Aug. 19, 1947. J. R. EVANS 2,426,004

STEAM BOILER FURNACE

Filed July 21, 1944 3 Sheets-Sheet 1

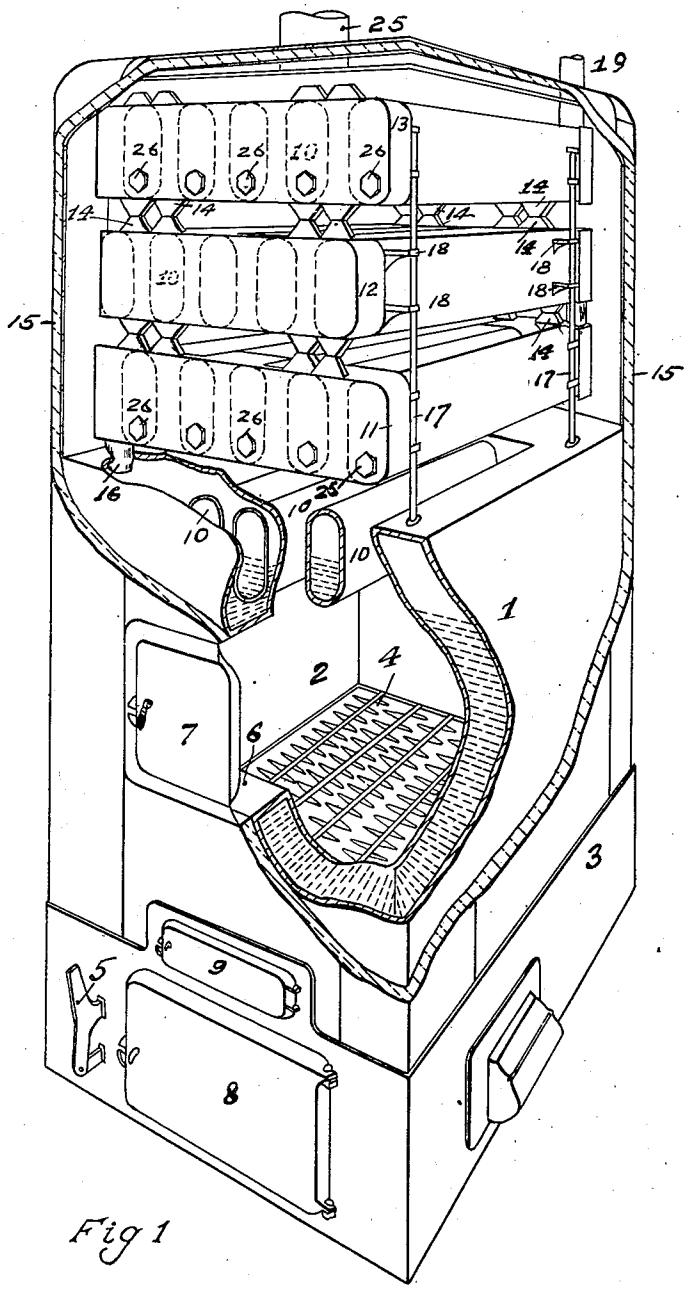


Fig 1

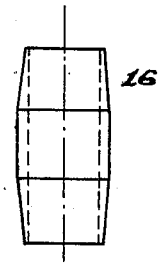


Fig 2

INVENTOR
John R. Evans
BY
L. E. Thomas
Atty.

