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STEAM AND HOT-WATER BOILER

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5 Claims. (Cl. 122—182)

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The present invention relates to heating devices and, more particularly, a boiler for steam or hot water.

The main object of the invention resides in the provision of a device of the character described which operates at high efficiency.

Another object is the provision of such a device which is highly versatile in use.

A further object concerns a boiler of the character described adapted to operate at a high degree of economy.

Still another object contemplates a hot water or steam boiler in which convection losses are reduced to a minimum.

A still further object envisages a boiler relatively inexpensive and easy to construct.

Other objects and advantages of the invention will become apparent, or be pointed out further, during the description to follow.

As an example, and for purposes of illustration only, an embodiment of the invention is shown in the annexed drawings wherein:

Fig. 1 is a top plan view of a boiler according to the invention;

Fig. 2*a* is a vertical section through the upper portion of the boiler;

Fig. 2*b* is a vertical section through the lower portion of said boiler and complementary to Fig. 2*a*;

Fig. 3 is a partial elevation of the outer casing taken on line 3—3 of Fig. 2*a*;

Fig. 4 is a horizontal half section taken on line 4—4 of Fig. 2*a*;

Fig. 5 is a similar view taken on Line 5—5 of Fig. 2*a*; and

Fig. 6 is yet another similar view taken on line 6—6 of Fig. 2*b*.

Referring to the drawings, wherein similar reference characters represent corresponding parts throughout, the reference letter O designates the outer casing of the device, which casing encloses the boiler itself, water jacket, flues and other elements associated with said boiler. A base B terminates the bottom of said casing, which base serves as an ash pit when burning solid fuel, or a burner compartment when liquid or gaseous fuel is used. The trap door 10 serves to tend the fire or service the burner.

Disposed inside the casing, and spaced concentrically therefrom, there is provided the boiler proper which consists of a cylindrical wall 15, defining a combustion chamber C, and a water jacket therearound. Said jacket is formed by the bottom wall 17 and the double wall 18 spaced from the casting 15 and extending upwardly for

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a portion of the boiler height; furthermore, the upper part of said jacket is constituted of double plates and a dome to be described later on.

As shown to advantage in Fig. 2*b*, the outer wall 18 of the jacket is depressed to form an annular cavity 19, the wall 20 of which accordingly lies closer to 15 to form therewith a constriction in the jacket, approximately adjacent to the point of the combustion chamber where the highest temperature prevails.

The upper edge 21 of the outer jacket wall 18 extends very slightly above the cavity 19 to form a flange, said flange receiving the lower extremity of a double wall comprising the upper part of the jacket. This double wall consists of concentric cylinders 23 and 24 spaced to form a dead-air space 25 therebetween, for heat insulating purposes. Said double wall is dome-shaped at the top, and apertured to receive the outlet header 26 welded or otherwise secured to the inner cylinder 23, as shown in Fig. 2*a*; the outer cylinder 24 terminates short of the said header to accommodate a collar 27 to which a casing cover is attached.

The inner wall 15 of the jacket, defining also the combustion chamber C, is provided at its upper edge with a marginal flange 30 having a peripheral upstanding rim 31, said rim retaining a dome 32 resting thereagainst on the flange 30. To the summit of said dome a flue pipe 33 is welded and which extends upwardly through the jacket and header 26, where it issues through the packing gland 35. The water circulating circuit is completed by the addition of a water inlet 36 disposed at the bottom of the jacket, in the outer wall 18; thus, water enters 36, rises in the jacket and the dome until it comes out of the boiler through the outlet pipe 37 connected to the header 26.

The circuit of the combustion gases forms, in reality, the important characteristic of the invention; said circuit is arranged to complete the longest possible travel of the gases between their inception and their exhaust to a chimney.

