Title: SOLID FUEL BURNING METHOD AND HEATING BOILER

Abstract: The present invention relates to a method to improve the air distribution in a heating boiler combustion furnace. In the upper part of combustion chamber (1) there is a hole, where there is an air feeding tube (2) able to slide freely up and down with an air distributor (3) on the end, installed. The air distributor (3) is hollow and is of disc shape on the upper zone of which there is the tip (18) and on the lower zone of which there is a cone head (19). On the peripheral zone of the disc, on the tip (18), at the narrow end of the head (19) and its sided there are holes (3a, 19a, 19b, 18a), with help of which the air is distributed in the focus of combustion. The air distributor (3) learns on the upper part of fuel charge and gets down when fuel is burning.
SOLID FUEL BURNING METHOD AND HEATING BOILER

FIELD OF THE INVENTION

The present invention is of the field of heating techniques and relates to a novel solid fuel burning (firing) method and boiler for central heating. The boiler also supplies hot water for domestic purpose.

There is known a boiler with a heat exchanger welded comprising a combustion chamber connected to a chimney, with a fuel loading door above and a cleaning one below, an air suction valve, furnace bars, a box for ash collection and outputs of heated water inlet and outlet (See Hot water boiler Atrama - 9 heated with solid fuel, Exploitation Manuals, Kaunas, 2001).

The operation of such a central heating boiler is based on fuel combustion from the bottom up to the top. Such combustion (burning) way works for little furnaces where fuel charge does not exceed the height of 20 cm, but however does not work for central heating boilers where fuel charges are considerably larger. During the burning process the rising flame heats up all the fuel in the combustion chamber. When it flares up, a large volume of combustible gas releases and incompletely burned gases are dropped into the chimney and then into environment, is blown - out.

There is known heating equipment consisted of loading - primary and secondary combustion chambers. The primary combustion chamber is connected at the bottom through the grating to an air feeding - ash collection chamber and to the secondary combustion chamber, as well. The wall of the secondary combustion chamber is double, where there is a reservoir with water. In the secondary combustion chamber there are more than two hollow, filled with water partitions, which prolong the smoke path into the chimney and increase the output of heat. Air feeding to the primary combustion chamber is controlled by opening the door of air
feeding - ash collection chamber, while to the secondary combustion chamber - by opening the air-feeding valve (See patent LT 4588 B). The construction of such a boiler is complex; imperfection of its operation is that fuel burning in the primary combustion chamber is not effective. It is complicated or even impossible to evade getting of air excess into the secondary combustion chamber, thus the performance decreases. As in the analogue described above the primary combustion chamber of such a boiler also uses fuel burning from the bottom up to the top. Hot gas first rises up, preheats the whole charge, then cool gas sets down and during quenching the combustion in the primary chamber it flows into the secondary combustion chamber.

SUMMARY OF THE INVENTION

The object of the present invention is to propose a novel method of solid fuel burning, which will allow increasing the performance of boilers operation and simplifying their construction. The said purpose is achieved when solid fuel charged into the combustion chamber is fired up, air fed into the combustion focus and distributed in it from the above.

Striving to achieve the purpose of present invention the essential operational characters are specified as the following:

- the air is fed by the tube with the air distributor at the end, which leans on the fuel in the combustion chamber and gets down, when fuel volume in the combustion chamber decreases.
- air fed is distributed as the following: 40 – 60% would get into the focus of combustion, 10 – 30% - onto the edges of the combustion focus, 20 – 40% - over the combustion focus.
- such air volume is fed that the focus of combustion would form 15 - 20 cm of the height of fuel charge in the combustion chamber.
It is another object of the invention to propose the construction of central heating boiler realizing said solid fuel burning (firing) method. The said purpose is achieved when the heating boiler comprises a combustion chamber, which a double wall has a reservoir filled with water to be heated, a smoke outlet opening, fuel charge and ash removal openings with doors and outputs of water inlet and outlet, the combustion chamber is installed vertically and is of the shape of a rounded or polygon cylinder, on the top of which there is a hole, where there is an air feeding tube able to move freely up and down with an air distributor at the end leaning on the fuel in the combustion chamber, installed.

