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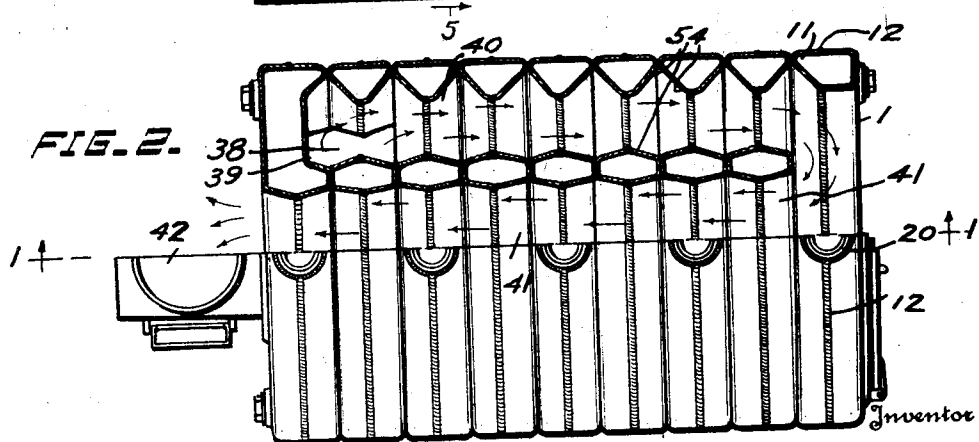
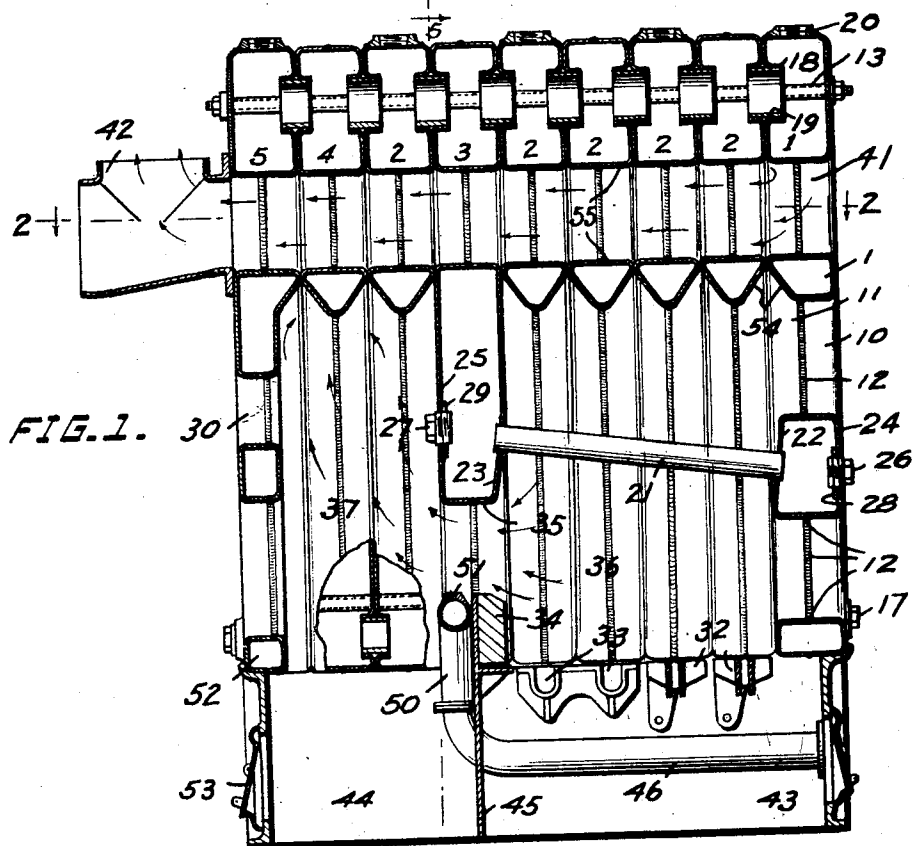
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SECTIONAL HEATING BOILER

Filed May 18, 1925

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

FIG. 5.

