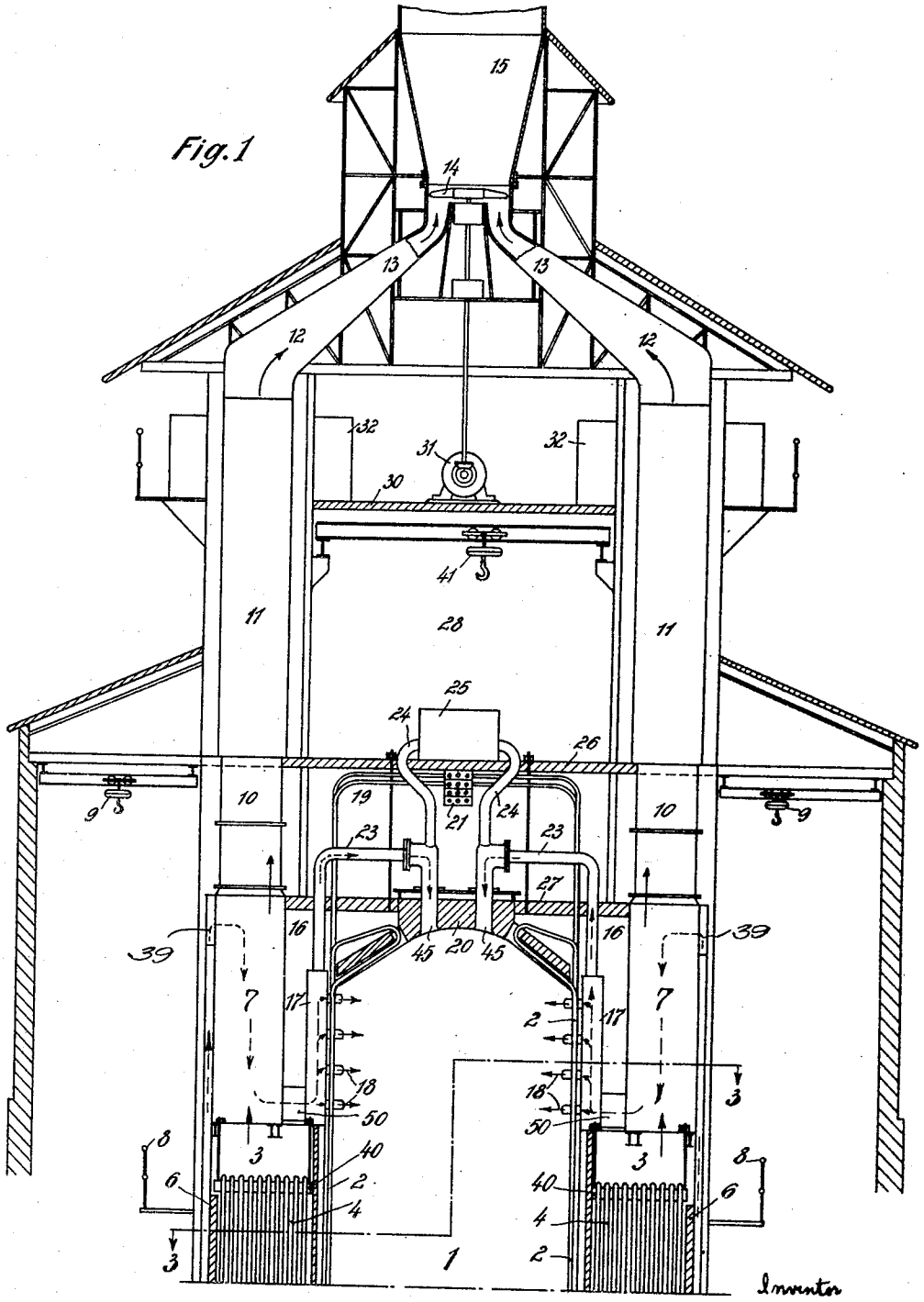
June 30, 1931. M. EULE 1,812,472

PARTICULAR CONSTRUCTION OF TUBULAR BOILERS

Filed April 3, 1928 3 Sheets-Sheet 1

Fig. 1



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Filed April 3, 1928 3 Sheets-Sheet 2

