Sept. 11, 1934. C. W. GORDON 1,973,377

FLUID HEATER

Filed April 12, 1933 2 Sheets-Sheet 1

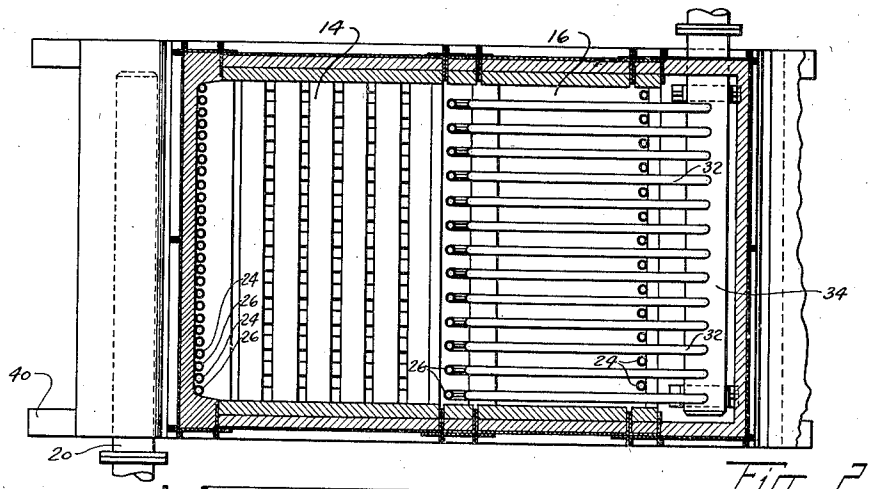


Fig. 2.

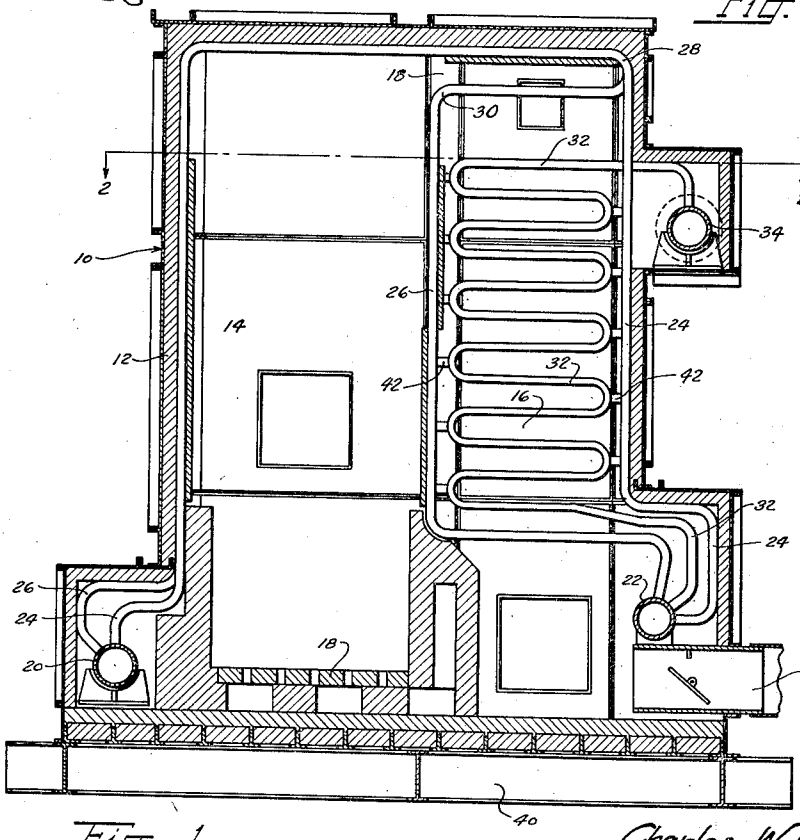


Fig. 1.

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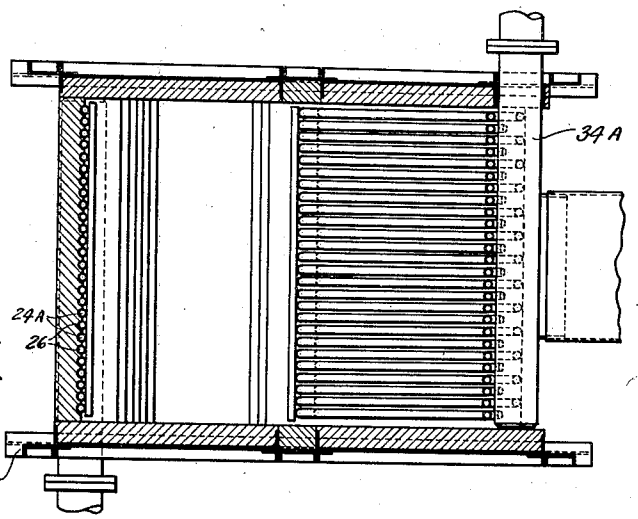


Fig. 3.

