Nov. 19, 1935. J. N. MACRAE 2,021,605

HEATING APPARATUS

Original Filed Oct. 8, 1931 2 Sheets-Sheet 1

Fig. 1.

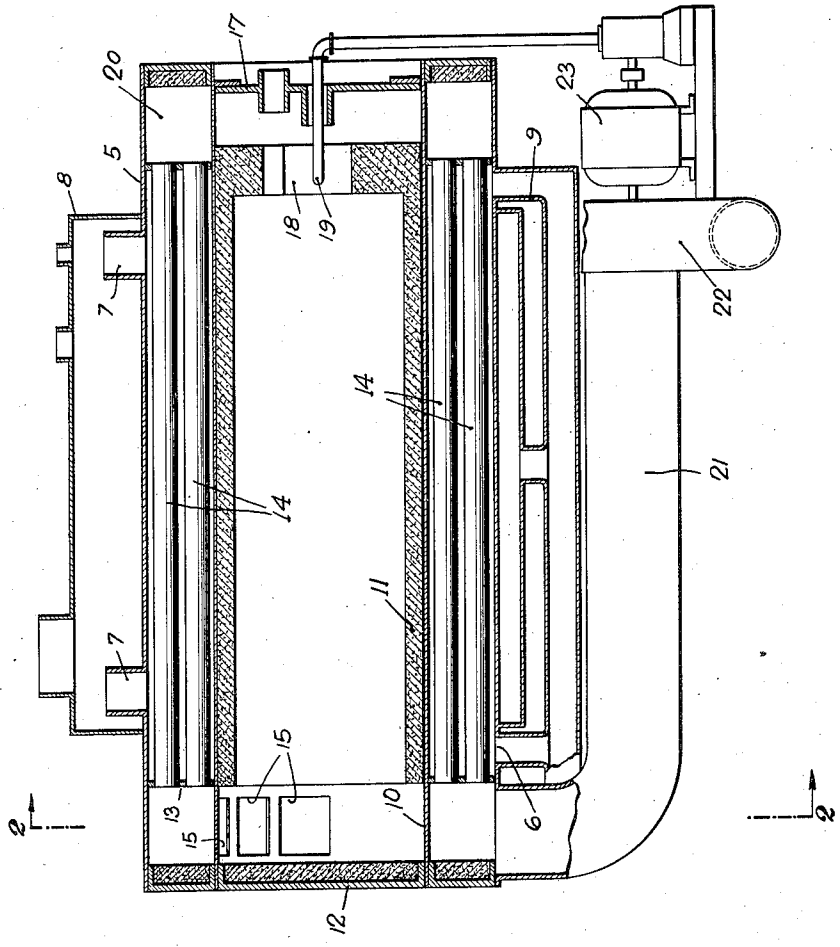
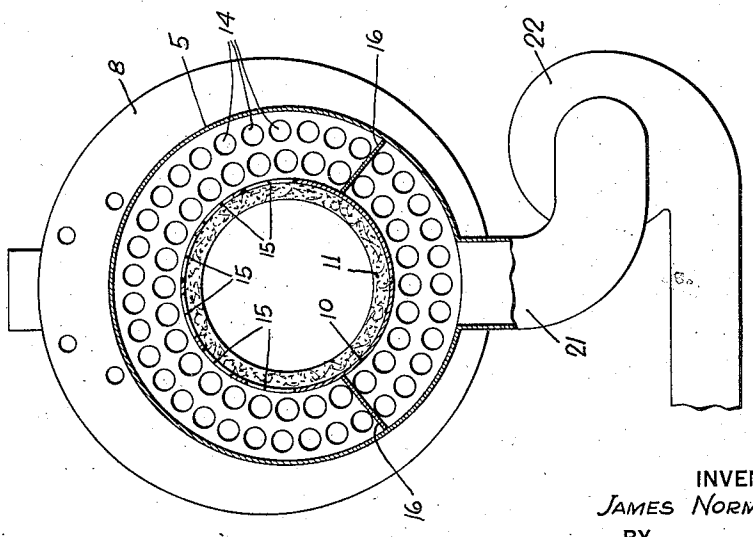


Fig. 2.



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Fig. 3.

