April 7, 1942. E. W. JOROLEMON 2,278,699

BOILER CONSTRUCTION

Filed Sept. 21, 1939 2 Sheets-Sheet 1

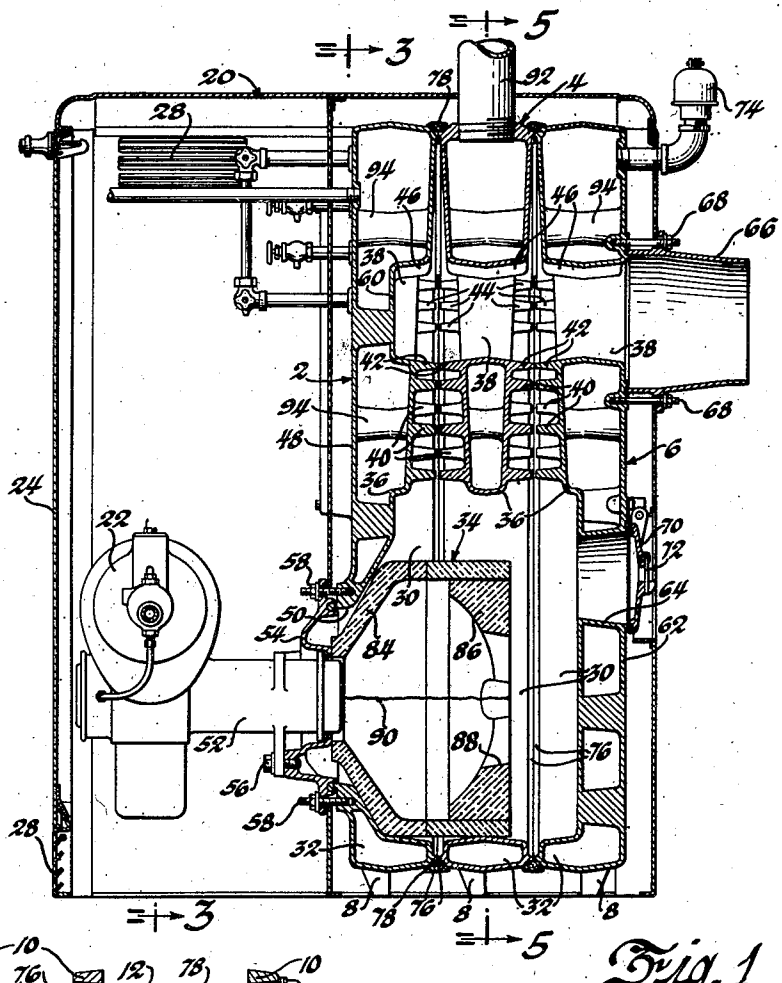

Fig. 1

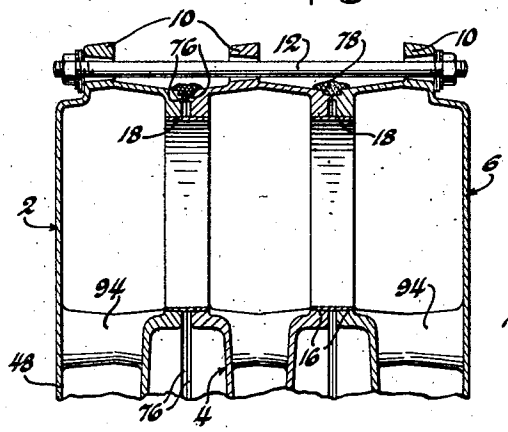

Fig. 2

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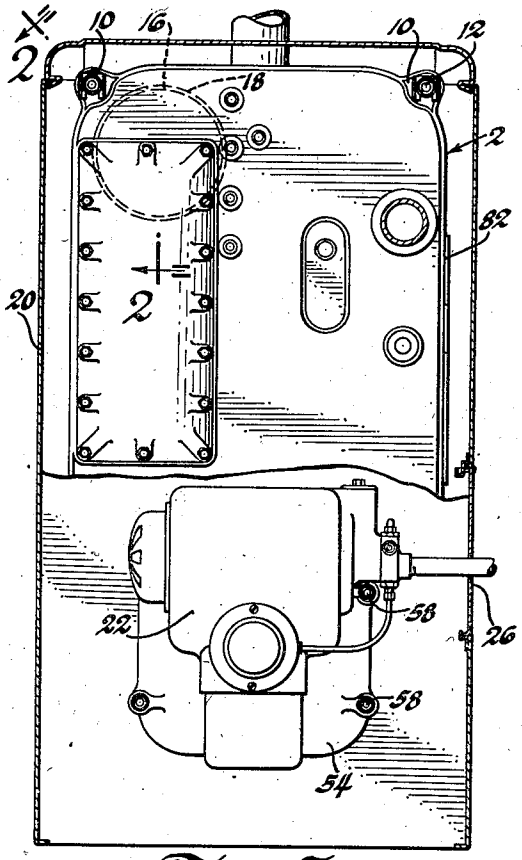

Fig. 3

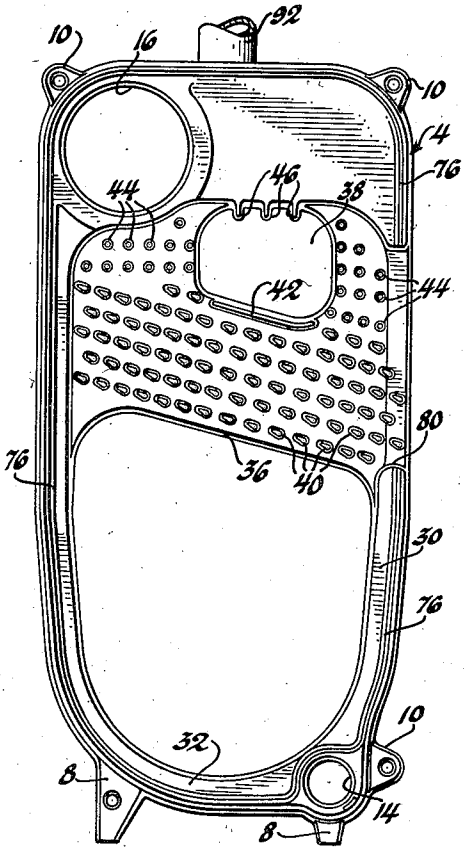

Fig. 4

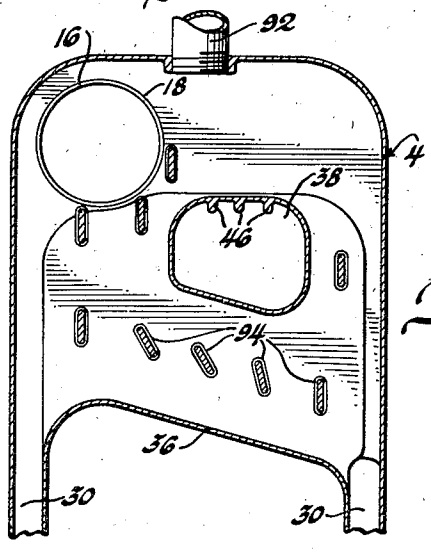

Fig. 5

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UNITED STATES PATENT OFFICE

2,278,699

BOILER CONSTRUCTION

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Application September 21, 1939, Serial No. 295,893

8 Claims. (Cl. 122—225)

This invention relates generally to boilers adapted for use in steam or hot water heating systems, and more particularly to improvements in boilers of the cast sectional type which are adapted for use with fluid fuel burners.

It is one of the principal objects of the invention to increase the efficiency of boilers of this type by certain improvements in the construction and arrangement of parts to provide a high rate of heat absorption.

A further object is to provide a plurality of specially constructed and arranged heat absorbing projections or fins on opposed faces of the boiler sections for the absorption of heat from the flue gases.

