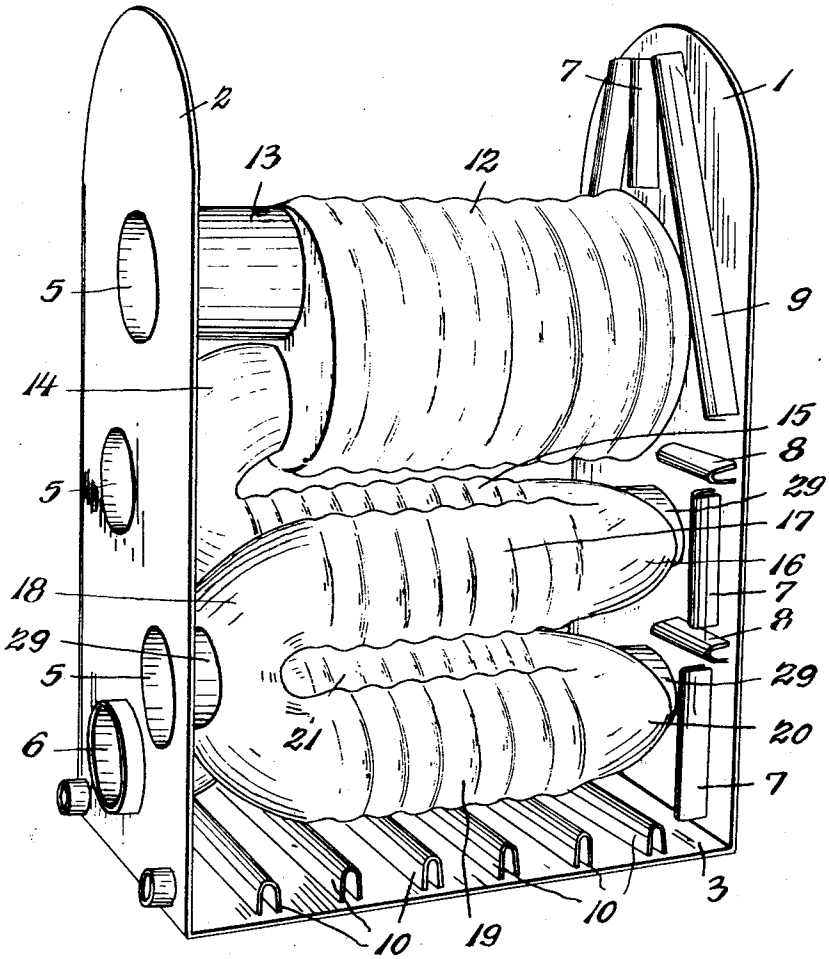
July 18, 1933. H. M. JEROME 1,919,164

BOILER CONSTRUCTION

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Fig. 1.



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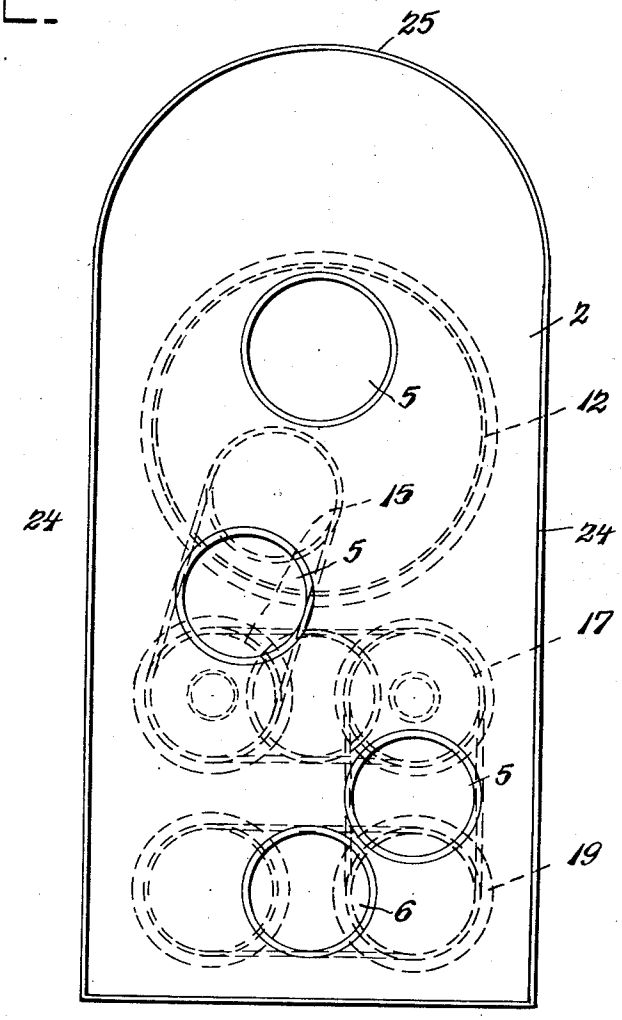
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BOILER CONSTRUCTION

