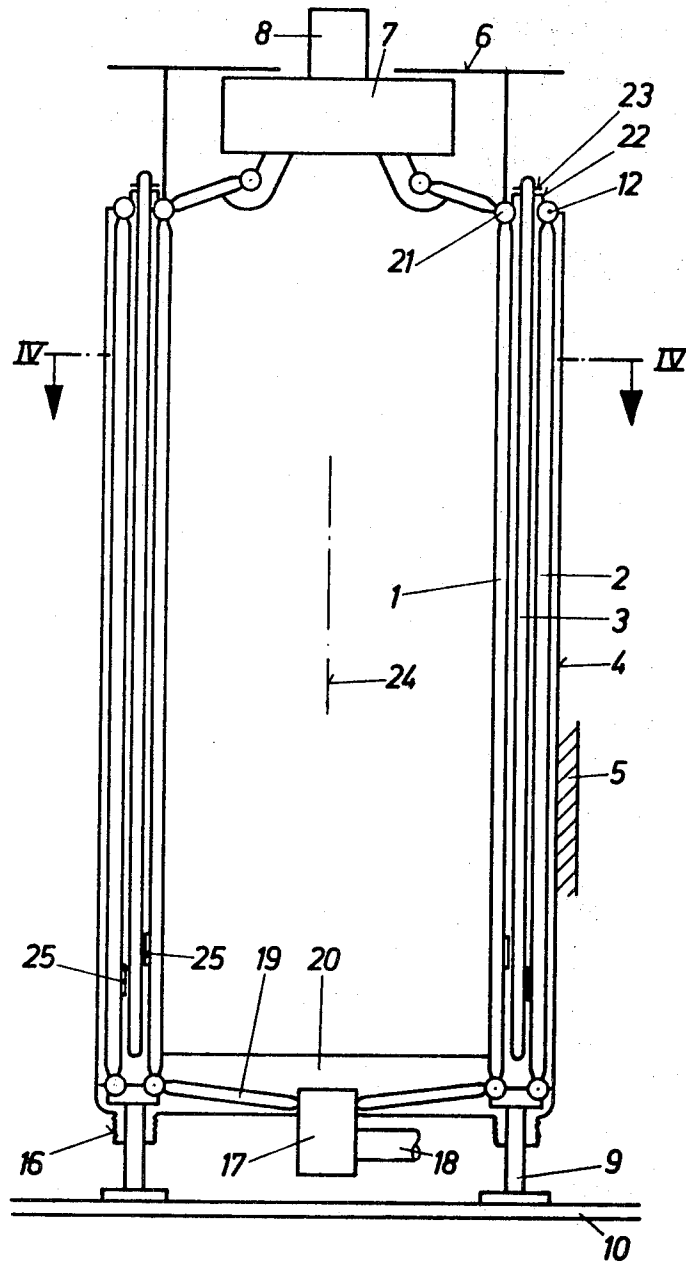


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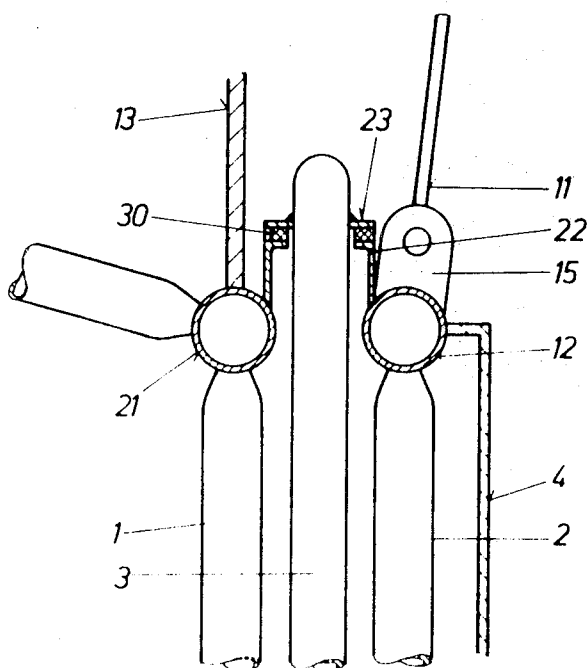
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Fig. 3



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Fig. 5



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FRAMELESS WATER PIPE BOILER

The present invention relates to a self-supporting water pipe boiler with two or more concentric cage heating surfaces of which each comprises vertical pipes and upper and lower headers and/or reversing bends while the individual cage heating surfaces are designed in a different manner as evaporator, superheater or feed water preheater or hot water generator, or one and the same cage is built up with different heating surfaces.

