

April 8, 1952

A. E. WATTS

2,592,216

RETURN FIRE TUBE BOILER WITH INDIRECTLY HEATED DOMESTIC SUPPLY

Filed Jan. 2, 1947

4 Sheets-Sheet 1

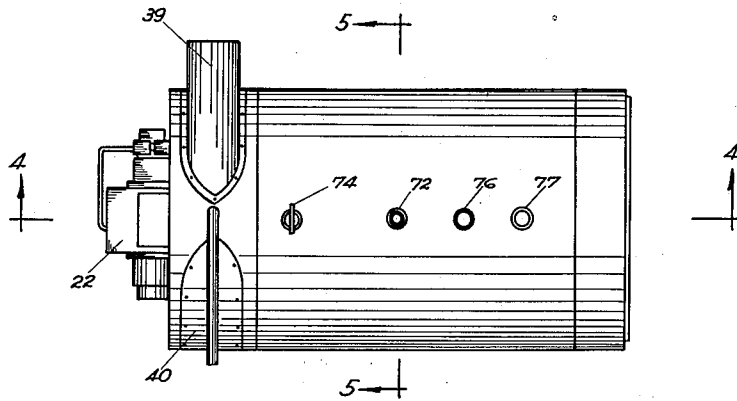


FIG-1

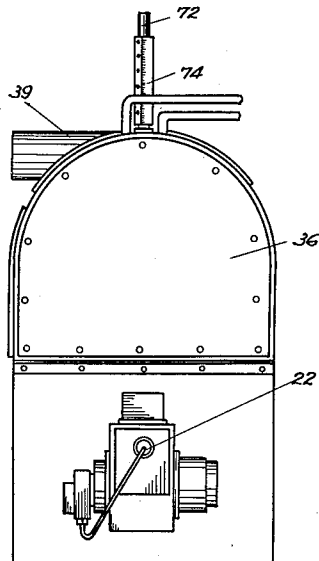


FIG-2

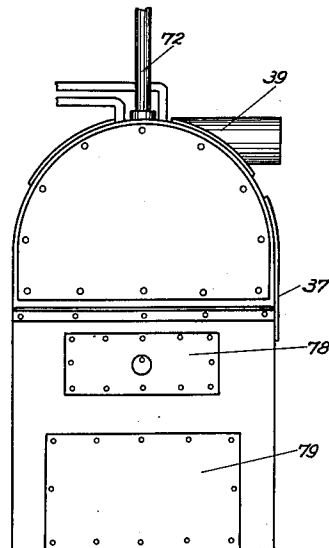


FIG-3

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4 Sheets-Sheet 2

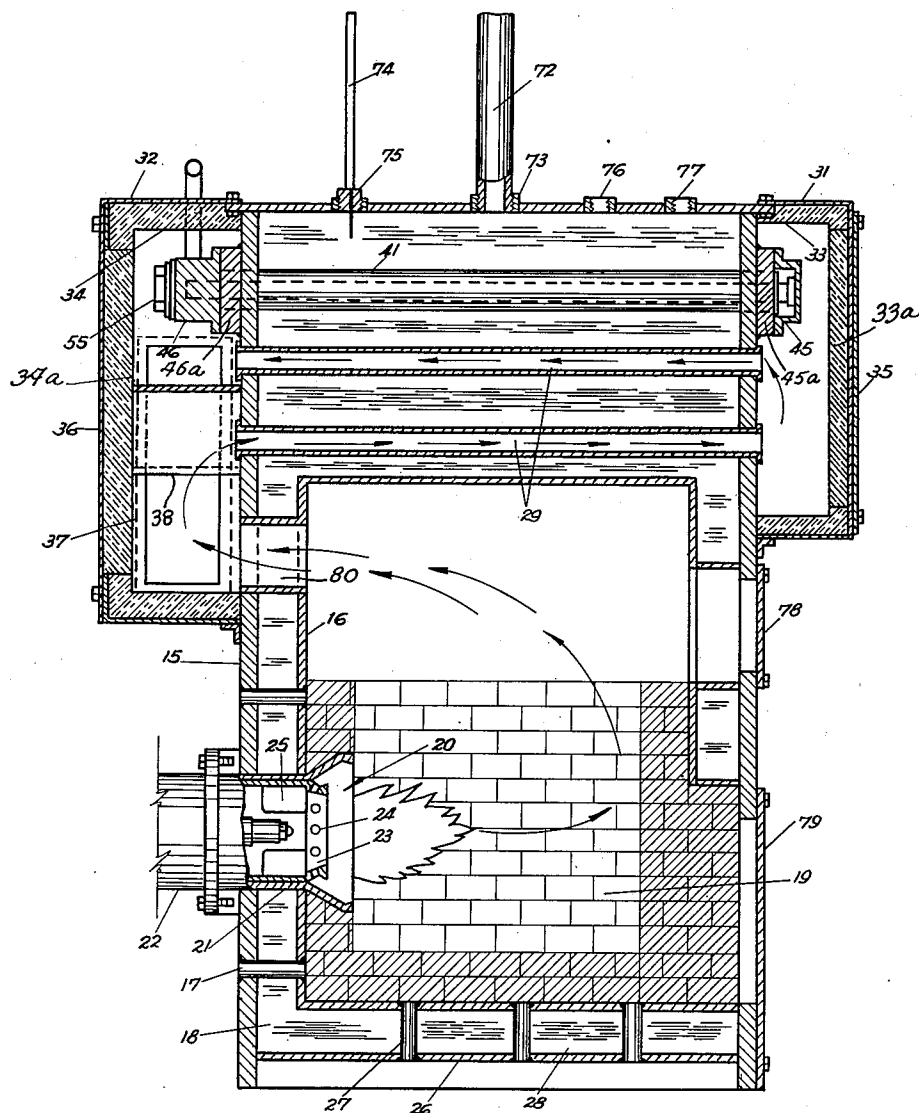


FIG-4

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4 Sheets-Sheet 3

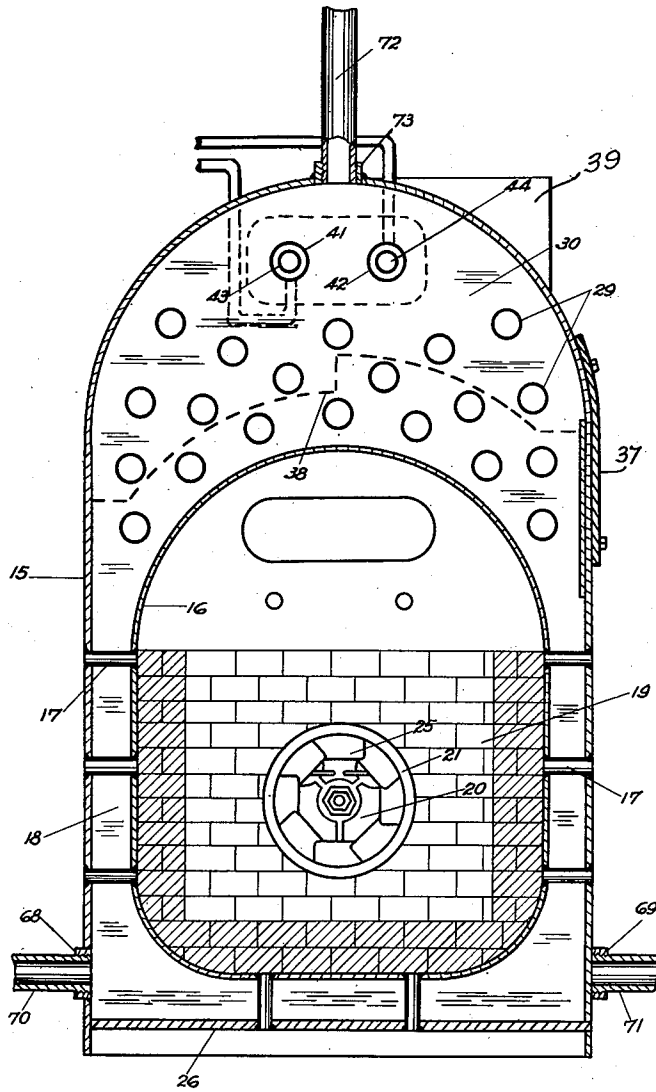


Fig-5

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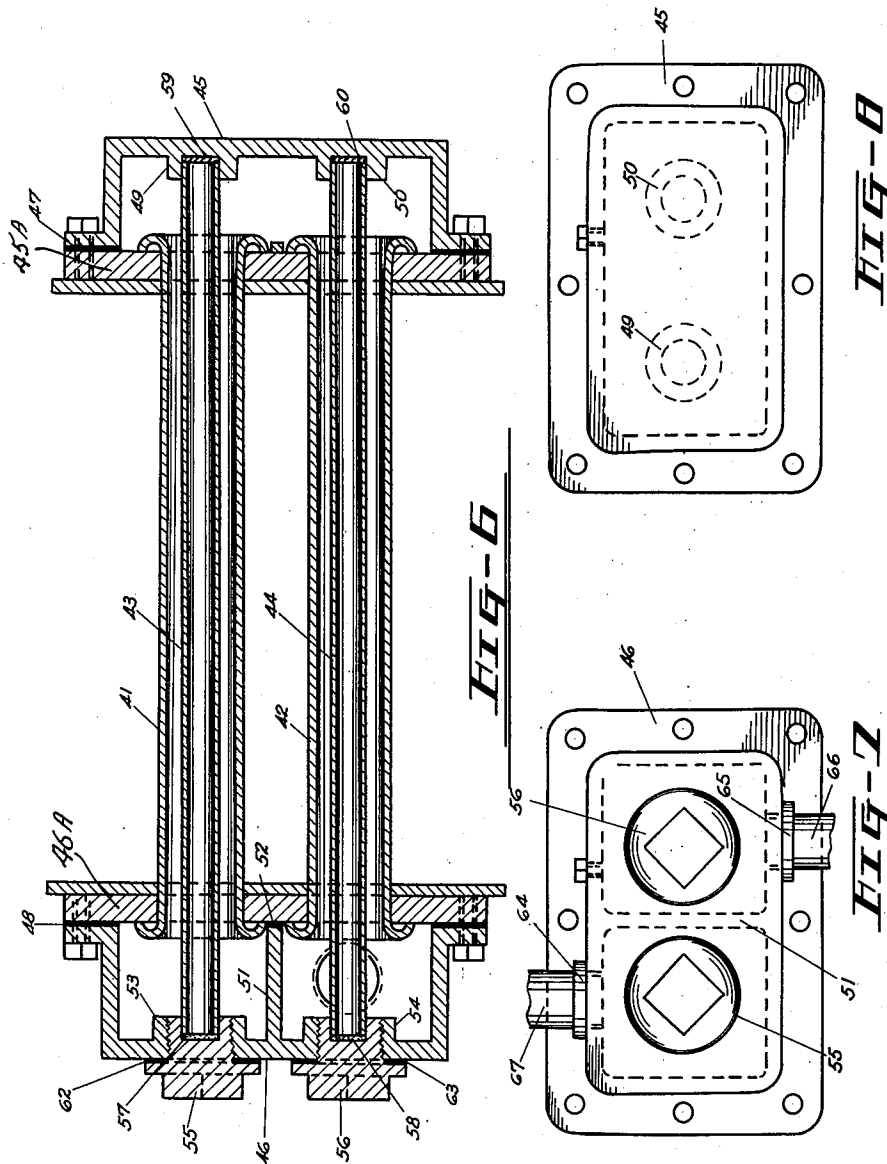
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RETURN FIRE TUBE BOILER WITH INDIRECTLY HEATED DOMESTIC SUPPLY

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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RETURN FIRE TUBE BOILER WITH INDIRECTLY HEATED DOMESTIC SUPPLY

