

E. H. FOSTER.
STEAM SUPERHEATING APPARATUS.
APPLICATION FILED OCT. 28, 1909.

1,047,027.

Patented Dec. 10, 1912.

4 SHEETS—SHEET 1.

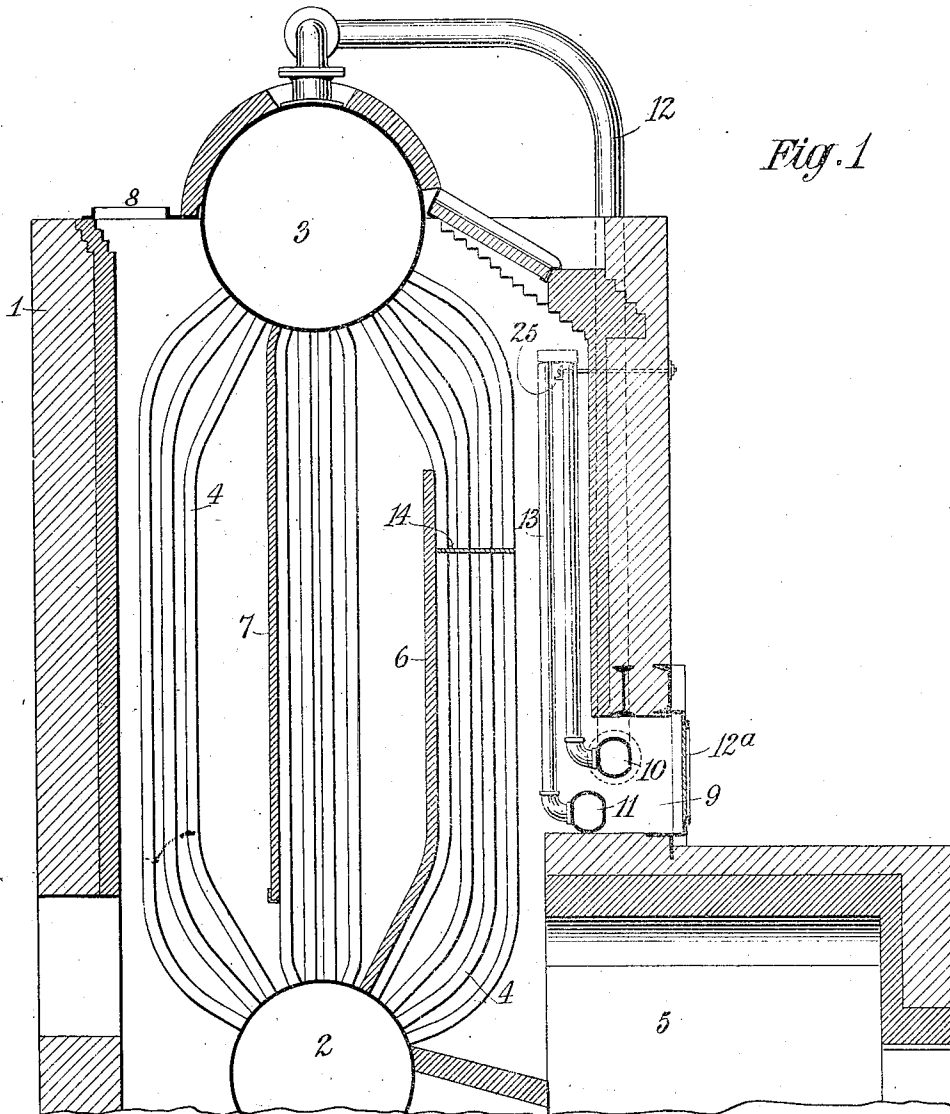


Fig. 1

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A. Dunham

E. H. Foster Inventor
By his Attorneys