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Fig. 2.



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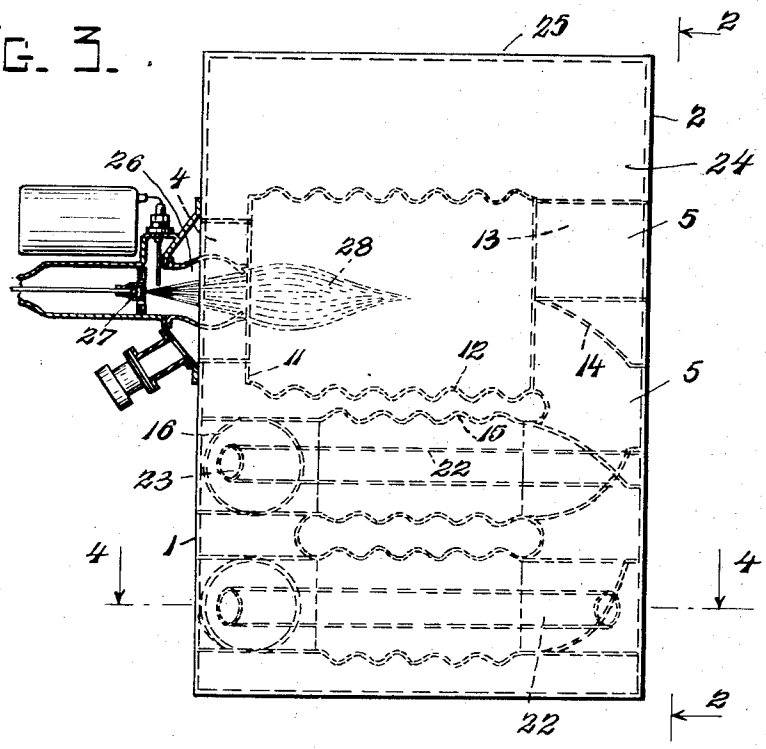
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BOILER CONSTRUCTION

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Fig. 3.



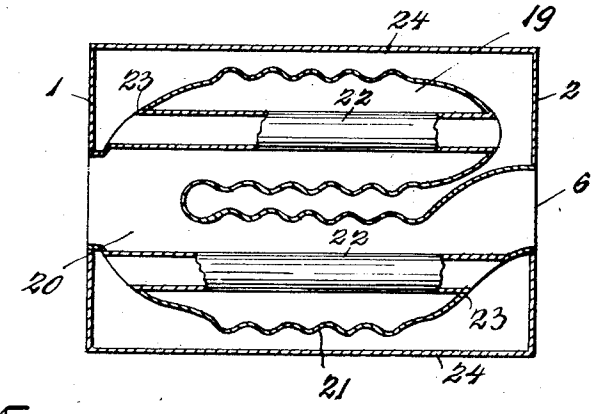


Fig. 4.

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UNITED STATES PATENT OFFICE

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BOILER CONSTRUCTION

Application filed April 5, 1930. Serial No. 441,888.

This invention is comprehended by a new design of boiler which is shown and cursorily described in my copending application filed on the same date.