The first portion of this travel is the obvious upward movement from the source of heat to the dome of the combustion chamber where further upward movement through the pipe 33 is normally blocked for reasons to be explained later on. From the dome, the next portion of the gases' travel is a downward movement through a multiplicity of pipes 40 disposed between the flange 30 and the wall 41 of the cavity 19 and effecting communication between the dome of the combustion chamber and said cavity 19 in the

outer side of the water jacket, as previously described. In order that the gases circulating in said pipes 40 be forced to scrub the side of said pipe, internally, there is placed in each tube or pipe a twisted narrow strip of metal 42 the edges of which contact the inside walls of the pipes and form, in effect, a screw thread imparting to the gases a rotary movement.

The combustion gases discharged in the cavity 19, and enclosed between said cavity and the outer casing O have a natural tendency to escape upwardly between the outer wall 24 of the water jacket and said casing O to collect at the top of said casing. The gases are then exhausted to a chimney through a flue pipe 45 connected to the casing cover 28 and therefrom to the chimney pipe 46.

For by-passing purposes, as for instance when starting a fire in the boiler, a short connection 47 between the ducts 33 and 46 is provided so that the hot gases rising in 33 may escape directly to the chimney. When, however, the boiler has been properly heated and a clean fire obtained, the butterfly-valve 50 may be closed by means of the outer handle 51 to interrupt communication between 33 and 46: obviously, in that case, the gases will have to follow the travel previously given to the pipe 40 and around the water jacket.

So far described, the boiler is perfectly operable to heat water in an efficient manner and to conduct the combustion gases to a chimney assuming, however, that the air of combustion is drawn through the door 10 or suitable regulatable opening therein. In order to increase further the efficiency of the device, and to reclaim, so to speak, a greater portion of the heat contained in the combustion gases, heat-exchanging means in the casings proper are provided and will be presently described.

Said heat exchanging means consists of a network of tubes disposed in vertical and spaced parallel relation, said tubes 50 extending inside the casing between the same and the outer wall 24 of the water jacket. Furthermore, the said tubes open at their lower end near the bottom of said water jacket immediately below the cavity 19. At their upper end they terminate just short of the casing cover 29 and are provided with elbows 51 through which the upper end of the tubes open to the atmosphere outside the casing.

As shown to advantage in Fig. 2b, the lower ends of the tubes 50 extend through an annular plate 52 closing the bottom of cavity 19 between the wall 20 and casing proper O. Purpose of this arrangement is to form a barrier between said cavity 19 and the underside of the boiler proper which communicates with the combustion chamber at the bottom thereof. The tubes 50 opening below the barrier 52, therefore, operate to admit below said barrier the air necessary for combustion purposes.

Inasmuch as said air of combustion is carried downwardly in the pipe 40, in counter-current to the hot combustion gases circulating around the tubes 50 on their way to the chimney, a large amount of the heat of said gases will be transferred by conduction through the tubes to the air circulating therein, which air of combustion will be effectively heated before being admitted to the combustion chamber. The net result of this arrangement is to provide an inner lining in the casing which effectively cools the same and, thereby, avoids a great loss of heat by convection on the outside of said casing.

Other refinements of the boiler according to the

invention may consist of a water level gauge 55 whenever said boiler is to be used for steam heating, a steam pressure gauge 56 in the outlet header 26, as well as spy glass 60 disposed at the extreme top of the duct 33 for visually inspecting the flame inside the furnace whenever desired.

Under certain peculiar conditions, it may happen that condensation occurs on the outer surface of the pipe 50, especially when starting a fire in the boiler, in which case water may drip in the cavity 19 and accumulate over the annular plate 52; in order to drain this water a faucet or cock 65 is provided in one side of the casing immediately above 52 for removing accumulation of condensation water.

Finally, for facility in installation the boiler may be mounted on adjustable legs 70 which are directly attached to the base of the water jacket, as shown clearly in Fig. 2b.