A still further object is to provide a complete boiler unit of simple and practical construction in which all parts are readily accessible for inspection, cleaning, or service.

With the foregoing and other objects which will appear as the description proceeds, my invention consists in certain novel features of construction and combinations and arrangements of parts, as will be set forth in the following description of one embodiment of the invention which is illustrated in the accompanying drawings, wherein

Figure 1 is a central longitudinal sectional view, with parts in elevation, of the complete boiler unit.

Figure 2 is an enlarged sectional view taken substantially on line 2—2 of Figure 3.

Figure 3 is a transverse sectional view, with parts in elevation, taken substantially on line 3—3 of Figure 1.

Figure 4 is a front elevation of the intermediate boiler section.

Figure 5 is a fragmentary transverse sectional view of the intermediate boiler section taken substantially on line 5—5 of Figure 1.

Referring now to the drawings, the present boiler has been shown for simplicity as comprising only three hollow sections, namely, a front section 2, an intermediate section 4, and a rear section 6, but as will be more fully set forth hereinafter, any number of similarly formed intermediate sections may be provided depending upon the boiler capacity desired.

Each boiler section is provided with laterally spaced depending pedestals or supports 8 on which the boiler rests and with outstanding lugs 10 to receive tie bars 12 by which the sections may be secured together. As shown in Fig. 4, the sections are provided adjacent the bottom of the boiler at one side with aligned openings 14 and adjacent the top of the boiler at the opposite side with aligned openings 16, within which are secured the nipples 18 as shown in Fig. 2 to provide for the circulation of heating fluid throughout the boiler. As is also shown in Fig. 4, the lugs 10 may be provided only at three corners of the boiler sections and the pedestals or supports 8 at the bottom corner opposite the openings 14 formed to receive one of the tie bars 12.

The assembled sections of the boiler are preferably enclosed by a casing or jacket 20 which is provided with a compartment to receive the fluid fuel burner unit 22 which is preferably, though not necessarily, of the pressure atomizing type. This compartment also serves as a housing for the usual burner and boiler controls and indicating instruments and is formed with removable front and side doors or panels, 24 and 26, respectively, to provide access for inspection or repair purposes. Suitable louvres 28 are also provided in this compartment, as shown in Fig. 1, to permit the circulation of air through such compartment and supply air to the fuel burner.

The several boiler sections are so formed as to provide a water space which substantially surrounds or encloses the combustion chamber space. On reference to Figs. 1, 4 and 5, it will be seen that the intermediate section 4 includes spaced front and rear walls to form a water and steam space with depending side water legs 30 which taper inwardly and are joined at their bottom by the curved portion 32 to eliminate any sharp corners or pockets in which sediment might accumulate and to provide a close fit for the refractory combustion chamber or fire box 34 to be described hereinafter. The combustion chamber space is defined by such side legs and curved bottom portion and the crown sheet 36 connecting the front and rear walls of the section. The crown sheet 36 is inclined to the horizontal and extends diagonally upward between the side legs. It will also be noted from Fig. 1 that the front and rear walls of the water or steam space above the crown sheet 36 diverge upwardly so that such space gradually increases in size to provide for expansion of the heating fluid.

A suitable transversely extending flue passage 38 is formed in the intermediate section 4 about midway between the crown sheet 36 and the upper wall of such section and is preferably offset to one side of the vertical center line thereof as is obvious from Figs. 4 and 5. The bottom wall of the flue passage 38 is inclined and substantially parallel to the inclined crown sheet 36, and between such wall of the flue passage

and the crown sheet, the front and rear walls of the section 4 are provided with a series of tapered and streamlined heat absorbing fins 40 which are inclined in rows parallel to the incline of the crown sheet and bottom wall of the flue passage and staggered in vertical rows.