Aug. 19, 1947. J. R. EVANS 2,426,004

STEAM BOILER FURNACE

Filed July 21, 1944 3 Sheets-Sheet 2

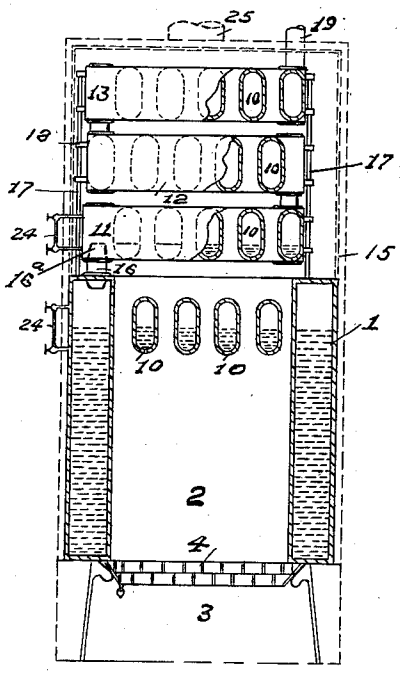


Fig 3

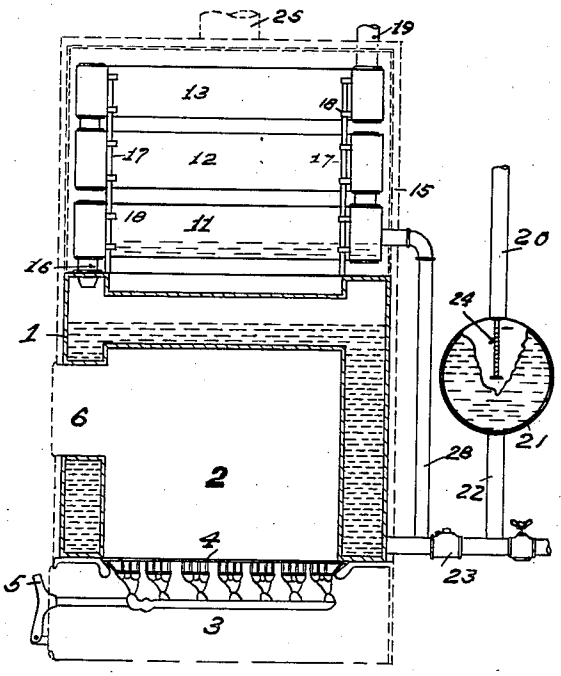


Fig 4

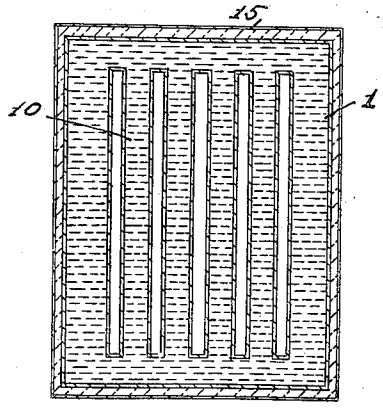


Fig 5

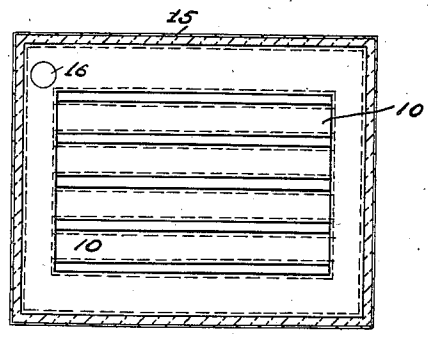


Fig 6

John R. Evans INVENTOR.

BY L. E. Thomas

Atty

Aug. 19, 1947. J. R. EVANS 2,426,004

STEAM BOILER FURNACE

Filed July 21, 1944 3 Sheets-Sheet 3

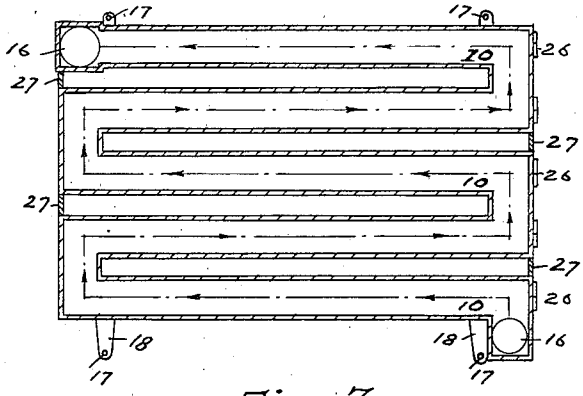


Fig 7

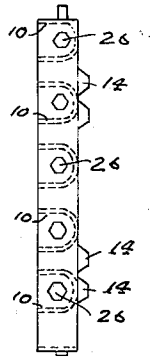


Fig 8

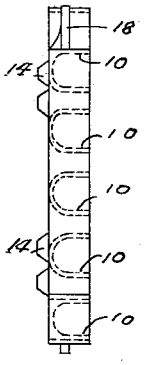


Fig. 10.

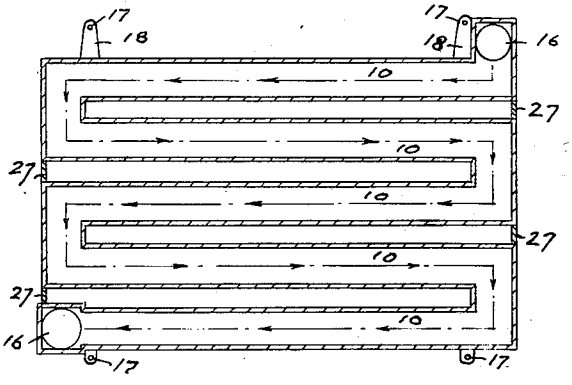


Fig. 9.

