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2,490,693

STEAM OR HOT WATER BOILER

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3 Sheets-Sheet 1

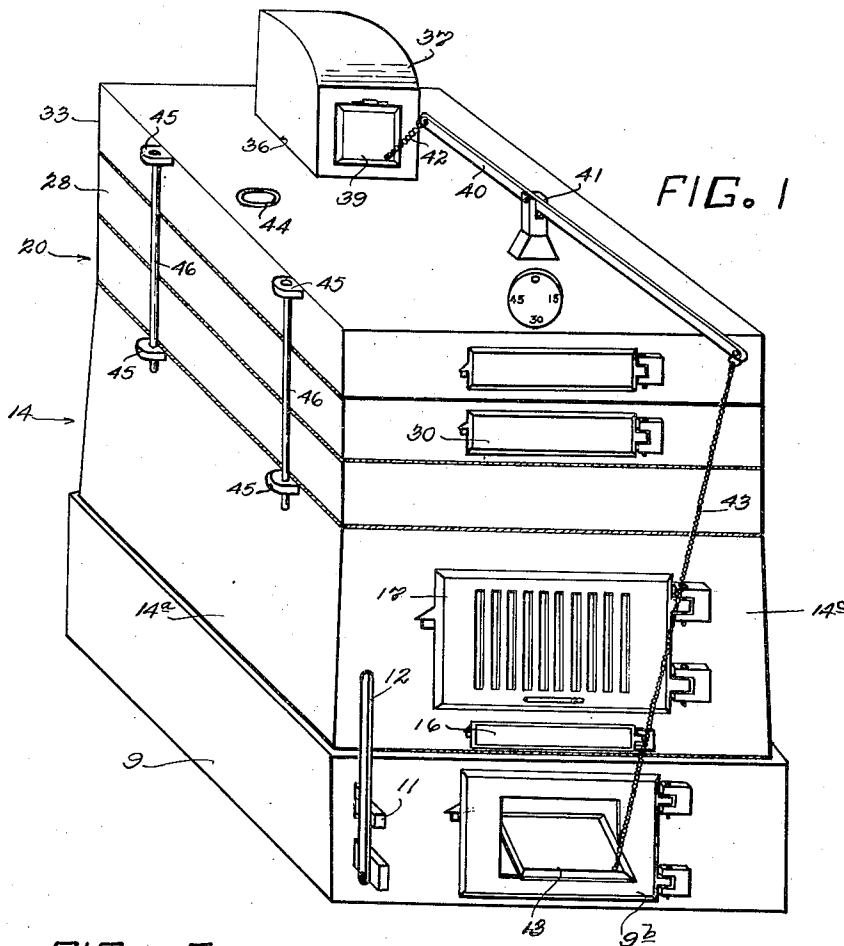


FIG. 7

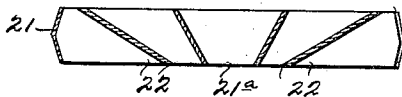
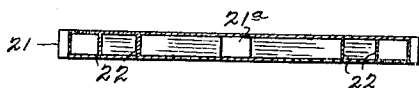


