June 28, 1938. C. J. GASKELL 2,122,369

BOILER

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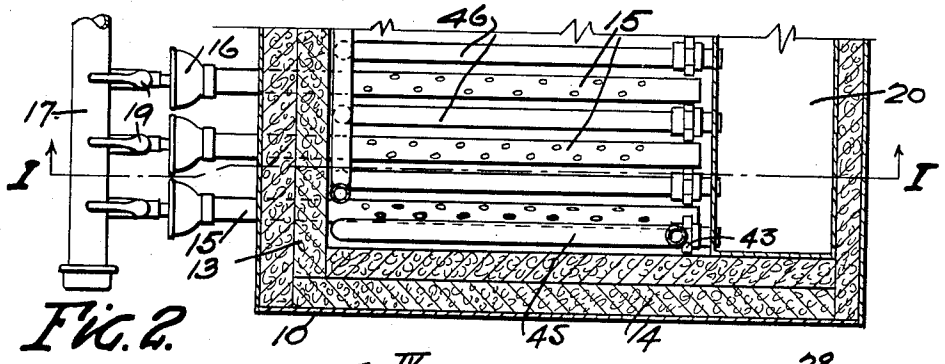
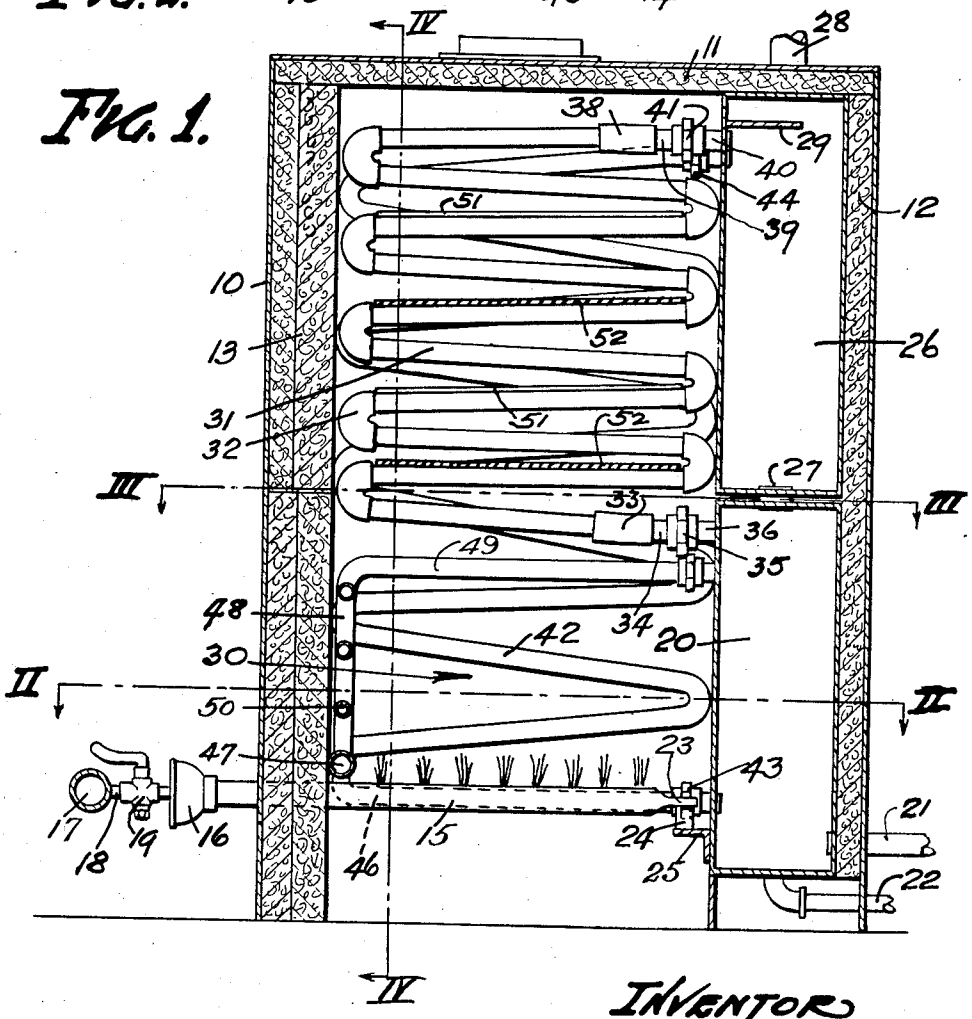


FIG. 2.

