(No Model.)

W. RADCLIFF.

BOILER.

No. 586,934. Patented July 20, 1897.

Fig. 2.

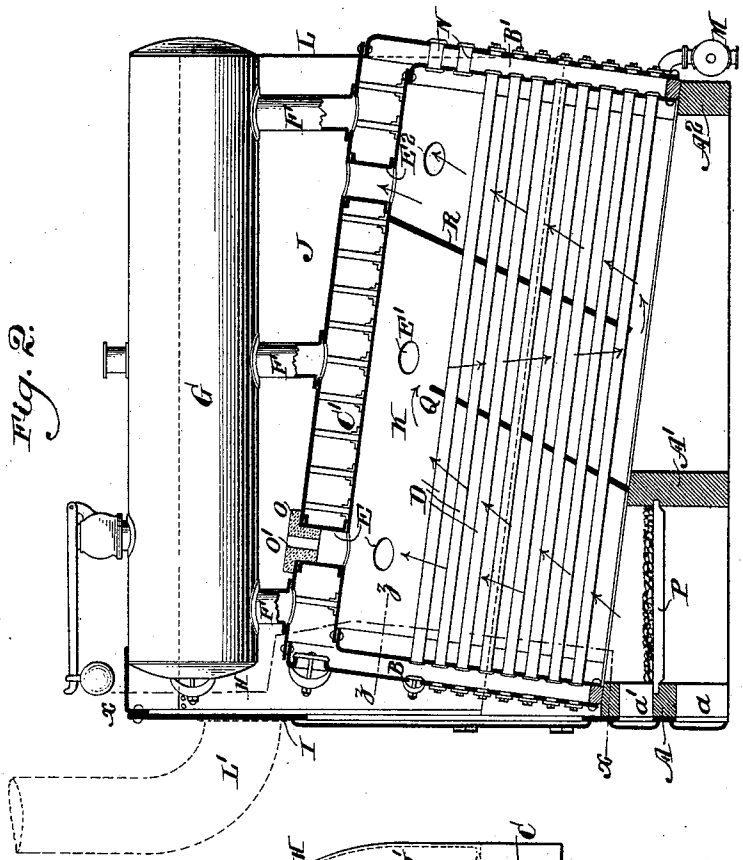


Fig. 3.

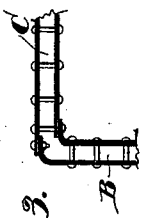
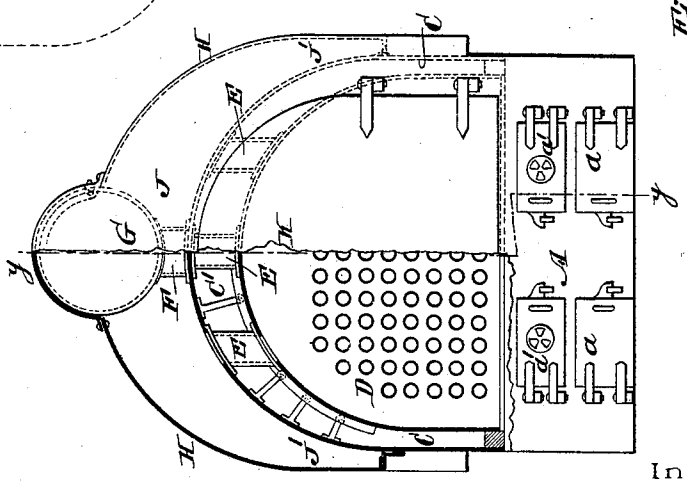


Fig. 1.



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BOILER.

SPECIFICATION forming part of Letters Patent No. 586,934, dated July 20, 1897.

Application filed January 2, 1897. Serial No. 617,718. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM RADCLIFF, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Boilers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the construction of boilers, having for its object the provision of the maximum amount of heating-surface, together with ample water-space, provision for free and energetic circulation of water, and novel arrangements for the distribution, with respect to the heating-surfaces of the boiler, of the products of combustion coming from the furnace.

The nature of my improvements will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a front view of my boiler, partly taken on the section-line *x x* of Fig. 2. Fig. 2 is a side elevation partly taken on the section-line *y y* of Fig. 1; and Fig. 3 is a section of one corner of my boiler, taken as on the section-line *z z*.

A A′ A^2 indicate brickwork supports for the boiler, A being the front wall, in which are formed the fire and ash bars *a′* and *a*, the grate P of the furnace being supported on the walls A and A′, as indicated.

