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(54) **Heating boiler with high autonomy of feeding with solid fuel.**

(57) The boiler is constituted by a combustion chamber (20;120) with oblique side walls (2, 4; 102, 104) adapted to cause the solid fuel to descend automatically by gravity towards a lower grid (5, 105) where combustion takes place.

The fuel is introduced through two capacious upper apertures (7, 8; 107, 108) provided with smokeproof covers.

The fluid to be fed to the heating bodies is heated in a central cylindrical body (14, 114) with flue pipes. The central cylindrical body (14; 114) can be made either in a version for feeding with solid fuel only or in a version for mixed feeding, in which case the boiler is provided with appropriate supports for a conventional burner (17).

The main advantage of the boiler is its great autonomy of feeding with solid fuel which is introduced therein in considerable amounts – if desired, in the form of large economical pieces of wood logs – which, however, are burned gradually in time.

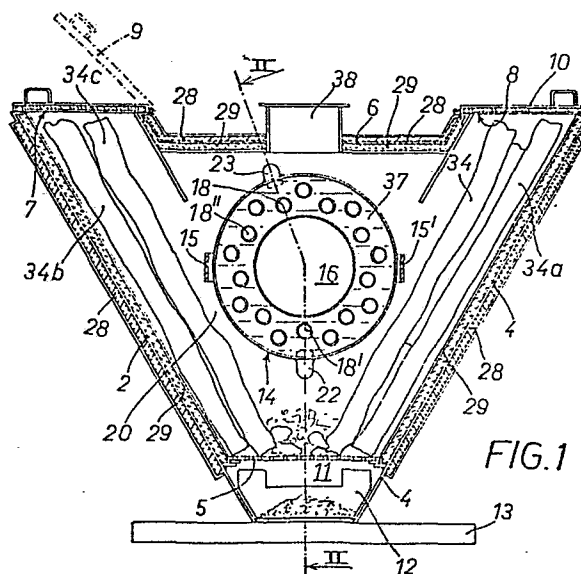


FIG.1

"HEATING BOILER WITH HIGH AUTONOMY OF FEEDING WITH SOLID FUEL"

The present invention relates to a heating boiler with high autonomy of feeding with solid fuel.

In recent times a growing interest has developed for domestic heating boilers fed with solid fuel, mainly because of the continuous increase in costs for liquid and gaseous fuels.

Commercially available are numerous models that are generally designed for heating individual apartments and are operated either by solid fuel or are of the mixed type, i.e. adapted to permit alternative burning of solid or liquid fuel.

With regard to the feeding with solid fuel, such boilers have the great disadvantage that they have to be charged with fuel many times in the course of one day, which causes almost continuous work for a person charged with this job.

It is an object of the present invention to eliminate or reduce the above-mentioned disadvantage by providing a heating boiler for solid fuel which does not require frequent feeding with fuel and consequent use of manpower, but is such as to have a high autonomy of operation.

Another object of the present invention is to provide a boiler which can be fed with solid fuel in large pieces, particularly wood in the form of logs whose cost is relatively low.

A further object of the invention is to provide a heating boiler which has the above-mentioned advantages and in addition can be fed, if desired, with liquid or gaseous fuel.

The above and other objects and advantages of the invention, which will become apparent from the following description, are achieved by a heating boiler characterized in that it comprises a combustion chamber for solid fuel, provided with oblique side walls converging downwardly on a grid for the fuel, and with at least one upper aperture for charging the fuel, said upper aperture being arranged adjacent said oblique side walls, a cylindrical body being arranged horizontally in the centre of said combustion chamber, said cylindrical body containing the heated fluid and being traversed by flue pipes opening into a discharge conduit.

According to another feature of the invention, a further combustion chamber for liquid or gaseous fuel is axially provided in the cylindrical body containing the heated fluid, said liquid or gaseous fuel being delivered by a burner secured to the front door of the boiler.