FIG. 1.



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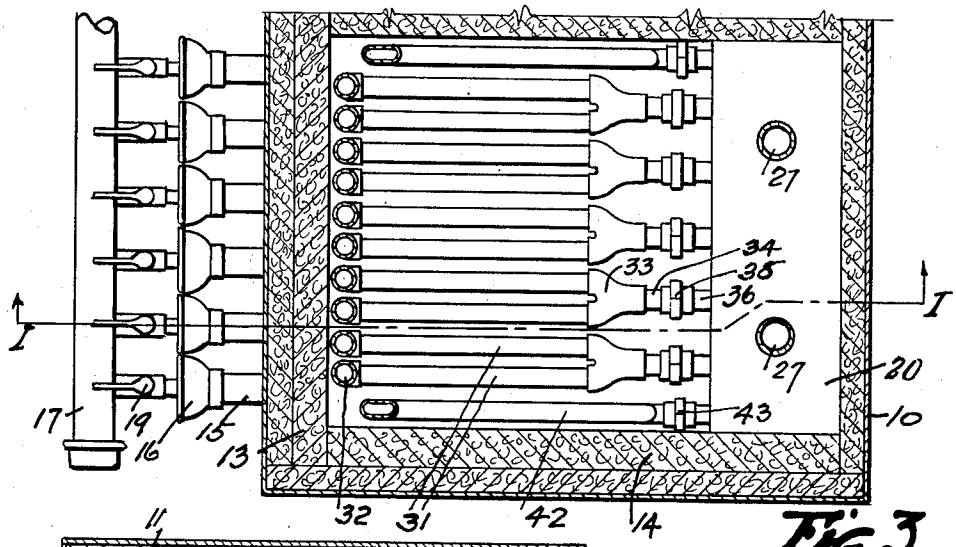


FIG. 3.

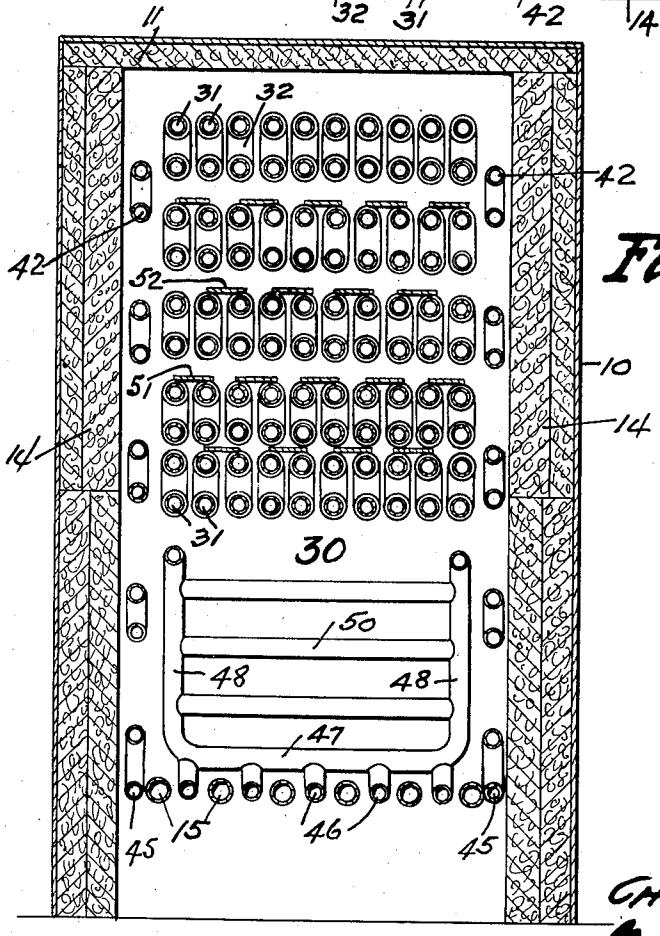


FIG. 4.