Rev. Paul Cooper & Hayward

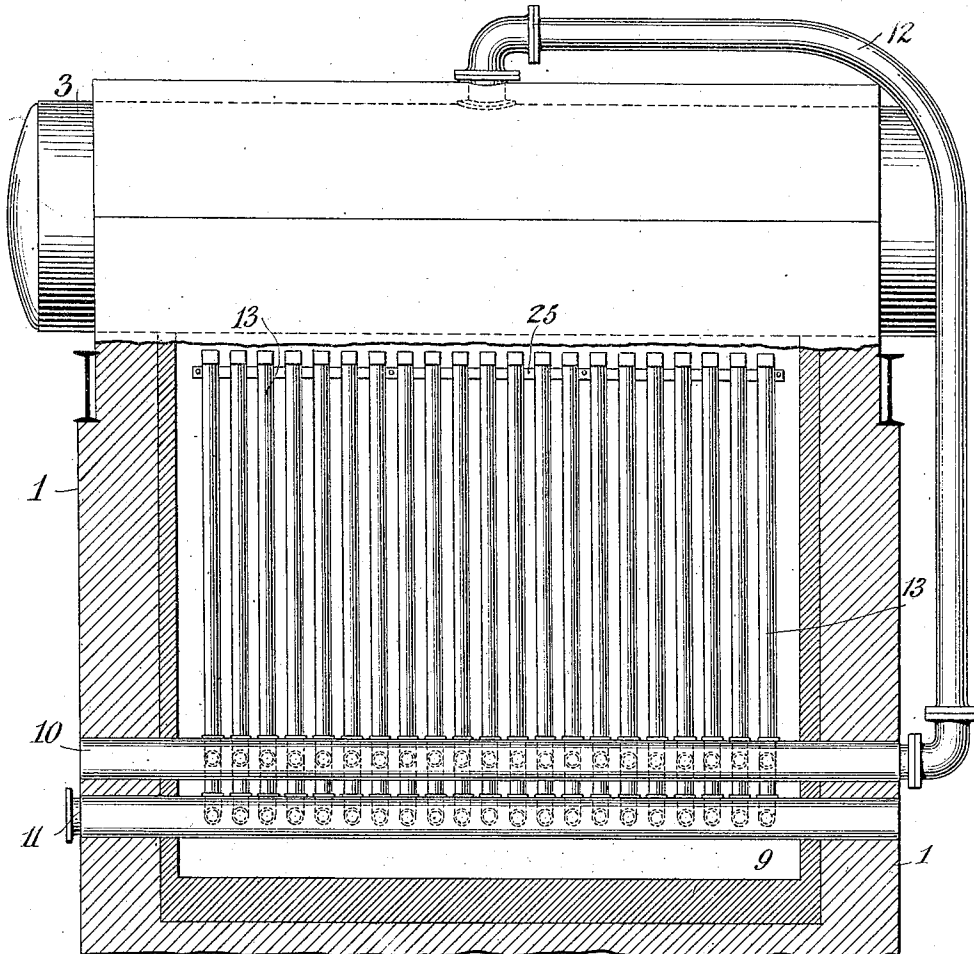
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4 SHEETS—SHEET 2.

Fig. 2



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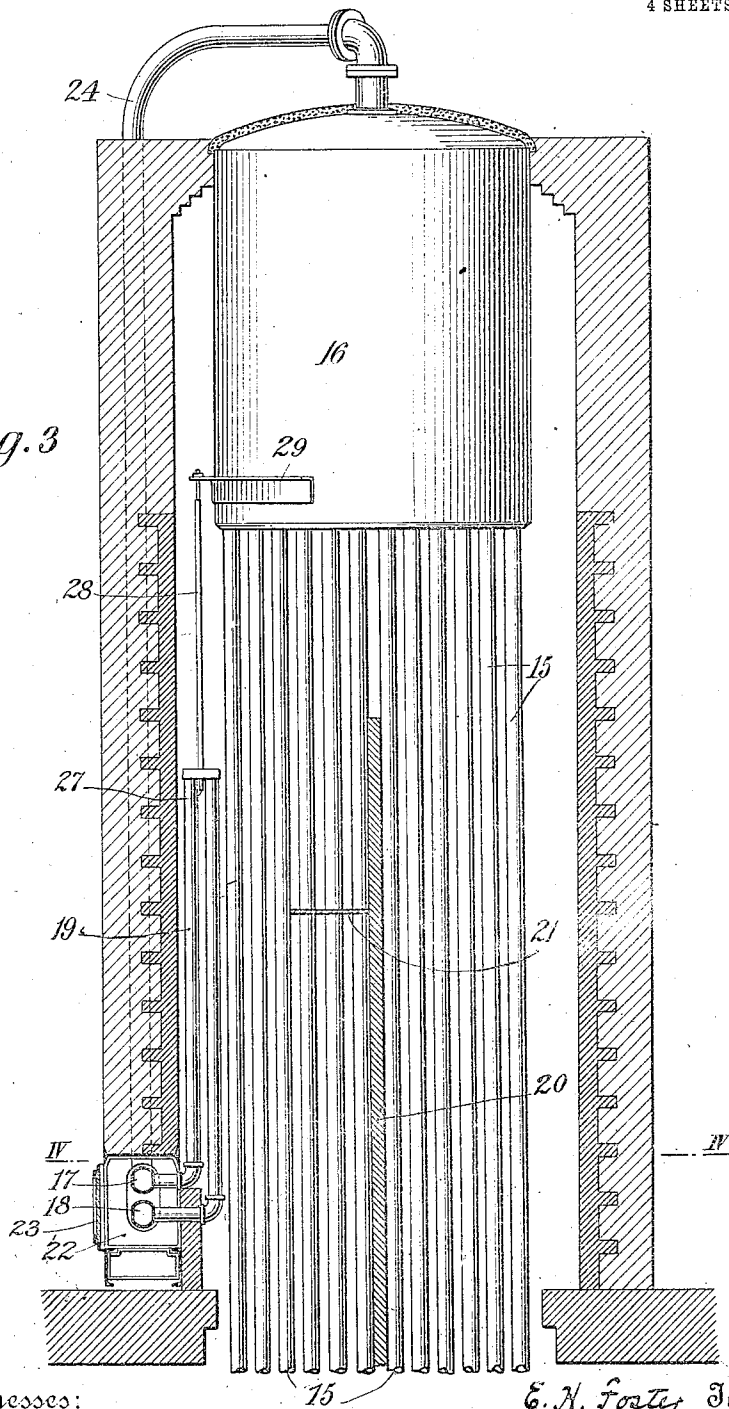
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4 SHEETS—SHEET 3.

