March 13, 1934. T. E. MURRAY 1,951,165

BOILER

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Fig. 1.

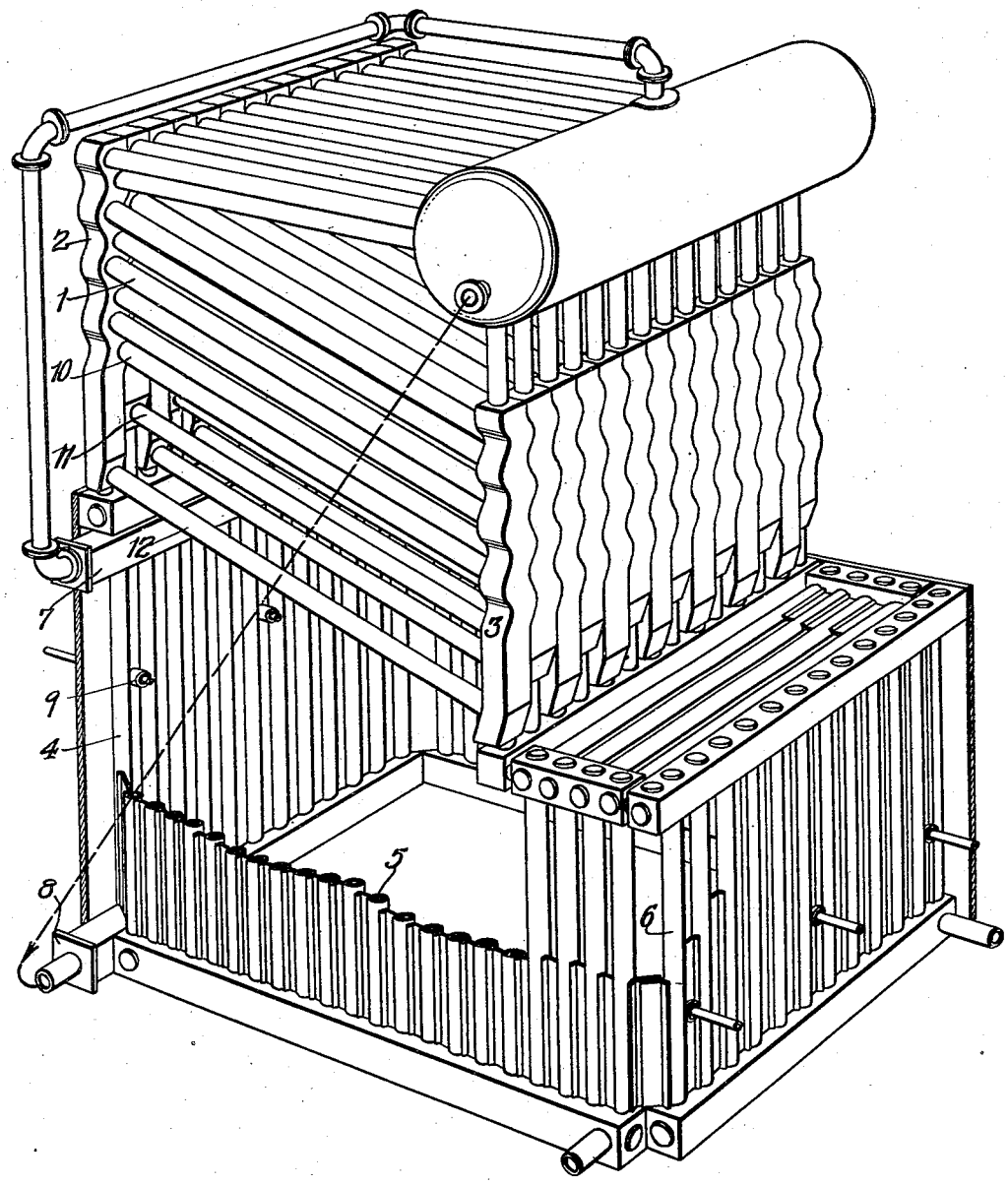

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Fig. 2.

