Feb. 11, 1964 W. MUELLER 3,120,838

BOILER FOR CENTRAL HEATING SYSTEMS AND FOR PREPARING HOT WATER

Filed Feb. 24, 1961 2 Sheets-Sheet 1

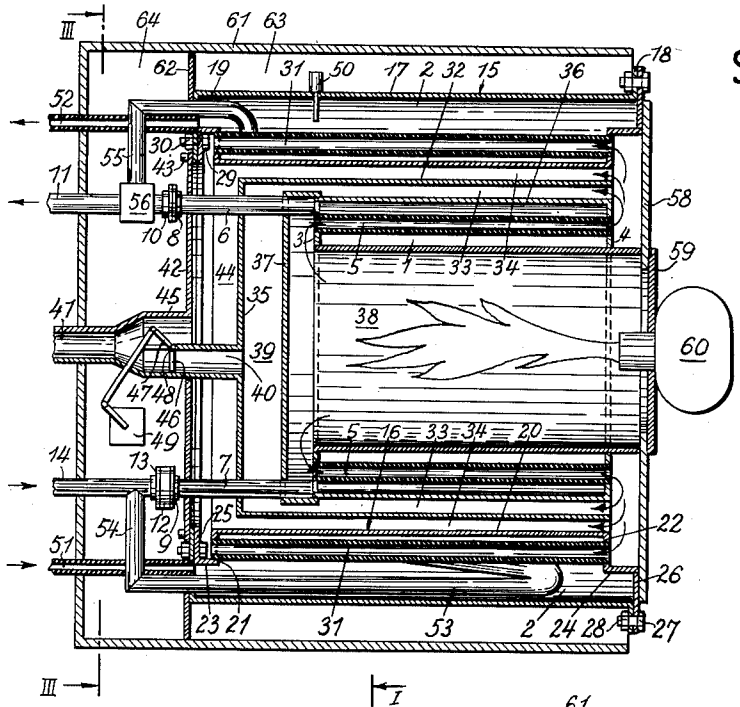


Fig. 1

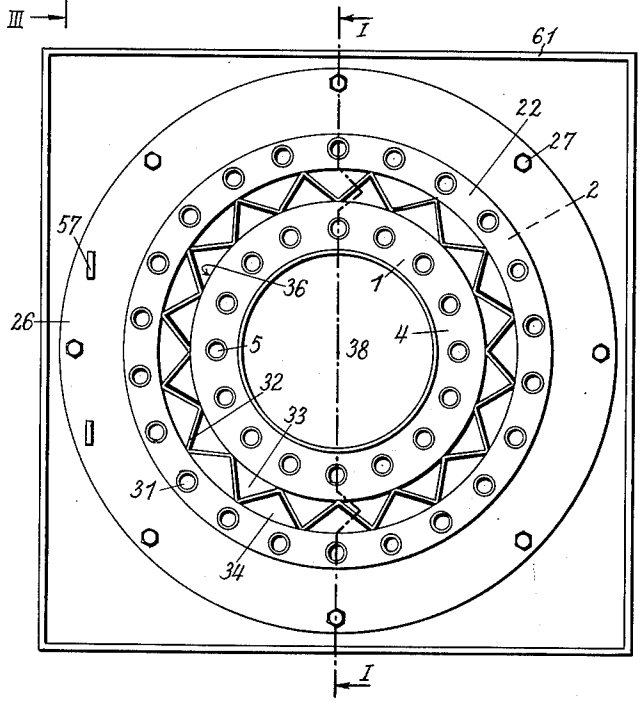


Fig. 2

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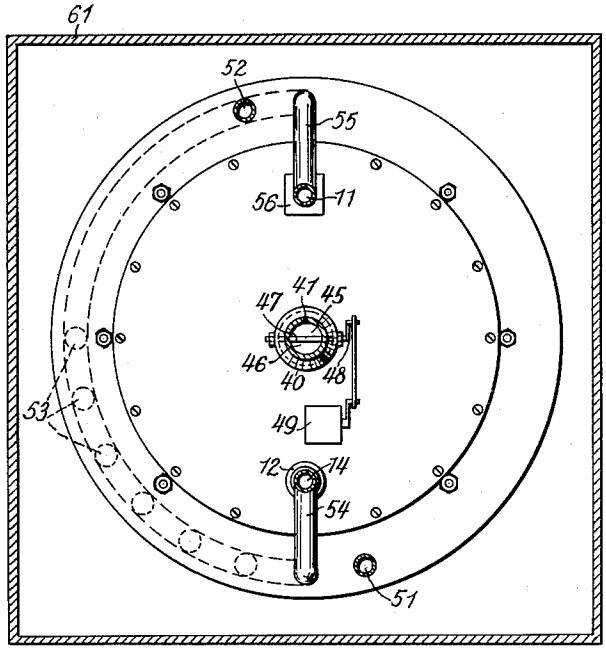


Fig. 3

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BOILER FOR CENTRAL HEATING SYSTEMS AND FOR PREPARING HOT WATER

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The present invention relates to a boiler for central heating systems and for preparing hot water.