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FIG. 6.

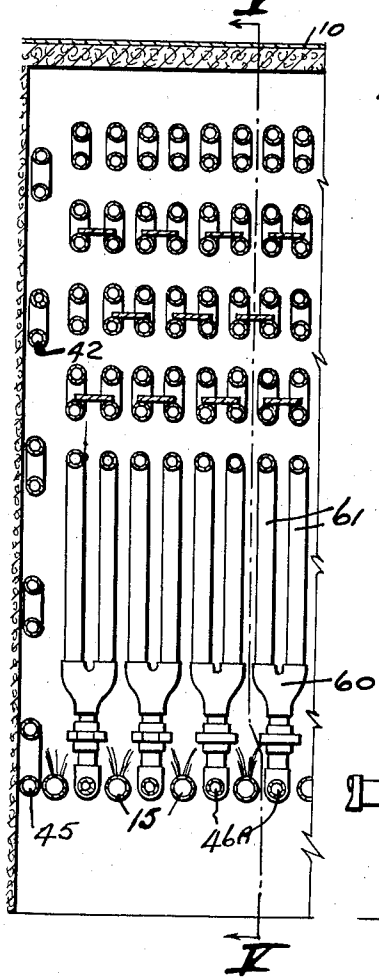
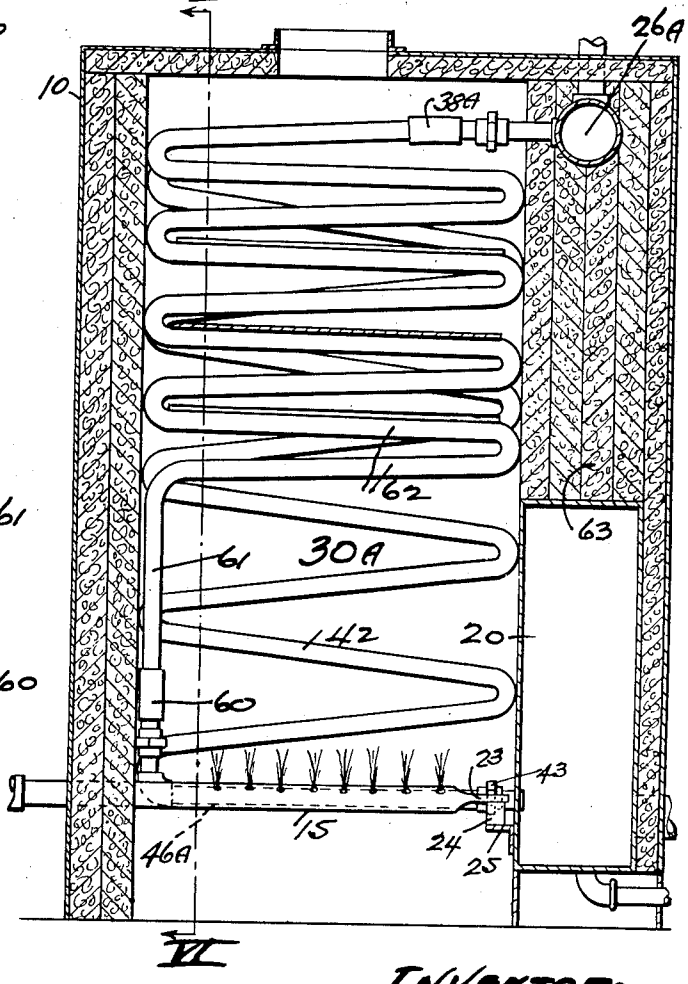


FIG. 5



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FIG. 8.