Fig. 3



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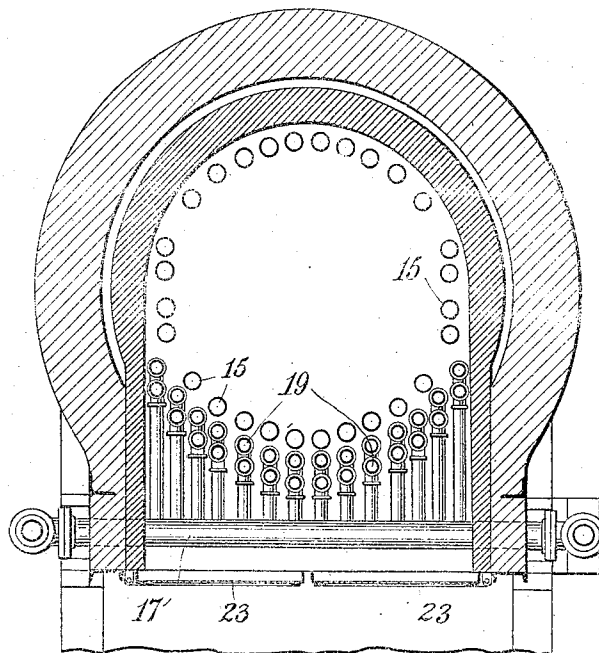
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4 SHEETS—SHEET 4.

Fig. 4



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UNITED STATES PATENT OFFICE.

ERNEST H. FOSTER, OF NEW YORK, N. Y.

STEAM-SUPERHEATING APPARATUS.

1,047,027.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed October 28, 1909. Serial No. 525,085.

To all whom it may concern:

Be it known that I, ERNEST H. FOSTER, a citizen of the United States, residing at New York, county of Richmond, and State of New York, have invented certain new and useful Improvements in Steam-Superheating Apparatus, of which the following is a full, clear, and exact description.

This invention relates to steam superheating apparatus, more particularly for steam boilers of the type in which the boiler-drums, arranged one vertically above the other, are connected by vertical water-tubes.

So far as I am aware, the schemes heretofore proposed, for boilers of the special type referred to, have not been as successful in practice as hoped for, and I have therefore been led to devise my present invention, which has for its chief object to provide for the purpose a superheating apparatus which shall be efficient in operation, and also convenient in arrangement and position so as to permit ready access for inspection, repair, etc.

To these and other ends the invention consists in the novel features of construction, arrangement of parts, and combinations of elements hereinafter described, and more particularly set forth in the appended claim.

In the annexed drawings I have illustrated, somewhat diagrammatically, a convenient and effective embodiment of the invention, in connection with boilers of the generic type mentioned, and referring now thereto, Figure 1 is a vertical section, showing the superheater applied to a boiler in which the boiler tubes occupy a space which is plane or flat at the front, next to the superheater; the boiler-drums being arranged with their axes horizontal. Fig. 2 is a front view of the same, with the front wall of the boiler-setting removed. Fig. 3 is a vertical section showing the superheater applied to a boiler in which the boiler-tubes occupy a space which is more or less cylindrical, or curved, toward the superheater; the upper drum alone being shown, arranged with its axis vertical. Fig. 4 is a horizontal section, on line IV-IV of Fig. 3.