FIG. 8

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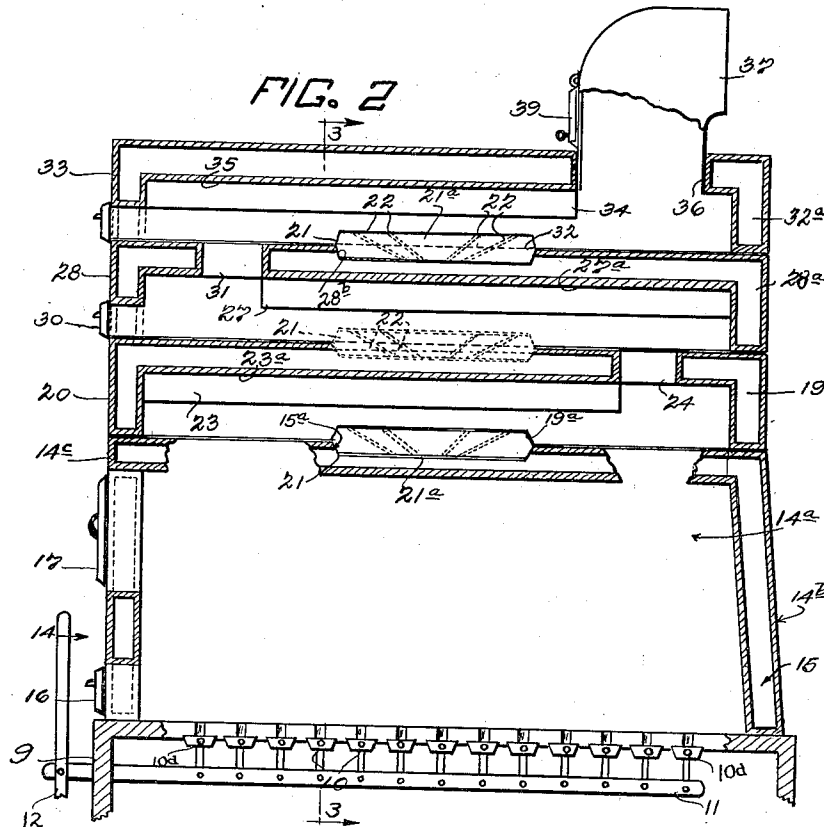
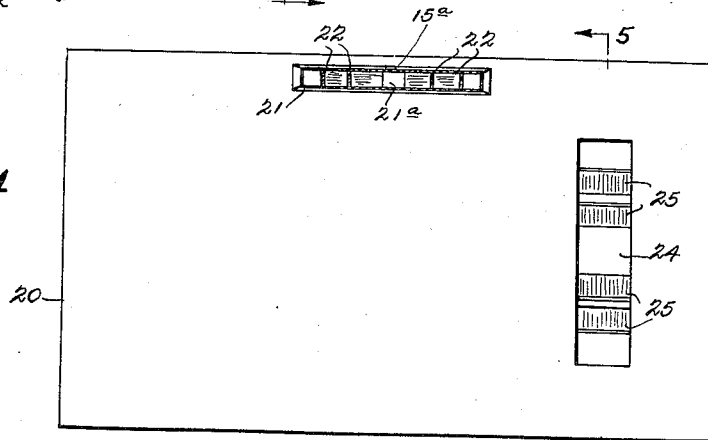


FIG. 4



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STEAM OR HOT-WATER BOILER

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8 Claims. (Cl. 122—218)

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My invention relates to improvements in steam or hot water boilers, with particular reference to those employed in domestic heating systems, although not, of course, limited thereto.

Boilers of the general class indicated as heretofore produced have failed to achieve any high degree of efficiency for a number of reasons. In the first place, they have usually been characterized by a relatively short passage for the products of combustion, from the fire-box to the outlet flue, which means that a large portion of the heat simply goes up the chimney instead of being utilized to heat the water jacket.

Another efficiency reducing characteristic in the conventional boiler, is that multiple supply and return lines for the steam or hot water are frequently employed and they lack means for causing the return supply to properly traverse the product-of-combustion heated areas while travelling from the return inlet to the supply outlet. In short, what usually happens in the usual boiler design is that the fluid short circuits, which is to say, is permitted to travel almost directly from the return inlet to the supply outlet. The obvious result is unnecessary fuel expenditure in obtaining the desired heat output in the radiator system.

The invention, therefore, has for its primary object to overcome the aforementioned objections through the provision of a sectional boiler construction which not only causes the products of combustion to traverse substantially the entire area of each jacket section in its passage to an outlet; but also provides means whereby the heated medium, whether steam or hot water, is compelled to traverse the entire product of combustion heated area of each section in its passage from the return or inlet line to the supply line outlet. A maximum of efficiency is therefore achieved for a given fuel expenditure.