To achieve the goal described above easier some of essential characters of the heating boilers are specified as the following:

- air distributor is hollow and is of disc shape, on the upper zone of which there is the tip for its connection to the air feeding tube, and on the lower zone of which there is a cone head. On the peripheral zone of the air distributor, on the tip, at the narrow end of the head and its sides there are holes, contacting with the internal cavity of the air distributor.

- the disc area of the air distributor constitutes 0.3 - 0.5 of cross-sectional area of the combustion chamber.

- the air feeding tube is of the shape of a telescope construction striving to decrease its length (a tube of a less diameter is put into another tube and is able to move freely inside this tube).

BRIEF DESCRIPTION OF THE DRAWING

The essence of the invention may be better understood from the following detailed description which refers to the drawing where a longitudinal section of the heating boiler is shown.
The heating boiler comprises of the main parts as the following: combustion chamber 1, air feeding tube 2, air distributor 3, cover 4 and air transmission cylinder 5 connected to it, protective housing 6 and heat insulating wrap 7.

The combustion chamber 1 is of the shape of a vertical cylinder and has double wall, i.e. internal 8 and external 9. The reservoir in the wall is filled with water 10. In the upper part of the combustion chamber 1 there is an opening of smoke outlet 11 and a fuel charge opening 12. At the bottom part of the combustion chamber 1 there is an ash removal opening 13. Fuel charge and ash removal openings 12 and 13 has doors respectively to 14 and 15. The top of the combustion chamber 1 is covered with a cover 4 and a transmission cylinder 5 is inside upper part of the combustion chamber 1. Between the transmission cylinder 5 and the internal wall 8 of the combustion chamber 1 there is a gap 16 thus smoke is directed along the wall 8. The bottom of the transmission cylinder 5 has a partition prolonging the path of smoke up to the outlet opening 11. In the cover 4 there is an air inlet opening 17.

The air feeding tube 2 is of telescopic construction striving to decrease its length (a tube of a less diameter is put into another tube of a larger diameter and is able to move freely inside this tube). The air feeding tube 2 shown in the drawing consists of three tubes of different diameters. The air feeding tube 2 is put into the inside of the combustion chamber 1 via the hole in the bottom of the transmission cylinder 5.

The air distributor 3 is hollow and of disc shape. On its upper zone there is a tip 18, and on the lower zone - a cone head 19. On the peripheral zone of the air distributor 3, on the tip 18 and at the narrow end and sides of the head 19 there are holes respectively to 3a, 18a, 19a and 19b, contacting to the internal cavity of the air distributor.

The air distributor 3 is connected to the internal air feeding tube 2a via the tip 18. To the internal air feeding tube 2a there is a thin rope 20 attached
which is led out into the exterior of the heating boiler through the cover 4 and over pulleys 21 and 22.
There is a valve 23 installed at the opening of air inlet 17. The heating boiler is mounted on the foundation 24 produced of bricks or fireproofing concrete.

The drawing does not show any outputs of water inlet and outlet.

FUNCTIONAL DESCRIPTION

The preparation of the heating boiler for combustion is as the following. When the rope 20 is pulled, the air distributor 3 with the air feeding tube 2 is drawn (lifted) to the bottom of the transmission cylinder 5. The door 14 is opened, and through the fuel charge opening 12 fuel is charged into the combustion chamber 1 up to its top; on the top there is kindling put; when the rope 20 is released the air distributor 3 leans on the kindling and the top part of fuel.
The heating boiler functions as the following. When the door 14 and valve 23 are opened, the kindling is fired through the fuel charge opening 12 and the door 14 is closed. During the burning of fuel its volume in the combustion chamber 1 is decreasing and the focus of combustion is getting (sliding) down. Because the air distributor 3 is leaning on fuel burning, it is also getting down up to the bottom of the combustion chamber 1 until fuel burns away completely. During the fuel burning released heat is transferred to the water 10 through the wall 8.
Combustion is occured as the following. Air gets into the combustion chamber 1 through the opening of air feeding 17, the transmission cylinder 5, the air feeding tube 2 and the air distributor 3. The air with the help of the air distribution 3 is distributed so that one part of air gets directly into the focus of combustion through the holes 19a and 19b, the second part gets onto the edges of the focus through the hole 3a, and the third air part gets over the air distributor 3.
through the hole 18a. The air getting into the focus of combustion through the head 19 (holes 19a and 19b) is used in CO generation, the air getting through the hole 3a, is partly used for CO generation and partly for CO combustion, and the air getting in through the hole 18a is used for CO combustion.

