Dec. 8, 1931. E. ROUČKA 1,835,091

BOILER

Filed April 8, 1930

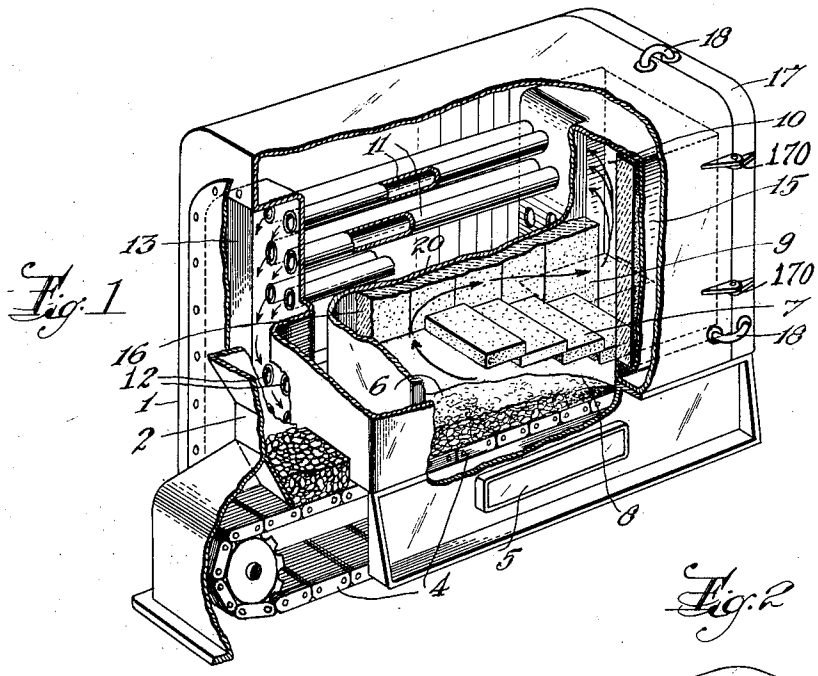


Fig. 1

Fig. 2

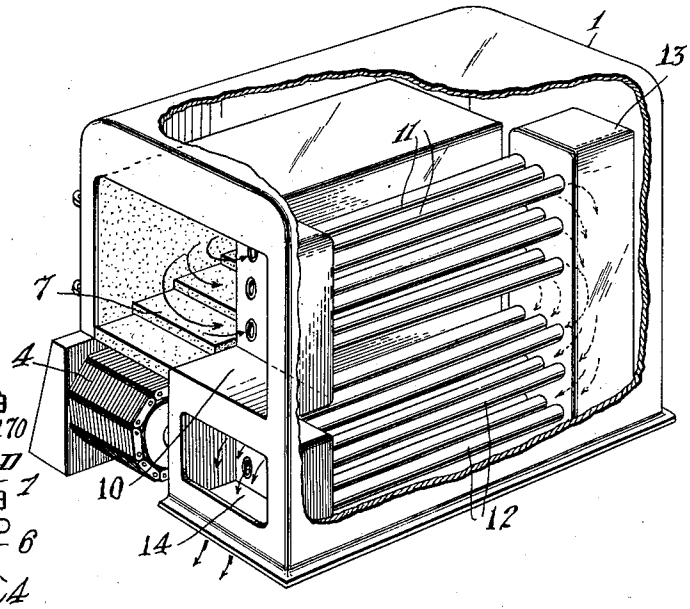
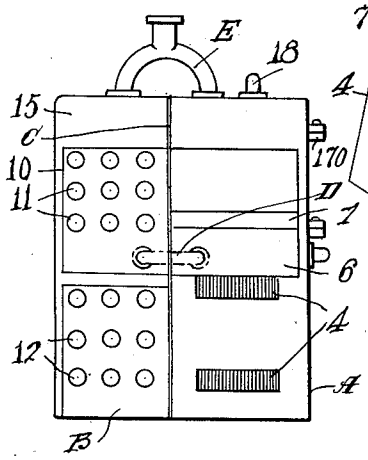


Fig. 3



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UNITED STATES PATENT OFFICE

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BOILER

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This invention relates in general to hot water or steam boilers, one object of the invention being to provide a novel and improved construction, combination and arrangement of a plurality of furnaces and the heating surfaces of the boiler, whereby complete combustion of combustible gases and vapors is obtained and heat therefrom efficiently utilized.

Another object is to provide a boiler of the general character described including a fire box having a primary furnace disposed over a grate, for example a traveling or chain grate, and a secondary furnace arranged in superposed relation to the primary furnace, with the main heating surface of the boiler located at one side of said furnaces and connected to the secondary furnace by a smoke box.

Other objects are to provide a boiler of this character in which the main fire box is divided substantially horizontally by an inclined wall or partition into a primary furnace and a secondary furnace which are arranged in superposed relation, with heating surfaces, such as fire tubes or flues, arranged at one side of said furnaces and connected by a smoke box to the secondary furnace, and to obtain other advantages and results as will be brought out by the following description.