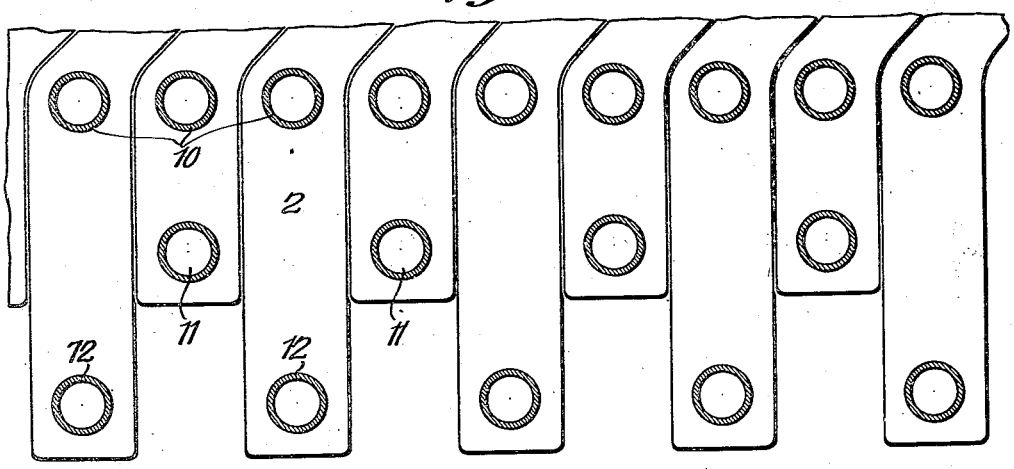
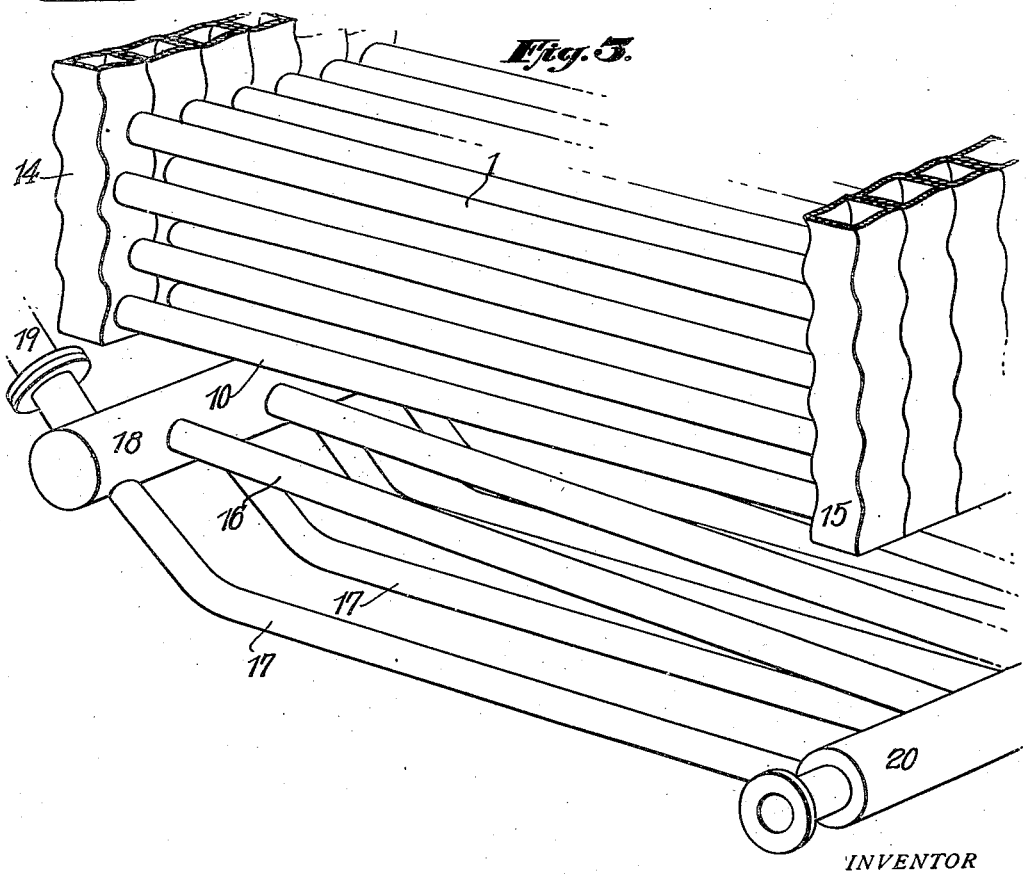


Fig. 3.



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Patented Mar. 13, 1934 1,951,165

UNITED STATES PATENT OFFICE

1,951,165

BOILER

Thomas E. Murray, Brooklyn, N. Y.; Joseph Bradley Murray, Thomas E. Murray, Jr., and John F. Murray, executors of said Thomas E. Murray, deceased, assignors to Metropolitan Engineering Company, a corporation of New York

Application September 10, 1927, Serial No. 218,692

3 Claims. (Cl. 122—235)

In a certain previous application No. 642,725 filed June 1, 1923, patented February 11, 1930, Patent No. 1,746,711, I have described a boiler having the sides of the combustion chamber formed of or lined with water tubes so that they are exposed to the direct radiant heat of the burning fuel. Boilers of this type have developed an extraordinary improvement in capacity and other advantages.

My present invention aims to secure similar advantages in connection with the overhead approximately horizontal tubing.

The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a perspective view showing a boiler similar to that of my previous application, with my improvement applied to the overhead tubing;

Fig. 2 is a cross-section of the lower row of ordinary horizontal tubes and certain supplemental tubes;

Fig. 3 is a perspective view illustrating a modification.

