March 12, 1935. J. F. McINTIRE 1,993,850

BOILER CONSTRUCTION

Filed May 1, 1933 2 Sheets-Sheet 1

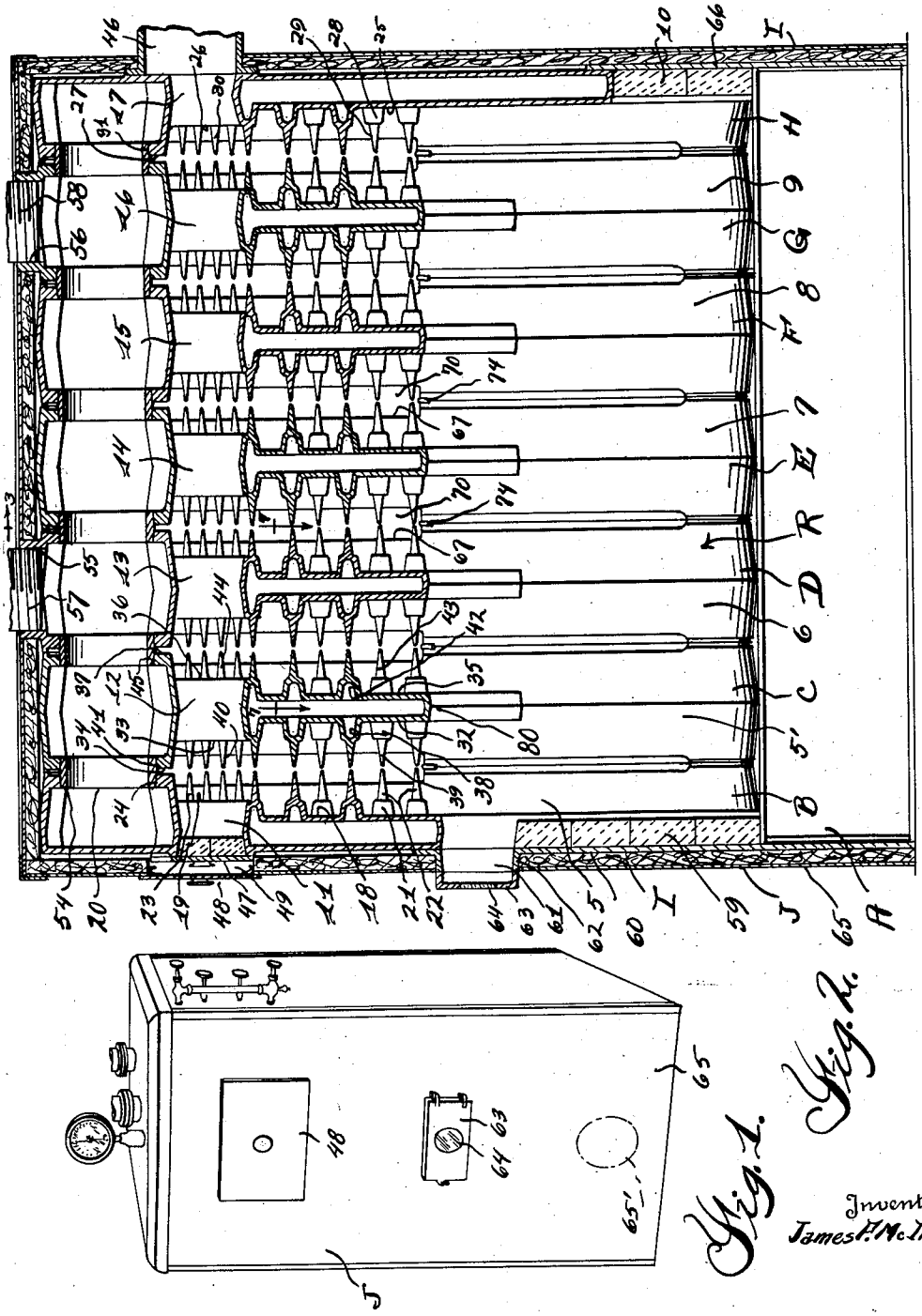


Fig. 1.

Fig. 2.

