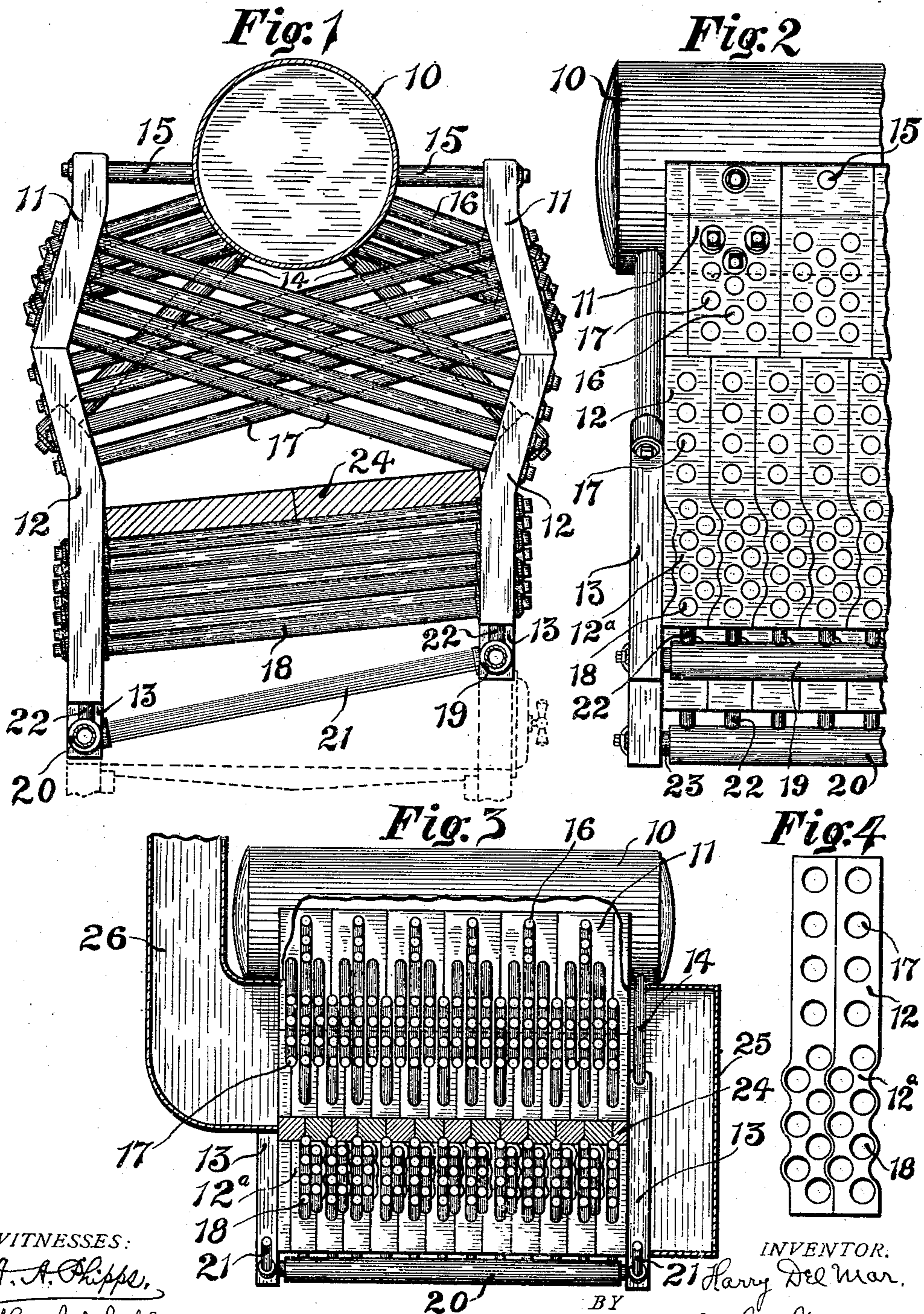


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PATENTED JAN. 29, 1907.

H. DEL MAR.
WATER TUBE BOILER.
APPLICATION FILED JULY 11, 1906.



WITNESSES:
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HARRY DEL MAR, OF NEW YORK, N. Y., ASSIGNOR TO BOILERS AND ENGINEERING COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

WATER-TUBE BOILER.

No. 842,633.

Specification of Letters Patent.

Patented Jan. 29, 1907.

Application filed July 11, 1906. Serial No. 325,629.

To all whom it may concern:

Be it known that I, HARRY DEL MAR, of the city, county, and State of New York, have invented a new and Improved Water-
5 Tube Steam-Boiler, of which the following is a full, clear, and exact description.

