This invention is a vertical flue boiler with interior water tubes.

One of the objects of the invention is to provide a boiler of cheap construction and particularly adapted for household use.

The main object of the invention therefore, is to provide a vertical flue boiler of the type mentioned possessing high efficiency and quick starting ability.

Other objects and advantages of the invention will become apparent as the following description is read on the drawings forming a part of this specification and in which similar reference characters are used to designate similar parts through-out the several views, of which:

Fig. 1 is a sectional elevation through the device showing the interior construction thereof.

Fig. 2 is an exterior view of the invention.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 is a bottom view of Fig. 1.

The boiler consists of an outer shell 10 of cylindrical form having a head 11, or the top 11 having a steam connection 12 communicating with the interior of the outer shell. A suitable gauge glass 13 is provided for indicating the height of water within the boiler.

Fixedly mounted within the outer shell 10 is an inner cylindrical shell 15, which is of smaller diameter than the outer shell and spaced therefrom, providing an annular water space 16. The inner shell 14 is also provided with a sealed head 16, which is spaced from the head 11, forming a steam space in the upper portion of the outer shell. The inner shell terminates adjacent the bottom of the outer shell 10 and is sealed thereto as indicated at 17, thereby forming a water and steam space about the inner shell and thereabove, the inner shell coincidently forming a combustion space 18.

A fire hole 19 is provided through the annular water space 16, this fire hole being provided with a suitable door 20, the frame of the fire hole sealing the annular water space at this point.

A suitable grate 21 or burner 22 of any suitable type is provided and suitable air passages 23 are formed through the lower portion of the boiler.

Mounted within the combustion space 18 are two sets of water tubes 24, 24a, one of said sets being arranged above the other set and each forming a series of spaced apart tubes passing at their lower ends through the inner shell and communicating with the annular water space 16, as indicated at 26. The other ends of the tubes pass through the top 16 of the inner shell, as indicated at 26, so that water circulation is extended upwardly through the tubes and downwardly through the annular water space.

A cylindrical partition 21 is mounted between the tubes and the inner shell and terminates at its lower end in an outwardly extending flange 28 which cooperates with the inner surface of the inner shell and a groove 29 is provided at its upper end for seating a frusto-conical or tapered cylindrical extension 30, which terminates in spaced relation to the top 16 as indicated at 31, 30.

A flue 22 passes through the annular water space 16 and is sealed therein, this flue being connected to a suitable stack or chimney.

Water heating means consists of a spiral 33 of tube, the lower terminal 34 and upper terminal 35 of which extend through the outer shell, the lower terminal 34 being connected to a water supply or main 36 through a suitable delivery pipe 37, with interposed pressure actuated valve 38, which valve is adapted to prevent flow of water except under pressure, in other words, the valve is intended to prevent circulation when no pressure is applied. When desired, this valve may be replaced by a check valve. The upper terminal 35 is connected through a suitable pipe 36' with the boiler as indicated at 37' to supply feed water which has been preheated to the temperature of the water within the boiler, and a suitable valve 38' is interposed in the pipe line 36' for controlling the feed of water to the boiler. A suitable branch 39 provides a supply of hot water for additional exterior uses. A suitable safety valve 40 is provided for protection against abnormal pressures within the boiler, and the usual pressure gauge 41 is also incorporated in the system.

It will be noted on viewing Fig. 4 that the water tubes 24 are closely related where they join the inner shell, and that the upper ends of the tubes are spread over a considerable area of the top 16 of the inner shell as shown in Fig. 3, it being obvious that the number of tubes incorporated in the structure could not all be mounted in one concentric circle through the head 16.

From the above, it will be noted that a combined hot water supply and steam supply means is provided, and that steam is generated in the boiler from one supply of water and other water isolated from the first supply is heated by the first supply, that the second supply of water is isolated by means of the coil mounted within the boiler and submerged in the water contained therein, and that due to the submergence of the coil in the water in the boiler, the feed water will be supplied to the boiler at the same temperature as that of the water within the boiler. It will also
be noted that the heat from the combustion within the combustion space passes upwardly through the tubes and thence is directed downwardly through the flue, and in its passage thereto, comes in contact with the inner walls of the inner shell to give up more of its heat, and also contacting with the outer surface of the partition maintaining the heat or increasing the heat of this partition and thereby increasing the efficiency of the boiler.

Having described an operative structure, it will be understood that variations in the construction and arrangement of parts which are consistent with the appended claim may be resorted to without detracting from the spirit or scope of the invention or sacrificing any of the advantages thereof.

I claim:

A vertical boiler comprising an outer shell and an inner shell having a water space formed therebetween and a combustion space within the inner shell, an inner series of water tubes extending vertically in said combustion space, each tube having its lower end connected through the inner shell wall intermediate the height of the shell and its upper end connected through the top of the inner shell, an outer series of water tubes extending vertically in the combustion chamber about the inner series with their ends secured through the head and annular wall of the inner shell whereby circulation is effected upwardly through both sets of tubes, and downwardly between the shells, a flue communicating with the inner shell for the escape of the products of combustion, said flue being located immediately above the lower connections of the outer series of tubes passing horizontally through the water space, and a cylindrical partition within the inner shell surrounding the inner series of tubes and having its lower end terminating in an annular flange engaging the wall of the inner shell between lower ends of the inner and outer tubes and its upper end terminating in spaced relation to the top of the inner shell whereby the heat is first applied to the inner series of tubes thence passing over the top of the partition and thence downwardly between the partition and the inner shell to the flue, to heat the outer series of tubes and the inner shell.

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