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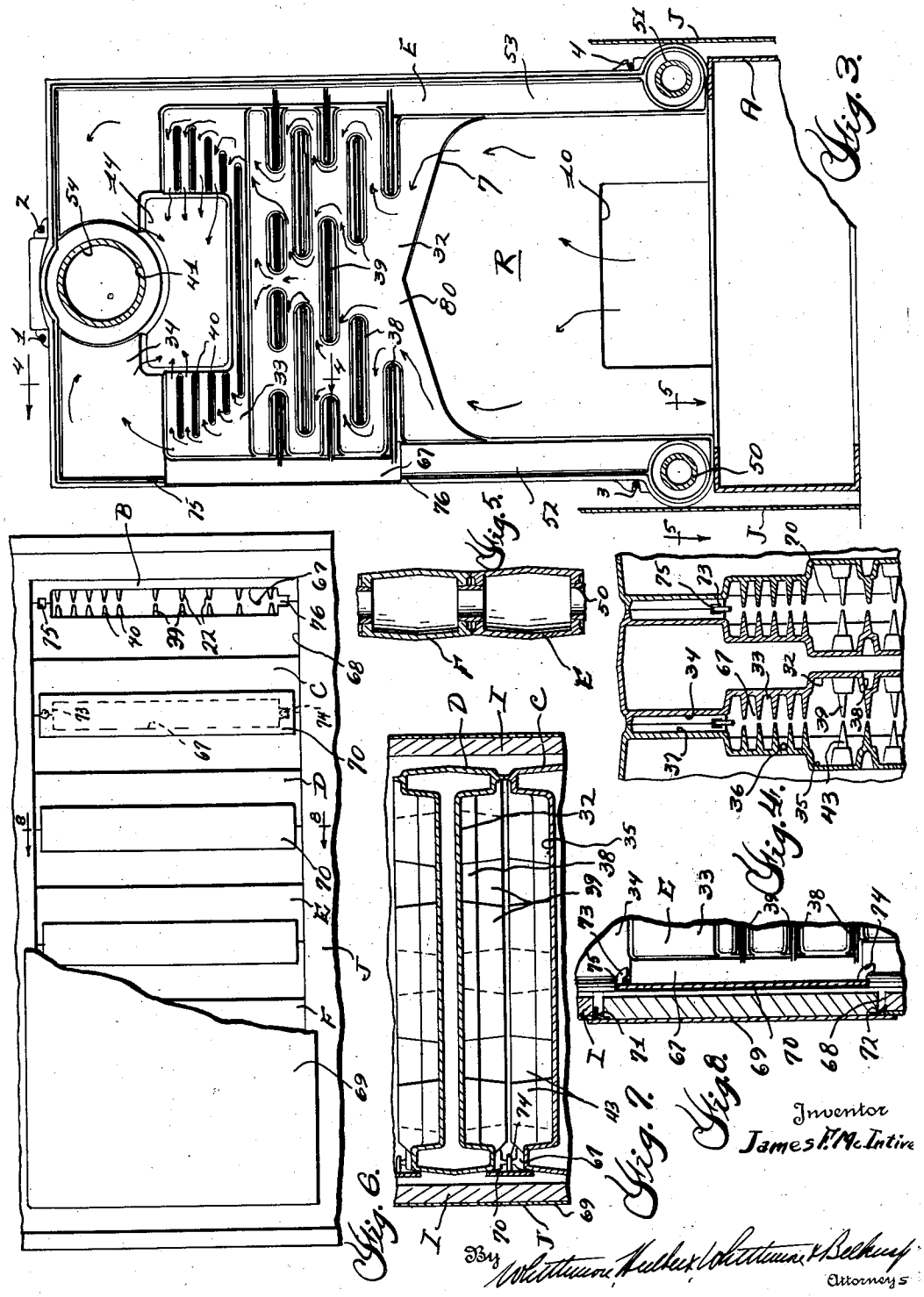


Fig. 3.

Fig. 5.

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 8.

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BOILER CONSTRUCTION

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Application May 1, 1933, Serial No. 668,877

10 Claims. (Cl. 122—225)

This invention relates generally to sectional boilers, especially those capable of being heated by oil burners and the like, and consists of certain novel features of construction, combinations and arrangements of parts that will be hereinafter more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a perspective view of a boiler embodying my invention;

Figure 2 is a central longitudinal sectional view through the boiler with the outer casing removed;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is a sectional view on the line 4—4 of Figure 3;

Figure 5 is a sectional view on the line 5—5 of Figure 3;

Figure 6 is a side elevation of the boiler with parts broken away;

Figure 7 is a sectional view on the line 7—7 of Figure 2;

Figure 8 is a sectional view on the line 8—8 of Figure 6.

Referring now to the drawings, A is the base; B, C, D, E, F, G and H, respectively, are the upright boiler sections; I is the insulation; and J is the jacket or outer casing of a sectional boiler embodying my invention. As shown, the base A, insulation I and jacket J are conventional in construction and are assembled in the usual manner. The upright sections B, C, D, E, F, G and H, respectively, however, are structurally quite different from any of which I have knowledge and constitute the subject matter of my invention.