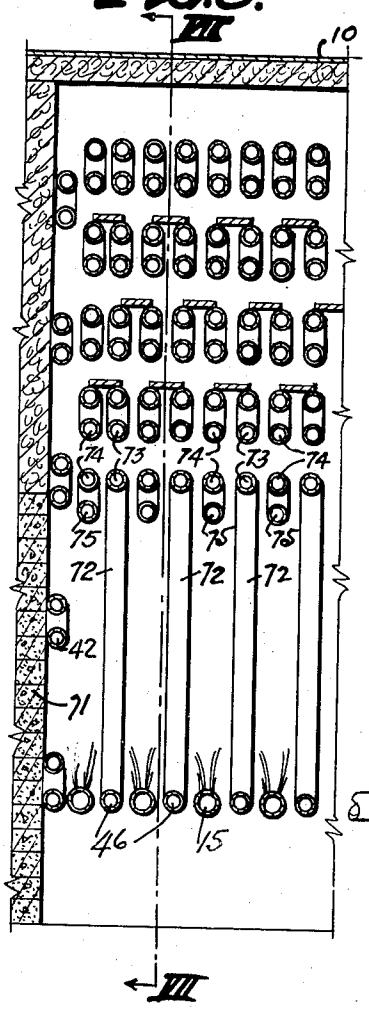
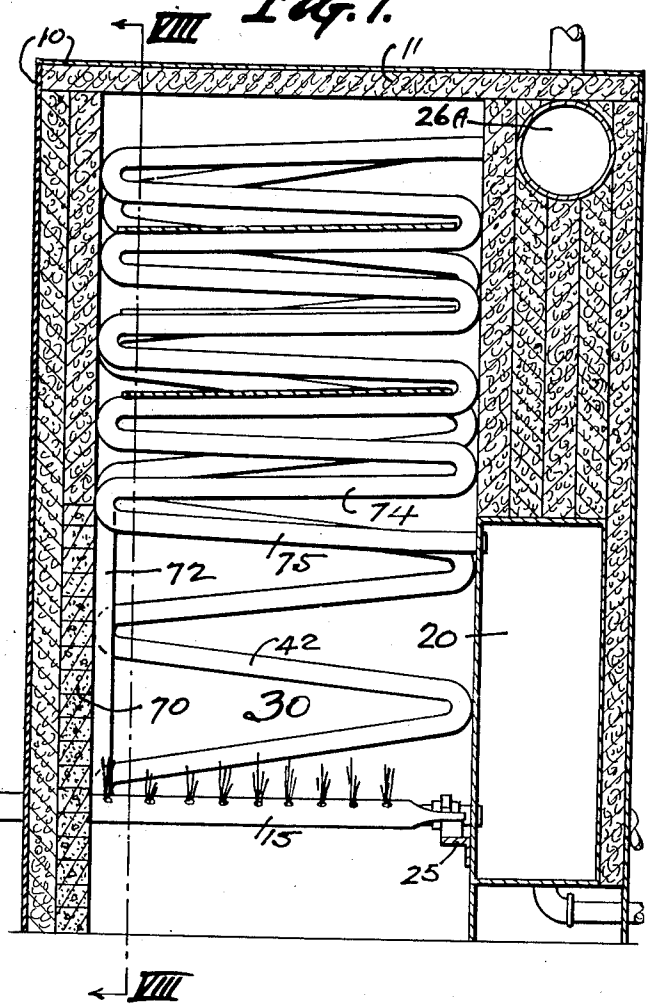


FIG. 7.



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Patented June 28, 1938

2,122,369

UNITED STATES PATENT OFFICE

2,122,369

BOILER

Charles J. Gaskell, Memphis, Tenn., assignor to The Halloran Company, Memphis, Tenn., a corporation of Tennessee

Application July 15, 1937, Serial No. 153,701

9 Claims. (Cl. 122—356)

This invention relates to boilers or heaters of the water-tube type and has particular reference to boilers of this kind which are heated by gas or oil burners.

A principal object of the invention is to provide means in a boiler of the water-tube type, whereby the water is caused to circulate in such path that no cross currents will be set up, thus insuring a rapid circulation throughout the boiler.