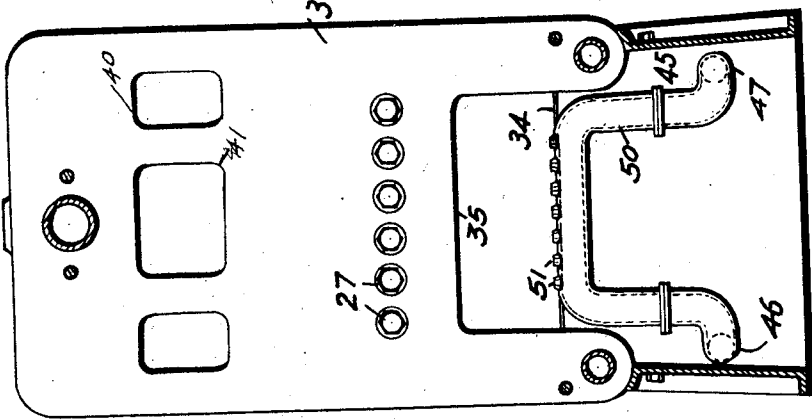


FIG. 4.

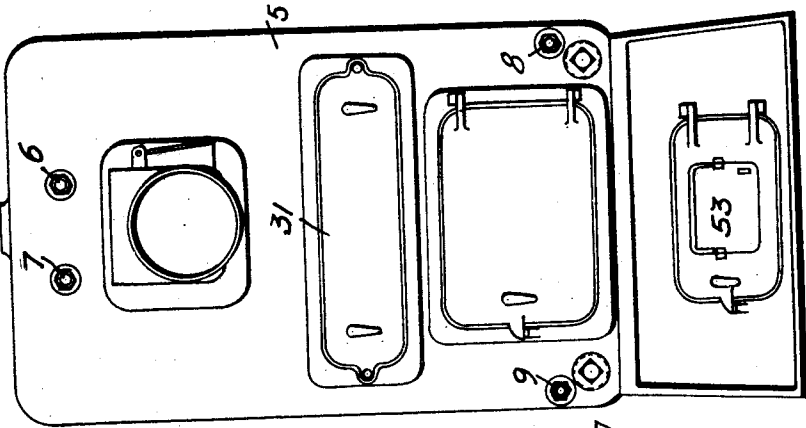
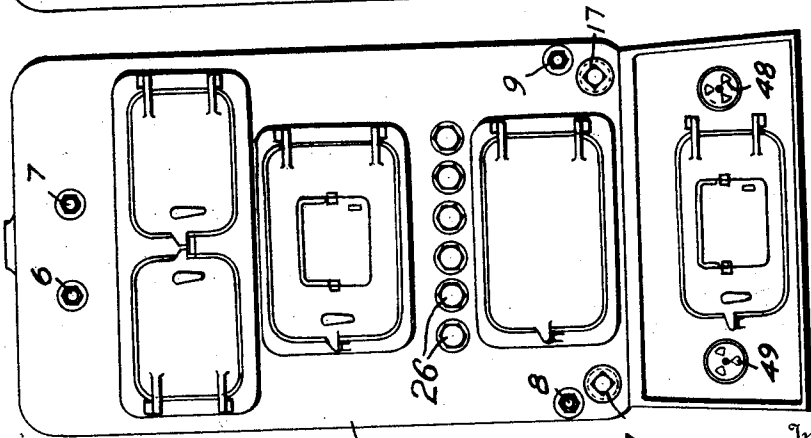


FIG. 3.