It is one object of the present invention to provide a boiler for central heating systems, and for preparing hot water which includes two axial water jackets of sheet steel, which are passed through by axially extending smoke gas flues and the inner one of which serves for heating the water for the central heating system and the outer one serving to prepare hot water, and by axially extending smoke gas flues disposed between the two water jackets, one part of the latter flues serving to heat the inner water jacket and the other part thereof serving to heat the outer water jacket.

As is apparent from the following description of an illustrative embodiment, this design enables the provision of a boiler, the hot water preparing section of which enables the withdrawal of hot water at a very high rate and which can be erected and removed, as well as operated in a very simple manner.

With this and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is a longitudinal sectional view taken along the lines 1—1 of FIG. 2 and showing a boiler for central heating systems;

FIG. 2 is a front elevation of the boiler, the door being removed for better demonstration; and

FIG. 3 is a section along the lines 3—3 of FIG. 1.

Referring now to the drawings, the boiler for central heating systems has a cylindrical inner water jacket 1 and a likewise cylindrical outer water jacket 2, which is coaxial with the inner jacket 1. The inner water jacket 1 serves for heating the water for the central heating system, whereas the outer water jacket 2 serves for preparing hot water. Smoke tubes 5 are welded into the annular heads 3 and 4 of the water jacket 1 consisting of sheet steel and extend axially through the water jacket 1. Two connecting pipes 6 and 7 are welded to the head 3 and extend also in an axial direction and have flanges 8 and 9, respectively, screwed onto their free ends.

The flange 8 has secured to it by means of a flange 10 a forward pipe 11, which is connected to the forward line. The flange 9 has connected to it a circulation pump 12, which is secured by a flange 13 to a return pipe connected to the return line.

The outer water jacket 2, which consists also of sheet steel, is composed of two sections 15 and 16. The outer section 15 consists of a cylinder 17, an outer flange 18 welded to the front end of this cylinder, and an inner flange 19 welded to the rear end of the cylinder 17. The inner section 16 consists of a cylinder 20, two annular heads 21 and 22 welded to the ends of the cylinder 20, two short cylinders 23 and 24 larger in diameter than the cylinder 20 and connected to these heads 21 and 22, an inner flange mounted at the end of the rear short cylinder 23 and an outer flange 25 mounted at the end of the front short cylinder 24. The two forward or outer flanges 18 and 26 are secured to each other by bolts 27 and nuts 28 with a gasket (not shown) interposed. Likewise, the two rearward or inner flanges 19 and 25 are secured to each other by bolts 29 and nuts 30 with a gasket (not shown) interposed. Smoke tubes 31 are welded into

the two annular heads 21 and 22 and extend axially through the outer water jacket 2.

A sheet steel element 32 corrugated in zig-zag shape is disposed between the water jackets 1 and 2 and divides the space between these water jackets, which space has the form of a cylindrical ring, into a series of axially extending inner smoke gas flues 33 and a number of also axially extending outer smoke gas flues 34. A head 35 extending at right angles to the boiler axis is welded at its rim to the rear rim of the corrugated sheet steel element 32 and covers the inner smoke gas flues 33 whereas it does not cover the outer smoke gas flues 34.

The outer sheet steel shell 36 of the inner water jacket extends rearwardly somewhat beyond the annular head 3 and is providd with a circular head 37, which forms the rear boundary of the combustion chamber 38. The chamber 39 axially confined by the heads 35 and 37 communicates with the discharge pipe 41 through a connection tube 40 of semicircular cross-section.

Another head 42 is secured with screws 43 to the rear or inner flange 19 of the section 15 of the outer water jacket. The chamber 44 axially confined by the heads 35 and 42 communicates with the discharge tube through a connecting tube 45 of semicircular cross-section, which adjoins the connection tube 40.

Two dampers 46 and 47, which are rigidly interconnected to extend at right angles to each other, are pivotally movable by a shaft 48, which is kinematically connected to an electric motor 49. The motor 49 is mounted on the floor 42 by suitable means (not shown) and is controlled by a thermostat 50 in dependence on the temperature prevailing in the outer water jacket 2. If this temperature falls below an adjustable limit, e.g. 85° C., the motor is controlled to move the dampers 46 and 47 to the position shown, in which the connecting tube 40 is closed by the damper 46 and the connecting tube 45 is open. When the temperature rises above the adjusted limit, the motor is controlled so that the damper 47 closes the tube 45, whereas the connecting tube 40 is open.