John R Evans INVENTOR.

BY

L. C. Thomas atty

Patented Aug. 19, 1947

2,426,004

UNITED STATES PATENT OFFICE

2,426,004

STEAM BOILER FURNACE

John R. Evans, Windsor, Ontario, Canada

Application July 21, 1944, Serial No. 545,994

3 Claims. (Cl. 122—214)

1

My invention relates to an improvement in steam boiler furnaces, for heating and other purposes, shown in the accompanying drawings and more particularly described in the following specification and claims.

In the drawings Figure 1 is a perspective view of the furnace, with parts broken away and in section, showing a water jacket surrounding the combustion chamber, with grate-bars level with the lower wall of the water jacket, also a plurality of spaced water tubes extending across the top of the combustion chamber and opening into the front and back walls of the water jacket; the view also shows a plural number of superposed sections—in spaced relation to each other, located above the combustion chamber, each section comprising a plurality of tubes, connected with the chambered ends of the section, but staggered in relation to the tubes of the adjacent section, above and below, for the circulation of water and vapor.

Figure 2 is a side elevation of the tapering push-nipples for connecting the respective sections together, and also for connecting the lower section with the water-jacket surrounding the combustion chamber.

Figure 3 is a vertical cross-sectional view through the furnace, showing portions of the end-walls of the respective sections broken away to disclose the connecting tubes in staggered relation to the tubes in the sections above and below.

Figure 4 is a vertical cross-sectional view of the furnace, taken at right-angles to that shown in the preceding view, to disclose the opening for delivering fuel into the combustion chamber, closed by a fire door, not shown; also a shaker mechanism for removing the clinkers; a water pipe to deliver water into the water jacket, under control of suitable check-valves, from a return feed-water reserve tank, and the water supply main.

Figure 5 is a horizontal cross-sectional view through the furnace, and the water tubes extending across the top of the combustion chamber, showing the water in the water jacket surrounding the combustion chamber in free circulation with the water in said tubes.

Figure 6 is a horizontal cross-sectional view through the furnace-wall, showing a plan view of one of the sections in place within the furnace and its plurality of tubes connected with the chambered ends of the section; also a vertical port-opening, as in each chambered end section, through which the water and vapor circulate to adjacent sections through like ports.

2

Figure 7 is a horizontal cross-sectional view through one of the sections—detached from the furnace—in which arrows indicate the flow of water and steam through the spaced tubes, connecting the chambered-ends of the section, also the removable nut-plugs opposite the end of each tube, whereby on the removal of the plugs, the core used in cast—the chambered tubes may readily be removed.

Figure 8 is an end-view of the lower half of the section shown in Figure 7, the tubes being indicated by dotted lines, showing the removable nut-plugs, and the lugs, to maintain the sections in spaced relation within the furnace wall.

Figure 9 is a horizontal sectional view through a section adapted to be mounted above or below the section shown in Figure 7, and to coordinate therewith, whereby the tubes of the respective sections will be in staggered relation to those in the sections above and below.

Figure 10 is a view of one-half of the section shown in Figure 9, indicating in dotted lines one-half of the spaced tubes, also the projecting lugs, adapted to abut like lugs on adjacent sections to maintain the sections in spaced relation to each other within the walls of the furnace.

Referring now to the reference numerals on the drawings: 1 denotes a water-jacket forming a combustion chamber 2, mounted on the walls of the ash-pit 3, the walls of which support a plurality of rocking grate-bars 4, adapted to be manually operated by a lever 5.

The combustion chamber 2 has an opening 6, in the front wall of the water jacket 1, whereby coal or other fuel may be delivered into the combustion chamber, closed by a door 7.

The numeral 8 indicates the usual ash-pit door, and 9, a clean-out door.

Extending across the combustion chamber and opening into the top of the water-jacket are a plurality of spaced tubes 10, and superposed above said tubes and supported in spaced relation thereto are sections 11, 12, and 13, see Figures 3 and 4, the respective tubes of said sections being staggered in relation to those above and below when superposed within the walls of the furnace, as indicated in the drawings.

