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HORIZONTAL RETURN FIRE TUBE BOILER HAVING A CENTRAL FURNACE WITH DOUBLE OUTLET

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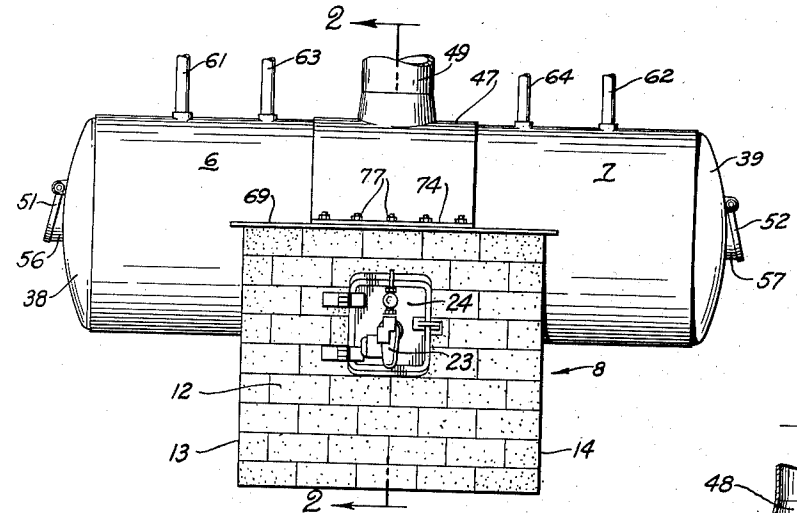


FIG. 1.

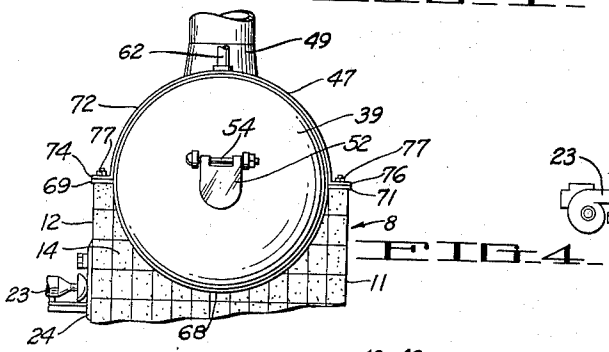


FIG. 4.

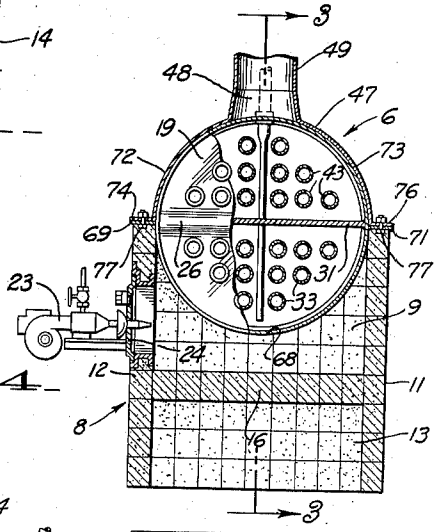


FIG. 2.

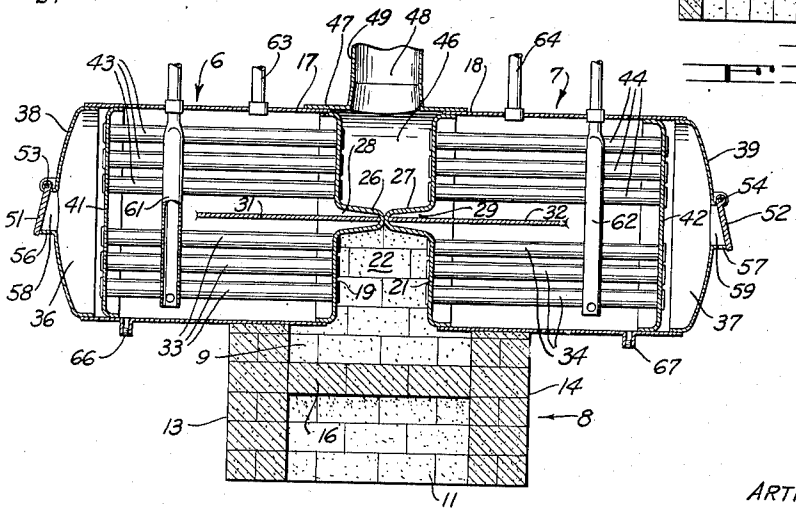


FIG. 3.