The outer water jacket 2 is connected at its rear end to two axially extending connection pipes 51 and 52, the lower one of which, 51, serves for connection to the cold water feed conduit, whereas the upper tube 52 serves for connection to the hot water discharge conduit. A heating pipe coil 53 (see FIG. 3) arranged in the outer water jacket 2 is connected by connecting pipes 54 and 55 at one end to the return pipe 14 and at the other end to the forward pipe 11. The pipes 55 and 11 are connected to each other by means of a change-over valve 56, which is also electrically controlled by the thermostat 50. When the water temperature in the outer water jacket is below the limit temperature, the passage through the pipe 55 will be free whereas the passage through the outer part of the forward pipe 11 is entirely or almost entirely obstructed. When the temperature rises above the limit the pipe 55 will be closed and the outer part of the forward pipe will be opened. In both cases the flow through the inner part of the forward pipe will not be hindered.

The forward or outer flange 26 of the inner jacket section 16 has secured thereto by means of a hinge 57 a door 58, which is provided with a central, perforated plate 59, on which an oil burner 60 is mounted. The entire unit is surrounded by an outer casing 61, which is divided by an annular wall 62 into a cylindrical front chamber 63 and a short rear chamber 64. The former is preferably filled with heat insulating material (not shown) whereas the latter remains preferably empty.

The described boiler operates as follows:

When the temperature of the hot water in the outer water jacket 2 is too low, so that the dampers 46 and 47

are in the position shown, the smoke gases will escape from the combustion chamber 38 along the following path:

Combustion space 38, fire tubes 5, outer smoke gas flues 34 and smoke tubes 31 parallel thereto, chamber 44, connecting tube 45, discharge pipe 41. Thus, the outer water jacket 2 is heated along two parallel systems of smoke gas channels 31, 34 whereas the inner water jacket 1 is heated only along one system of smoke gas channels 5.

The water discharged by the pump 12 flows in the following cycle: Pump 12, connecting pipe 7, inner water jacket 1, pipe 6, inner portion of forward pipe 11, change-over valve 56, pipe 55, heating pipe coil 53, pipe 54, forward pipe 14, pump 12. The circulating water heated in the inner water jacket 1 delivers its heat by the heating coil 53 to the water contained in the outer water jacket 2 so that the latter is not only directly heated by the smoke gases but also indirectly from the inner water jacket 1 by means of the circulating water.

If the change-over valve 56 does not completely shut off the outer portion of the forward pipe 11 in this operating condition, a certain part of the water heated in the inner jacket 1 will circulate through the central heating system, in addition to the cycle described. This will be generally desirable.

When the withdrawal of water has been discontinued the described operating condition prevails only for a very short time, because the water in the outer water jacket 2 is very rapidly heated in the manner described. Owing to the rapid heating, the water can be withdrawn at a high rate so that the water jacket 2 will operate as a flow heater even at a high rate.

When the temperature rises above the limit of, e.g., 85° C., the damper 47 will assume its closed position and the damper 46 will assume its open position. At the same time the change-over valve 56 will shut off the pipe 55 and will open the outer portion of the forward pipe 11. The fire gases will then flow along the following path: Combustion chamber 38, smoke tubes 5, inner smoke gas flues 33, chamber 39, connecting tube 40, discharge pipe 41. The inner water jacket 1 will now be heated with high intensity along two systems of smoke gas paths 5 and 33 flown through in series by the smoke gases. The outer water jacket 2 is no longer heated at all because there is no flow along the smoke gas paths 31, 34 nor in the heating coil 53. As a result, there is no danger that the service water is too highly heated and brought to boil or that unnecessary heat losses occur.

In addition to the advantages resulting from the above mode of operation and residing in a hot water production at a high rate, quick readiness and avoidance of losses, the described boiler has the additional advantage, that it can be erected and removed very easily and can easily be transported and cleaned. When the door 58 is open, the flange bolts (not shown) have been removed and the flanges 8 and 9 have been screwed off, the inner water jacket 1 together with the head 37 and the pipes 6 and 7 can be pulled out of the corrugated sheet metal element 32. After the dampers 46, 47 have been removed, the corrugated sheet metal element 33 can then be pulled out of the outer jacket 2 together with the head 35 and the connecting tube 40. When the screws 27, 29 and the nuts 28, 30 have been removed, the inner section 16 of the outer water jacket 2 can be pulled out of the outer section 15 when decalcification is required.

For the removal of the soot normally formed in the boiler it is sufficient to open the door 58, whereafter the smoke tubes 5 and 31 and the smoke gas flues 33 and 34 can be cleaned without difficulty.

It is obvious that refractory slabs or bricks can be arranged in known manner in the combustion chamber 38 to avoid a direct impingement of the burner flame on the inner water jacket 1 and the head 37. The oil

burner may be replaced by a grate to enable solid fuel to be fired. Electrical heater elements may be accommodated in the outer water jacket 2 for preparing hot water when the central heating system is not used or when the oil burner cannot or is not to be used for any reason whatever.