From the foregoing it should be evident that the present invention is an advance of the art in that it provides for a boiler which is easily adaptable to hot water or steam heating, which boiler is very compact and quite efficient for burning any fuel whatever in a most economical manner. More particularly, it is emphasized that the reverse flow of combustion gases circulating in a direction opposed to the natural current of water being heated, result in a most complete transfer of the heating energy, the heat exchanging net work of the outer part further avoiding the convection losses which are normally present in boilers having heated walls in direct contact with atmospheric air. Therefore, clumsy and costly insulating jackets are unnecessary and their absence provide for a more compact and neat device.

It must be understood that various changes as to the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A broiler of the character described, comprising a combustion chamber, a water jacket surrounding said chamber, a dome at the top of the chamber, flue pipes extending downwardly inside the jacket from the dome margin to an intermediate peripheral cavity on the outside of the jacket, a casing spaced from the jacket and surrounding the same to form a concentric smoke flue, a chimney flue connected to the top of said casing, an annular ring at the bottom of the jacket cavity to close the space between the jacket and casing, and a plurality of closely spaced parallel tubes opening near the top of the casing and extending downwardly inside the same and through the ring for admitting combustion air thereunder.

2. In a boiler as claimed in claim 1, twisted flat narow strips inserted inside the flue pipes for imparting a rotating action to the combustion gases circulating therein.

3. In a boiler as claimed in claim 1, a duct connecting the top of the dome to the chimney flue, and valve means in said duct for interrupting circulation therein.

4. In a boiler as claimed in claim 1, means at the bottom of the jacket cavity for draining condensation water accumulating therein.

5. In a boiler, a combustion chamber, a water jacket surrounding said chamber having a perimetric recess intermediate the length thereof, flue pipes extending longitudinally through said jacket in communication at one end with said chamber and at the other end with said recess, a casing spacedly enclosing said jacket and cham-

ber to form a concentric smoke flue, a ring plate between the casing and the jacket closing the space therebetween adjacent the recess, and a plurality of closely spaced parallel tubes open to the atmosphere near one end of the casing and extending longitudinally inside the same and outside the water jacket and penetrating through the said ring plate for admitting preheated air of combustion to said chamber.

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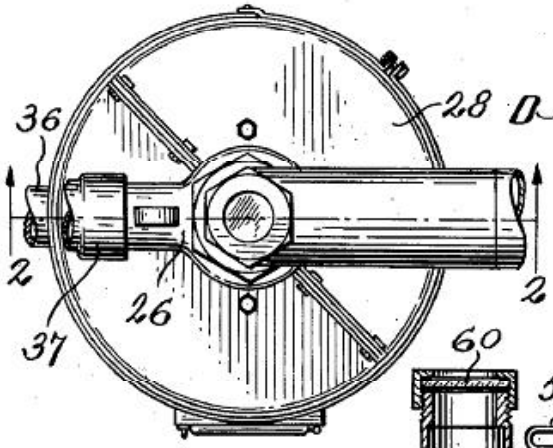