INVENTOR.
ARTHUR S. WELDY

BY Joseph B. Gardner
Atty.

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HORIZONTAL RETURN FIRE TUBE BOILER HAVING A CENTRAL FURNACE WITH DOUBLE OUTLET

Arthur S. Weldy, Mount Eden, Calif.

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3 Claims. (Cl. 122—54)

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The invention relates to boilers and more particularly constructions utilizing a plurality of boiler units in conjunction with a common centrally arranged fire box.

An object of the present invention is to provide a boiler of the character described wherein a plurality of boiler units or sections are unitarily assembled with respect to a common fire box and are constructed and arranged so as to provide an improved utilization and saving of heat with a consequent improvement in efficiency of operation.

Another object of the invention is to provide a boiler of the character above which will afford an improved flexibility in operation in that the individual sections may be employed in various arrangements and combinations for the production of hot water or steam, or both.

A further object of the present invention is to provide a boiler of the character described which may be easily and readily constructed by assembly of major component parts and wherein the individual units may be simply and rapidly withdrawn from service where replacement or repair is required.

Still another object of the present invention is to provide in a boiler construction of the character described an improved type of safety relief valve effective to safeguard the boiler against damage in the event of flashback or explosive burning in the flue tubes.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawing:

Figure 1 is a side elevation of a boiler constructed in accordance with the present invention.

Figure 2 is a transverse sectional view taken substantially on the plane of line 2—2 of Figure 1.

Figure 3 is a longitudinal sectional view of the boiler taken substantially on the plane of line 3—3 of Figure 2.

Figure 4 is an end elevation of the boiler.

The boiler of the present invention, as illustrated in the accompanying drawing, comprises a pair of containers 6 and 7 for fluid to be heated,

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mounted in generally horizontal alignment upon a base support 8. The latter is here shown constructed of refractory material such as firebrick, and provides an open topped fire box 9 defined between upstanding side walls 11 and 12, end walls 13 and 14, and a raised bottom wall 16. The mounting of the containers 6 and 7 on the base support is such that the adjacent ends 17 and 18 of the containers overlie the sides and ends of the base support and extend into the firebox enclosure defined thereby, see Figure 3. As an important feature of the present invention, the adjacent end walls 19 and 21 of the containers are arranged in spaced substantially parallel vertical planes so as to define a passageway 22 therebetween registering with and providing a vertical extension of the fire box 9. Any suitable type of conventional burner 23 may be mounted within the fire box 9 and access to the burner and the fire box is afforded through an opening in the side wall 12, normally covered by a door or closure plate 24.

In accordance with the present invention and as a principal feature thereof, a thermal connection is provided between the end walls 19 and 21 of the containers in the form of a baffle extending into the passageway 22 in such a manner as to be heated by direct conduction and radiation from the fire box and being operative to transfer its heat by conduction to the end walls 19 and 21 of the containers. Preferably, such means extends completely across the passageway 22 so as to provide a closed top for the fire box, and is additionally of hollow construction, so as to contain within the baffle fluid from the containers to be heated. This arrangement is accomplished in the present construction by the provision on the end walls 19 and 21 of outwardly projecting hollow ribs 26 and 27 which extend transversely across the end walls 19 and 21 in substantially a horizontal plane and project outwardly from the end walls into the passageway 22 and into abutting relation, so as to define a top enclosure for the passageway. The ribs are preferably pressed out of the end walls 19 and 21 approximately centrally of the height thereof and arranged with the hollow interiors 28 and 29 of the ribs in direct communication with the interiors of their respective containers 6 and 7. Also, since the ribs project out into the passageway 22 approximately centrally of and directly over the fire box 9, these ribs will be directly heated by the products of combustion originating in the fire box 9, such heating, of course, being effected by both conduction of