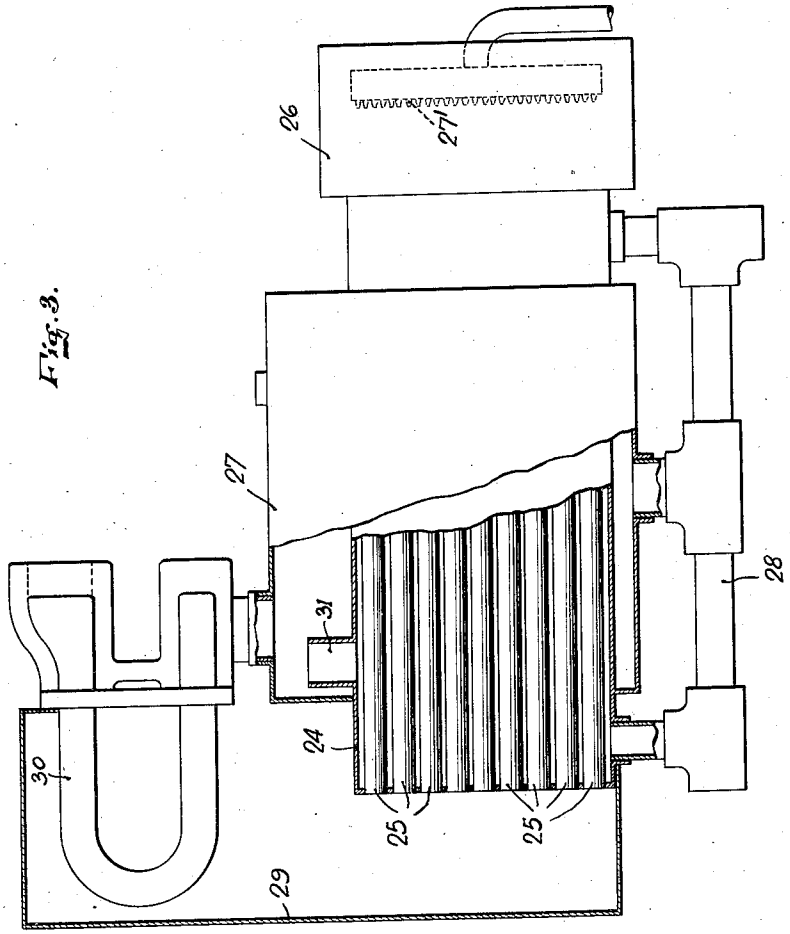
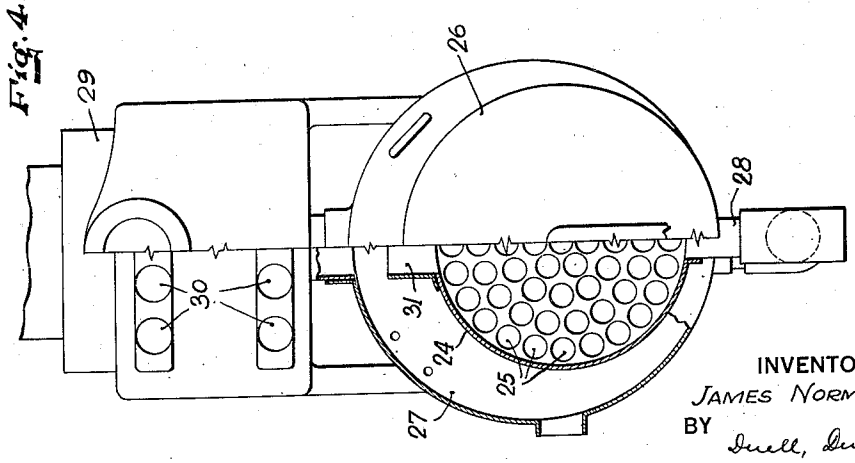


Fig. 4.



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UNITED STATES PATENT OFFICE

2,021,605

HEATING APPARATUS

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Application October 8, 1931, Serial No. 567,548
Renewed May 10, 1935

10 Claims. (Cl. 122—37)

This invention relates to a functionally and structurally improved heating apparatus capable of use in numerous different associations but primarily intended to be employed as a boiler and to be used in connection with oil and gas burners.

It is an object of the invention to provide an apparatus of this character which will embody relatively few parts, each individually simple and rugged in construction, these parts being capable of ready manufacture and assemblage to furnish a unitary apparatus operating over long periods of time with freedom from difficulties.

A further object of the invention is that of constructing an improved heating apparatus and specifically a boiler in which there will be a maximum and efficient heat transmission from the combustion chamber and products of combustion to the fluid to be heated.

A still further object is that of furnishing a boiler to which feed water will be supplied in an improved manner. Moreover, by this invention danger of damage to the parts will be reduced to a minimum.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating practical embodiments of the invention and in which

Figure 1 is a partly sectional view of one form of boiler;

Figure 2 is a transverse sectional view taken along the lines 2—2 and in the direction of the arrows of Figure 1;

Figure 3 shows a form of boiler slightly different from that shown in Figure 1, and

Figure 4 is a view similar to Figure 2 but being a partially transverse section only.