It has long been known that extraction of greater benefit from heat units was expectable if the products of combustion were compelled to follow a rather long and sinuous passage before discharge into a stack. A zig-zag flue travel has theoretical advantages, but has till now not proved feasible for use with products of combustion from an oil burner because of the profuse carbon deposition therealong until the temperature about the mouth of the burner has mounted to the stage of complete combustion.

My purpose has been to manufacture a boiler which would increase the efficiency of the entire heating appliance and I have successfully realized the object in conjunction with an oil burner capable of promptly attaining perfect combustion. As exemplified by the drawings the boiler is constructed with a series of welded steel sections which together prescribe a zig-zag progressively downward flue travel beyond the combustion chamber into which the flame belches. The defining walls of the sinuous flue passage are corrugated to increase the impinged metal area and the straight interjacent portions of the conduit are provided with tubular central partitions to prevent what is known as core flow or to compel travel of the heated gases in the annular passages between the partitions and surrounding corrugated walls.

It is to be realized that the scope of my invention comprehends many equivalent constructions. The showing of the drawings and the particular description are merely specific exemplifications of a plurality of mechanical embodiments and arrangements.

Adverting to the drawings:

Figure 1 is a perspective view of the interior construction of a boiler embodying the principles of my invention, the same being shown with the casing removed.

Figure 2 is a rear end view showing the sinuous and various zig-zag fluid conduit in dotted lines.

Figure 3 is a vertical cross-section from front to rear in connection with the discharge end of an oil burner.

Figure 4 is a horizontal section on line 4—4 of Figure 3.

As revealed in Figure 1, the construction is composed entirely of steel and welded parts including a front plate standard 1, a rear plate standard 2 and adjoining bottom 3. The front plate is provided near its top with an inlet 4 through which an oil burning flame jet is to be projected. The rear plate 5 is provided with three holes 5 to facilitate cleaning or repair and the rear plate also has a lower stack outlet 6. The opposed surfaces of the two plates are provided with a series of upright stiffening members 7 of bowed formation, likewise with a series of horizontal braces or corrugations 8 and near the top is reinforced with a pair of upwardly converging welded corrugations 9. The bottom 3 is similarly reinforced by a series of crosswise extending arches 10.

In communication with the inlet 4 is a combustion chamber 11 fashioned with a corrugated cylindrical wall 12. The rear upper end of the combustion chamber communicates through a welded steel pipe 13 with the opening 5. Below the pipe 13 the combustion chamber 11 is provided with an outlet for the production of combustion which communicates with an elbow 14 as the first section of a sinuous doubly zig-zag flue conduit to be enveloped by a water reservoir. By doubly zig-zag, I refer to the formation clearly disclosed in Figure 1 wherein it may be observed that the conduit has both horizontally and vertically disposed U-shaped sections welded end to end. Access is had to the elbow 14 through the middle of the rear openings 5. The combustion gases proceed obliquely downwardly through the elbow 14 to enter a corrugated section 15 of smaller diameter than the combustion chamber 12. The section 15 extends horizontally along one side of the boiler, the front connects with another elbow 16, thence the flue passage continues through another horizontal section 17, thence directly downwardly through a vertically disposed elbow 18 (to which access may be had through the lower opening 5) which leads to another sec-

tion 19 which is connected by means of a horizontal elbow 20 with a last and rearwardly extending corrugated section 21, which discharges into the stack through the outlet 6. All of the parts consecutively numbered from 12 to 21 are progressively welded together and some additionally to either of the end plates 1 or 2.

One of the features of my boiler construction consists of the provision within each of the sections 15, 17, 19 and 21 of concentrically located water tubes 22. The ends of which are open through the correspondingly located walls of the elbows 14, 16, 18 and 20 to which they are welded at 23, as may be clearly seen in Figure 4. The tubes 22 are therefore in connection at both ends with the reservoir and while sealed against the flue passage section, in which they are located, will be enveloped by the gases of combustion. In addition to the added heat absorbing surfaces which the tubes 22 provided, their presence has the additional advantage of preventing so-called core flow through the sections 15, 17, 19 and 21 and compelling the gases to creep along their inner corrugated annular surfaces. A water-tight housing is, of course, provided and may consist of a casing including side walls 24 and a bowed top 25.