heat by the products and radiation from the fire box. In this manner, the fluid contained within the hollow interiors 28 and 29 of the ribs will be rapidly heated. Additionally and as an important feature of the present invention, means is provided for conducting the heat from the ribs 26 and 27 directly into the interiors of the containers 6 and 7. This means is here in the form of heat conducting plates 31 and 32, which are secured, as by welding or the like, to the interior apex of the ribs 26 and 27 and extend horizontally therefrom into the interior of the containers. Preferably and as will be seen from Figure 2, these plates extend across substantially the full width-wise dimension of the containers.

The heated products of combustion generated in the fire box 9 are conducted through containers 6 and 7 by a plurality of the flue tubes 33 and 34 which extend horizontally and longitudinally through the containers from the end walls 19 and 21, below the ribs 26 and 27, to flue chambers 36 and 37 in the outer ends of the containers. These chambers are provided with end enclosure members 38 and 39 covering in spaced relation the outer end walls 41 and 42 of the containers. As will be seen from Figure 3 the opposite ends of the flue tubes 33 and 34 are secured to and extend through the container end walls 19 and 41, and 21 and 42, so that the heated products of combustion will pass from the fire box longitudinally through the tubes 33 and 34 in intimate heat exchange relation with the contents of the containers and emerge into the end chambers 36 and 37. From these end chambers, the products are directed back through the containers 6 and 7 by a plurality of flue tubes 43 and 44 extending longitudinally through the containers above the plane of the ribs 26 and 27, the latter tubes being also secured to and extending through the opposite end walls 19 and 41, and 21 and 42 of the containers. In this manner, the products of combustion are delivered at the discharge ends of tubes 43 and 44, into a flue discharge chamber 46 defined in the space between the adjacent end walls 19 and 21 above the plane of the ribs 26 and 27. Desirably, a smoke hood 47 is surmounted on the adjacent ends 17 and 18 of the containers so as to provide an enclosure for the flue chamber 46, and is additionally formed with a flue outlet opening 48 defined within a collar 49.

As an important feature of the present construction, means is provided for relieving sudden or instantaneous surges of pressure within the boiler such as may be occasioned by a flash-back in burning or combustion explosions occurring within the flue tubes. Such means is here provided in the end flue chambers 36 and 37 in the form of relief valves 51 and 52 carried by the end enclosure members 38 and 39. Preferably, these valves are of a simple gravity closing type consisting of doors hinged at their upper extremities to horizontally extending pivot pins 53 and 54 and being normally supported in a generally downward and outwardly inclined position on annular seats 56 and 57 surrounding exit openings 58 and 59 in the members 38 and 39. In this manner, a sudden surge of pressure within the end chambers 36 and 37 will force the doors 51 and 52 to swing outwardly away from their seats and thereby vent the pressure to the atmosphere, the doors thereafter returning by gravity to their seated position.

Water or other fluid is fed into and removed from the containers 6 and 7 by independent

piping connections so that individual or separate operation of the units may be maintained. As here shown, inlet pipes 61 and 62 extend from the top sides of the containers 6 and 7 to the lower levels of the interiors of the containers, where the inlet water or other fluid is discharged in intimate contact with the lower flue tubes 33 and 34. Preferably, the pipes 61 and 62 are flattened in a longitudinal vertical plane, as illustrated in Figures 2 and 3, so as to fit within the plurality of flue tubes within the containers while affording an enlarged volume input. Discharge pipes 63 and 64 extend from the upper sides of the containers 6 and 7 for removal of the heated fluid from the upper regions of the containers. If desired, clean-out openings 66 and 67 may be provided on the bottoms of the containers 6 and 7.