The fins 40 are formed as solid, tapered projections to facilitate cleaning and on reference to Fig. 1 it will be understood that such fins are adapted to oppose similar fins on the adjacent boiler sections with only a relatively narrow space therebetween to thereby provide flue spaces between the sections for the movement of the gases from the combustion chamber space to the flue passage through the sections, and such fins will cause the gases to follow tortuous paths and provide for an effective transmission of heat therefrom to the heating fluid within the sections.

Before describing the construction of the front and rear boiler sections, it is desired to note that by reason of the divergence of the front and rear walls of the intermediate section 4 and the inclined arrangement of the walls of the front and rear sections which oppose the same to thereby provide the vertically expanding water and steam space in each section above the crown sheet 36, the flue spaces between the sections are correspondingly narrowed vertically to afford vertically contracting flue spaces for the combustion gases.

The inclined arrangement of the fins 40 below the flue passage through the sections tends to deflect the combustion gases towards the left side, as viewed in Fig. 4, and a deflector or baffle plate 42 is provided on the lower edges of the flue passage 38 on each wall of the intermediate section 4 to contact similar deflectors or baffle plates on the adjacent walls of the front and rear sections to prevent the gases from passing vertically directly to the flue passage from the combustion chamber space. To increase the heat absorption, circular, tapered fins 44 are arranged in substantially horizontal rows in line with the flue passage 38, and three depending fins 46 are also shown as provided in the flue passage 38.

The front boiler section 2 is preferably formed with substantially the rear half thereof similar to the rear half of the intermediate section 4, and the rear boiler section 6 may be formed with its front half similar to the front half of the intermediate section 4. In fact, it has been found expedient to make a separable pattern for casting the intermediate section and then use the halves of such pattern for casting the inner halves of the end sections.

As will be seen particularly from Fig. 1, the rear portion of the front boiler section 2 is formed with the crown sheet portion 36, the sets of fins 40, 44 and 46, and flue passage 38 with the deflector or baffle plate 42, all of which are similar to corresponding parts of the rear half of the intermediate section 4. The rear portion of the section 2 may also be said to include the depending water legs 30 joined by the curved bottom portion 32, but the front portion of section 2 is formed with a front vertical wall 48 with side walls which are so formed and joined with the rear portion of this section as to provide a front hollow water and steam space communicating directly with the water legs and curved bottom portion. This space is continuous throughout the vertical extent of this section except for the opening 50 which is provided to receive the burner tube 52 of the fuel burner unit 22 which may be secured to the front boiler section 2 and supported thereon by means such as the bracket 54 secured to the burner tube as by bolts 56 and to the section 2 as by bolts 58. As will be noted, the opening 50 in section 2 is considerably larger than the diameter of the burner tube 52 to permit the insertion through this opening of the several parts which make up the combustion chamber or fire box 34. The flue passage 38 does not extend through the section 2 but terminates therein with the end wall 60, and the vertical front wall 48 of this section is formed as shown with several openings to provide for the connection of the usual gauges and controls.

As will also be apparent from Fig. 1, the front portion of the rear boiler section 6 is formed with the crown sheet portion 36, the sets of fins 40, 44 and 46, and flue passage 38 with the deflector or baffle plate 42, all of which are similar to corresponding parts of the front half of the intermediate section 4. The front portion of the section 6 may also be said to include depending water legs 30 joined by the curved bottom portion 32, but the rear portion of such section is formed with a rear vertical wall 62 and side walls which are so formed and joined with the front portion as to provide a rear hollow water and steam space communicating directly with the water legs and curved bottom portion. This hollow water and steam space is continuous throughout the vertical extent of the section 6 except for the extension of the flue passage 38 through the same and the relief passage 64 therethrough. The usual smoke pipe to carry away the products of combustion is adapted to be connected to the flue passage 38 by means such as the smoke ring 66 secured to the rear section 6 as by bolts 68. The relief passage 64 is provided on the rear wall of the section 6 with the hinged relief door 70 to relieve suddenly accumulating pressures in the combustion space and this door 70 may be provided with a centrally located inspection opening which is normally closed by a glass cover or a pivoted cover plate 72 to permit inspection of the combustion conditions without opening the larger relief door for this purpose. The rear section 6 may also be provided with a suitable opening to receive the usual steam pressure relief valve 74.