Air fed to the combustion chamber is distributed as the following: 40-60% gets into the focus of combustion, 10-30% gets onto the edges of the combustion focus, 20-40% - over the combustion focus.

The advantages of the solid fuel burning method described above is that during the basic time of combustion the heating boiler operates under optimal conditions, i.e. only the upper part of fuel burns intensively, combustible gas released does not cool down, does not heat the total fuel in the combustion chamber and burns effectively.

The heating boiler described above burns fire - wood and other wooden craps, e.g. sawdust.
The power of the heating boiler depends on the area of the combustion chamber cross - section, time of combustion - on the height of combustion chamber. Intensity of fuel combustion may be defined manually or by automatic monitoring of the draught gauge by opening or closing the valve.
The method of solid fuel combustion proposed above may be applied to heating equipment with various powers.
CLAIMS

1. The solid fuel burning method where fuel is charged into the combustion chamber, air fed and fuel fired up, characterized in that fuel is fired up, air is fed into the combustion focus and distributed from the above.

2. The method according to claim 1, characterized in that the air is fed by the tube with the air distributor at the end, which leans on the fuel in the combustion chamber and gets down, when fuel volume in the combustion chamber decreases.

3. The method according to claims 1, 2, characterized in that the air fed is distributed as the following: 40 - 60% would get into the focus of combustion, 10 - 30% - onto the edges of the combustion focus, 20 - 40% - over the combustion focus.

4. The method according to claims 1 to 3, characterized in that such air volume is fed that the focus of combustion would form 15 - 20 cm of the height of fuel charge in the combustion chamber.

5. The heating boiler comprising a combustion chamber (1), which the double wall (8, 9) has a formed reservoir filled with water (10) to be heated, a smoke outlet opening (11), fuel charge (12) and ash removal (13) openings with doors (14, 15) and outputs of water inlet and outlet, characterized in that the combustion chamber (1) is installed vertically and is of the shape of a rounded or polygon cylinder, on the top of which there is a hole, where there is an air feeding tube (2) able to slide freely up and down with an air distributor (3) at the end leaning on the fuel in the combustion chamber (1), installed.

6. The boiler according to claim 5, characterized in that the air distributor (3) is hollow and is of disc shape on the upper zone of which there is the tip (18) for its connection to the air feeding tube, and on the lower zone of which there is a cone head (19); besides, on the peripheral zone of the disc, on the tip, at the narrow end of the head and its sides there are holes (3a, 19a, 19b, 18a), contacting with the internal cavity of the air distributor (3).
7. The boiler according to claims 5 and 6, characterized in that the disc area of the air distributor (3) constitutes 0.3 - 0.5 of cross-sectional area of the combustion chamber (1).

8. The boiler according to claim 5, characterized in that the air feeding tube (2) is of the shape of a telescope construction.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F23L1/00 F23L9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category * Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.

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A paragraph '0008' - paragraph '0009!

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paragraph '0016' - paragraph '0025!

paragraph '0032' - paragraph '0033!

figures 1,6,7

Further documents are listed in the continuation of box C.

* Patent family members are listed in annex.

* Special categories of cited documents:

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier document but published on or after the international filing date

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'S' document member of the same patent family

Date of the actual completion of the international search

25 July 2002

Date of mailing of the international search report

02/08/2002

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