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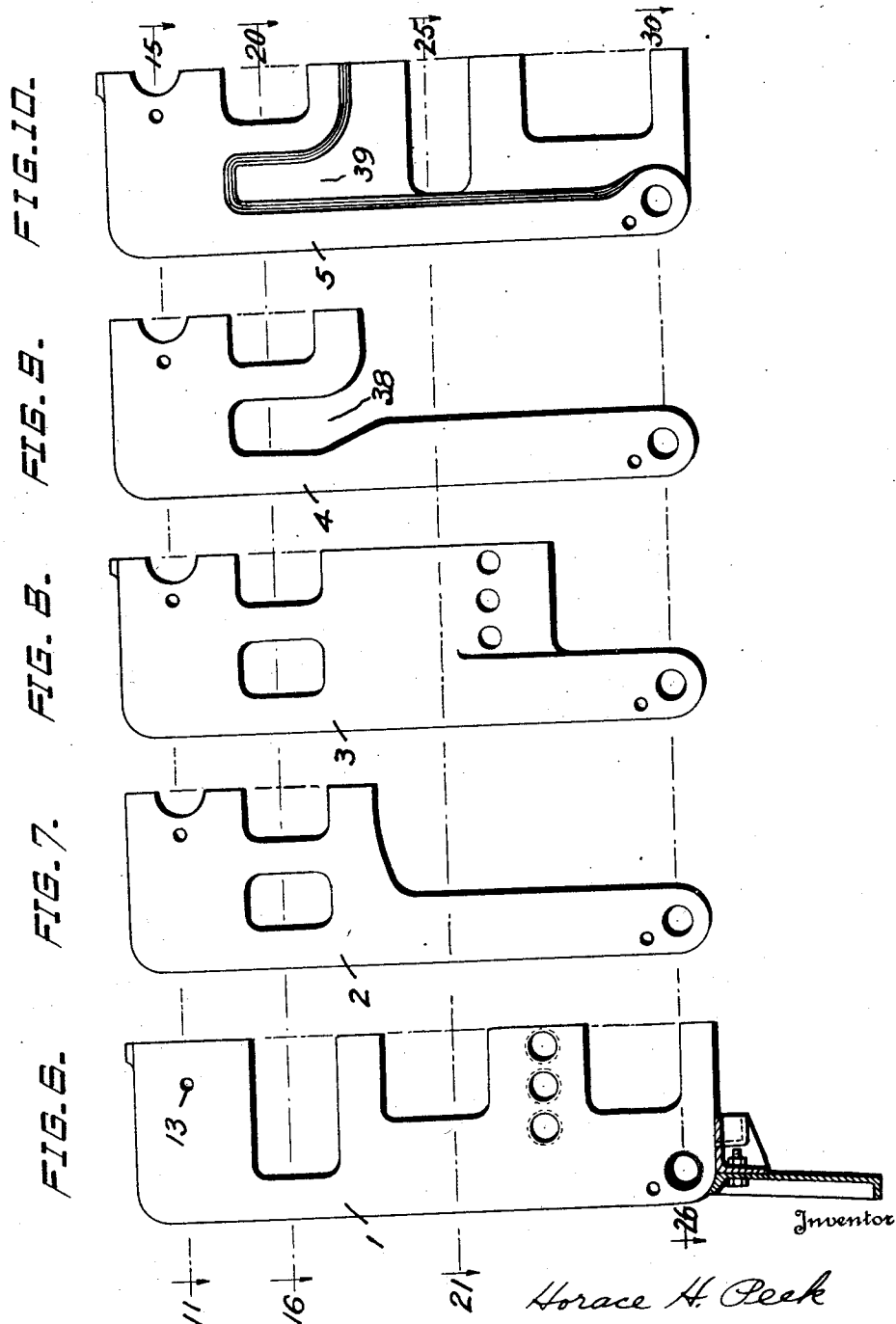
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4 Sheets-Sheet 3