As noted heretofore, the several boiler sections are adapted to be assembled, as will be apparent from Fig. 1, so that all of the heat absorbing fins 40 and 44 on the adjacent walls of the sections will be opposed with only a relatively narrow space between the opposed ends of such fins, and the opposed deflectors or baffle plates 42 will substantially contact one another. To close the combustion and flue spaces the adjacent walls of the sections are provided with machined flanges 76 which extend almost entirely around the sections and which are adapted to contact one another with a suitable sealing means 78 at such joints.

On reference to Fig. 4 it will be seen that such flanges 76 are discontinued at one side of each section in horizontal alinement with the heat absorbing fins 40 and 44 and flue passage 38 to provide cleanout openings 80 between the sections. Such openings may be normally closed by means such as cleanout doors indicated at 82 in Fig. 3, which when removed permit the insertion of a brush or other means to remove any soot or dirt from the fins and flue passage.

The combustion chamber or fire box 34 within the combustion space may be of any suitable shape but is preferably formed as shown in Fig. 1

as generally cylindrical with a front conical end 84 having an opening to receive the burner tube 52 and with the rear end substantially closed by the target portion 86 which may be formed with an X or cross-shaped opening 88 to permit egress of the products of combustion or combustion gases. Although this chamber may be of any desired material it is shown as being made of refractory material which is molded or preformed into sections of the desired shape and dimensions which may be inserted into the boiler through the opening 50 after assembly of the boiler sections and then cemented together. As indicated by the irregular line 90, both the conical, cylindrical and target portions may conveniently be preformed in upper and lower halves to permit the insertion thereof through the opening 50 which is shown as being of smaller diameter than the assembled combustion chamber. It will be noted that the combustion chamber or fire box 34 does not occupy all of the combustion space of the boiler but provides a space outside of the chamber to allow the combustion gases to expand and equalize before passing upwardly to the flues between the several boiler sections.

As will be obvious, although the boiler has been shown for simplicity as having only a single intermediate section 4, any number of similarly formed intermediate sections may be employed depending upon the boiler capacity desired, with no change whatsoever in the size or construction of the front and rear boiler sections but merely a change in the size or length of the combustion chamber 34 and the external casing or jacket 20. The steam outlet pipe 92 has been shown as connected to the intermediate section 4 and when more than one intermediate section is employed, separate steam outlet pipes may be readily provided if desired, or only a single outlet on one of the intermediate sections.

It will be apparent that the relative location of the aligned openings and nipples for circulation of fluid throughout the boiler sections at the opposite corners, as shown particularly in Fig. 4, promotes a diagonal circulation within the upwardly diverging space in each section to provide a greater scrubbing action and increased heat absorption than if the flow were more or less localized between vertically aligned openings. Each section is shown as provided with internal strengthening webs 94 between the spaced front and rear walls and some of such webs may be angularly arranged as shown in Fig. 5 to act as guides for the diagonal flow of fluid.

The upwardly inclined crown sheet 36 presents a greater area to the products of combustion or flue gases than if such sheet were horizontal. The gases move upwardly in the converging spaces between the sections and the major portion of such gases are diagonally deflected by the inclined rows of heat absorbing fins and are prevented from being short-circuited or passing directly to the longitudinal flue passage through the sections by the deflectors or baffle plates 42.

It will also be apparent that the particular arrangement of the heat absorbing fins and the streamlined and tapered shape of such fins not only affords an exceedingly effective heat absorption but also prevents any appreciable soot formation and facilitates the cleaning of the fins through the cleanout doors in the side of the boiler which also permit the ready cleaning of the flue passage through the sections.

Many advantages of the several novel features of my invention in addition to those mentioned above will be apparent to those skilled in the art, and while only a single embodiment of my invention has been shown and described herein, it will be understood that many changes and modifications may be made in the detailed construction and arrangement of parts within the scope of my invention as defined in the following claims.