The boiler setting in Figs. 1 and 2 is designated by 1, and incloses the boiler drums, the lower or "mud" drum being designated by 2 and the upper or steam drum by 3. Between the drums are the vertical water-tubes 4, which, it will be observed, approach closely to the front and rear walls of the

setting. At the front, adjacent to the lower drum, is the boiler furnace, 5. Extending upwardly from the lower drum, and downwardly from the upper, are two baffles, 6 and 7 respectively, so that the course of the gases from the furnace will be upward in front of the first baffle, downward between the two, and upward in rear of the second baffle, the gases thence flowing through the opening 8 to the stack.

In the front wall of the setting is a horizontally disposed chamber 9, in which the horizontal inlet and outlet headers, 10 and 11 respectively, of the superheater, now to be described, are arranged. By preference the headers extend entirely across the boiler-setting, so that the connection of the inlet header with the steam-supply pipe 12, by which steam is delivered to the header from the upper drum, and the connection of the outlet header with the steam line, can both be made outside of the setting, as shown. At the front of the header chamber is a suitable closure, as a door 12^a, which can be opened to afford access to the interior of the chamber.

The U-shaped superheating elements or tubes 13, connecting the headers, extend rearwardly and upwardly therefrom, and occupy the relatively narrow space between the front row of boiler tubes and the front wall of the setting. These elements may be of any approved construction, but are preferably of the type described in my prior Patent No. 744,323, issued Nov. 17, 1903, and the patent of L. B. Nutting, No. 921,878, issued May 18, 1909. At a suitable point, say about half-way up the superheating elements, is a baffle 14, extending horizontally and forwardly from the front vertical baffle 6, the function of the horizontal baffle being to deflect the upwardly flowing furnace gases into and among the said elements, which are thus effectively subjected to the hot products of combustion before the latter have given up much of their heat to the boiler.

In the type of boiler illustrated in Figs. 3 and 4 the front row of boiler tubes, 15, is curved, and the axis of the upper drum, 16, is vertical. However, instead of being curved the headers, 17 and 18, are preferably straight, as shown, in which case the horizontal portions of the superheating tubes or elements 19 are graded in length, as illustrated, to bring the vertical portions

within the cylindrical boiler-setting and into conformity with the curved space between the front row of boiler tubes and the forward part of the setting. In the midst of the boiler tubes is an upwardly extending baffle 20, and extending therefrom toward the front is a horizontal baffle 21, for the same purpose as the corresponding baffle in the arrangement illustrated in Fig. 1. The header chamber 22 is also of the same general type as the chamber 9, and is provided with one or more doors, as 23, to afford access to the interior when desired. The inlet header, 17, is connected to the drum 16 by a steam supply pipe 24.

In the construction shown in Fig. 1, the superheating tubes are supported in vertical position by a transverse box or angle 25, mounted on the inner ends of suitable rods or bolts 26 extending through the front wall of the setting, and in Fig. 3 the desired support is afforded by a curved member or bar 27, suspended by hangers 28 from a bracket 29 on the drum 16. Each header may be provided with a draincock, not shown, for convenient drainage of water therefrom.

The operation in both the constructions described is apparent. The steam, delivered to the inlet header through the steam supply pipe, flows through the superheating tubes and is in its course subjected to the heat of the furnace gases. Being in the first pass of the boiler, the temperature encountered by the superheater is high, so that an effective degree of superheat is assured. From the outlet header the steam flows to the steam line and thence to the point of utilization. The superheater occupies a minimum amount of space, in fact it occupies practically only what would otherwise be

waste space, only slight recessing or advancing of the front wall of the setting being necessary, if at all. Although the superheating tubes themselves are subjected to high heat, as before stated, the headers are out of the direct current of the gases and hence the header joints are not subjected to injurious temperatures.

While the structures illustrated are the preferred forms, it is to be understood that the invention is not limited thereto, but may be embodied in other forms without departure from its proper spirit and scope as defined by the appended claim.

What I claim is:

The combination of a steam boiler, comprising upper and lower drums connected by vertical boiler tubes, a curved boiler setting having its front wall adjacent to the boiler tubes and having a furnace in the lower end thereof, a superheater comprising substantially straight inlet and outlet headers located in a chamber in said front wall and without the path of the hot gases, horizontal tubes of graded length connected to and extending inward from said headers, substantially U-shaped vertically extending superheating tubes connecting said horizontal tubes, the length of the aforesaid horizontal tubes being such that the superheating tubes are in the path of the hot gases at the outside edge of the boiler tubes, and means for deflecting the hot gases passing from the furnace among said superheater elements.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

ERNEST H. FOSTER.

Witnesses:

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S. S. DUNHAM.