Further objects are:

To provide in a boiler of this type a circulation system in which the circulation tubes are so positioned with relation to the burners as to subject the water circulating through the tubes to a maximum heating effect;

To provide, in connection with the primary heating coils, auxiliary coils adapted to absorb burner heat flowing upward along the side walls;

To provide auxiliary coils tending to confine a portion of the heat at one end of the burner chamber and adapted to absorb the burner heat along such end;

To provide drums or headers adjacent the opposite end of the burner chamber positioned to be directly acted on by the heat of the burners;

To provide auxiliary coils lying directly between the burners and below the flame level, which coils are adapted to absorb heat radiating from the burner walls and thereby to reduce the burner wall temperature; these coils also serving to reduce and regulate the air flow past the burners;

To provide an efficiently insulated casing adapted to enclose the coils, burners, and drums, and to conserve the burner heat and increase the efficiency of the structure.

The means by which the foregoing and other objects are accomplished and the method of their accomplishment will readily be understood from the following specification, on reference to the accompanying drawings, in which—

Fig. 1 is a sectional elevation taken as on the line I—I of Fig. 2, looking in the direction of the arrows and showing a steam boiler type as contrasted to a hot water type;

Fig. 2 is a fragmentary sectional plan taken as on the line II—II of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a sectional plan taken as on the line III—III of Fig. 1, looking in the direction of the arrows;

Fig. 4 is a sectional elevation taken as on the line IV—IV of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a sectional elevation taken as on the line V—V of Fig. 6, looking in the direction of the arrows, and illustrating a hot water type of the boiler as contrasted to the steam type, and showing a modified front wall grid;

Fig. 6 is a fragmentary sectional elevation taken as on the line VI—VI of Fig. 5;

Fig. 7 is a sectional elevation similar to Fig. 5, showing a modification of the tube system; and

Fig. 8 is a corresponding sectional elevation taken as on the line VIII—VIII of Fig. 7.

Referring now to the drawings in which the various parts are indicated by numerals:

10 is a rectangular casing preferably of metal and preferably externally highly polished, the side walls and top of this casing being lined with heat insulating material; the top and back being lined each with a single layer 11, 12 respectively, of insulation, whereas the front and side walls each are lined with a double layer, 13, 14, respectively, the top and these walls being hereinafter referred to by the insulation numerals. Disposed within the casing, near the bottom thereof, are a number of elongated multi-nozzle burners 15; six of these burners being here shown (Fig. 4). These burners extend through the front wall 13 and are each provided with a gas and air mixing chamber 16, gas being supplied to these mixing chambers from a joint header 17, through individual tubes 18, which are controlled each by a regulating valve 19, all being of usual and well known type. 20 is a header or drum provided with the usual feed water line 21 and drain 22, this drum lying within the insulation 12, at the back of the casing. The rear end of each burner 15 has a flattened portion 23 which extends adjacent the drum 20, these flattened ends being supported by blocking 24, which rests on an angle iron 25, secured to the drum 20 and extending substantially the full width of the boiler, this angle iron blocking flow of air past the ends and end portions of the burners.

Disposed above the drum 20, and closely adjacent thereto, is a second drum 26, the two drums being connected by short tubes or nipples 27, so that they function substantially as a single drum. They may be replaced if desired by such a drum. 28 is the usual steam pipe leading from the drum 26, and 29 a baffle underlying this steam pipe in usual manner.

Disposed above the burners 15 is the principal bank of heating coils, this bank of coils being spaced well above burners 15 to provide a combustion chamber 30. Each heating coil may be made up of a plurality of tubes 31 connected to-

gether by return bends 32 into a zigzag structure. Pairs of these each are connected through a Y 33, a nipple 34, union 35, and a second nipple 36 into the drum 20, near the upper end thereof, the unions being introduced for ease in assembling and being unnecessary should the nipple be connected directly into the drum and welded thereto, as they obviously may be. Each pair of these zigzag structures is similarly connected adjacent the top of the casing through a Y 38, nipples 39 and 40 and union 41, into the upper drum 26 near the top thereof and adjacent the underside of the baffle 29.