My invention relates to improvements in water-tube steam-boilers; and the object of my invention is to produce a sectional wa-
10 ter-tube boiler having tubes arranged in cross-sectional series diagonally opposed, in combination with a set of staggered tubes running between the lower headers, and to baffle the gases, so as to consume the prod-
15 ucts of combustion, reduce the temperature of the flue-gases, and produce steam economically and rapidly. In carrying out this arrangement I further make the upper headers relatively wide, or double the width of the
20 lower headers, so as to admit of three rows of tubes, and the lower headers are partly straight and partly bent, so as to admit of a series of tubes in staggered relation, all to the end that an efficient and simple boiler may be
25 produced.

To these ends my invention consists of certain features of construction and combinations of parts, which will be hereinafter described and claimed.

30 Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a sectional end elevation of the
35 boiler embodying my invention. Fig. 2 is a broken side elevation of the same. Fig. 3 is a broken vertical section at right angles to the view taken in Fig. 1, and Fig. 4 is a detail of a preferred form of lower header.

40 The boiler is provided with a steam-drum 10, and its sides are formed, essentially, of the upper and lower headers 11 and 12, while at the corners are the water-legs 13, which connect with the steam-drum 10 by the down-
45 flow-pipes 14. The upper headers 11 are relatively wide, so as to admit of three rows of tubes, as shown in Fig. 2, and they connect with the steam-drums by the tubes 15 and also by the inclined tubes 16, which are
50 arranged between the rows of tubes 17, and these are of the cross-sectional type and are diagonally arranged, so as to extend from the upper headers 11 to the lower opposed headers 12. Each lower header 12 is straight on

the sides at its upper part, and at the lower
55 part it is serpentine or bent, as shown in Figs. 2 and 4 and preferably as in Fig. 4, as this form of bend permits the cross-tubes 18 to be perfectly staggered, so as to utilize all the
60 rising heat.

The boiler is provided with suitable mud-
drums 19 and 20, those shown being small; but obviously they may be large, and the
65 rear mud-drum 20 can be made large enough to take the place of the lower parts of the headers 12, if desired. The mud-drums are connected by the tubes 21, and they connect
70 with the headers above them by the tubes 22 and with the water-legs by the nipples 23. (See Fig. 2.)

Just above the tubes 18 is a baffle 24,
which extends across the boiler and for its full length, and this baffles the gases, so that they pass into the combustion-chamber 25 at
75 one end of the boiler, from which they can pass back between the upper tubes 16 and 17 and finally pass out through the stack 26.

It will be seen that this makes an arrange-
80 ment in which the heat from the products of combustion is utilized to good advantage and that the boiler is of simple construction for a water-tube boiler. The baffle can be differently arranged, if desired, and the baf-
85 fle may be omitted without affecting the invention, and likewise the bent or serpentine part of the header can be made in a different part, if preferred.

Having thus fully described my invention, I
90 claim as new and desire to secure by Letters Patent—

1. A cross-tube sectional boiler having up-
per and lower headers on each side of the boiler, an upper series of cross-tubes, and a lower series of staggered tubes running par-
95 allel with the cross-section series and from a point below the series of cross-section tubes.

2. A cross-tube sectional boiler having up-
per and lower headers on each side of the boiler, cross-tubes connecting the upper
100 headers to the upper parts of the lower headers opposite, and the lower part of the lower headers having bent or serpentine portions with tubes arranged in a staggered position therein, said tubes connecting the lower part
105 of the lower headers on one side of the boiler with the lower part of the lower headers on the opposite side of the boiler.

3. A cross-tube sectional boiler having up

per headers and upper cross-tubes, the latter arranged one directly over the other, in combination with a series of lower headers, each having the lower portion bent or serpentine 5 and with cross-tubes arranged in a staggered position and connecting the lower parts of the lower headers on opposite sides of the boiler.

4. A boiler of the kind described having 10 upper and lower headers on opposite sides of the boiler, the lower headers having the upper half with tubes arranged in a single series one over the other, and the lower half serpentine or corrugated, with the cross-tubes connecting said serpentine portion, the said 15 tubes being in staggered position.

5. In a boiler of the kind described, the combination with the upper cross-sectional series of tubes and the lower staggered series 20 of tubes, of the baffle between the upper and lower series.

6. In a boiler of the kind described, the combination of an upper cross-sectional se-

ries with tubes arranged one directly over the other, with a lower series of staggered tubes, 25 and the baffle between the upper and lower series of tubes.

7. In a boiler of the kind described, a header having means for receiving a single series of tubes in its upper portion, which is 30 straight, and constructed to receive a double series of tubes in staggered relation in its lower portion, said lower portion being bent or serpentine.

8. In a boiler of the kind described, the 35 combination of an upper series of cross-tubes, one directly over the other, a lower series of staggered tubes beneath the said cross-tubes, a baffle between the two series of tubes, and upper and lower headers on opposite sides of 40 the boiler, connecting the upper and lower series of tubes.

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