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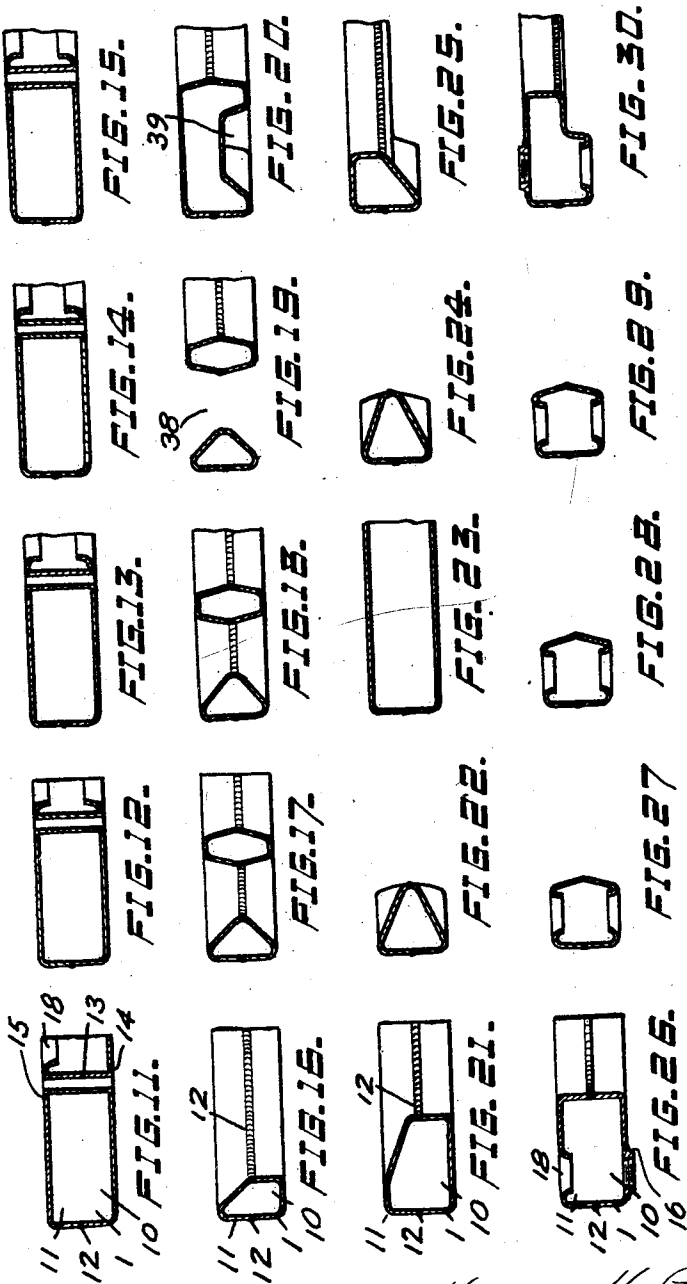
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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SECTIONAL HEATING BOILER.

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This invention relates to heating boilers and comprises all improvements over the prior art which are disclosed in this application. One object is to provide a sectional heating boiler which shall have certain marked advantages over those now in use. Prior to my invention, sectional heating boilers have all been composed of sections made of cast iron. Such a boiler is necessarily relatively thick and heavy and of non-uniform thickness owing to the inherent difficulties of casting. The metal is non-homogeneous and therefore has a tendency to non-uniform corrosion, especially such portions as are directly adjacent a high temperature zone—resulting in one or more sections rusting out prematurely. In casting the sections, a certain percentage are lost due to blow-holes and other defects, since in practice it has not been found practical to properly weld the casting defects in cast iron sections so as to permit the sections to be used with safety. For the same reason, when a section rusts through prematurely, it cannot be properly welded, but must be replaced by a new section, which necessarily involves considerable expense and delay. Owing to the strains set up in the metal due to the sudden and unequal cooling when being cast, and due to the inherent brittleness of cast iron, cracks are liable to occur spontaneously, or due to a sudden mechanical blow on a section, or when the boiler is fired. In actual practice, fires are sometimes built in boilers in which there is no water, or in which the water is low, or during operation, the water is permitted to get too low. Thus the cast iron not in contact with water but directly in contact with high temperature, becomes overheated and when water is turned into the boiler to replenish the supply, the sudden chilling sets up strains which are frequently beyond the ability of the brittle cast iron to resist—resulting in cracks—and as such boilers are frequently used under conditions in which they are under substantial pressure, such cracks result in explosions.