Preferably the sections B, C, D, E, F, G and H are hollow castings substantially rectangular in configuration and are arranged one in rear of the other in abutting relation upon the base A. Any suitable means such as the tie rods 1, 2, 3, and 4, respectively, may be used to hold such sections together. The sections B, C, D, E, F and G, respectively, are provided at their lower ends from front to rear with arched portions 5, 5', 6, 7, 8 and 9, respectively, which cooperate to form the fire box R of the boiler, while the rear section H is provided adjacent its lower end in alignment with said arched portions with a tubular portion 10 of substantially rectangular configuration. All of said sections are provided adjacent their upper ends with tubular portions 11, 12, 13, 14, 15, 16 and 17, respectively, of substantially rectangular configuration that extend in a line fore and aft of the boiler. The front face of the front section B is flat while the rear face of said section is provided from the top of the arched portion 5 to its upper end with stepped portions 18, 19 and 20, respectively. The lower stepped portion 18 has a plurality of vertically spaced rearwardly projecting hollow horizontal ribs 21 provided with rearwardly projecting horizontal fins 22. The intermediate stepped portion 19 is provided with a plurality of vertically spaced rearwardly projecting horizontal fins 23 and the upper stepped portion 20 has a flat rear face provided with a circular opening 24. The rear face of the rear section H is also flat while the front face of said section is provided in horizontal alignment with the stepped portions 18, 19 and 20 with stepped portions 25, 26 and 27, respectively. The lower stepped portion 25 is provided in horizontal alignment with the ribs 21 with a plurality of vertically spaced forwardly projecting hollow ribs 28 having forwardly projecting fins 29. The intermediate stepped portion 26 is provided in horizontal alignment with the fins 23 with a plurality of vertically spaced forwardly projecting fins 30 and the upper stepped portion 27 has a flat front face provided with a circular opening 31. The front face of the rear section H beneath the lower ribs 28 is flat and constitutes a depending extension of the lower stepped portion 25. The front faces of the intermediate sections C, D, E, F and G are provided in horizontal alignment with stepped portions 32, 33 and 34, respectively, corresponding to the stepped portions 25, 26 and 27, respectively, of the rear section, while the rear faces of the intermediate sections are provided in horizontal alignment with the stepped portions 25, 26 and 27 with stepped portions 35, 36 and 37, respectively, corresponding to the stepped portions 18, 19 and 20 of the front section. As shown, the lower stepped portions 32 are provided in horizontal alignment with the ribs 21 with vertically spaced forwardly projecting hollow ribs 38 having forwardly projecting fins 39 in horizontal alignment with the fins 22. The intermediate stepped portions 33 are provided in horizontal alignment with the fins 23 with vertically spaced forwardly projecting fins 40 and the upper stepped portions 34 have flat front faces provided with circular openings 41. The lower stepped portions 35 are provided in horizontal alignment with the ribs 28 with vertically spaced rearwardly projecting hollow ribs 42 having rearwardly projecting fins 43 in horizontal alignment with the fins 29. The intermediate stepped portions 36 are provided in horizontal alignment with the fins 30 with vertically spaced rearwardly pro-