With water pipe boilers of the above mentioned type, the static, i. e. the mutual support of the individual cage heating surfaces is of foremost importance with regard to the differing heat expansions in view of differing temperatures.

It is, therefore, an object of the present invention to greatly simplify the construction of water pipe boilers and to prevent the heat expansions in the individual cages from affecting adjacent cages.

This object and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 diagrammatically illustrates a longitudinal section through a water pipe boiler according to the invention with supporting inner cage which comprises three cages and the flue chamber mantle.

FIG. 2 is a cross-section through FIG. 1 taken along the line II—II thereof.

FIG. 3 is a diagrammatic longitudinal section through a water pipe boiler with supporting inner and outer cage which comprises three cages and the flue chamber mantle.

FIG. 4 is a cross-section taken along the line IV—IV of FIG. 3.

FIG. 5 illustrates on a considerably larger scale than FIG. 1 that part of the latter which is encircled by a dot-dash circle.

The frameless water pipe boiler according to the present invention is characterized primarily in that the inner cage which defines the firing box and, if provided, cages having the same temperature as the inner cage are mounted on the foundation while to the upper ends thereof there are connectable the remaining cage heating surfaces, the flue chamber mantle with insulation, the water steam separating vessel and a walk-on upper platform with all accessories, including the burner assembly.

In order to assure a proper positioning of the said upper ends or spacing therebetween as well as spacing as to height, it is suggested according to the invention that the outer cage, which is designed as draft guiding wall, is at its upper end pivotally connectable to the supporting elements resting on the inner supporting cage, for instance, by means of anchors designed as turn buckles, while the pitch diameter of the upper anchor joints differs from the pitch diameter of the lower anchor joints. In order to provide good accessibility, it is provided that between the inner cage and the outer cage forming the draft guiding wall or between the latter and the flue chamber mantle there are provided one or more cages which have their upper end in a flue gas tight manner resting inwardly or outwardly on, for instance, annular headers or profiled strips arranged thereon. This flue gas tight engagement is obtained by an interposed seal. After disengagement of the outer connecting lines, the said cage or cages is or are rotatable about an axis common to all cages.

Furthermore, there is provided that the outer connecting lines of the cages which are rotatably suspended are flexible and that the said cages have their lower portion by means of spacer members guided on adjacent cages.

Referring now to the drawings in detail and FIGS. 1 and 2 thereof in particular, the structure shown therein comprises an inner cage 1 which defines the fire box, an outer cage 2, and an intermediate cage 3. The structure furthermore comprises the flue chamber mantle 4 with the insulation 5, the upper walk-on platform 6 with all accessories thereon as well as the air tank 7 with the burner 8. The supporting inner cage 1 is by means of legs 9 resting on the base plate 10. The outer cage 2 which serves as draft guiding wall is at its upper end suspended

on anchors 11 which form turn buckles and are pivotally connected to the upper annular headers 12 of the outer cage 2 and of the platform 6. The platform 6 is by means of supporting members 13 supported by the inner cage 1. The pitch diameter of the upper anchor joints 14 is in the illustrated example greater than the pitch diameter of the lower anchor joints 15. The anchor 11 is thus arranged at an angle with regard to the vertical plane. In this way a centering will be obtained. By actuating the turn buckles 11, the upper annular header 12 of the outer cage 2 can be moved into the desired position. For purposes of conveying forces into the base plate, exclusively straight pipes of the cage 1 are employed as supporting elements for the pressure body. If the cages 2 and 3, for instance, represent superheaters with different temperatures, these cages can expand freely in downward direction. The flue chamber mantle 4 with the insulation 5 is in a gas tight manner welded to the upper annular header 12 of the outer cage 2 and is able to expand freely in downward direction in conformity with its differing temperatures. The flue chamber mantle 4 is, through the intervention of compensating means 16 in a flue gas tight manner welded to the legs 9 and the distributing pot 17. Adjacent the distributing pot 17 there are provided the non-heated drop pipes 18. The distributing pot 17 and the distributing pipes 19 arranged in a star-like manner form the bottom of the fire box and are protected by fire-proof clay and insulating bricks 20 against flame radiation. Angled rings 22 are welded to the upper annular header 21 of the inner cage 1 and to the annular header 12 of the outer cage 2. Flanged rings 23 welded to the intermediate cage 3 on the inside and outside rest on said angled rings 22. Between the members 22 and 23 there is inserted a seal 30. Thus, cage 3 rests by its own weight on the angled rings 22. In case of an explosion, this arrangement serves as explosion flap inasmuch as the overpressure on the flue gas side will lift the cage 3. After disengaging the outer flexible connecting lines of cage 3, the latter can be rotated about the axis 24 common to all cages. The cages 2 and 3 which are fixed at their upper ends and are freely expandable in downward direction are at their lower ends centrically guided by spacer members 25. In FIG. 2, the supporting pipes of cage 1 have been hatched.