Projecting from each section are lugs 14, to maintain said sections when superposed, in spaced relation within the walls 15 of the furnace. A tapering push-nipple 16, see Figure 2, connects the water jacket 1 with the section 11, directly above, and similar tapering push-nipples respectively connect section 11, with sections 12 and 13, for the circulation of steam. Tie-rods 17, rising

from the top of the water-jacket 1, are connected by bracket-arms 18, with the respective sections to maintain the tubes of the several sections in staggered relation to the tubes above and below. A steam-pipe 19, see Figures 1, 3, and 4, rises from the upper section 13, to connect with radiators, not shown; and 20 indicates a return pipe for condensation, leading to a reserve-tank 21, in turn connected by a pipe 22, under control of a check-valve 23, to insure the maintenance of a predetermined water level in the water jacket.

There is also provided a pipe 28 connecting the lower tubes with the water supply pipe line and engaged with the lower tubes at the level of the upper end of the nipple. Thus, water formed by condensing steam may collect in the lower portions of the lower super heater tubes where it will be subjected to heat of products of combustion passing upwardly about the tubes and this hot water will be reconverted into steam. If too much water accumulates in the lower tubes, same will run off through the pipe 28 and into the water supply pipe line.

Suitable water gauges 24 are provided for the reserve-tank 21, the water jacket 1, and the section 11, see Figure 3.

Rising from the top of the furnace is a smoke-pipe 25.

Water will start boiling in the water-jacket 1, and thence the boiling point in section 11, circulation of the steam is then started throughout its entire course of travel in the boiler, absorbing all the heat transmitted by the hot gases so that when the steam reaches the plurality of tubes in the 12 and 13, it is superheated. The superheated steam leaves the boiler through pipe 19, to fulfil its function of heating, cooking etc., and the condensation therefrom returns to the reserve-tank 21, and thence to the water-jacket 1, as previously explained.

The tubes 10 are relatively narrow and convex-shaped at the top and bottom to effect the ready release or discharge of any soot or carbon that might otherwise cling to the outside of the tubes and thereby retard the rapid heating of the water circulating therethrough.

Nut-plugs 26 are screwed into the respective sections 11, 12, and 13, opposite the ends of the tubes 10, following the withdrawal of the cores used in casting the chambered sections.

Numeral 27, denotes a "connecting tie" between the otherwise "free ends" of sections 11, 12, 13, and the adjacent tubes 10, to retain the tubes in fixed parallel relation.

What I claim is:

1. A steam boiler comprising a casing having a lower portion of double wall construction forming a water jacket and constituting walls of a fire-box, the portion of the casing above the water jacket constituting a heating chamber communicating with the fire-box, rods extending upwardly from the water jacket at opposite sides of the heating chamber, tubes in the upper portion of said fire-box having ends communicating with front and rear portions of the water jacket, super heaters in said casing supported from said rods one above another and each having transversely spaced inter-communicating tubes, nipples connecting the super heaters with each other and the lower super heaters with the top of the water jacket, a service pipe leading from the upper super heater, a tank for receiving condensate, a pipe line for supplying water to the lower portion of the water jacket, a pipe leading from the bottom of said tank to said pipeline and a pipe leading from the lower super heater in spaced relation to the bottom thereof to the pipeline, a check valve in the pipeline between said pipes opening towards the water jacket.

2. A steam boiler comprising a casing having a lower portion of double wall construction forming a water jacket constituting walls of a fire-box and an upper portion constituting walls of a heating chamber, tubes extending horizontally in the upper portion of the fire-box having their ends communicating with the water jacket and filled with water to the level of water in the water jacket, super heaters in the heating chamber one above another and each having inter-communicating tubes, nipples connecting the super heaters with each other and the lower super heater with the top of the water jacket, the nipple of the lower super heater projecting upwardly therein whereby condensate may accumulate in the lower super heater, a pipeline for delivering water to the water jacket and a pipe for delivering condensate from the lower super heater to said pipeline.

3. A steam boiler comprising a casing having a lower portion constituting water jacketed walls of a fire-box and an upper portion constituting walls of a heating chamber, transversely spaced tubes in the upper portion of the fire-box having ends communicating with the water jacket, and filled with water from the water jacket, super heaters in the heating chamber spaced one above another and communicating with each other, a nipple connecting the top of the water jacket with the lower super heater and projecting upwardly through the bottom thereof, a water line for delivering water to said water jacket, and a pipe leading from the lower super heater to said pipe line and communicating with the said super heater at the level of the upper end of said nipple.

JOHN R. EVANS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,576,646	Farmer	Mar. 16, 1926
158,755	Taylor	Jan. 12, 1875
930,140	Bosley	Aug. 3, 1909