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Application January 2, 1947, Serial No. 719,689

3 Claims. (Cl. 122—33)

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The invention relates to improvements in boilers as described in the present specification and illustrated in the accompanying drawings that form a part of the same.

The invention consists essentially of the novel features of construction as pointed out broadly and specifically in the claims for novelty following a description containing an explanation in detail of an acceptable form of the invention.

The objects of the invention are to devise a boiler which will provide a maximum of hot water; and at the same time, be economical to operate; to provide a boiler in which the flow of hot gases from the burner will be directed so as to more efficiently heat the water in the boiler; to construct a boiler in which the various parts will be readily accessible for inspection, cleaning and repairing; to devise a boiler specially adapted for use with an oil burner; to construct a boiler in which the various parts are of sufficient strength to provide a suitable margin of safety; to devise a boiler which may be easily regulated to produce the desired volume of hot water; and generally to provide a boiler which will be durable and efficient for its purpose.

In the drawings:

Figure 1 is a plan view of the boiler.

Figure 2 is a rear view of Figure 1.

Figure 3 is a front view of Figure 1.

Figure 4 is a side sectional view as taken on the line 4—4 in Figure 1.

Figure 5 is a sectional view as taken on the line 5—5 in Figure 1.

Figure 6 is a plan sectional view of the domestic hot water tubes in the upper portion of the boiler.