More specifically stated, the invention contemplates a sectional boiler comprehending a plurality of water jacketed sections and novel means for not only alignedly connecting the sections, but also for establishing fluid communication therebetween. Said units being arranged to provide the fluid inlet to one section at a point remote from the fluid outlet therefrom which supplies the fluid to the next adjacent section.

Additionally, it is an aim of the invention to provide section connectors, as stated, which incorporate vanes or the like for deflecting in different directions the fluid supplied from one section to another, said vanes furthermore serving

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as reinforcements for the boiler section connectors.

Still another object is to provide a sectional boiler wherein the sections besides having remotely located fluid inlet and outlet passages in communication with one another, also have product of combustion inlets and outlets so located as to cause the hot gases to traverse the whole area of each section, the travel of the gases following a tortuous path from the fire-box to the smoke outlet.

Additionally, the invention contemplates a sectional boiler wherein the several sections are made of aluminum or other light alloy so as to make them easy to handle and to facilitate repairs by welding without necessitating the device being out of service for any appreciable period, such as while waiting for a replacement section.

Other objects and advantages of the invention will be understood and appreciated by those skilled in the art upon reference to the accompanying drawings, in connection with the detailed description thereof appearing hereinafter.

In accordance with the patent statutes, the illustration and description deal with a now preferred example of the invention. However, it is susceptible of other mechanical expression within the spirit and scope of the subject matter claimed hereinafter.

In the drawings, wherein the same reference characters have been used to designate the same parts throughout the several views:

Fig. 1 is a perspective view of a boiler embodying my invention;

Fig. 2 is a vertical longitudinal sectional view through the assembled boiler taken substantially on the plane of the line 2—2 of Fig. 3;

Fig. 3 is a vertical sectional view taken at right angles to the disclosure in Fig. 2 and approximately on the line 3—3 of Fig. 2;

Fig. 4 is a top plan view of the fire box crown section removed;

Fig. 5 is a cross sectional view through the fire box crown section taken on the line 5—5 of Fig. 4;

Fig. 6 is a bottom plan view of the fire box crown section removed;

Fig. 7 is a vertical longitudinal sectional view through one of the nipples for connecting the water jackets of adjacent boiler sections; and

Fig. 8 is a top plan view of one of the nipples of Fig. 7.

Referring to the drawings by reference characters, numeral 9 designates what in the present instance is a rectangular base section having inner edge bearing recesses in the top portions of

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opposite sides for the pintle ends 10a of the usual grate bars 10. In accordance with standard practice, the grate bars 10 have aligned depending arms adjacent one end, which arms are connected to a horizontally reciprocal shaker rod 11, which is operated by the horizontally pivoted hand lever 12 carried at the front of said base section 9.

The base section 9 has the ashpit door 9b, which is provided with a force draft opening, which is controlled by the horizontally pivoted plate valve 13.

Supported upon the top of the base section 9 is a generally rectangular fire box section 14, whose side and rear walls 14a, 14b, slant inwardly slightly in the direction of their upper ends so as to make for better heat transmission from the fire, it being understood, of course, that the fire box section is of double walled construction to provide the water jacket 15.

The front wall 14c of the fire box section has adjacent its lower edge the clinker removal opening which is controlled by the vertically pivoted clinker door 16, while adjacent the upper end of the fire box section front wall there is provided the conventional fire door 17, which is carried by the usual door frame which has a gas-tight fit with the opening provided in the front wall 14c.

The water jacket 15, of course, has the front wall-provided portion which communicates with the side wall portions. It is particularly to be noted that the water jacket 15 has preferably in its rear wall 14b, adjacent its lower edge and one side wall, the single fluid return inlet 18. There is particular advantage of but a single inlet as against several return inlets which is conventional practice. Further reference to this will be made later on.

Transmission of fluid under thermal action from the fire box water jacket 15 to the water jacket 19 of the superjacent or fire box crown boiler section 20, is had through the single rectangular top opening 15a, in one side wall 14a of fire box section 14. This opening 15a communicates with the correspondingly shaped and positioned water jacket inlet 19a, of said fire box crown section 20.

