

No. 844,713.

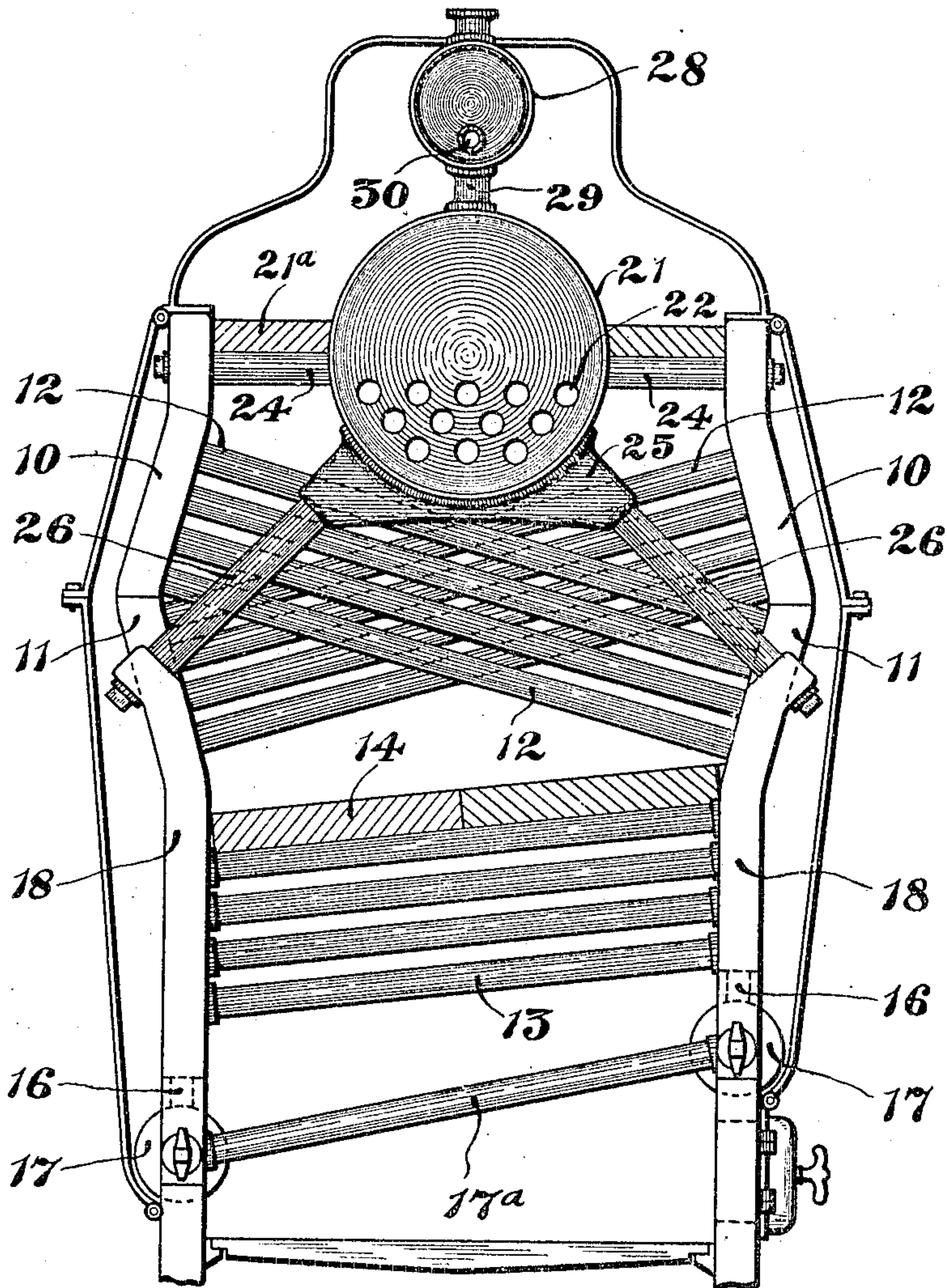
PATENTED FEB. 19, 1907.

H. DEL MAR.  
WATER TUBE STEAM BOILER.

APPLICATION FILED DEC. 3, 1906.

2 SHEETS—SHEET 1.

**Fig. 1**



WITNESSES:

Frank L. Stubbs.  
Ralph Lancaster.