jecting fins 44 and the upper stepped portions 37 have flat rear faces provided with circular openings 45. Preferably the ribs 21, 28, 38 and 42, respectively, with their fins 22, 29, 39 and 43, respectively, are staggeredly arranged in horizontal rows on the stepped portions 18, 25, 32 and 35, while the fins 23, 30, 40 and 44, respectively, on the stepped portions 19, 26, 33 and 36 are arranged respectively beneath and upon opposite sides of the tubular portions 11, 12, 13, 14, 15, 16 and 17, respectively. In this connection it will be noted that the rear ends of the fins 22 and 23 are in a common vertical plane; the forward ends of the fins 39 and 40 are in a common vertical plane; the rear ends of the fins 43 and 44 are in a common vertical plane; and the forward ends of the fins 29 and 30 are in a common vertical plane. It will also be noted that the vertically aligned fins on the rear face of the front section B substantially abut the vertically aligned fins upon the front face of the section C; that the vertically aligned fins upon the front face of the rear section H substantially abut the vertically aligned fins upon the rear face of the section G; and that the vertically aligned fins of the intermediate sections substantially abut. Thus the products of combustion or gases from the fire box R will follow circuitous paths in a number of vertical planes between the upright sections to the tubular portions 11, 12, 13, 14, 15, 16 and 17, respectively. A flue 46 of suitable design is secured to the flat rear face of the rear section H about the rear end of the tubular portion 17 for the reception of such gases while closures 47 and 48, respectively, are provided for the forward end of the tubular portion 11 and for a horizontally aligned clean-out opening 49 in the front wall of the jacket J. Push nipples 50 and 51, respectively, snugly engage aligned openings in the upright portions 52 and 53, respectively, of the arches to permit a suitable fluid such as water to flow from one section to another, while push nipples 54 snugly engage the openings 24, 31, 41 and 45, respectively, in the sections to permit the fluid after being heated to flow from one section to another and then out through suitable fluid openings 55 and 56 to the piping 57 and 58 leading to the radiators (not shown) of the heating system. In the present instance, fire brick 59 is located in the arch 5 of the front section B and is secured to the rear face of a relatively heavy metal plate 60 between the front face of the front section and the insulation I upon the inner side of the jacket J. Preferably this fire brick terminates just below an opening 61 in the plate and the latter is provided about said opening with a forwardly projecting flange 62 to which a suitable door or closure 63 is hingedly connected. Preferably such door has an opening 64 containing the glass so that the interior of the fire box R may be conveniently inspected at will without having to open the door. The front wall 65 of the jacket may be cut as indicated by dotted lines 65′ in Figure 1 for the reception of suitable oil burner apparatus (not shown) when it is desired that such apparatus is to be used with the boiler. Otherwise grates (not shown) may be employed at the lower ends of the sections and the base A may then function as an ash pit. In such a case the front wall 64 of the casing and the plate 60 would be appropriately provided with openings to the ash pit and with one or more closures for such openings. A plate 66 is also used between the flat rear face of the rear section H and the insulation I upon the inner side of the rear wall of the jacket to close the tubular portion 10.

In order that the fins 22, 23, 29, 30, 39, 40, 43 and 44, respectively, may be readily cleaned while the boiler is in use I have provided a series of laterally spaced vertically extending openings 67 which are accessible through an elongated opening 68 in one side of the jacket J. (See Figure 6.) Preferably a single closure 69 is provided for the opening 68, while individual closures 70 are provided for the opening 67. As shown, the closure 69 is provided with spring elements 71 and 72, respectively, for snap engagement with the edges of the opening 68, while the closures 70 are provided with hook shaped lugs 73 and 74 at the top and bottom thereof for engagement with suitable slots 75 and 76 in the sections at the top and bottom of the openings 67.

Thus from the foregoing it will be apparent that the bridge portions 80 of the arches form the crown sheet and the tubular portions 11, 12, 13, 14, 15, 16 and 17, respectively, form the receiving chamber or flue for the gases from the combustion chamber R. The staggered ribs and fins intermediate the crown sheet and receiving chamber cooperate with the opposed faces of the sections to cause the gases to follow circuitous paths in their passage upwardly from the combustion chamber R to the receiving chamber, consequently all heat will be absorbed from such gases while in transit and will be transferred to the water in the sections. In fact, the construction is such that each section serves to direct the travel of the gases and such gases actually flow upwardly in and between portions of said sections. The time required for the passage of the gases from the combustion chamber to the receiving chamber is longer due to the arrangement of ribs and fins, however, the flow is continuous hence no increase in draft is required. Due to the fact that the ribs and fins are constructed and arranged similarly on the respective sections the circuitous passages for the gases extending upwardly from the crown sheet at spaced points longitudinally of the boiler are all alike, consequently the distribution and retardation of gases from the fire box to the receiving chamber will be uniform from one end of the boiler to the other. As a result the heat absorption by the respective sections will likewise be uniform. In effect an equal division of the gases is obtained from the crown sheet to the receiving chamber. This results in uniform temperature at the crown sheet and the most effective and efficient distribution of gases over the heat absorbing surfaces. In addition, the multiplicity of upwardly extending circuitous passages provide a greater flue space for the gases and greater heat absorption means in a smaller area. Moreover, the rib structure not only provides increased heat absorbing surfaces and permits the water in the sections to be received therein in the path of the upwardly flowing gases but materially reinforce and strengthen the structure. The fins may be readily cleaned after the sections are assembled, consequently such fins may be maintained in the best of condition for securing the maximum efficiency. In all, a more efficient and reliable boiler construction is provided.