As illustrated, the fire box crown section 20 has its under surface provided with a plurality of laterally spaced hollow heat absorbing ribs 23 which are a part of the fire box crown section water jacket 19. These hollow ribs 23 extend from the front end of the section 20 but terminate at the site of the transversely disposed product of combustion outlet 24 adjacent the rear end.

It is particularly to be noted that the product of combustion opening 24 of said section 20 is provided with angularly disposed deflector vanes 25 which are laterally spaced from one another and extend the full width of opening 24. While four of these vanes 25 are shown, the number may, of course, be increased or diminished. The vanes 25 adjacent one end of the opening 24 are inclined theretoward, while the vanes adjacent the other end of opening 24 are inclined toward that end.

An important thing to be noted, in respect to the pair of spaced laterally inclined product of combustion deflecting vanes 25 adjacent each end of the combustion outlet 24 of the fire box crown section 20, is that they assure of the transmission of hot gases to the outer ones of the laterally spaced lineal channels 27a formed in the bottom of the superjacent boiler section 28. It is to be noted that the lineal channels 27a of said super-

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jacent section 28 are separated by hollow laterally spaced heat absorbing ribs 27 which are similar to the ribs 23 of section 20 and are part of the water jacket 28a of the superjacent boiler section 28.

Adverting again to the fire box section 14, and its crown section 20, it will be observed that the aligned outlet and inlet openings 15a, 19a, receive a rectangular connecting nipple 21 which is shaped to make a snug fit in said openings and has the vertical jacket connecting passage 21a.

This rectangular connecting nipple 21 has a three-fold function. Firstly, it establishes fluid communication between the water jackets 15, 19 of the fire box and crown sections 14, 20. Secondly, it provides a means for properly centering the crown section 20 upon the fire box section 14; and thirdly, said connector nipple 21 provides directional flow means in the form of inclined panels 22 for directing incoming fluid to both the front and rear of the water jacket 19 of said fire box crown section 20.

The directional flow panels 22 adjacent the rear end of the section 20 are inclined in that direction, while the other two panels are inclined forwardly. This arrangement assures of uniform heat treatment of the boiler fluid because it will be caused to pass in substantially uniform volume laterally across the spaced water jacket channels which are provided by the hollow ribs 23 in order to reach the rectangular outlet 25 to the jacket of the superjacent section 28. The fluid outlet 25 of crown section 20 is at the opposite side of same from the water jacket inlet 19a. A very efficient and uniform heating of the boiler fluid is thus achieved, and with a minimum of fuel expenditure.

The rectangular boiler section 28, previously alluded to as supported upon the fire box crown section 20, has a water jacket 28a and is identical in formation with the fire box crown section 20, except that its product of combustion outlet 31 is located adjacent the front end of said section instead of being at the rear. Also, of course, the fluid jacket inlet 29 is at the opposite side from the crown section inlet and is in registry with the fluid jacket outlet 26 of said crown section. The section 28 provides a flue clean-out opening which is controlled by the usual vertically pivoted door 30.

The section 23 has a water jacket outlet 28b, and such outlet is disposed in registry with the correspondingly shaped inlet 32 of the water jacket 32a of the rectangular dome section 33. The under surface of dome section 33 also has hollow laterally spaced heat absorbing ribs 34 as a part of its water jacket 32a and these ribs are separated by channels 35. And there is a product of combustion outlet 36 in its top adjacent its rear end. Products of combustion pass from the dome section opening 33 to the usual smoke outlet hood 37, which is fitted in said opening. The hood 37 has the conventional check valve opening which is controlled by the horizontally pivoted plate valve 39.

Alternate operation of the check valve 39 and the force draft valve 13 is effected by the lever 40 which is pivoted as is usual in the bearing 41 carried by the top of dome section 33. There is the usual chain connection between the lever 40 and the valves as indicated by reference characters 42, 43, respectively.