Preferably, the containers 6 and 7 are constructed of substantially cylindrical shells and are mounted on the base support in approximately coaxial relation. To accommodate and support the cylindrical form of the shells, the opposite end walls 13 and 14 are relieved to provide concave seats 68 fitting around approximately the lower half of the circumference of the shells, see Figure 2, these seats also functioning to seal the shells in the end walls. On the other hand, the side walls 11 and 12 extend up to approximately the central plane of the shells to substantially contact the periphery of the shells thereat. As an important feature of the present construction, the shells are provided with outstanding flanges 69 and 71 which lie in substantially the central horizontal plane of the shells and rest directly upon and are supported by the upper ends of side walls 11 and 12, to thereby seal the containers to such side walls. Additionally, the flanges 69 and 71 are preferably constructed of steel or other heat-conducting material, so as to transfer heat from the side walls of the fire box to the containers. The flanges 69 and 71 also afford a support for the opposite sides 72 and 73 of the smoke hood 47, the sides 72 and 73 having out-turned base flanges 74 and 76 mounted directly upon the upper sides of the flanges 69 and 71. A plurality of bolts 77 may be imbedded in the upper extremities of the side walls 11 and 12 for securing the flanges 69, 71, 74 and 76 in place.

The mounting construction for the individual boiler units above described permits a simple and ready assembling of the boiler or a subsequent removal of one or both of the units. Should one of the boiler sections require repair, such section may be quickly removed by the unfastening of its bolted connection and another identical section may be readily inserted in place with a minimum of shutdown time being involved. The use of a plurality of boiler units or sections as herein described also affords, as will be understood, an improved flexibility of operation. Since there is no direct water connection between the two containers, one may be used for the production of hot water while the other is used to produce steam, or both may be used for hot water or steam, as may be desired. The units may be connected in series where a temperature boosting effect is required, or the units may be connected in parallel where increased output is required. Where the units are connected in series, hot water may be taken off from the first unit and steam from the second unit. Or, if desired, any other external booster heater may be connected to either one or both of the units. While such flexibility of the use and application of the

boiler is afforded in the present construction, it will be likewise understood from the foregoing that the construction and arrangement of the units is such as to provide a maximum heat transfer and utilization of heat whereby efficiency of operation is assured.

I claim:

1. A boiler comprising, a pair of containers for fluid to be heated mounted in substantially horizontal alignment with adjacent ends in spaced substantially parallel relation defining a vertical passageway therebetween, means providing a fire box underlying said ends and in registration with said passageway, said ends being formed with extensions defining a substantially horizontal baffle in said passageway positioned for heating by direct radiation from said fire box, and plates of heat-conducting material connected to said extensions and extending interiorly in said containers for heating the contents thereof.

2. A boiler comprising, a pair of containers for fluid to be heated, mounted in substantially horizontal alignment with adjacent ends in spaced substantially parallel relation defining a vertical passageway therebetween, said ends providing a seal between said containers so as to prevent flow of fluid therebetween, means providing a fire box underlying said ends and in vertical registration with said passageway, U-shaped ribs provided on and extending transversely across said ends and projecting into said passageway and into abutting relation to define a closure for said passageway, said ribs being positioned for heating by direct radiation from said fire box and having the hollow interiors thereof in communication with the interiors of said containers for filling of said ribs with fluid to be heated, boiler flue tubes extending from said passageway through and exteriorly of said containers, and plates of heat-conducting material carried by said ribs and extending interiorly of said containers for heating the contents therein.

3. A boiler comprising, a support providing a fire box having opposed sides and an open top, a pair of independent containers for fluid to be heated and each formed with side flanges of

heat-conducting material projecting from the opposite sides thereof, the said containers each being sealed relative to the other so as to prevent the flow of fluid therebetween, said flanges being mounted upon the upper extremities of said fire box sides to seal said containers thereon, the adjacent ends of said containers being arranged in spaced substantially parallel relation defining a vertical passageway therebetween registering with said fire box, said ends being formed with medial extensions abutting each other along a substantially horizontal line within and dividing said passageway into upper and lower portions, and defining a closed top for said fire box, a hood mounted on said flanges and surrounding and enclosing said container ends above said extensions to define a flue discharge chamber in communication with said upper passageway portion, and separate flue tubes extending through each of said containers and connecting said passageway with said chamber, and means intermediate said passageway and chamber providing a pressure relief valve for the heated gases in said flue tubes.

ARTHUR S. WELDY.

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