Fig.2

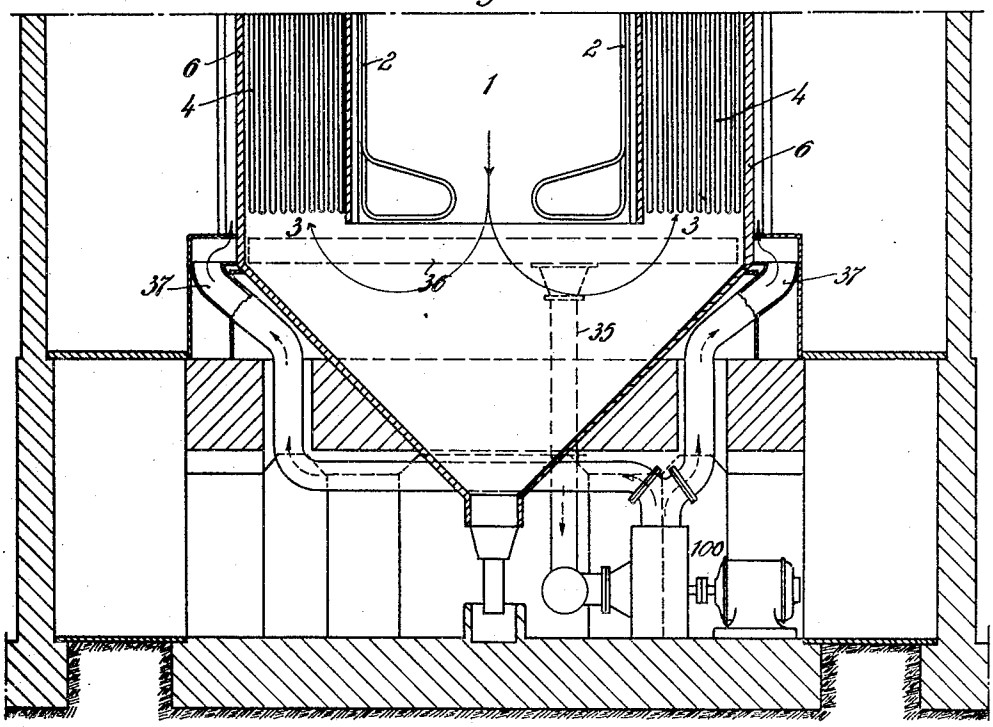
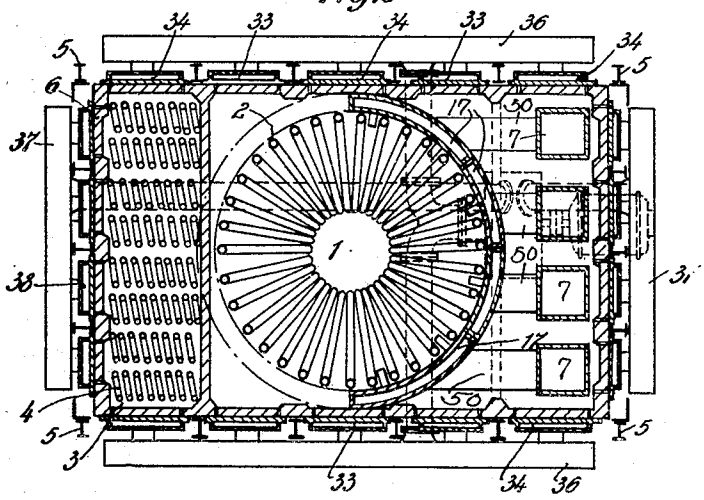


Fig.3



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Filed April 3, 1928 3 Sheets-Sheet 3