The invention will now be described with reference to the accompanying drawings provided by way of a non-limiting example and in which :

Fig. 1 is a cross-sectional view of a first embodiment of the boiler according to the invention;

5 Fig. 2 is a view in section taken along the line II-II of Fig. 1;

Fig. 3 is a cross-sectional view of a second embodiment of the boiler according to the invention, and

Fig. 4 is a view in section taken along the line IV-IV of Fig. 3.

70 Figs. 1 and 2 illustrate a preferred embodiment of the invention constituted by a heating boiler which can be operated both by solid fuel and liquid or gaseous fuel.

The boiler comprises a front wall 1, a rear wall 3 and two side walls 2, 4 having the basic characteristic of being oblique and converging downwardly towards the centre on a bottom grid 5. The rear wall 6 of the boiler is 15 provided with two longitudinal apertures 7 and 8 which are closed by pivotally mounted covers 9, 10. The above-mentioned elements together form the combustion chamber 20 for solid fuel of the boiler.

Provided below the grid 5 is a chamber 11 for accommodating the ash-pan 12; the entire structure is supported by an appropriate base 13.

20 A cylindrical body 14 containing the heated fluid is arranged in the centre of the combustion chamber 20 and is secured rearwardly directly to the wall 3 of the boiler and forwardly is spaced from the wall 1 to which is connected by brackets 15, 15'. The combustion chamber for the liquid or gaseous fuel delivered by a burner 17 is provided in an axial recess 16 of the cylindrical 25 body 14. The cylindrical body 14 further comprises a bundle of flue pipes 18, 18', 18'', etc., opening rearwardly into a chamber 19 communicating with the discharge conduit 21. The fluid to be heated, for example water 37, is fed to the body 14 through a conduit 22 and is removed through the conduit 23 to be conducted to radiators or other heating bodies, not shown.

30 As shown in Fig. 2, the burner 17 is mounted in a hole of a door 24 adapted to close a capacious inspection and cleaning aperture provided in the front wall 1 of the boiler.

35 The assembly 25 for emitting the fuel and forming the flame of the burner 17 is received in a deflector 26 having a flange 27 arranged coaxially in front of the axial recess 16 of the body 14, but anchored at a slight distance therefrom for reasons which will be explained hereinafter.

40 The walls 1, 2, 3, 4 and 6 of the combustion chamber are appropriately insulated on the outside by insulating material 28 and inwardly are coated with refractory material 29 as is known in the art. In alternative, the refractory material can be replaced by an hollow space containing water connected to the fluid to be heated.

45 An aperture 30 closed in an adjustable manner by a door 31 is made in the lower area of the rear wall 3 adjacent the ash collecting chamber 11 to provide access for the air necessary for burning the solid fuel. Further, openings 32, 32' for controlling the combustion are provided in the front door 24.

The operation of the boiler described above is as follows:

After opening the covers 9 and 10, solid fuel is introduced into the upper openings 7 and 8. An important advantage of the boiler according to the invention is that it permits to be charged with large pieces of solid fuel, particularly large pieces of wood logs 34, 34a, 34b; 34c, which are accommodated in the combustion chamber parallel to each oblique wall 2, 4 and supported thereon. After combustion has initially been started by small fuel above the grid 5, it will propagate to the lower ends of the logs 34, 34a, etc., and will gradually consume them and cause the progressive descent by gravity of the logs towards the grid 5. It has been found that the actual combustion was restricted to the lower portion of the combustion chamber 20 while the smoke strikes the fuel and potentially dries it, if it is moist, and passes through the axial recess 16 of the cylindrical body 14 - by virtue of the clearance between its mouth and the deflector 26 of the burner - and also through the flue pipes 18, 18', 18" to be discharged into the chamber 19 and from there into the discharge conduit 21.

The gradual and automatic descent of the large log pieces towards the grid permits to feed the flames with fresh fuel for long periods without any need of frequently charging the boiler. By appropriately dimensioning the combustion chamber an automatic feeding of solid fuel for about 12 hours has been obtained for heating a medium single-family apartment with simultaneous production of sanitary water. The latter can be produced in a kettle located outwardly of the boiler and heated by water taken from the body 14 through the conduit 35 and fed thereto through the conduit 36.