Fig. 1

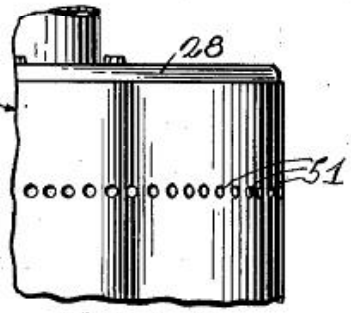

Fig. 3

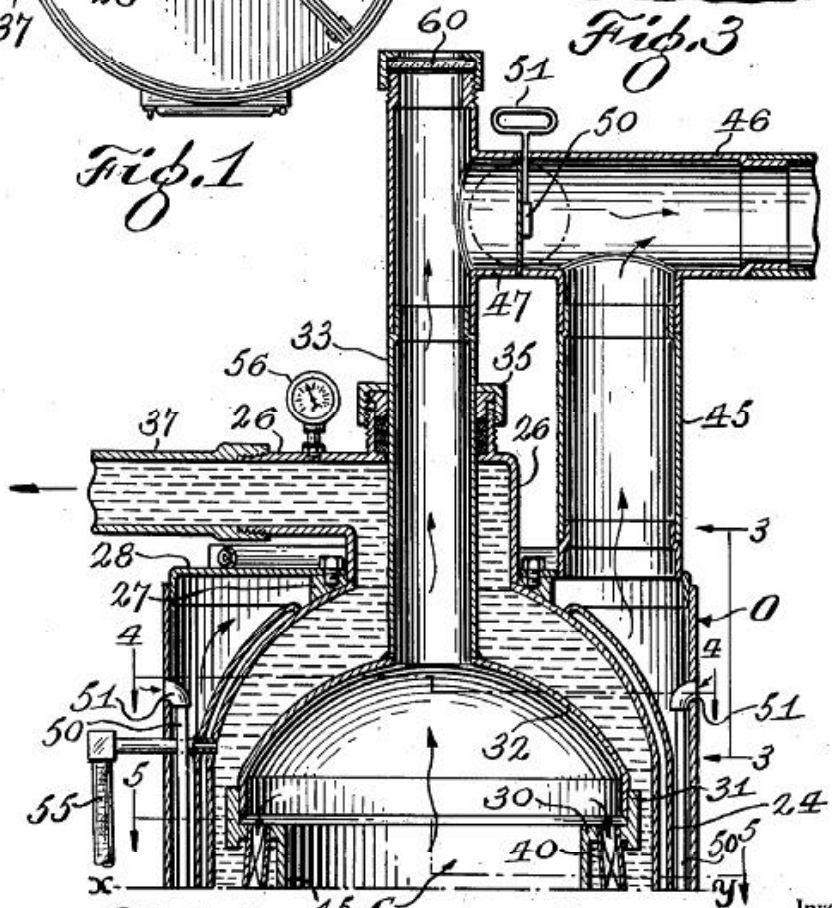

Fig. 2a

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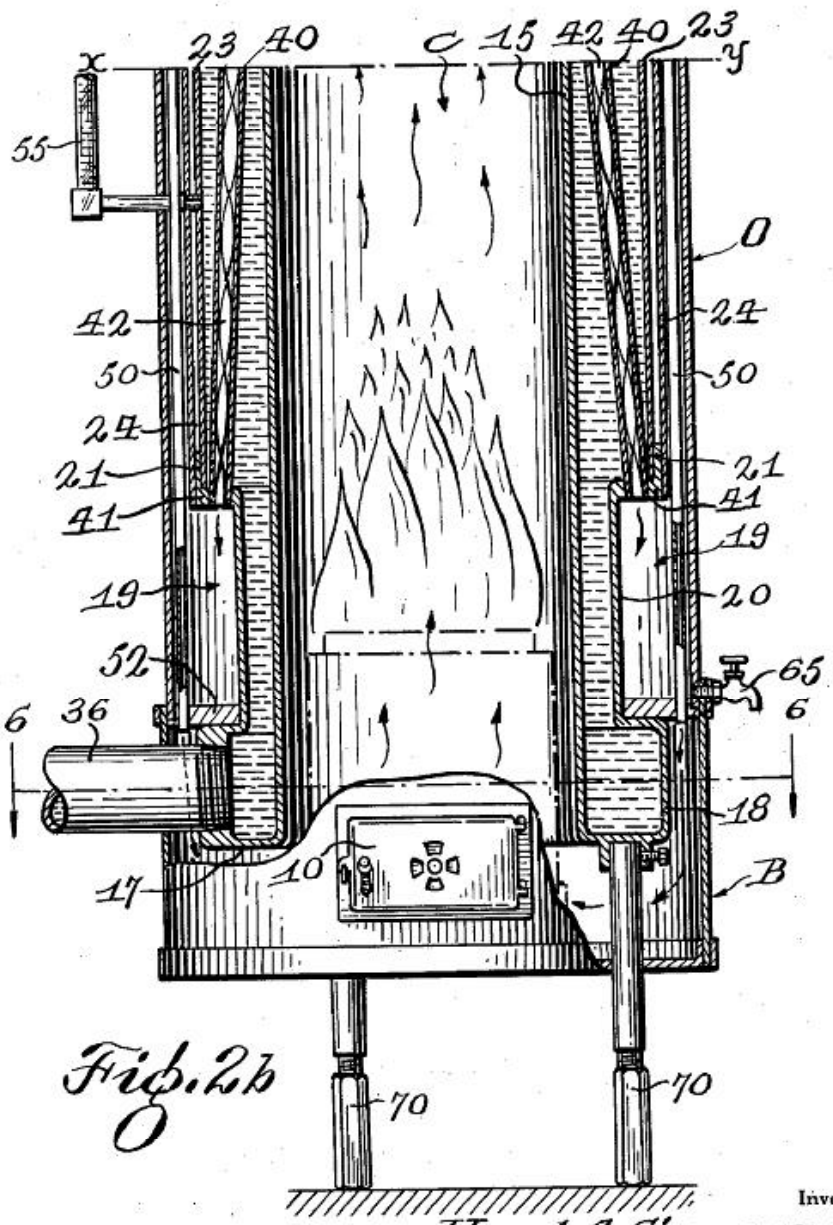