The single outlet or supply line connection 44, to the radiator system is provided preferably at

one side of the dome section 33 and intermediate the ends thereof.

In order to hold the sections 20, 28, 33, in tightly clamped relationship, I provide the dome section 33 and the fire box section 14 with aligned apertured ears 45, preferably in spaced pairs. These ears 45 receive the tie rods 46 having nuts whereby the rods effect joining of the sections into tight contact.

From the foregoing description, it will be apparent that the products of combustion from the fire box section 14 have initial direct contact with the lineally ribbed under surface 23, 23a, of the water jacketed fire box crown section 20 and then pass through the rear product of combustion outlet 24 of said crown section to impinge against the ribbed under surface 27, 27a of section 28. The deflecting panels 25 in the product of combustion outlet 24 assure of deflection of the products of combustion to the ribs and channels 27, 27a adjacent each side of the superjacent section 28. The products of combustion then pass forwardly to the fume outlet 31, of said superjacent section 28 to reach the ribbed or grooved under surface 34, 35, of the water jacketed dome section 33, passing thence rearwardly to outlet hood 37.

The alternate front and rear location of the product of combustion inlets and outlets of the respective boiler sections 20, 28 and 33 assures of travel of the hot fumes throughout the entire length of each of the jacketed sections mentioned. The deflectors 25, which are arranged in the fume outlet openings 24 and 31, serve as previously indicated to conduct the fumes laterally to the outermost channels or grooves of the respective sections so that each transverse area will receive uniform heat treatment for heating the water jacket contained fluid, whether steam or water.

A very high degree of efficiency and conservation of fuel is effected by the product of combustion outlet arrangement mentioned, but the arrangement of inlets and outlets from the water jackets of the respective sections is equally important.

Fig. 3 illustrates that the fluid from the jacket portion 15 of the fire box section 14 passes into the fire box crown section jacket 19 at one side through the rectangular nipple 21 and passes from said jacket 19 through a similar nipple 21 at the opposite side into the jacket 28a of the superjacent section 28. Thus, the fluid traverses laterally the entire series of hollow lineally extending ribs 23. Also, the forwardly and rearwardly inclined deflectors 22, in the jacket connecting nipples 21 deflects the fluid forwardly and rearwardly in the respective sections so that there will be an initial uniform spread of fluid throughout the entire length of each jacketed section.

The deflector panels or vanes 22 in the rectangular nipples 21 not only have the fluid deflecting function mentioned but they also reinforce said nipples. This is important because the nipples 21 serve to center and retain the boiler sections in operative relationship.

Having thus described my invention, what I claim is:

1. In a boiler or the like, comprising a water jacketed fire box section and superjacent water jacketed fume outlet passage-providing sections carried thereby in stacked relationship thereto and to one another, the combination of combined section centering and water jacket connecting

nipples interposed between the respective sections, and a pair of spaced transversely disposed fluid-directing panels in each nipple for directing fluid passing therethrough laterally in opposite directions.

2. The combination of a boiler comprising a fire box section, superposed water jacket providing boiler sections carried by said fire box section and disposed in stacked relationship to the latter and to one another, said jacket providing section defining a product of combustion exit passage, the outlet from the portion of said passage which is provided by each section being at the opposite end from the outlet provided by adjacent sections, a fluid connection between the water jackets of adjacent sections, the respective fluid connections being located alternately at opposite sides of the boiler whereby the boiler fluid is caused to proceed transversely of said sections across the path of subjacent product of combustion passageway, and each of said water jacket fluid connections comprising a rectangular nipple providing a vertical fluid passageway of like outline, and at least one transversely disposed fluid directing panel adjacent each end of said nipple provided passage and inclined toward the proximate end thereof whereby to direct incoming boiler fluid to opposite ends of each section.