The burner 17 for liquid or gaseous fuel and the associated combustion chamber formed by the recess 16 is intended to be used in case of lack of solid fuel or in case it is temporarily exhausted for failure to introduce fresh fuel. Thus, the boiler may be provided with known means adapted to detect any potential decrease in temperature of the heated fluid and to control the consequent starting of the burner 17 to restore the predetermined temperature of operation, as well as the usual adjustment and safety devices known in the art. Further, an additional discharge mouth 38 is provided which is connected to the chimney and is provided with an exhaust fan, not shown, which can be switched on when the covers 9, 10 are opened for the introduction of fuel to avoid the escape of smoke into the boiler room.

Although the feeding with large pieces of wood logs is preferred, also in consideration of its lower cost in comparison with chopped firewood of ordinary size, mixed feeding with large pieces of wood logs and pieces of firewood and/or coal, by which the spaces not occupied by the large wood logs are filled, is also possible.

Another embodiment of the boiler for heating according to the invention is illustrated in Figs. 3 and 4.

This embodiment differs from the one described previously in that it is designed to be fed only with solid fuel and in that means are provided to permit the use of solid fuel of small size while still ensuring a high autonomy of feeding.

The configuration of the walls 101, 102, 103, 104 and 105 and the other

structural parts of the boiler is the same as in the embodiment of Figs. 1 and 2, so that they will no longer be described in detail.

5 As operation with solid fuel only is contemplated, the cylindrical body 114 containing the heated fluid 137 is provided with a bundle of flue pipes 118, but does not contain any inner combustion chamber. With the same dimensions, the body 114 can therefore occupy a smaller space in the interior of the combustion chamber with the consequent possibility of charging a greater amount of fuel.

Two U-shaped structural bars 40, 41 are secured parallel to the axis of the cylinder to the lower cylindrical surface of the body 114. Removably inserted in the groove of the U's are two C-shaped supporting elements 43, 44 of sturdy metal sheet provided with upper extensions 45, 46 adapted to be inserted in the U-shaped structural bars 40, 41.

15 The above-mentioned means permit to feed the boiler with a great amount of solid fuel of small size such as wood 48 or coal 49 which is retained by the elements 43, 44 so as to define only one sufficiently restrained drop mouth in the vicinity of the hearth 50 so as to feed the combustion gradually and permit a high autonomy of operation of the boiler.

20 The removability of one or both the elements 43, 44 is designed to permit feeding also with large pieces of wood logs as mentioned previously.

It has been found that the angle of inclination α of the walls 102, 104 or 2, 4 relative to the horizontal plane preferably is between 45 and 60°. The best inclination depends on the prevalent destination of the boiler which is to be fed either with small solid fuel or large pieces of wood logs; in the first case
25 a greater inclination is required. If it is desired to facilitate sliding of the fuel along the walls 2, 4, 102, 104, it is preferable to superimpose on the refractory coating 29, 129 a wear sheet 51 as the morphological configuration of the surface of the refractory material tends to restrain by friction the descent of the fuel towards the hearth 50.

30 Obviously the invention is not limited to the embodiments described above, but is liable to numerous modifications and variations within the scope of the same inventive idea.

CLAIMS

1. A heating boiler with high autonomy of feeding with solid fuel, characterized in that it comprises a combustion chamber (20; 120) provided with oblique side walls (2, 4; 102, 104) converging downwardly on a grid (5; 105) for the fuel, and with upper apertures (7, 8; 107, 108) for charging said fuel, said apertures being located adjacent said oblique side walls (2, 4; 102, 104), a cylindrical body (14; 114) being arranged in the centre of said combustion chamber (20; 120) and being spaced from the front wall (1; 101) of the boiler and containing the heated fluid, said cylindrical body (14; 114) being traversed by flue pipes (18; 118) opening into a discharge conduit (21; 121).