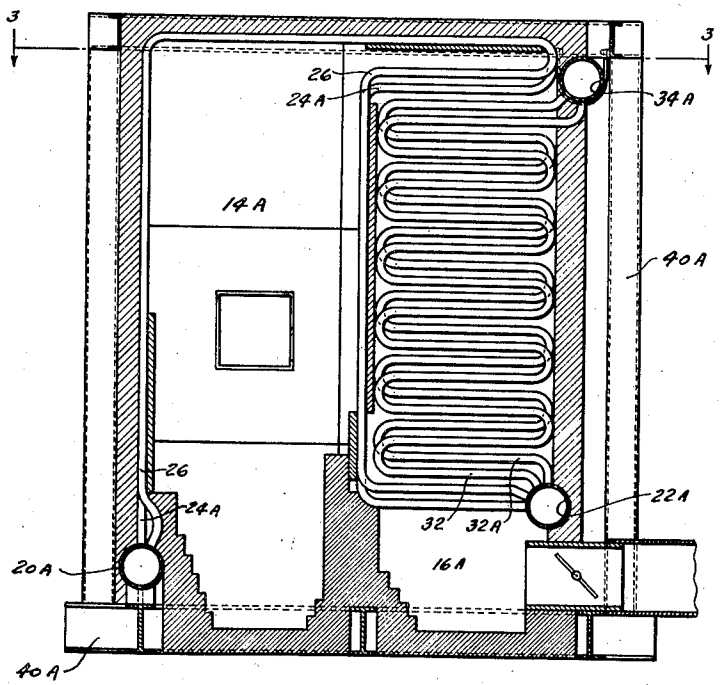


Fig. 4.

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FLUID HEATER

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Application April 12, 1933, Serial No. 665,683

2 Claims. (Cl. 122—356)

My invention relates to the type of fluid heater having a combustion chamber and a flue connected to receive gases therefrom, and having tubes exposed to the radiant heat in the combustion chamber and tubes heated by convection in the flue.

It is one of the objects of my invention to provide a novel arrangement for such heaters having a high space efficiency and comparatively moderate first-cost and upkeep.

A further object of my invention is to provide an arrangement having a high degree of rigidity to promote portability.

In order that my invention, together with its objects and advantages may be readily and fully understood, I will now describe in detail by way of example and in connection with the accompanying drawings two fluid heaters embodying my invention and selected from a number of possible embodiments thereof. In the drawing,

Fig. 1 is a sectional elevation of a fluid heater in accordance with my invention.

Fig. 2 is a sectional plan taken on a line 2—2 of Fig. 1.

Fig. 3 is a sectional plan of a second form of heater within my invention and taken on the line 3—3 of Fig. 4.

Fig. 4 is a central sectional elevation of the heater shown in Fig. 3.

The heater 10 illustrated in Figs. 1 and 2 of the drawings comprises an outer casing 12 preferably of rectangular form in plan view and having within it a combustion chamber 14 and a flue 16. In the arrangement shown, the flue 16 connects with the combustion chamber 14 at the top of the said chamber. Any suitable means may be employed for creating combustion within chamber 14 and I have illustrated a gas burner 18 for this purpose. The fluid to be heated is confined within tubular units which are arranged to absorb heat both in the combustion chamber 14 and in the flue 16. As illustrated, three headers are employed in connection with the heat absorbing units. Two such headers are illustrated at about the level of the bottom of chamber 14, one at 20 and another at 22. Preferably the header 20 is employed as an inlet header. Header 20 has connected thereinto two series of units 24 and 26 both of which connect also into the header 22. Both the sets of units 24 and 26 extend upwardly from header 20 along one vertical inner face of the combustion chamber 14 and thence across the roof of such chamber in a direction perpendicular to said face. Preferably the tubes 24 and 26 extend not only across the top of chamber 14 but also across the top of the flue 16 to the side of the flue 16 and the outer casing 12 removed farthest from the header 20. At the corner between the roof and such side of the casing, units 24 and 26 bend downwardly as shown at 28. Units 24 extend vertically downward along the inside of the outer wall of flue 16 to their connection with the header 22. Units 26, however, bend back across the top of flue 16 and then bend downwardly again as shown at 30 so as to lie within the wall of the flue 16 opposite the downward extensions of the units 24. At a level near the lower end of flue 16, units 26 bend again to cross such flue and to connect into the header 22. The units 24 and 26 therefore help to form two opposite walls of the flue 16, one such wall lying between combustion chamber 14 and the flue 16. However, I do not limit myself to such feature in all cases nor to the feature of extending the units across the top of flue 16.