Instead of using a sheet metal element 32 corrugated in zig-zag shape to define the two systems of smoke gas flues 33, 34, angle sections may be used, which are welded along their two longitudinal edges to the cylinder 20 of the inner section 16 of the outer water jacket 2 and contact the water jacket 1 at their angle edge. In this case the angle sections can be assembled and removed only together with the water jacket section 16 but the structure is stronger and can be assembled more easily.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A boiler structure for a central heating system and for preparing hot water,

a boiler comprising two outer sheet steel cylinders and two inner sheet steel cylinders to define an outer water jacket and an inner water jacket, respectively,

said inner water jacket being coaxially disposed in said outer jacket,

a first tube defining a first smoke flue extending axially through said inner water jacket,

a second tube defining a second smoke flue extending axially through said outer water jacket,

means defining third and fourth smoke flues extending axially between said inner and outer water jackets,

means feeding cold water into said inner water jacket,

hot water discharge means connected with said inner water jacket,

means feeding cold water into said outer water jacket,

hot water discharge means connected with said outer water jacket,

a combustion chamber disposed within said inner jacket and open at its rear end to communicate with said second smoke flue in order to feed fire gases emerging from said combustion chamber therethrough,

said second smoke flue communicating with said first, third and fourth smoke flues, and

means permitting the flow of said fire gases alternately through said first, second and fourth smoke flues, and through said first, and third smoke flues, respectively.

2. The boiler structure, as set forth in claim 1, which includes connecting means detachably connecting said cold water and hot water feeding means to said inner jacket, and said inner jacket being removable from said boiler upon releasing said connecting means.

3. The boiler structure, as set forth in claim 1, which includes a flange connection between said inner and said outer sheet steel cylinders, said inner cylinders being removable from said outer cylinders upon releasing said flange connection.

4. The boiler structure, as set forth in claim 1, in which said means defining said third and fourth smoke gas flues comprises a sheet steel element corrugated in zig-zag shape provided at one end with a head which covers only said second smoke gas flues, and wherein said means permitting alternate flow of said fire gases comprises a first connection tube connected to said third smoke gas flue, a discharge pipe connected to said connection tube, and damper means detachably mounted in said connection tube, and said sheet steel element being removable, upon removing said damper means.

5. The boiler structure, as set forth in claim 4, in which said damper means comprises two interconnected first and second dampers, and which includes a second connection tube connecting said fourth smoke gas flues to said discharge pipe, said dampers being movable between two

positions, said first damper opens said first connection tube in one of said positions and said second damper closes simultaneously said second connection tube in said one of said positions, whereas said first damper closes said first connection tube in the other of said positions and said second damper opens simultaneously said second connection tube in said other of said positions, the arrangement being such that in said one of said positions a smoke gas path through said inner jacket through said first smoke gas flues only is opened and in said outer water jacket through said second and fourth smoke gas flues, whereas in the other of said positions said first and third smoke gas flues are connected in series, whereas said second and fourth smoke gas flues are closed.

6. The boiler structure, as set forth in claim 5, which comprises an electric motor arranged to operate said dampers, a thermostat arranged to control said electric motor in dependence upon the temperature in said outer jacket, so that said dampers are in said one position, when said temperature is below and in said other position when it is above a predetermined limit.

7. The boiler structure, as set forth in claim 1, which includes a heating pipe coil disposed in said outer water jacket and connected at one end to said cold water feeding means and at the other end to said hot water discharge means of said inner water jacket, and circulation means for generating a circulation of water through said inner water jacket and said heating coil.

8. The boiler structure, as set forth in claim 7, in which said circulation means comprise a circulation pump connected to said cold water feeding means of said inner water jacket and a change-over valve disposed in said hot water discharge means of said inner water jacket and movable between two positions to be arranged in one of said positions to open the circulation through said inner water jacket and said heating pipe coil and to at least partly obstruct the circulation through said cold water feeding means and hot water discharging means of said inner water jacket, whereas in the other of said positions said change-over valve is arranged to shut off said circulation through said inner water jacket and said heating pipe coil and to fully open the circulation through said cold water feeding means and said hot water discharge means.

9. The boiler structure, as set forth in claim 8, which comprises a thermostat arranged to automatically control said change-over valve in dependence upon the temperature in said outer water jacket, to cause said change-over valve to assume said one of said positions, when the temperature is above and to assume the other of said positions, when said temperature is below a predetermined limit.

10. The boiler structure, as set forth in claim 1, in which said inner water jacket comprise an outer shell and an annular head at one end of said inner water jacket, said shell extending rearwardly beyond said annular head and being provided with a circular head forming a rear boundary of said combustion chamber.

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