To overcome the above drawbacks and to secure other important advantages, I make a sectional heating boiler in which each section is composed of preferably two pieces of sheet metal, preferably steel, pressed to shape to form complementary parts and joined together, preferably by welding. In a boiler so constructed, the metal is thinner and the boiler is much lighter. In a sectional boiler, of necessity only a portion of the surface area of the sections are directly exposed to the high temperature. Thus the rate of heat transmission to the water is limited. By making the boiler of sheet metal the rate of heat transmission is substantially increased due to two reasons. First, the sheet metal sections are made much thinner than is possible with cast iron. Second, steel has higher heat conductivity than cast iron. Thus the sheet metal sectional boiler gives better fuel economy than a cast iron sectional boiler. Sheet metal being made by rolling down a relatively large mass of metal, is relatively homogeneous. Owing to the ductility of sheet metal, it can be readily repaired by welding. Also owing to its ductility, it does not crack under any of the conditions encountered in practice. Thus a sectional boiler in which the sections are composed of sheet metal, does not explode from these causes.

The above and other objects which will hereinafter appear are attained by improvements embodying new and useful features as disclosed in this application.

To enable others skilled in the art to so fully comprehend the essential features of the improvements that they may embody the same by the modifications contemplated by the improvements disclosed in this application, drawings illustrating a preferred form have been annexed as a part of this disclosure.

Fig. 1 is a longitudinal sectional view of the boiler on line 1—1 of Fig. 2 with some of the doors etc. omitted.

Fig. 2 is a top plan view of the boiler with one half shown in section on line 2—2 of Fig. 1 with some parts omitted.

Fig. 3 is a front elevation of the boiler showing doors and dampers thereon.

Fig. 4 is a rear elevation showing doors and dampers thereon.

Fig. 5 is a section on line 5—5 of Fig. 1.

Figs. 6, 7, 8, 9, 10 are front elevations respectively of the left halves of symmetrical units 1, 2, 3, 4, 5.

Figs. 11, 12, 13, 14, 15, are sections of Figs. 6, 7, 8, 9, 10, respectively, on line 11—15.

Figs. 16, 17, 18, 19, 20, are sections of Figs. 6, 7, 8, 9, 10, respectively, on line 16—20.

Figs. 21, 22, 23, 24, 25, are sections of Figs. 6, 7, 8, 9, 10, respectively, on line 21—25.

Figs. 26, 27, 28, 29, 30, are sections of Figs. 6, 7, 8, 9, 10, respectively, on line 26—30.

In the present embodiment, the boiler comprises a water container comprising a plurality of units or sections 1, 2, 3, 4, 5, bolted together by thru rods 6, 7, 8, 9, in a usual manner. All the units while differing in details, are similarly made and therefore a detail description of the mode of making unit 1 will be given as illustrative. Unit 1 (Figs. 1, 2, 6, 11, 16, 21, 26) is made by pressing to shape, complementary parts 10, 11 of sheet metal, preferably steel, and integrally joining the same preferably edge to edge along their meeting edges 12, preferably by autogenous welding such as by gas or the electric arc. I find it to be especially important that those portions of the units which are directly adjacent the high temperature zone shall have non-lap joints, since the poor heat conductivity across a lap joint (riveted joint for instance) will result in fire cracking. Where the thru rods 6, 7, pass thru the unit 1, nipples 13 are preferably welded at 14, 15 (Fig. 11). Screw collars 16 are preferably welded in place as shown to receive wash out screw plugs 17. Pressed in flanges 18 are made to take slip or screw nipples 19 to put the units in water communication with each other. A steam outlet 20 is secured by welding or otherwise, in the top of preferably each alternate unit.