The portions of the units on the outer wall and roof of the combustion chamber 14 absorb heat primarily by radiation. The portions of the units 24 along the walls of the flue 16, however, can receive comparatively little heat by radiation and are not well placed to receive heat by convection, although portions of units 26 in the wall between chamber 14 and flue 16 are shown as capable of receiving heat by radiation. In order to improve the efficiency of the heater and to increase the temperature of the fluid being heated, I provide a set of convection heated units 32 which connect into the header 22 at one end. Units 32 have a serpentine form and extend upwardly within flue 16, the upper ends of units 32 passing out of flue 16 between the downward runs of units 24 and extending to a connection with the third header 34, which is located at a higher level than header 22. When the header 20 is used as an inlet header, header 34 is used as an outlet header. As shown, header 34 is used as an outlet header. Also as shown, header 34 is supported on a bracket almost immediately above header 22. An outlet 36 is provided for taking off gases from the lower end of flue 16. Preferably the units 32 are supported in part from headers 22 and 34 and in part from the downward runs of the units 26 and 24.

In the heater illustrated in Figs. 3 and 4, there is a combustion chamber 14A and a flue 16A. In Figs. 3 and 4, however, while units 26 extend from header 20A to header 22A in much the same way as in Figs. 1 and 2, running in the

wall between chamber 14A and flue 16A as well as along the outer wall and roof of chamber 14A, units 24A, which alternate with units 26 in Figs. 3 and 4, also run in the wall between chamber 14A and flue 16A. Room is thereby provided on headers 22A and 34A for additional serpentine units lying in the same vertical planes as units 24A. In the Figs. 3 and 4 therefore, I have illustrated serpentine units 32A as well as serpentine units 32 connecting headers 22A and 34A. The frame 40A of the heater of Figs. 3 and 4 is extended along the sides and roof of the heater as well as along the bottom. Except for minor details which are obvious from the drawings, the heater illustrated in Figs. 3 and 4 is otherwise similar to that illustrated in Figs. 1 and 2.

In both the heaters illustrated in the drawings, certain of the units extend along the face and roof of the combustion chamber and have a generally U-shaped form which adds greatly to the rigidity of the structure, while also providing a large area for the absorption of radiant heat. Heaters within my invention are therefore able to utilize relatively large amounts of fuel in proportion to the size of the heater while maintaining a commercial efficiency.

The arrangement illustrated and described herein is well adapted for use as a portable heater. However, I do not limit myself to any field of use, although I have illustrated the heater 10 as mounted on a portable framework 40. Also, in Figs. 3 and 4, I have shown an additional framework 40A. Such frames are, however, optional.

Obviously units 32, 32A may be connected with units 24, 26, 24A and/or frame 40 or 40A in order to further stiffen the structure and connecting pieces 42, 42 are shown for this purpose in Fig. 1, but are omitted from Fig. 4.

What I claim is:

1. A fluid heater having a combustion chamber and a flue arranged to receive gases therefrom, a pair of headers, a group of tubes connecting said headers, all of said group having portions on one vertical side and on the roof of said chamber, a number of said group having portions along the division between said chamber and said flue and the remainder of said group having portions on the vertical side of said flue removed from said chamber, a third header and tubes in said flue connecting one of said first headers to said third header.

2. A fluid heater having a combustion chamber and a flue arranged to receive gases therefrom, and arranged along one vertical side of such chamber, a pair of headers substantially at the same level, a group of heating units connecting said headers, said units having substantially the shape of an inverted U open at the bottom, and all having portions extending upwardly along the vertical side of said combustion chamber farthest from said flue, and also having portions extending across the top of said combustion chamber and said flue, some at least of said units having portions extending across the upper portion of said flue below the roof and thence downwardly between said chamber and flue, a third header, and tubes in said flue for connecting one of said first headers to said third header.

CHARLES W. GORDON.