Fig. 4

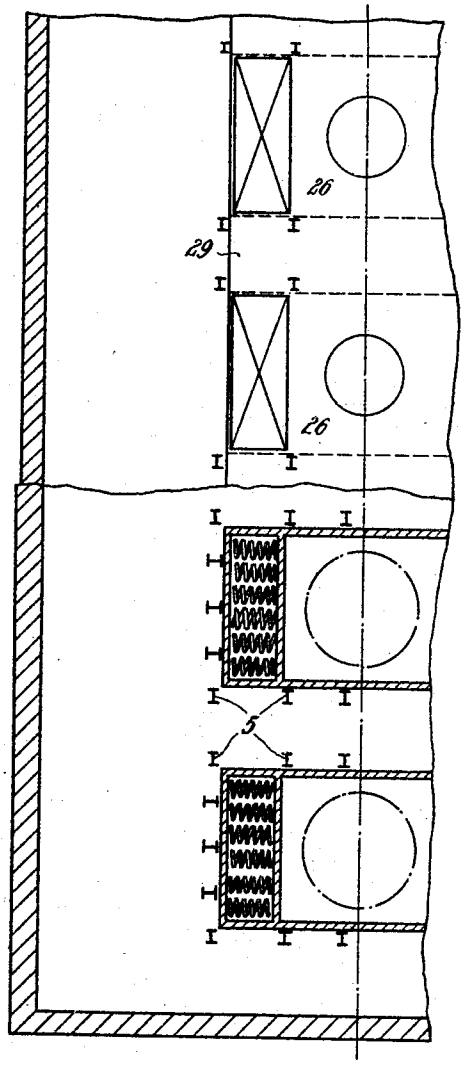
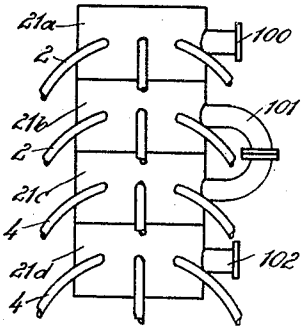


Fig. 5



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UNITED STATES PATENT OFFICE

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PARTICULAR CONSTRUCTION OF TUBULAR BOILERS

Application filed April 3, 1928, Serial No. 266,944, and in Germany April 8, 1927.

My invention refers to a particular construction of tubular boilers in the form of a vertical shaft which constitutes the fire box and contains therein the generator tubes, the superheater tubes arranged laterally on both sides of the shaft, so that the flue gases emanating from the fire box can pass between the superheater tubes.

My invention further involves additional features in connection with the arrangement of the superheater tubes, such as the air heaters and flue gas filters, whereby these elements can be arranged with respect to space as well as efficiency in the most economical manner.

According to my invention the superheater elements, such as the superheater tubes, are not arranged as heretofore in a circle around the entire shaft, but they are disposed in two chambers situated on two opposite sides of the shaft. From such a construction result a number of advantages. First of all, by the concentration of the many individual chambers heretofore used into only two lateral chambers, the entire construction of the boiler becomes simple. Furthermore, a boiler so constructed utilizes the ground area on which it stands most economically so that it can be very conveniently erected in a boiler house preferably in such a manner that the boiler structure itself forms all or a part of the boiler house structure.

The general idea underlying this novel arrangement is the desirability to arrange in this manner a number of boilers in a straight row, so that the main columns of the individual boilers constitute, at the same time, the main supports of the boiler house construction. Thereby the boiler house is divided into a main nave which contains the boilers and into two lateral naves in the upper structure of which travelling cranes can be very easily accommodated by which the superheated tubes can easily be conveyed when it is necessary to exchange them.

Directly vertically above the superheater tubes in the lateral chambers are disposed the air heaters and the flue gas filters. After leaving the filters, the flue gases are conducted towards the center of the structure, where they are conveyed through an exhaust fan into the common main flue.