The heating boiler illustrated comprises one of each of units 1, 3, 4, 5, and five of units 2 (Fig. 1). All the units are symmetrical, and therefore only half of each unit is shown in Figs. 6 to 10. Such differences in form as exist between the different units are readily seen from the drawing, and therefore only certain of these differences will be specifically referred to. Extending across from unit 1 to unit 3 is a water grate comprising a plurality of tubes 21 which slope upwardly from unit 1 to provide free water circulation. These tubes 21 are preferably expanded into openings in the rear faces or walls 22, 23 of units 1 and 3. In line with the tubes 21 in the rear faces or walls 24, 25, are secured removable screw plugs 26, 27, the walls being preferably reinforced by plates 28, 29. Screw plugs 26, 27 are preferably substantially larger than the size of tubes 21 in order that the tubes 21 may be passed in or out thru the openings in walls 24, 25 which are normally closed by plugs 26, 27, and so that suitable tools may be readily operated thru these openings to either secure in, or remove from, place, the tubes 21. In the rear unit 5 is an opening 30 normally closed by cover 31 (Fig. 4). This opening is so located as to permit access to, and in line with, tubes 21, to provide for inserting or removing tubes 21 therethru and also to provide for the straight line operation of tools inserted therethru in operating on tubes 21.

Below the water grate is a secondary grate 32 mounted in sockets 33 in a well known man-

ner. At the rear of the grate 32 is a baffle 34 preferably of fire brick. The fires on the water and secondary grates are operated in a well known manner. The portion 35 of unit 3 with baffle 34 provides a restricted passage from the fire box 36 to the combustion chamber 37. The gases pass from the combustion chamber 37 up through an opening formed by passage 38 (Figs. 2, 9, 19) in each side of unit 4 and depression 39 (Figs. 2, 10, 20) in unit 5. Thence the gases pass toward the front along two flues 40 at opposite sides of the boiler and merge together and pass toward the rear thru central flue 41 and out at 42.

Beneath the grate 32 is ash pit 43 and below the combustion chamber 37 is ash chamber 44. Partition 45 separates pit 43 and chamber 44 and supports baffle 34. Located within ash pit 43 are two auxiliary air pipes 46, 47 controlled respectively by dampers 48, 49 at the front of the ash pit. Pipes 46, 47, extend through partition 45 and are connected to U-pipe 50 (Figs. 1, 5) having a plurality of separate auxiliary air outlets 51. Auxiliary air in passing through pipes 46, 47 is heated by the surrounding heat present in the ash pit. The air then passes into pipe 50 and out openings 51. As the top of pipe 50 is slightly higher than baffle 34, it is kept quite hot by the hot gases passing over it and thus as the air passes out of openings 51, it is raised considerably in temperature and mixes with the passing gases to more completely burn same. The part of unit 5 forming the rear of the combustion chamber is made thinner to increase the size of the combustion chamber. As will be seen by considering Figs. 1, 5, 7, 9, the combustion chamber 37 and ash chamber 44 directly open into each other. This provides additional size to the combustion chamber by there being no cross portion to units 3, 2 and 4 at this point similar to cross portion 52 of unit 5. Also this permits some of the light ashes carried into the combustion chamber to settle into ash chamber 44. Also by regulation of damper 53, air may be admitted to the combustion chamber to still further regulate the draft and combustion of fuel.

The inner side and top portions 54 of the sections forming the combustion chamber and fire box, and the sides of the flues, are angular to increase the heating area. The top and bottom 55 of the flues are preferably straight to permit of easily cleaning the flues.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics of the invention, and the present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the

meaning and range of equivalency of the claims are therefore intended to be embraced therein.

I claim:

- 5 1. A heating boiler comprising, two water container portions, a grate comprising a plurality of independent side by side tubes connected to the near faces of said portions, a rear wall spaced from said portions, openings
10 in the far faces of said portions and substantially in line with said tubes and normally closed by removable closure means, and one or more openings in said rear wall providing access to, and in line with, said tubes.
2. The structure set forth in claim 1 in 15 which one water container portion is part of one section of a sectional boiler and in which the other water container portion is part of another section of said sectional boiler.

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