Fig. 2b

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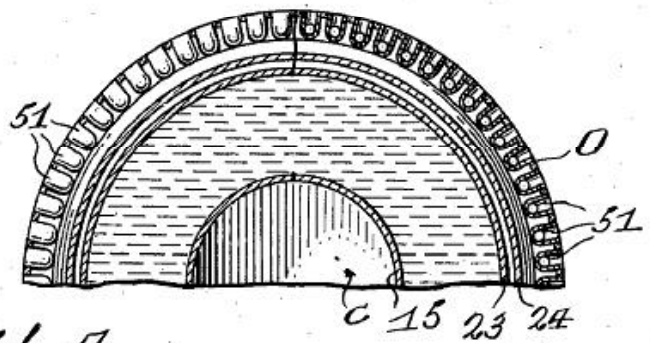

Fig. 4

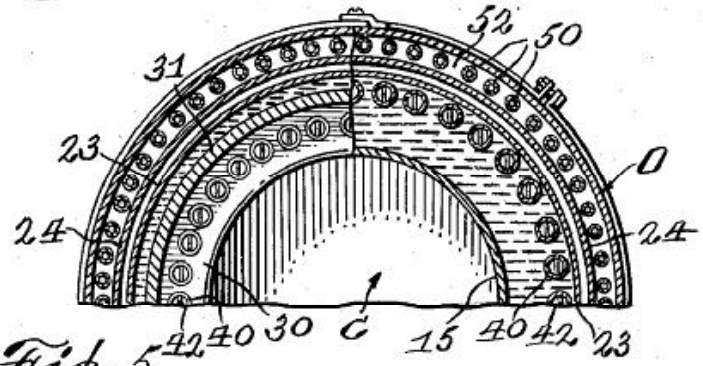

Fig. 5

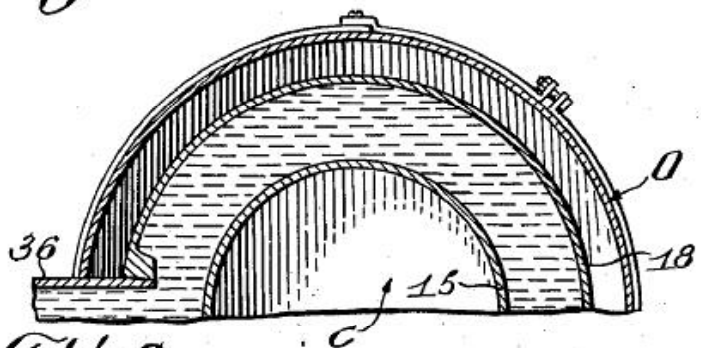

Fig. 6

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