I claim:

1. A sectional boiler having a series of upright hollow sections, said sections being formed to provide a combustion space adjacent their lower ends and a longitudinally extending flue passage adjacent their upper ends, a plurality of opposed heat absorbing fins on the opposed faces of said sections between said combustion space and said flue passage, each of said fins having its major axis transversely inclined with said fins arranged in diagonally extending rows to deflect combustion gases towards one side of the boiler and the opposed faces of said sections being spaced at one side of the boiler to provide openings for access to said fins.

2. A sectional boiler having a series of upright hollow sections, said sections being formed to provide a combustion space adjacent their lower ends and a longitudinally extending flue passage adjacent their upper ends, said flue passage being offset to one side of the vertical center line of said sections, and means on the opposed faces of said sections between said combustion space and said flue passage adapted to permit a generally upward movement of the combustion gases and deflect the major portion of the combustion gases diagonally towards the opposite side of said sections.

3. A sectional boiler having a series of upright hollow sections, said sections being formed at their lower ends to provide a combustion space and at their upper ends to provide a longitudinally extending flue passage, said combustion space and flue passage being vertically spaced and said sections being formed with vertically extending opposed faces between said combustion space and said flue passage and a plurality of heat absorbing fins on said opposed faces of said sections, said fins being transversely tapered to deflect combustion gases towards one side of said boiler.

4. A sectional boiler having a series of upright hollow sections, said sections being formed at their lower ends to provide a combustion space and at their upper ends to provide a longitudinally extending flue passage, said combustion space and flue passage being vertically spaced and said sections being formed with vertically extending opposed faces between said combustion space and said flue passage and a plurality of heat absorbing fins on said opposed faces of said sections, said fins being transversely tapered and arranged in horizontally inclined transverse rows to deflect combustion gases laterally during travel from said combustion space to said flue passage.

5. A sectional boiler having a series of upright hollow sections, said sections being formed at their lower ends to provide a combustion space having a transversely inclined crown sheet, a longitudinally extending flue passage adjacent the upper ends of said sections, and a plurality of opposed heat absorbing fins on the opposed faces of said sections between said crown sheet and said flue passage, said fins being so formed as to deflect combustion gases towards one side

of the boiler and arranged in inclined rows which are substantially parallel to said crown sheet.

6. A sectional boiler having a series of upright hollow sections, said sections being formed at their lower ends to provide a combustion space having a transversely inclined crown sheet, a longitudinally extending flue passage adjacent the upper ends of said sections, said flue passage extending through said sections with the bottom of said flue passage transversely inclined and substantially parallel to said crown sheet, and a plurality of opposed heat absorbing fins on the opposed faces of said sections between said crown sheet and said flue passage, said fins being so formed as to deflect combustion gases towards one side of the boiler and arranged in rows which are substantially parallel to said crown sheet and the bottom of said flue passage.

7. A sectional boiler having a series of upright hollow sections, said sections being formed at their lower ends to provide a combustion space having a transversely inclined crown sheet, a longitudinally extending flue passage adjacent the upper ends of said sections, a plurality of opposed heat absorbing fins on the opposed faces of said sections between said crown sheet and said flue passage, said fins being so formed as to deflect combustion gases towards one side of the boiler and arranged in inclined rows which are substantially parallel to said crown sheet, and a plurality of opposed heat absorbing fins on the opposed faces of said sections in horizontal alinement with said flue passage and arranged in substantially horizontal rows.

8. A sectional boiler having a series of upright hollow sections, said sections being formed to provide a combustion space adjacent their lower ends and a longitudinally extending flue passage adjacent their upper ends, and a plurality of opposed heat absorbing fins on the opposed faces of said sections between said combustion space and said flue passage, each of said fins having its major axis transversely inclined with said fins arranged in diagonally extending rows to deflect combustion gases towards one side of the boiler.

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