Arranged along each side wall is a zigzag coil 42, which is connected at its lower end into the drum 20 and at its upper end into the drum 26, unions 43, 44, being introduced as before for construction purposes. The lower run 45 of each of these coils lies along a side of one of the burners 15 between the burners and the adjacent side wall, and is substantially at the same level as the burner.

46 are tubes, each lying between a pair of the burners 15, these tubes being connected at their rear ends into the lower drum 20 and at their front ends being bent upwardly and connected into a transverse header 47. The two ends of the header 47 (Fig. 4) are bent upwardly into vertical risers 48, which extend substantially the height of the combustion chamber 30, and are thence continued rearwardly each through a substantially horizontal connecting tube portion 49 into the drum 20. Preferably the risers 48 are connected by a plurality of horizontally disposed tubes 50, the structure formed by the risers 48 and the tubes 50 forming a grid of tubes adapted to absorb the heat of the burner flame along the front of the combustion chamber. It will be particularly noted that the tubes 46, and the tubes 45 co-operate with the side walls of the burners 15 to reduce the air flow.

51, 52 are baffles overlying pairs of the tubes 31, the baffle 52 being staggered with relation to the baffle 51, so that they overlie other pairs. Preferably the baffles while close to the tubes 31 do not rest directly thereon, so that a restricted air passage is left.

In Figs. 5 to 8, inclusive, modified forms of the structure are shown which are better adapted to a hot water boiler. In these views the casing structure 10 is identical with that previously shown, as are also the bottom drum 20 and the burners 15, with their supply pipe and support, and these portions of the structure have therefore been given the same numerals; also the coils 42 along the side wall may be identical with those before shown. In the form of the boiler shown in Figs. 5 and 6, however, the tubes 46A, lying between the burners, have been bent upward as before, but each is connected through a Y 60 to a pair of vertically disposed tubes 61, these tubes extending to the top of the combustion space 30A, and thence being rearwardly bent and zigzagged upward to form the primary heating coils 62, these coils being connected in pairs through Y's 38A into a drum or header 26A, which preferably is of reduced capacity as compared with drum 20, and which has no connection with the lower drums. Preferably the space vertically above the drum 20 is filled with insulation 63, which surrounds the upper drum.

In Figs. 7 and 8, insulation 70 at the front, and 71 at the sides, of the combustion chamber 30, is intended to indicate fire brick lining, and such lining may be used in the other modifications if desired. The tubes 46 between the burners 15 extend to the front of the combustion chamber 30 and thence upward as risers 72 to the top of the chamber and are then zigzagged as coils 73, which connect into the drum 26A. Alternating with the coils 73 are coils 74 which are substantially identical, except that their lowest runs each extends rearwardly into the drum 20.

It will be distinctly understood that while the drawings show the tubes making up the bank of heater tubes connected in pairs through Y's 38 into the upper drum and through similar Y's 38 into the lower drum in Fig. 1, that these tubes may be connected directly into the upper and lower drums without intervening Y's, as are the tubes 74, 75 of Fig. 7.

It will also be understood that the tubes 62, making up the heating coils in Fig. 5, may be connected without the intervention of the Y's 38A directly into the drum 26A, in the same manner as are the tubes of Fig. 7.

I claim:

1. A water-tube boiler including a casing lined with insulation and enclosing a plurality of elongated burners, said burners being disposed adjacent the lower portion of said casing; a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber, a lower drum and an upper drum along the insulated back wall of said casing, the lower and upper ends of said tubes being connected respectively into said lower and upper drums, said lower drum being substantially co-extensive in height with said combustion chamber and forming a back therefor; said boiler also including coils, each along a side wall of said casing, said coils being connected into said lower drum and extending therefrom, at the level of and along said burners, substantially to the front of said casing; thence zigzagging upward to a connection with said upper drum; a grid of tubes substantially co-extensive in width and height with said combustion chamber, disposed along the front wall of said casing, a plurality of tubes extending from said lower drum along and between said burners, connecting the bottom of said grid and said drum, and tubes connecting the top of said grid into one of said drums.