Referring primarily to Figures 1 and 2, a boiler has been shown which is particularly intended to be used in connection with an oil burner, although it is not necessarily limited to this association. Moreover, it will be understood that merely one and comparatively simple form of the invention has been depicted in these views. Obviously, the parts might be rearranged in numerous different respects in order that results might be produced consistent with maximum efficiency. This is also true of the showing and description in connection with Figures 3 and 4, hereinafter referred to.

Thus, the numeral 5 indicates a boiler casing provided with inlets 6 and with an outlet opening defined by collars 7. Both the inlets and outlets communicate with the interior of a jacket 8 encircling the casing 5 and this jacket may be provided with water intake openings and the height of the water within the same may be controlled in any suitable manner (not shown). The collars 7 extend well above the water level within the jacket 8 and communication between the inlet openings 6 and the jacket may be afforded by tube portions 9 which are arranged in the form of what might be termed an intake manifold integral with the jacket and/or boiler casing.

Disposed within and spaced from the casing 5 is a further casing 10. This casing defines within its body a combustion chamber, and between its exterior face and the inner face 5, provides a space for the fluid to be heated. The combustion chamber may of course be lined with fire clay 11 and a head 12 disposed at the rear end of the chamber may be similarly faced.

End plates or rings 13 are disposed between the casings 5 and 10 and passages for the flow of the products of combustion are afforded by interposing tubes 14 between these plates or rings. Communication between the inner ends of certain of these tubes and the combustion chamber is provided for by forming the casing 10 with a series of ports 15. At this time it will also be noted that partition members 16 are preferably disposed to extend transversely of the boiler heads so as to divide the tubes into two groups of passages.

At that end of the boiler which is opposite to the head 12 a second head 17 is provided and at this point the lining of fire clay 11 may be interrupted to provide an opening 18 for the end of the nozzle 19. Similarly to the head 12, the head 17 is spaced from the adjacent plates or rings 13 so that a space 20 is provided through which combustion products may flow.

Finally, it will be noted that a stack 21 is furnished for the escape of the products of combustion and this stack has its inner end connected to the lower portion of the space between the head 12 and the plates or rings 13, while its outer end is connected to a suitable escape flue (not shown). Interposed within this stack is a blower 22 which may be coupled to the same motor 23 which drives a pressure pump (not shown) connected to the nozzle 19.

In operation it will be appreciated that the jacket 8 is filled with water and that this water feeds in through the inlets 6 to completely fill the casing 5. Care must necessarily be taken that the water level falls short of the upper edge of the rings 7 or their equivalent. The motor 23 is now set into operation. This causes a suction within the stack 21 and an injection of oil through the nozzle 19. Preferably, no blower is employed

in connection with this nozzle, although it is obvious that the structure of the firing apparatus might be varied within wide limits. In any event, flame occurs within the combustion chamber and the flame rebounds from the head 12—the inner surface of which acts as a baffle—the products of combustion escaping thus through the ports 15 and flowing from the space between the head and plate through the upper group of tubes 14 and thence into the space 20. They pass thence through this latter space to a point in line with the lower group of tubes, i. e., the tubes between the lower faces of the partition 16. After flowing through these tubes they escape into the stack 21 and so into the flue.

In this manner, the water within the boiler is heated and the resultant steam or vapor moves through the collars 7 and thence through the escape opening or openings, in the jacket 8. Thus, the feed water becomes pre-warmed and serves in effect to a considerable extent to insulate the boiler. Moreover, as the water within the boiler is converted into steam it is constantly replaced by the reserve supply within the jacket. Under these circumstances it is substantially impossible to rapidly exhaust the water between the casings 5 and 10. Also, the more rapidly the steam is generated, the more rapid will be the flow of water through the intake manifold.

In the form of apparatus shown in Figures 3 and 4, virtually the same construction has been employed as that heretofore described. The boiler unit comprises a casing 24 through which tubes 25 extend. One end of the casing has a head 26 defining a combustion chamber within which a burner 27' is positioned. The casing 24 is substantially enclosed by a jacket 27 which serves as a feed water reservoir and the lower ends of this jacket and casing are interconnected by a manifold 28. The outlet ends of the tubes 25 communicate with a casing 29 within which superheater coils 30 may be disposed. These coils may be connected in series with the collar 31 which extends from the casing into the jacket. By a structure such as this it will be understood that a heater is provided which is ideally suited for use in connection with gas and similar burners. Maximum efficiency is assured and at the same time a sufficient supply of preheated feed water is always at hand so that damage to the parts will not occur.