Figure 7 is a detail showing the rear coil cover for the domestic hot water tubes.

Figure 8 is a detail showing the front coil cover for the domestic hot water tubes.

Like numerals of reference indicate corresponding parts in the various figures.

Referring to the drawings, the boiler consists of the boiler shell as indicated by the numeral 15 which has the inner casing 16 suitably located within the lower portion of same. The stay bolts 17 provide a means of maintaining the inner casing 16 within the boiler shell 15 so that the passages 18 are formed between the walls of the same. The fire-box 19 within the inner casing 16 is lined with a refractory and has the burner head 20 of the oil burner 22 extending through same. The burner head 20 has the refractory cone 21 mounted on the end thereof. This refractory cone 21 has the mouth of same set in an

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opening in the brickwork of the fire box 19. The burner head 20 is mounted on the oil burner 22 which in turn, is suitably located on the outside of the boiler shell 15. The fire box 19 has brickwork on the bottom and sides thereof, and the top of the same is open permitting hot gases from the refractory cone 21 of the oil burner to rise towards the upper portion of the boiler.

The burner head 20 consists of an inner cone 23 and having a shoulder in the inside thereof towards the front of same.

The inner surface of the forward portion of the inner cone 23 is of a truncated shape, tapering inward towards the front thereof. The outer surface of the forward portion of this inner cone 23 tapers inward to coincide with the inner surface of same for a predetermined distance and then flares outward at the front of the cone. A series of holes 24 are provided in the wall of the tapered portion of the inner cone 23 adjacent to the flared portion of same. These holes permit part of the air to pass through same, and to be thrust upon the side wall of the refractory cone 21. The vanes 25 form a part of the inner cone 23 and function in co-operation with the same in directing the flow of air there-through.

The inner casing 16 is raised a suitable distance above the bottom 26 of the boiler by means of the stay rods 27 so as to form the passage 28 therebetween.

The fire-tubes 29 are open at each end thereof and extend through the upper portion 30 of the boiler. These fire tubes pass through holes in the walls of the boiler shell 15 and are substantially sealed and secured thereto. The front boiler cover 31 and rear boiler cover 32 are fixedly secured to the outer surface of the shell 15, thus forming gas chambers in which the fire-tubes terminate. These boiler covers 31 and 32 have the inner walls of same lined with the insulation 33 and 34 respectively. The front boiler cover 31 has the clean-out door 35 detachably secured thereto. The rear boiler cover 32 has the back clean-out door 36 and side clean-out door 37 detachably secured thereto. These clean-out doors on the boiler covers 31 and 32 have insulation material 33a and 34a secured to their inside faces in a like manner to the covers and permit easy access to the fire-tubes and other parts in the upper portion of the boiler, thus facilitating cleaning and repairing of the same.

The baffle plate 38 is located within the rear boiler cover 32 and suitably shaped so as to divide these fire-tubes into two equal groups. This

baffle plate 38 extends from the boiler shell 15 to the insulation of the clean-out door 36 and determines the direction of flow of hot gases from the fire-box 19. This gas is directed through the lower half of the fire-tubes 29 by the baffle plate 38 to the front portion of the boiler which is enclosed by the front cover 31. From this point the gas enters the upper half of the fire-tubes 29, thus passing from the front portion of the boiler to the rear portion of the same which is enclosed by the rear cover 32.

The smoke stack 39 is adapted to be secured to the upper portion of the rear boiler cover 32 at either side thereof, thus facilitating installation of the same at the site. The plate 40 is adapted to cover either of the openings in the rear boiler cover 32 which are not used in connection with the smoke stack 39.

The domestic hot water-tubes or outer members 41 and 42 extend longitudinally through the upper portion 30 of the boiler above the fire-tubes 29. These water-tubes pass through holes in the walls of the boiler shell 15 and are substantially sealed and secured thereto. The water-tubes 41 and 42 are open at each end thereof permitting water to pass directly through the boiler. The dummy tubes or inner members 43 and 44 extend through the water-tubes 41 and 42 respectively. These dummy tubes are adapted to occupy the central portion of the space within the water tubes so that the water passing there-through is adjacent to the walls of the same. In this manner it will be seen that the water within the water-tubes 41 and 42 will be more easily heated by the latter.