2. A heating boiler according to claim 1, characterized in that an axial combustion chamber (16) for gaseous liquid fuel is provided in said cylindrical body (14), said gaseous liquid fuel being delivered by a burner (17) secured to a front door (24) of the boiler and partly received in a deflector (26) firmly secured to said door (24), but spaced from the front side of said cylindrical body (14).

3. A heating boiler according to claim 1, characterized in that the inclination of said oblique side walls (2, 4; 102, 104) relative to the horizontal plane is defined by an angle of preferably between 45 and 60°.

4. A heating boiler according to claim 1, characterized in that it comprises two U-shaped structural bars (40, 41) secured to the outer lower area of said cylindrical body (114) for supporting two removable elements (43, 44) for retaining the solid fuel introduced into the boiler.

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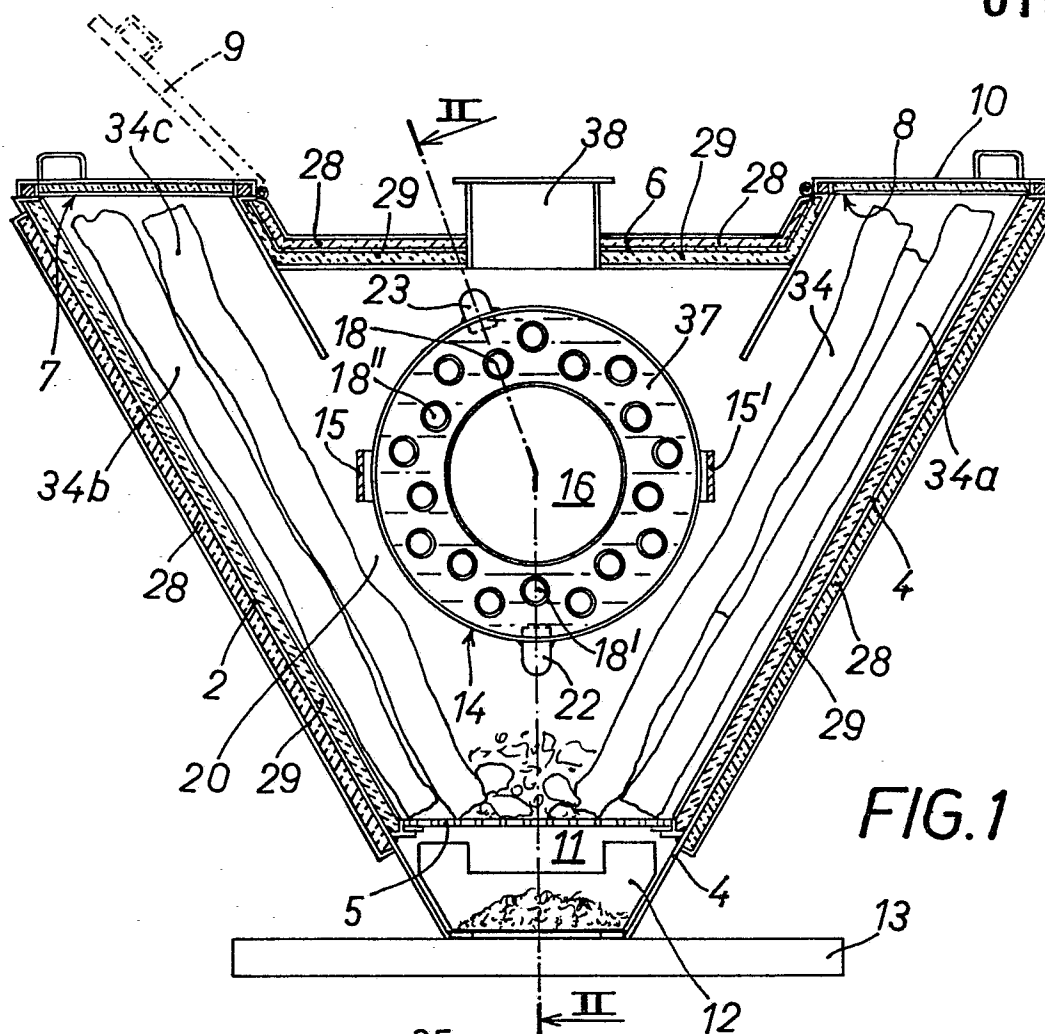