According to the embodiment of FIGS. 3 and 4, the inner cage 1 and the outer cage 2 are supporting cages and by means of legs 9 rest on the base plate 10. In FIG. 4, the supporting pipes are hatched.

All of the supporting pipes are passed through by substances of even temperature as, for instance, boiling water and, accordingly, will expand uniformly in upward direction. The upper annular headers 12 and 21 will accordingly not change their relative position as to height. The suspension, expansion and guiding of the intermediate cage 3 is effected in the same manner as illustrated in FIG. 1 and described in connection therewith. The free windows 27 between the supporting heating pipes 26 of cage 2 are in the illustrated example filled in with superheater pipes 28. These super-heater pipes are suspended, for instance, on the upper annular header 12 by means of non-illustrated reversing bends at the upper annular header 12 and can expand freely in downward direction while, for instance, non-illustrated fire-proof bricks and plates prevent flue gas from passing over from the intermediate to the outer lane.

The advantages obtained by an arrangement according to the present invention consist primarily in that the various heat expansions of differently designed and differently heated cage heating surfaces have been taken into consideration in such a way that expansions are not impeded. The third cage, which rests at its upper end inwardly and outwardly, simultaneously serves as explosion flap which is lifted as soon as the flue gas overpressure is sufficient to lift the weight of this cage. Moreover, in this case the cage, which is preferably designed as superheater, is following the disengagement of the outer connecting lines rotatable about the axis which is common to all cages whereby it will be possible to check and, if desired, to repair all flue gas actuated pipes of this cage on all sides.

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawings but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. A self-supporting water pipe boiler having a walk-on platform, which includes at least two coaxially arranged cage means located one within the other in radially spaced relationship to each other, flue chamber mantle means surrounding the outer one of said cage means and being provided with an insulation, each of said cage means comprising substantially vertical pipes and pipe connecting means respectively interconnecting upper and lower pipe ends of said vertical pipes, the inner one of said cage means defining a fire box and being adapted to be stationarily mounted on a foundation, and supporting means arranged at the upper end of said inner cage means for connecting thereto the other cage means and said flue chamber mantle means with insulation and said platform.

2. A boiler according to claim 1, which includes at least one intermediate cage means arranged coaxially with and radially between said inner and outer cage means and mountable on the same foundation as said inner cage means.

3. A boiler according to claim 1, in which the individual cage means respectively form evaporator means, superheater means, feed water preheater means and hot water generator means.

4. A boiler according to claim 1, in which said outer cage means forms a draft guiding wall, and which includes adjustable connecting means interposed between and pivotally connected to said supporting means and the upper end of said outer cage means, the upper ends of said connecting means being located on a first circle, and the lower ends of said con-

necting means being located on a second circle having a diameter less than the diameter of said first circle.

5. A boiler according to claim 1, which includes at least one additional cage means arranged between said inner cage means and said flue chamber mantle means and having its upper end portion provided with shoulder means, supporting means associated with the upper portions of said inner and outer cage means, and sealing means interposed between said shoulder means and said last mentioned supporting means, said additional cage means being adapted to be connected to and disconnected from external connecting lines and when being disconnected from said external connecting lines being rotatable about an axis common to all of said cage means.

6. A boiler according to claim 1, in which said rotatably suspended additional cage means is adapted to be connected to and disconnected from flexible external connecting lines.

7. A boiler according to claim 5, in which the rotatably suspended cage means are guided at the lower end thereof on spacer means interposed between said rotatably suspended cage means and adjacent cage means.

8. A boiler according to claim 1, in which the supporting cage means comprise a plurality of evaporator pipes at least approximately evenly distributed over the circumference of said boiler, and which includes superheater pipes arranged within the windows formed by said supporting pipes.

9. A boiler according to claim 8, in which said superheater pipes are suspended at the upper end of said supporting cage means.

10. A boiler according to claim 8, in which said supporting cage means include evaporator pipes and superheater pipes.

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