The front cap 45 and rear cap 46 are fixedly secured to the outer surface of the boiler shell 15, thus forming fluid chambers in which the water-tubes 41 and 42 terminate. The gaskets 47 and 48 provide a means of sealing the joints between the caps 45 and 46 respectively and mounting plates 45a and 46a which in turn are suitably welded or otherwise substantially sealed to the outer surface of the boiler shell 15. The inside surface of the front cap 45 has the bosses 49 and 50 which are recessed to accommodate the end of the dummy tubes 43 and 44 respectively. These caps 45 and 46 are adapted to be easily removed so as to permit removal of the dummy tubes 43 and 44 when it is desired to clean the water-tubes 41 and 42.

The partition 51 in the rear cap 46 divides the latter into two compartments. The gasket 52 provides a means of sealing the joint between the free end of the partition 51 and the outer surface of the boiler shell 15. The inside surface of the rear cap 46 has the bosses 53 and 54 which are internally threaded to accommodate the plugs 55 and 56. Each of these plugs are recessed to accommodate the end of the dummy tubes 43 and 44. The gaskets 57 and 58 are located in the recess in the plugs 55 and 56, while the gaskets 59 and 60 are located in the recesses in the bosses 49 and 50 within the front cap 45. These gaskets are of lead or any other suitable material, and adapted to seal the ends of the dummy tubes 43 and 44. The gaskets 62 and 63 provide a means of sealing the joints between the plugs 55 and 56 respectively, and the outer surface of the rear cap 46.

In assembling the dummy tubes 43 and 44 in the domestic hot water tubes 41 and 42 respectively, one end of the dummy tubes are placed in the recesses in the front cap 45. The plugs 55 and 56 are then threaded into the rear cap 46

so that the other end of the dummy tubes 43 and 44 are engaged in the recesses of same. As the plugs 55 and 56 are tightened, the ends of the dummy tubes 43 and 44 are forced against the gaskets 57, 58, 59 and 60, thus substantially sealing these tubes.

While in this instance, a pair of domestic hot water tubes are described, any suitable number of tubes may be used without generally affecting the advantages of the invention.

The bushings 64 and 65 are mounted in holes which are suitably located in the rear cap 46, thus providing connections for the inlet pipe 66 and outlet pipe 67 respectively.

The bushings 68 and 69 are located at opposite sides of the boiler shell 15 towards the bottom thereof, and are adapted for connection to the inlet supply pipe 70 and the inlet return pipe 71 respectively. The outlet pipe or supply pipe 72 to radiation is connected to the top of the boiler shell 15 by means of the bushing 73. The thermometer 74 is mounted in the bushing 75 which is located near the outlet pipe 72 on the top of the boiler.

The bushings 76 and 77 are located in the top of the boiler shell 15, and are adapted for connection to the hot water control mechanism.

The plates 78 and 79 are detachably secured to the front of the boiler shell 15 rendering the interior of the boiler accessible for cleaning and repairing.

The invention described in the foregoing is adapted to be assembled ready for installation with the oil burner 22 mounted on the boiler shell

15. In the operation of the invention the boiler is filled so that water occupies all the spaces around the inner casing 16, fire-tubes 29 and hot water-tubes 41 and 42. The hot gases from the oil burner head 20 enter the interior of the fire-box 19 and rise towards the upper portion of the same. These gases then pass through the passageway 80 which is formed between the inner casing 16 and boiler shell 15, as the hot gases rise in the gas chamber formed by the rear boiler cover 32 the baffle plate 38 directs the gases into the lower half of the fire-tubes 29. These gases pass through the aforesaid fire-tubes and enter the gas chamber formed by the front boiler cover 31. From this gas chamber the gases enter the upper half of the fire-tubes 29 and pass therethrough, thus entering the upper portion of the gas chamber formed by the rear boiler cover. These gases are then carried from the boiler by means of the smoke stack 39. During the passage of the hot gases through the boiler, the water in same is heated, and in due course is fed through the outlet pipe 72 to the radiation.

The domestic hot water-tubes 41 and 42 are heated by the hot water in the boiler surrounding the same. The water enters the water-tubes 41 from the inlet pipe 66 and passes through the former until it reaches the compartment formed by the front cap 45. From this compartment the water passes through the water-tube 42 and into the outlet pipe 67 which is connected to the rear cap 46. In this manner hot water is provided for domestic use close to the temperature of the boiler water itself.

It will be seen from the foregoing that a boiler has been devised that will furnish hot water for domestic use as well as for the heating of homes, offices and numerous other buildings.