While the present apparatus is ideally suited—particularly as illustrated—for use in connection with gas and oil fuels, it will be appreciated that by suitable minor modifications it might be adapted for use in connection with coal. Moreover, as will be readily apparent to those skilled in the art, boilers constructed in accordance with the present invention might be disposed in other than a horizontal plane. Also, numerous other changes and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims, it being obvious that, among others, the several objects of the invention as specifically aforenoted are achieved by the constructions heretofore illustrated and described.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A boiler including a casing, a jacket extending around said casing and materially above the same, said jacket being formed with an outlet, the upper surface of said casing being formed with an outlet opening and means whereby communication is afforded between the lower ends of said jacket and casing.

2. A boiler including a casing, a second casing enveloping said casing and being spaced therefrom, means spaced from and disposed within said first named casing to provide a combustion chamber, said first named casing communicating adjacent its lower end with the second casing and a collar extending from the upper end of said first named casing and affording communication with the interior thereof, such collar terminating short of the inner face of said second casing.

3. A boiler including a pair of spaced shells, the innermost shell defining a combustion chamber, a casing encircling the outermost shell and spaced therefrom, said outermost shell being formed with an opening adjacent its lower end whereby fluid may flow from said casing into the space between said shells, a tube disposed between said shells and connected to said chamber to provide a passage for the products of combustion, the outermost shell being formed with an opening adjacent its upper end for the discharge of heated fluid into the upper end of said casing, and said casing being formed with an opening to conduct said heated fluid therefrom.

4. A boiler including a pair of spaced shells, the innermost shell defining a combustion chamber, a casing encircling the outermost shell and spaced therefrom, said outermost shell being formed with an opening adjacent its lower end, whereby fluid may flow from said casing into the space between said shells, a tube disposed between said shells and providing a passage for the products of combustion, both said shells and said casing having substantially horizontal axes, and said casing being eccentrically disposed with reference to said shells, the outermost shell being formed with an opening adjacent its upper end for the discharge of heated fluid into the upper end of said casing, and said casing being formed with an opening to conduct said heated fluid therefrom.

5. A boiler including a pair of spaced shells, the innermost shell defining a combustion chamber, a casing encircling the outermost shell and spaced therefrom, said outermost shell being formed with an opening adjacent its lower end, whereby fluid may flow from said casing into the space between said shells, a tube disposed between said shells and connected to said chamber to provide a passage for the products of combustion, both said shells and said casing having substantially horizontal axes, and said casing being eccentrically disposed with reference to said shells and being spaced to a minimum extent from said shells adjacent its lower end, the outermost shell being formed with an opening adjacent its upper end for the discharge of heated fluid into the upper end of said casing, and said casing being formed with an opening to conduct said heated fluid therefrom.

6. A boiler including a pair of spaced shells, the innermost shell defining a combustion chamber, a casing encircling the outermost shell and spaced therefrom, said outermost shell being formed with an opening adjacent its lower end whereby fluid may flow from said casing into the space between said shells, a tube disposed between said shells and connected to said chamber to provide a passage for the products of combustion, the outermost shell being formed with an opening adjacent its upper end, a collar extending above said opening and discharging into said casing, and said casing being formed with

an opening to conduct therefrom heated fluid flowing through the opening and collar of the outermost shell.

7. A boiler including a pair of spaced shells, the innermost shell defining a combustion chamber, a casing encircling the outermost shell and spaced therefrom, said outermost shell being formed with an opening adjacent its lower end whereby fluid may flow from said casing into the space between said shells, a tube disposed between said shells and connected to said chamber to provide a passage for the products of combustion, the outermost shell being formed with an opening adjacent its upper end for the discharge of heated fluid into the upper end of said casing, said casing being formed with an opening to conduct said heated fluid therefrom, said casing and shell openings being axially offset with respect to each other.

8. A heating apparatus including, in combination a pair of shells spaced from and disposed one within the other, a casing enclosing said shells and spaced therefrom, the innermost of said shells defining a combustion chamber, the outermost of said shells being formed with an opening adjacent its lower surface whereby fluid may flow from said casing into the space between said shells, said outer shell and casing being both formed with openings adjacent their upper surfaces and through which heated fluid may escape.

9. A heating apparatus including a casing to contain fluid to be heated, a jacket enclosing said casing, said casing being formed with an opening adjacent its lower surface whereby fluid within said jacket may flow through such opening into such casing, means within such casing and providing heat transfer surfaces for the fluid therein and said casing and jacket being formed with outlet openings and at points adjacent their upper surfaces.

10. A heating apparatus including a casing to contain fluid to be heated, means providing a heat transfer medium within such casing, a combustion head at one end of such casing and connected to the means providing the heat transfer medium, a jacket enclosing said casing, said casing being formed with an opening adjacent its lower surface whereby fluid within said jacket may flow through said opening into the interior of said casing, and said casing and jacket being formed with outlet openings adjacent their upper surfaces.

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