FIG. 1

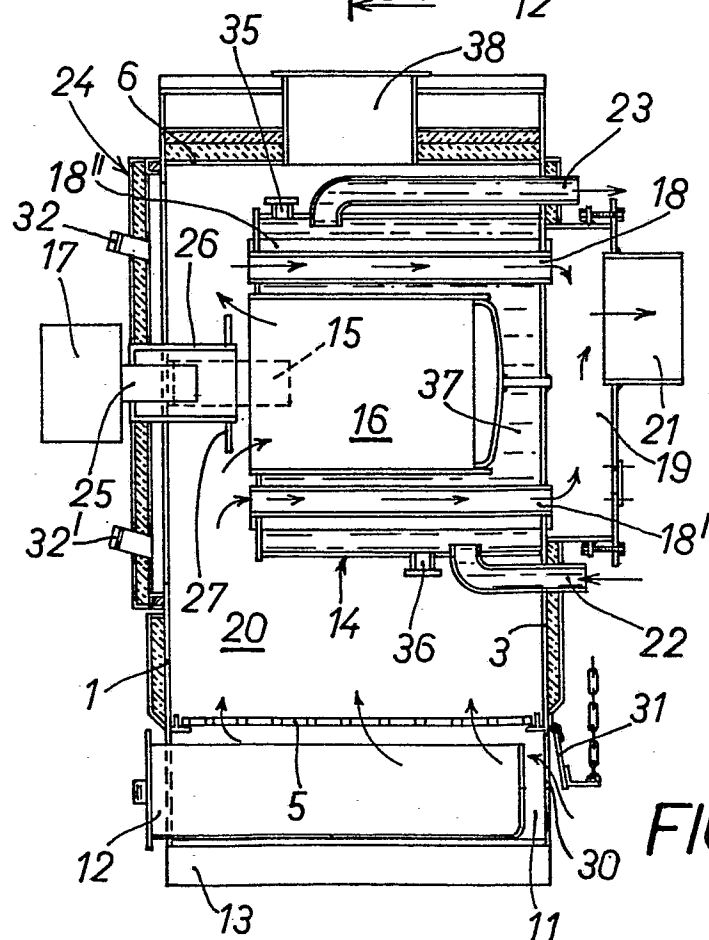


FIG. 2

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