The boiler of Fig. 1 is provided with the usual overhead tubes 1 heated by convection, that is, by the passage of the gases between them. Generally baffles are arranged to direct the course of the gases to utilize that heat to the best extent. At their upper ends the hot water and steam passes through vertical headers 2 up to the steam drum over head from which the water descends to the vertical headers 3 at the lower ends of such tubes.

Below these tubes is a combustion chamber which is lined with vertical tubes 4 at the back and 5 at the sides and 6 at the front. The hot water and steam from these pass out through headers such as 7 at their upper ends, up to the drum, whence the water is returned to headers such as 8 at the bottoms of these tubes. The fuel in the form of powdered coal, oil or gas is supplied in jets through nozzles 9 and burns at a very high temperature in the combustion chamber so that the various water walls illustrated are exposed directly to the radiant heat. The lowermost row of horizontal tubes 10 is exposed in the same way to the radiant heat, and I propose to increase the extent of surface thus exposed.

Below the lowermost regular bank of tubes 10, I arrange one or more rows or banks of tubes so widely separated that they leave the tubes 10 partly exposed to the radiant heat, while they are themselves fully exposed thereto.

For example, in Figs. 1 and 2, the headers 2 and 3 are extended at their lower ends to accommodate two supplemental rows of tubes 11 and 12 respectively at different levels. The lowest row of tubes 12 are exposed to the rays from the burning gases throughout their entire circumference if we assume that combustion continues up to the level of the lowest regular bank of tubes 10; or on considerably more than half their circumference even if we assume the combustion to be complete below these tubes 12 because the rays are not merely vertical but strike in all directions from the flame.

Similarly the tubes 11 are exposed to the radiant heat over more than half their circumference, the full extent depending on the height to which the process of combustion continues.

The tubes 10 are exposed, at the least, to such rays as can pass completely through the spaces left between alternate tubes 11 and 12 below. This means an exposure for the tubes 10 equal to approximately half their circumference. The greater the vertical distances between the banks of tubes 10, 11 and 12 respectively, the better the exposure of the banks above the tubes 12. The horizontal spacing of the supplementary tubes may be varied, but the maximum surface exposed to radiant heat is obtained by providing supplementary tubes in vertical alignment with all the tubes 10 and at sufficient vertical distances to secure very little interference with the rays projected from the fire to the tubes 10.

In Figs. 1 and 2, although I have referred to the tubes 10 and 11 as supplementary, yet they may be considered the ordinary overhead tubes modified only as to spacing. They utilize the same headers and the same circulating connections.

Fig. 3 shows an alternative construction in this respect. The lowermost bank of tubes 10 are connected to the lower ends of headers 14 and 15 of the usual or any suitable type. Below these are two banks of supplemental tubes spaced in transverse section like the tubes 11 and 12 of Fig. 2. Corresponding tubes in Fig. 3 are numbered 16 and 17. At their upper ends both sets of tubes are connected to a header 18 from which the hot water and steam pass by a pipe 19 to a drum, whence the water is returned by an outside circulating pipe to the drum 20 at the lower ends of the tubes 16 and 17.

The tubes which surround the combustion chamber are shown bare. The invention may be applied, however, to installations in which such tubes are shielded to a greater or less extent. In either case there is a utilization of the intense radiant heat of the burning fuel, more effective than the heating of the upper tubes by contact

or convection gases, and there is also a great diminution in cost of installation and maintenance compared with the ordinary refractory walls.

Various other modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. A boiler having above the combustion chamber a bank of approximately horizontal tubes below which and approximately parallel thereto is a second bank in a plurality of horizontal lines of staggered tubes, the tubes of both banks being of the same diameter, the tubes in horizontal alignment in the second bank being spaced apart farther than those in horizontal alignment in the first bank, and the vertical distance between the tubes in adjacent horizontal lines of the second bank being greater than that between the horizontal lines of tubes in the first bank.

2. A boiler having above the combustion chamber a bank of approximately horizontal tubes below which and approximately parallel thereto is a second bank, the space between the two banks of tubes being unobstructed and the tubes of the second bank being spaced farther apart than those of the first bank and being so widely separated as to expose the tubes of the first bank to the radiant heat of the burning fuel in the combustion chamber below, means for burning fuel in suspension in the combustion chamber and a set of upright steam generating tubes lining said combustion chamber and having a circulating system which is independent of that of the overhead banks.

3. A boiler having above the combustion chamber a bank of approximately horizontal tubes below which and approximately parallel thereto is a second bank, the tubes of the second bank being spaced farther apart than those of the first bank and being so widely separated as to expose the tubes of the first bank to the radiant heat of the burning fuel in the combustion chamber below, headers carrying the first bank of tubes and separate headers carrying the second bank and providing an independent circulation therefor, means for burning fuel in suspension in the combustion chamber and a set of upright steam generating tubes lining said combustion chamber and having a circulating system which is independent of the circulating systems of the two overhead banks.

THOMAS E. MURRAY.