My invention is illustrated in the accompanying drawings in which

Figures 1 and 2 represent together a transverse sectional elevation through the boiler house, assumed to contain a number of boilers,

Figure 3 represents a horizontal section through the boiler on the line 3—3, in Figure 1,

Figure 4 represents a horizontal section through the boiler house seen from the top, and

Figure 5 represents diagrammatically the distribution arrangement.

Referring more particularly to Figures 1 and 2, 1 represents the inner cylindrical boiler shaft which constitutes the fire box, and which has disposed around its inner wall the steam generating tubes 2. Fuel is supplied to the fire box from the top through burner nozzles 45 and any suitable fuel, such as oil or powdered coal and air, may be used. Consequently, the flue gases pass downward and escape laterally at the bottom of the shaft in the direction of the two semi-circular arrows.

Laterally of the shaft on diametrically opposite sides are arranged two chambers 3 within which the superheater tubes are suspended on transverse bars 40, which are pushed through the bent round portions of the tubes. These superheater pipes are built in sections so that individual sections can be removed. The entire supporting structure of the boiler and also of the entire boiler house comprises the main columns 5 (see also Figure 3), which are spaced a certain distance from the boiler proper. The spaces

between the individual columns are closed by removable double wall doors 6 and 34, which can be individually removed as shown so that the individual superheater sections can be laterally withdrawn and carried away by the overhead crane 9. Chambers 3 extend above the superheaters 4 and contain in their upper portions the air heaters or heat exchangers 7. These air heaters may be constructed in any suitable manner. In a preferred construction a plurality of plates are arranged in a box, the air flowing along one side of said plates and the flue gases along the other.

Chambers 3 are open at the bottom so that the flue gases emanating at the bottom of the fire box 1 can enter, and the flue gases rise in chambers 3, passing between the superheater coils 4 and thence passing through the air heater 7 in each chamber where the heat is given up to the air entering the heaters at the top at 39.

The walls 6 of chambers 3 are removable also at the places where the air heaters 7 are located, so that the individual units of which these heaters may be composed may be laterally removed by the overhead crane 9 in most convenient manner. The details of these air heaters 7 are omitted in the cross-section through chamber 3 in Fig. 3. They may be of any approved type of heat exchanger and they are shown in section only by squares connected with the hot air boxes 17 to be described later.

Above the air heaters are disposed connecting ducts 10 which lead the flue gases further up into the flue gas filters 11 of any suitable construction, the great advantage of the entire construction as shown being that in such an arrangement these flue gas filters can follow almost immediately the air heaters, whereby the connecting conduits 10 can be made extremely short. Furthermore, since the flue gases are distributed as uniformly as possible over the entire cross-sectional area by the air heaters by virtue of their construction, it becomes very easy to thus uniformly distribute the flue gases over the entire cross-section of the flue gas filters without employing separate distributing ducts which are otherwise necessary when the flue gas filters are far removed from the heaters.

The flue gases emanate at the top of the filters 11, whence they are conducted by conduits 12 towards the center of the boiler roof, whence they are delivered by the exhaust fan 14 into the stack 15.

When the air heaters 7 are arranged in the continuation of the chambers 3 as shown, spaces 16 remain between each air heater and the central boiler shaft. In these spaces are disposed the hot air boxes 17 into which the air heated in heaters 7 is delivered from the bottom in the direction of the dotted arrow line shown in the drawings. Hot air boxes 17, as shown in the drawings are connected through ducts 50 with the air heaters 7 and through air nozzles 18 with the upper portion of the fire box and thus deliver part of the air into the fire box to aid the combustion. The remainder of the air passes from each box upwards through conduits 23 which lead to the burner 45, where it is mixed with the fuel, for instance pulverized coal supplied from the common supply chamber 25 through pipes 24.