A gasifying chamber 26 of an oil burning unit is suitably mounted at the inlet 4 so that a spray of oil from a nozzle 27 may become ignited in the chamber 26 and project a resulting flame 28 into the combustion chamber 11 without, however, permitting the flame to impinge any surface of the combustion chamber because, as set forth in my earlier application herein identified, my developed type of oil burner so quickly attains perfect combustion as not to require a preheated refractory lining and as to avoid a rigidly accumulated carbon deposit with its disadvantageous insulation consequence.

The elbows 14, 16, 18 and 20 communicate with short pipe lengths all designated by the numeral 29 and such pipe lengths have ends welded around the openings 5 to afford access therethrough into the sections of the conduit when alined registering handhole closures (not shown) in the standards 1 and 2 or in the housing are opened.

It is to be understood that the flame, whether from an oil burner, as illustrated, or from a gas burner, may optionally be projected into the combustion chamber 11 at its other or rear end so that the products of combustion find entrance near where they are to find exit and thus would be compelled to follow a zig-zag course at the outset also within the combustion chamber.

I claim:

1. A boiler comprising the combination of a water casing provided with an upper inlet and a lower outlet, an elongated sinuous flue passage extending from said inlet to said outlet, said passage being fashioned with straight interjacent sections and curved sections connected end to end with said straight sections and water tubes in said straight sections and opening through and welded to the curved sections.

2. A boiler construction comprising a reservoir, and a zig-zag flue passage formed of welded metal units and disposed therein, said passage having an enlarged upper inlet and a lower outlet, said passage also including; elongated horizontal sections, relatively transverse horizontally extending sections and relatively transverse vertically extending sections, and partitions for preventing flow of the products of combustion through the central portions of said elongated sections.

3. A boiler construction comprising a reservoir for the fluid to be heated and a single continuous flue conduit traversing said reservoir in a direction from top front to lower rear and sealed with respect thereto, said conduit being of doubly zig-zag formation including a plurality of pairs of sections in substantially horizontal and vertical planes respectively whereby said conduit is compactly confined by said reservoir.

4. A composite boiler comprising a casing, a combustion chamber in the top of said casing and a sinuous flue conduit formed of straight and curved sections all smaller than said combustion chamber, pairs of said straight sections being superposed and other pairs of straight sections being substantially disposed in distinct horizontal planes and on opposite sides of a median vertical plane through the combustion chamber.

5. A boiler construction comprising a reservoir for the fluid to be heated, a combustion chamber near the top of said reservoir and a single continuous flue conduit traversing said reservoir below said combustion chamber and including a curved obliquely disposed section connected with said chamber and further including a plurality of straight sections and return bend sections, said straight sections and return bend sections being alternately arranged, pairs of alternately arranged straight sections lying in substantially horizontal and substantially vertical planes respectively.

6. A boiler construction comprising a reservoir and a serpentine-shaped flue passage disposed therein and formed of welded metal units some of which are straight and some of which are bent, said units including water conduits projecting lengthwise through straight sections of said flue passage and having oblique ends welded to the walls of return bends thereof.

7. In a boiler, the combination of a zig-zag flue passage therethrough comprising substantially straight sections and return bends and tubes axially supported in said straight

sections of said passage, said tubes having their ends opening through, conforming to and weld-sealed to margins of openings in said return bends and adapted to prevent core flow.

8. In a boiler, the combination of a reservoir for the water to be heated, a single sinuous passage for products of combustion traversing said reservoir both laterally and at progressively varying elevation and closed thereto, and water tubes extending through straight portions of said passage and having their ends opening through curved portions of the wall of said passage, said tubes further having their end edges flush-welded to the juxtaposed obliquely disposed margins of the openings of the wall of said passage.

HORACE M. JEROME.