What I claim is:

1. In a boiler, a boiler shell, an inner casing having a fire box within the same, fire tubes extending longitudinally through the upper portion of said boiler shell and secured in holes in the walls of the same, a front boiler cover and a rear boiler cover fixedly secured to the outer surface of said boiler shell and forming gas chambers in which said fire tubes terminate, a passageway leading from the fire box into the rear gas chamber, a baffle plate located within said rear boiler cover and dividing said fire tubes into two groups and directing the flow of hot gases therethrough, mounting plates in said front and rear covers secured to the outer surface of said boiler shell, domestic hot water tubes extending longitudinally through said boiler shell and said mounting plates the open ends of said water tubes being securely joined to said boiler shell and said mounting plates, rear and front caps in said rear and front covers secured to said mounting plates forming water compartments into which the open ends of said water tubes terminate, inlet and outlet pipes connected to said rear cap, auxiliary tubes of smaller diameter extending through said water tubes, bosses on the inner surface of said front cap adapted to receive one of the ends of each of said auxiliary tubes, a partition in said rear cap subdividing said rear water compartment into sub-compartments, threaded bosses on the inner surface of said rear cap, threaded members adapted to enter holes in the outer wall of said rear cap and to be secured in said bosses, said threaded members being recessed to receive and tightly seal the remaining circumferential extremities of said auxiliary tubes, and a quantity of water throughout said boiler which will surround said fire tubes, said domestic water tubes and a portion of the fire box.

2. In a boiler, a boiler shell, an inner casing having a fire box within same, a plurality of fire tubes positioned in the upper portion of said boiler shell and secured to the walls of the same, gas chambers comprising a front boiler cover and a rear boiler cover fixedly secured to the outer surface of said boiler shell, said fire tubes terminating in said gas chambers, a baffle plate within said rear boiler cover and dividing said fire tubes into two groups and adapted to direct the flow of gases therethrough, mounting plates in said front and rear covers secured to the outer surface of said boiler shell, domestic hot water tubes extending longitudinally through said boiler shell and said mounting plates the open ends of said water tubes being securely joined to said boiler shell and said mounting plates, a rear cap forming connections with said water tubes, rear and front caps in said rear and front covers secured to said mounting plates forming water compartments into which the open ends of said water tubes terminate, inlet and outlet pipes connected to said rear cap, auxiliary tubes extending through said water tubes, bosses on the inside of said front cap adapted to receive one of the ends of each of said auxiliary tubes and securely seal the circumferential extremities thereof, threaded bosses on the inside of said rear cap, threaded members adapted to

be secured in said bosses through apertures in the outer wall of said rear cap, recesses in said threaded members adapted to receive and securely seal the other of the circumferential extremities of said auxiliary tubes, and inlet means provided for the introduction of a quantity of water which will surround said fire tubes, said water tubes and a portion of the fire box.

3. In a boiler, a boiler shell, an inner casing, a fire box within said inner casing, a plurality of fire tubes extending longitudinally through the upper portion of said boiler shell, said fire tubes passing through holes in the walls of said boiler shell and being substantially secured thereto, a front boiler cover and a rear boiler cover fixedly secured on the outer surface of said boiler shell and forming gas chambers in which said fire tubes terminate, a passage leading from said fire box into one of said gas chambers, insulation lining the outer walls of said boiler covers, clean-out doors suitably located in said boiler covers, a baffle plate located within said rear boiler cover and dividing said fire tubes into two groups thus directing the flow of hot gases therethrough, mounting plates in said front and rear covers secured to the outer surface of said boiler shell, a smoke stack adapted to lead from the upper portion of said rear boiler cover, domestic hot water tubes extending longitudinally through said boiler shell and said mounting plates, the open ends of said water tubes being securely joined to said boiler shell and said mounting plates, rear and front caps in said rear and front covers secured to the outer surface of said mounting plates forming water compartments into which the open ends of said water tubes terminate, inlet and outlet pipes connected to said rear cap, auxiliary tubes of smaller diameter extending through said water tubes, bosses on the inner surface of said front cap adapted to receive one of the ends of each of said auxiliary tubes and securely seal the circumferential extremities thereof, a partition in the said rear cap separating said water tubes, threaded bosses on the inner surface of said rear cap, threaded members adapted to enter holes in the outer wall of said rear cap and be secured in said threaded bosses, said threaded members being recessed to receive and securely seal the circumferential extremities of the other ends of said auxiliary tubes, inlet means for the introduction of water into said boiler shell which water will surround said fire box, said domestic water tubes and a portion of said fire box.

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