The fire box is covered by the dome 20 which on its upper side is approximately in line with the floor 27. The space on this floor enclosed at the two ends by the flue gas conduits 10 contains the connections between the air supply conduits 23 and burners 45 and further the steam pipe manifolds 21, one of which is diagrammatically illustrated in Figure 5 on an enlarged scale. It consists of individual sections 21^a, 21^b, 21^c, 21^d, separated from one another. The feed water is supplied to the section 21^a through the branch 100 and is there distributed over the individual parallel tubes 2. The steam generated in the individual tubes flows to the section 21^b, is there collected and is conducted to the section 21^c through the tube 101, where it is distributed over the superheater tubes 4. The superheated steam flows from the superheaters into the section 21^d and is discharged therefrom through the branch 102.

The space 28, between the flue gas filters 11 can be used as a room for the operators. Above the space 28 in each individual boiler structure is provided a floor 30 on which are mounted the necessary accessory apparatus and machinery, such as the motor 31, which drives the exhaust fan 14, previously mentioned, and also the electrical apparatus indicated by 32 which may be required in case electric flue gas filters are used.

The air spaces provided in the hollow double wall doors which are formed in the vertical chambers 3, and in the walls, immediately adjacent to the boiler shaft, such as 33 and 34, afford the opportunity of cooling all the outer walls of the boiler up to the height of platform 26 by the air passing through the hollow spaces, which air can then be most conveniently used as combustion air, which is supplied to the air heaters 7 through entrance ports 39, previously mentioned. For this purpose this cooling air is conducted as follows. The air enters the boiler walls at 33 of doors 34 about at the level of platform 26. Thence, the air is drawn through the jackets downward by the ventilator 100, arranged at the base of the boiler, where the air from the cooling spaces joins in the header 36, this header leading through the duct 25 to the ventilator, thence the air is delivered by the ventilator through duct 37 to the hollow spaces provided in the doors 6 which close the superheated chambers. The air rises in these spaces 38 and

enters at 39 the air heaters 7 as previously described. There the air is finally heated by the flue gases and, as previously described, is delivered into the hot air boxes 17, where it passes in the fire box through nozzles 18, and part of it passes to the burners through conduits 23 as also previously described.

I claim:

1. A tubular boiler composed of a vertical shaft heated from the top and containing the generating tubes, two vertical casings disposed on opposite sides of the shaft, each casing containing in its lower portion superheating tubes and in its upper portion an air heater, means for conducting the flue gases in a single reversal of direction from the shaft bottom into the lower portion of each vertical casing whereby the gases traverse seriatim the superheater and air heater contained therein, before they are discharged from the boiler.

2. A tubular boiler of substantially rectangular cross-section, containing a vertical shaft heated from the top and enclosing generating tubes, two vertical casings disposed on opposite sides of the shaft, each casing containing in its lower portion superheating tubes and in its upper portion an air heater, passages between the lower portion of the vertical shaft and the lower portion of each vertical casing, arranged for passing the gases seriatim through the superheater and air heater contained therein, before they are discharged from the boiler, the two opposite outside walls directly adjacent to the shaft being hollow and air cooled, the cooling air entering on top of these walls, a ventilator at the bottom of the boiler, drawing said air to the bottom, an air jacket separating the superheater casing from the outside, conduits for conducting the air from said ventilator to said jackets, means for conducting the air from said jackets to the air heaters and means for conducting the air heated therein to said boiler shaft for combustion purposes.

3. A vertical boiler having a central vertical combustion chamber and vertical superheaters arranged laterally and on opposite sides of said chamber, the boiler having four jacketed outside walls, one pair of opposite walls being adjacent to the combustion chamber and the other pair adjacent to the superheaters, a forced draught fan arranged at the bottom of the boiler and being connected with said wall jackets to draw combustion air downward through the jackets of the pair of walls adjacent to the combustion chamber, and to force said air upwards through the wall jackets adjacent to the superheaters and means for delivering the heated air from the last-named wall jackets to said combustion chamber.

4. A plurality of tubular vertical boilers arranged within a common housing and in a row, said boilers having support structures which extend above and beyond the boilers proper and support at the same time a part of the roof structure of said housing, said part of the roof structure being so far above the other parts of the roof structure of the housing that a separate elevated aisle is formed.

In testimony whereof I affix my signature.

MARTIN EULE.