2. A water-tube boiler including a casing lined with insulation, said casing enclosing a plurality of elongated burners disposed adjacent the lower portion of said casing, a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber; a lower drum and an upper drum, both along the insulated back wall of said casing, the lower and upper ends of said tubes being connected respectively into said lower and upper drums, said lower drum being substantially co-extensive in height with said combustion chamber and forming a back therefor; said boiler also including tubes substantially co-extensive in width and height with said chamber and lying adjacent the front wall thereof, a plurality of tubes extending from said lower drum to a connection with the lower portion of said grid, each tube along and between a pair of said burners, and tubes connecting the top of said grid into one of said drums.

3. A water-tube boiler including an enclosing casing, a plurality of elongated burners, disposed adjacent the lower portion of said casing, a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber, a lower drum and an upper drum along the back

wall of said casing, the lower and upper ends of said tubes being connected respectively into said lower and upper drums, said drums forming a back for said combustion chamber; said boiler also including a grid of tubes substantially co-extensive in width and height with said chamber, and lying adjacent the front wall thereof; a plurality of tubes, each lying along and between a pair of said burners, connecting said lower drum and the lower portion of said grid, and tubes connecting the upper portion of said grid into one of said drums.

4. A water-tube boiler including an enclosing casing, a plurality of elongated burners disposed within and adjacent the lower portion of said casing; a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber, a lower drum and an upper drum within said casing and along the insulated back wall thereof, the upper ends of said tubes being connected into said upper drum, said lower drum forming a back for said combustion chamber; said boiler also including a grid of vertically disposed tubes substantially co-extensive in width and height with said chamber, and lying along the front wall thereof, each of said tubes respectively being connected to a respective one of said heating tubes, a plurality of tubes extending from said lower drum each along and between a pair of said burners, and each connecting into a pair of said grid tubes.

5. In a water-tube boiler, a casing, a plurality of elongated burners within said casing, disposed adjacent the lower portion thereof, a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber, drum means along the back wall of said casing, the lower and upper ends of said tubes being connected into said drum means, said drum means forming a back for said combustion chamber; a grid of tubes lying adjacent the front wall of said chamber; a plurality of tubes, each lying along and between a pair of said burners, connecting said drum means and the lower portion of said grid, and tubes connecting the upper portion of said grid into said drum means.

6. A water-tube boiler including a casing, a plurality of elongated burners disposed within and adjacent the lower portion of said casing, and a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber; said boiler also including a grid of vertically disposed tubes lying along the front wall thereof, each of said tubes respectively being connected at its upper end to a respective one of said heating tubes, and a plurality of circulation tubes lying each along and between a pair of said burners, and each connecting into the lower end of a pair of said grid tubes.

7. In a water-tube boiler, a casing, a plurality of burners within said casing, disposed adjacent the lower portion thereof, a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber; drum means along the back wall of said casing, the lower and upper ends of said tubes being connected into said drum means, said drum means forming a back for said combustion chamber; a grid of tubes lying adjacent the front wall of said chamber; and tubes interconnecting said grid and drum means.

8. A water-tube boiler including a casing, a plurality of elongated burners disposed within and adjacent the lower portion of said casing, and a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber; said boiler also including a grid of tubes lying along the front wall thereof, said grid being connected at its upper end to said heating tubes, and a plurality of circulation tubes lying each along and between a pair of said burners, and each connecting into the lower end of a pair of said grid tubes.

9. A water-tube boiler including a casing, a plurality of burners disposed within and adjacent the lower portion of said casing, and a bank of heating tubes disposed above said burners and spaced therefrom to form a combustion chamber; said boiler also including a grid of tubes lying along the front wall thereof, said grid being connected at its upper end to said heating tubes, and a plurality of circulation pipes interspaced between said burners, said pipes connecting into the lower portion of said grid.

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