What I claim as my invention is:

1. A boiler having a base, a series of upright sections arranged one in rear of the other on said base, all but the rear section having arched portions at their lower ends cooperating to form a fire box, all of said sections being provided adja-

cent their upper ends with tubular portions that extend fore and aft of the boiler, the opposed faces of said sections between said arched portions and tubular portions being stepped and provided with opposed means forming circuitous passages through which the gases may flow upwardly from the fire box to the tubular portions.

2. A sectional boiler having a series of upright flue sections arranged one in rear of the other, provided at their lower ends with aligned arches forming a fire box and provided at their upper ends with aligned openings forming a gas-receiving chamber or flue, the opposed faces of said sections between said fire box and flue being stepped and spaced apart, the steps having vertically spaced horizontal ribs that cooperate with said steps to form circuitous gas passages.

3. A boiler having a series of upright sections arranged one in rear of the other, provided at their lower ends with arched portions forming a fire box and provided at their upper ends with tubular portions forming a flue, the opposed faces of said sections between said fire box and flue being stepped and provided with opposed means forming circuitous passages through which the gases may flow upwardly from the fire box to the flue.

4. A sectional boiler having a series of upright flue sections arranged one in rear of the other, all of said sections but the rear section having arched portions at their lower ends cooperating to form a fire box, all of said sections being provided adjacent their upper ends with openings through which gases may pass to a flue, the opposed faces of said sections between said arched portions and openings being stepped and provided with opposed means forming circuitous passages through which the gases may flow upwardly from the fire box to said openings.

5. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being provided at their lower ends with arched portions forming a fire box and provided at their upper ends with tubular portions forming a flue, portions of the opposed faces of said sections between said fire box and flue being stepped and being provided with opposed means forming circuitous gas passages from the fire box to the flue.

6. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being provided at their lower ends with aligned arches forming a fire box and provided at their upper ends with openings through which the gases may flow to a flue, the opposed faces of said sections between the fire box and openings being stepped and spaced apart, and means cooperating with said stepped portions to form circuitous gas passages including vertically spaced substantially horizontal heat absorbing ribs on said stepped portions in the spaces provided between the spaced faces of said sections, the ribs on certain of said stepped portions being hollow and opening into said sections whereby a fluid in said sections is free to circulate in said ribs.

7. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being provided at their lower ends with arched portions forming a fire box and provided at their upper ends with tubular portions forming a flue, portions of the opposed faces of said sections between said fire box and flue being stepped and spaced apart to provide gas passages from the fire box to the flue, and means cooperating with said stepped portions to direct the flow of gases in said passages including spaced substantially horizontal heat absorbing ribs on said stepped portions in the spaces provided between the spaced portions of said sections, the ribs on certain of said stepped portions being hollow and opening into said sections whereby a fluid in said sections is free to circulate in said ribs.

8. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being provided at their lower ends with arches forming a fire box and provided at their upper ends with openings through which gases may pass to a flue, the opposed faces of said sections between the fire box and openings being stepped and spaced apart intermediate their upright side edges to provide vertically extending gas passages, and heat absorbing means on the opposed stepped faces of said sections constructed and arranged to direct the course of said gases in said passages.

9. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being hollow for the reception of a fluid and provided with means whereby such fluid may circulate from one section to another, said sections being provided at their lower ends with aligned arches forming a fire box and provided at their upper ends with openings through which gases may flow to a flue, the opposed faces of said sections between said fire box and openings being stepped and spaced apart to provide vertically extending gas passages, substantially horizontal heat absorbing ribs on the stepped portions cooperating therewith to direct the gases in said passages from the fire box to the openings, the ribs being so constructed and arranged that the free ends of opposed ribs in each vertically extending passage substantially meet in a common vertical plane, the opposed faces of said sections at one side of the boiler being spaced apart to provide vertically extending elongated openings through which the horizontal ribs aforesaid are accessible from the exterior of the boiler, and means for closing said vertically extending openings whereby the spaced ribs in one vertically extending passage may be cleaned at one time without exposing the ribs in the other of said passages.

10. A sectional boiler having a series of upright flue sections arranged one in rear of the other, said sections being hollow for the reception of a fluid and provided with means whereby said fluid may circulate from one section to another, said sections being provided at their lower ends with arched portions forming a fire box and provided at their upper ends with tubular portions forming a flue, portions of the opposed faces of said sections between the fire box and flue being stepped and spaced apart, and means cooperating with said stepped portions to form circuitous gas passages from the fire box to the flue including vertically spaced substantially horizontal heat absorbing ribs on said stepped portions in the spaces provided between the spaced portions of said sections, the ribs on certain of said stepped portions being hollow and opening into the hollow sections whereby a fluid in said sections is free to circulate in said ribs.

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