3. The combination of a boiler comprising a fire box section, superposed water jacket providing boiler sections carried by said fire box section and disposed in stacked relationship to the latter and to one another, said jacket providing section defining a product of combustion exit passage, the outlet from the portion of said passage which is provided by each section being at the opposite end from the outlet provided by adjacent sections, a fluid connection between the water jackets of adjacent sections, the respective fluid connections being located alternately at opposite sides of the boiler whereby the boiler fluid is caused to proceed transversely of said sections across the path of subjacent product of combustion passageway, and each of said water jacket providing boiler sections having laterally spaced lineally extending heat absorbing ribs extending into the portion of the combustion exit passage provided thereby, and deflectors adjacent the opposite sides of said exit passage portion outlets and inclined theretoward whereby to deflect hot fumes to the outermost ones of said water jacket provided ribs of the superjacent exit passage portion and to the spaces between said ribs.

4. In a boiler comprising juxtaposed water jacket providing sections, means for centering said sections upon one another and comprising a water jacket connecting nipple, and each of said sections having a nipple receiving recess, said nipple having a vertical fluid passage of rectangular outline, deflectors adjacent each end of said passage and having their upper ends inclined towards said adjacent passage end whereby to direct fluid from one boiler section towards opposite ends of the superjacent section.

5. The combination set forth in claim 4, and each of said boiler sections providing a portion of a combustion exit passage, and at least one of said sections having its water jacket providing laterally spaced lineally extending grooves and said groove portion projecting into the combustion exit passage to define spaced heat absorbing ribs extending lengthwise of said exit passage.

6. A boiler comprising in combination, a fire box, superposed water jacketed sections carried by said fire box and arranged in stacked relation to the same and to each other, water jacket connecting means comprising fluid passages between the water jackets of adjacent sections only, said passages between one pair of adjacent sections being at one side of said boiler and the connecting means for the next adjacent section being at the opposite side of said boiler, means in each passage for directing fluid passing therethrough laterally in opposite directions in the adjacent section, said sections providing a lineally and vertically extending product of combustion outlets, said lineally extending outlets transverse first rearwardly and then forwardly between said sections, and each of said vertical outlets having means for directing products of combustion passing therethrough laterally in an adjacent lineally extending outlet in opposite directions substantially at right angles to the flow of fluid in adjacent jacket sections.

7. In a boiler, the combination with a fire box, superposed water jacketed sections carried by said fire box in vertically spaced relation whereby to provide a plurality of vertically spaced horizontally disposed water jackets extending transversely across said fire box, marginal vertically disposed water passages connecting adjacent jacket sections, said vertical passages being staggered, horizontal smoke flues interposed between adjacent jacket sections, and laterally staggered smoke passages connecting adjacent horizontally disposed flues and extending through adjacent jacket sections; of diverging water baffle means in each water passage for directing the flow of water passing therethrough horizontally in opposite directions across the entire width of the jacket section next above, diverging smoke baffle means in each smoke passage for directing the flow of smoke passing therethrough horizontally in opposite directions across the entire width of the smoke flue next above, all of said water baffle means directing the flow of all water substantially parallel directions, and all of said smoke

baffle means directing the flow of all smoke in substantially parallel directions but at right angles to the direction of water flow induced by said water baffle.

8. A boiler comprising in combination, a fire box, superposed water jacketed sections carried by said fire box and arranged in stacked relation to the same and to each other, water jacket connecting means comprising fluid passages between the water jackets of adjacent sections only, said passages between one pair of adjacent sections being at one side of said boiler and the connecting means for the next adjacent section being at the opposite side of said boiler, at least a pair of spaced and oppositely inclined baffle panels in each passage for directing fluid passing therethrough laterally in opposite directions in the adjacent sections, said sections providing a lineally and vertically extending product of combustion outlets, said lineally extending outlets transverse first rearwardly and then forwardly between said sections, and each of said vertical outlets having at least a pair of spaced transversely disposed oppositely inclined baffle panels for directing products of combustion passing therethrough laterally in an adjacent lineally extending outlet in opposite directions substantially at right angles to the flow of fluid in adjacent jacket sections.

THOMAS E. LENNON.

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