Referring to the accompanying drawings in which corresponding parts are designated by the same reference characters throughout the several views.

Figure 1 is a perspective view of a boiler embodying my invention showing portions broken away and illustrated in section.

Figure 2 is a similar view looking at the boiler from the opposite end, the door being removed, and

Figure 3 is a schematic transverse sectional view illustrating the manner of constructing the boiler in sections for convenience in transportation.

Specifically describing the illustrated embodiment of the invention, the boiler is shown as including a casing 1 having at one side adjacent the bottom thereof a chain grate mechanism 4 to which fuel, such as coal, is fed by a hopper 2 in the usual manner to form a fuel bed 3. Beneath the chain grate mechanism 4 is arranged the usual ash pit (not shown), and the usual ash pit damper 5 is provided for producing a draft. Above the chain grate mechanism is a fire box 6 which is divided substantially horizontally by an inclined wall 7 into a primary furnace 8 below the wall, and a secondary furnace 9 above the wall. This wall extends upwardly from the end of the fire box 6 opposite the hopper 2 toward the hopper or fuel supply end of the fire box and terminates short thereof; and the wall 7 preferably is formed of blocks of refractory material. At the end of said inclined wall 7 opposite the fuel supply hopper 2 is arranged a smoke box 10 which is horizontally wider than the fire box 6.

With this construction, it will be observed that one side of the smoke box 10 communicates with the secondary furnace 9 so that the combustion gases from the fuel bed 3 rise upwardly from the fuel bed beneath the inclined wall 7 toward the fuel supply end of the fire box 6, then upwardly around the end of the wall 7 and rearwardly through the secondary furnace 9 into the smoke box 10. At one side of the fire box 6 are arranged the main heating surfaces of the boiler which in the present instance are shown as comprising two banks 11 and 12 of horizontal flues or fire tubes of known construction. The flues of the bank 11 are connected at one end to the smoke-box 10 and at the other end to a second smoke box 13. The second bank of fire tubes 12 have one end connected to the smoke box 13 and the other ends connected to a second smoke box 14, which is in turn connected to a chimney or stack (not shown). The combustion gases thereby turn through the smoke box 10 from the secondary furnace 9 into the bank 11 of fire tubes, horizontally at an angle of 180 degrees. From the fire tubes 11 the gases of combustion pass through the smoke box 13 into the fire tubes 12 and thence to the chimney or stack.

Surrounding the fire box and the fire tubes 11 and 12 is the usual water chamber 15 through which the fire tubes pass in the usual manner.

Preferably the secondary furnace 9 has its walls lined with refractory material such as fire brick 16 to produce a high temperature so as to cause complete combustion of all combustible gases and vapors.

Also, the outer end of the smoke-box 10 is preferably in the form of a door or closure 17 hinged at 170 and having a water chamber which may be connected to the chamber 15 by suitable fittings 18, this door being primarily utilized for installation and repairing of the refractory lining of the furnace and the inclined wall 7.

For convenience in transporting and erecting large boilers embodying the invention, the boilers may be divided into two parts A and B along a vertical longitudinal plane C, secured together in any suitable manner as shown in Figure 3 of the drawings with the portions of the water chamber connected together by any suitable means such as known fittings D and E. The section A may comprise the main fire box and a part of the smoke box 10, while the other section may include the fire tubes 11 and 12 and the remainder of the smoke-box. In other words, the boiler may be divided at the fire box side of the wall 20 which separates the main fire box 6 and the water chamber.

With this construction it will be observed that the primary combustion takes place in the primary furnace 8, the gases of combustion passing along the underside of the wall 7 and then upwardly around the end of the wall into the secondary furnace 9 where complete combustion of the combustible gases and vapors takes place. The gases then pass from the secondary furnace into the smoke-box 10 and through the fire tubes 11 and 12 to the stack. The heat from the combustion is thereby efficiently utilized in heating the water in the water chamber 15.

While I have shown and described my invention as embodied in certain details of construction, it should be understood that this is primarily for the purpose of illustrating the principles of the invention and that many modifications and changes may be made in the details of construction without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim is:

A boiler comprising a casing having a main fire box at one side thereof, said fire box having a grate therein and a fuel supply opening at one end thereof, an inclined wall above said grate extending upwardly from the other end of the fire box toward and terminating short of said fuel supply end and dividing said fire box into a primary furnace between said grate and said wall and a secondary furnace above said wall, a smoke-box at the end of said secondary furnace communicating therewith and extending transversely of the casing toward the other side thereof beyond said main fire box, a water chamber, fire tubes through said water chamber at one side of said main fire box and communicating at one end with said smoke box, a second smoke box at the first-mentioned end of said casing communicating with the other ends of said fire tubes, and additional fire tubes through said water chamber connected at one end to said second smoke box and with their other ends to be connected to a flue or chimney, whereby the gases of combustion pass from said primary furnace through said secondary furnace into said smoke box, then turn horizontally 180 degrees into the first-mentioned fire tubes and thence through said second smoke box and the second-mentioned fire tubes.

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