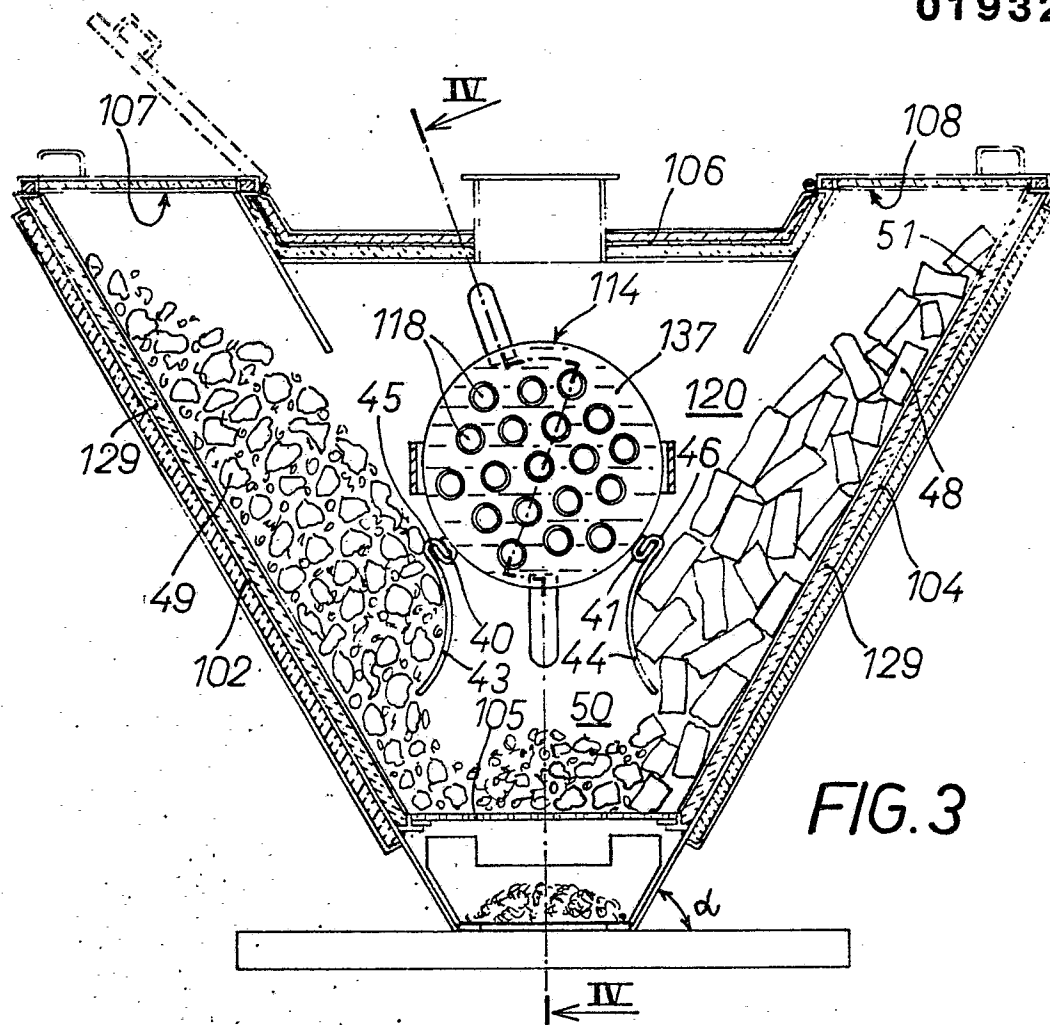


FIG. 3

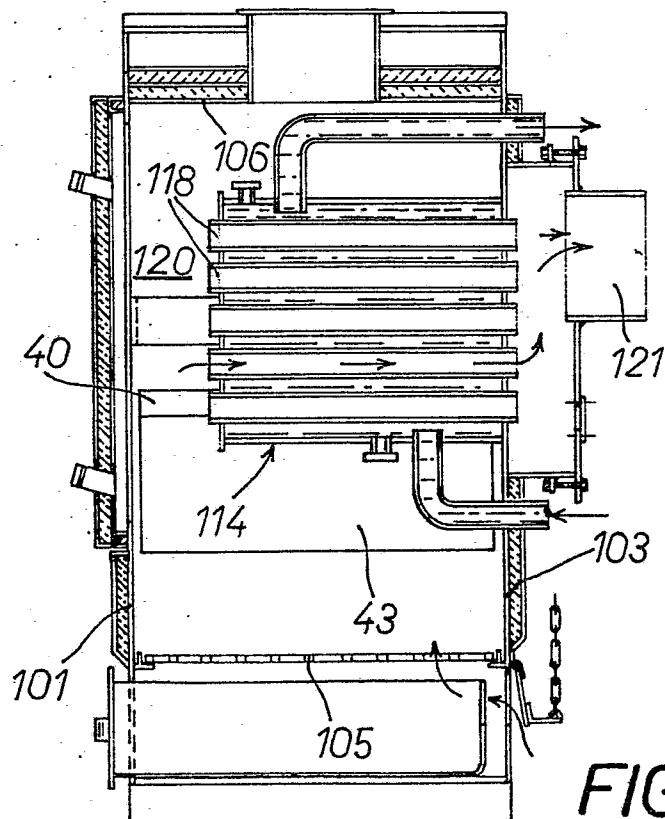


FIG. 4