B and B′ indicate, respectively, the front and rear water-heads of the boiler, and C C′ C indicate an arch-shaped water-chamber connecting with the heads B and B′, preferably not only at the top C′ of the arch-shaped chamber, but also to the vertical walls C C, as shown in Fig. 3, which is a sectional view of one corner of the boiler. The arch-shaped water-chamber is preferably set at an angle, as indicated, and the water-heads B B′ are connected by a water-tube system, (indicated at D,) also set at an angle to facilitate the circulation of the water.

E E′ E^2 indicate flue-passages passing through the upper part of the arch-shaped water-chamber, these flue-passages being, as indicated, provided at various distances from the front of the boiler. Their function is obviously to connect the fire-chamber (indicated at K) within the arch-shaped water-chamber with the flue-passage J, extending over and around the outside of said chamber.

F F indicate connections between the top of the arch-shaped water-chamber and the drum G, situated above said water-chamber and designed to contain both water and steam.

H H indicate the outer walls of the flue J. The plates making up these walls are, as shown, secured to the sides of the drum G and extend well down on the sides of the arch-shaped water-chamber, thus insuring that the products of combustion passing through said flue J will be brought in contact with the bottom of the drum G and with the greater part of the outside of the arch-shaped water-chamber.

I indicates the front plate of the boiler-setting and forms the front wall of the flue J.

L, Fig. 2, indicates the point at which the flue J would open into a stack situated at the rear of the boiler, and at L′ I have indicated in dotted lines how a flue may be led from the front wall of the flue J if it is desired to take off products of combustion from the front rather than the rear of the boiler.

M indicates the mud-drum, of any usual construction; N, passages through the upper part of the rear head B′, which may be conveniently provided to permit of the inspection of the rear part of the fire-chamber.

O, Fig. 2, indicates a tile of a form adapted to enter the top of one of the flue-passages E and rest upon the top of the arch-shaped water-chamber, O′ indicating a passage through this tile.

P indicates the fire-grate, and Q R baffle-plates provided to insure a proper circulation of the products of combustion over the water-tubes D.

It will be obvious to any one skilled in the art that my combination and arrangement of the arch-shaped shell of the tubular part of my boiler with the drum G, the fire-chamber K, and the flue J secure at the same time an ample water-space in my boiler and a very large and well-disposed heating-surface, and it will also be clear that my described construction provides also for a thoroughly good circulation of the water through my boiler. In the

particular construction illustrated, in which I have provided flue-passages E, E′, and E^2, arranged at different distances from the front of the boiler, I contemplate dividing the products of combustion arising from the furnace, passing a portion through the flue-passages E and E′ and thus insuring that the outside of the arch-shaped water-chamber and the lower part of the drum G shall be subjected to the heating action of intensely-hot gases arising from the furnace. The portion of the furnace-gases which do not pass through the flues E and E′ are caused to circulate to any desired extent over the water-tubes D and finally issue from the rear of the fire-space K, through the flue-passages E^2, into the rear of the flue J, reuniting at this point with the gases which have passed into the flue J through the flues E and E′, and all of the gases passing out to a stack at the rear of the boiler. The amount of the products of combustion permitted to pass through the various flues leading from the chamber K can be regulated in any convenient way. I prefer, however, to effect this regulation by means of tiles, such as O, by means of which any of the flues leading from the inside of the arch-shaped water-chamber can be wholly or partially closed.

When instead of providing an outlet for the products of combustion from the rear of the flue J, I provide an outlet at the front of the boiler, as indicated in dotted lines at L′, I would omit or close the flue-passages E and E′, carrying all of the furnace-gases to the rear of the chamber K, thence to the rear of the flue J through passages E^2 or any convenient connections, and thence forward through the flue J to the outlet L′.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A boiler having an arch-shaped water-chamber as C C′ C with water-heads B and B′ at front and rear together with water-tubes as D connecting said heads and a drum-like water and steam chamber as G situated above and connected with the top of the top of the water-chamber C C′ C in combination with flue-spaces as J extending over the top and down over the sides of the arch-shaped water-chamber so as to practically jacket said chamber, said flue-spaces also extending beneath the drum G and connecting with the fire-chamber on the inside of the said water-chamber.

2. A boiler having an arch-shaped water-chamber as C C′ C with water-heads B and B′ at front and rear said water-chamber having flue-passages as E E′ E^2 formed through it at different distances from its front and together with water-tubes D connecting the heads B B′ and a drum as G situated above and connected with the water-chamber aforesaid in combination with a flue J passing over the top and down on the sides of the arched water-chamber and also extending beneath the bottom of the drum said flue being in communication with the fire-chamber within the arched water-chamber through the flue-passages E E′ E^2.

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