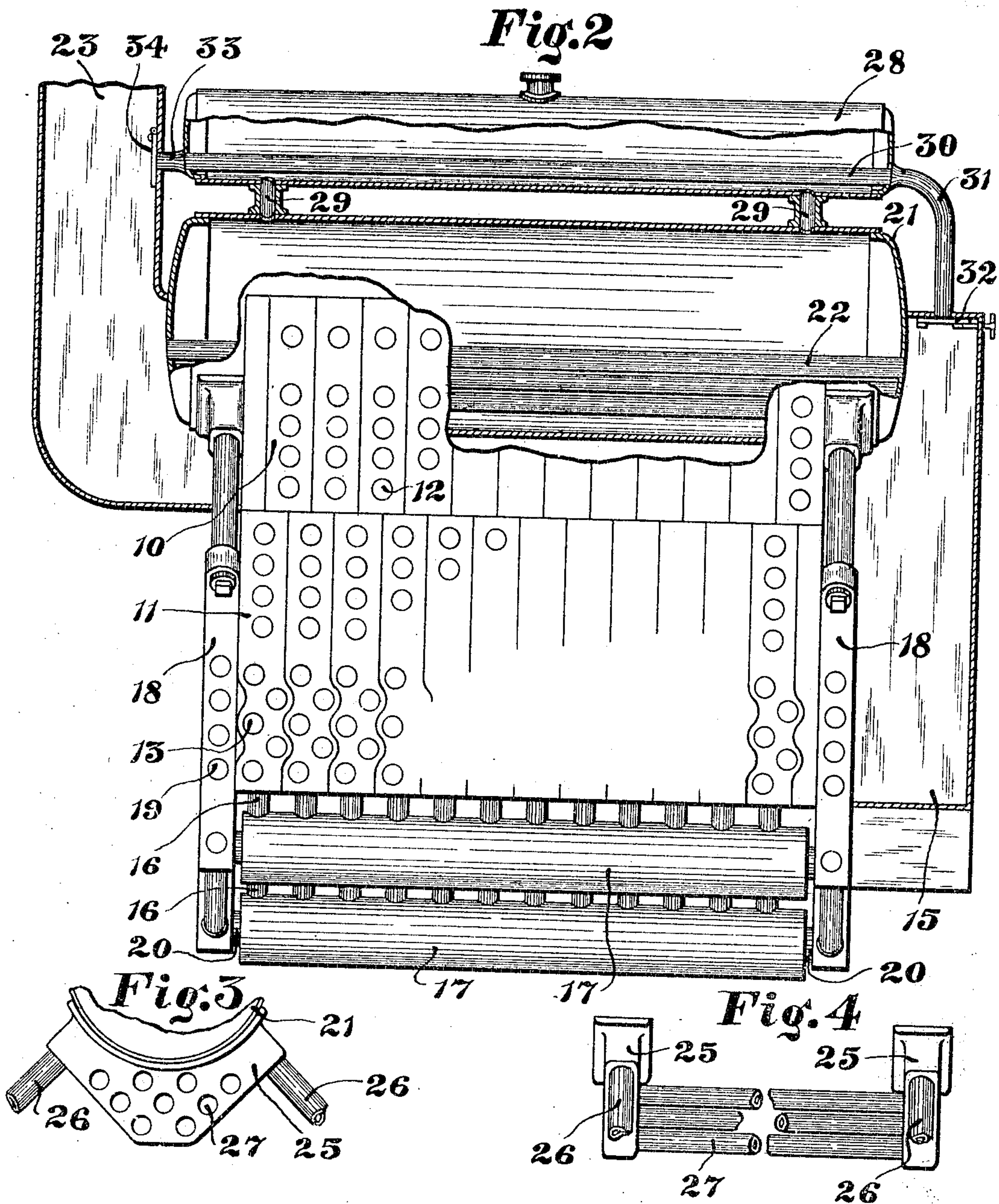
Harry Del Mar. INVENTOR.  
BY W. B. Hutchinson. ATTORNEY.

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ATTORNEY.



# UNITED STATES PATENT OFFICE.

HARRY DEL MAR, OF NEW YORK, N. Y.

## WATER-TUBE STEAM-BOILER.

No. 844,713.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed December 3, 1906. Serial No. 345,981.

*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 cross-tube sectional water-tube steam-boilers, and the object of my invention is to produce a  
10 boiler of this type which is arranged so that the gases of combustion are consumed to a great extent before entering the outlet-flue, and I aim also to get the best results by arranging the tube series so that the gases pass  
15 through a series of staggered tubes, thence to a combustion-chamber, thence over a second series of cross-tubes, and through a set of firm tubes arranged in the upper water and steam-drum. By this arrangement of the tube series the temperature of the flue-gases is reduced to a minimum.

One great objection to cross-tube sectional water-tube boilers is the high flue temperatures. The gases are not baffled to the best  
25 advantage, but pass up through the tubes and are not consumed after passing over the lower series of tubes, so that a high flue temperature is the result, and this means a great loss of heat and consequent bad economy.  
30 By my invention I aim to utilize the heat to practically the best extent.

With these ends in view my invention consists of certain features of construction and combinations of parts, which will be herein-  
35 after described and claimed.

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 figures.

40 Figure 1 is a vertical cross-section of the boiler embodying my invention. Fig. 2 is a longitudinal section with parts in elevation. Fig. 3 is a broken detail elevation showing a slightly-modified arrangement of the water-legs and connections below the water and  
45 steam drum, and Fig. 4 is a broken side elevation showing the aforesaid water-legs and connections.

The sides of the boiler are made up of upper  
50 and lower headers 10 and 11, which can be of any approved construction so far as this particular invention is concerned, but which I prefer to have as shown in Fig. 2, staggered in relation to each other and with the lower  
55 parts of the lower headers serpentine. The

upper headers connect with the upper parts of the lower headers by cross-tubes 12, and the lower parts of the lower headers connect by a second series of cross-tubes 13, the upper and lower series being separated by a baffle  
60 14, which deflects the rising products of combustion into the combustion-chamber 15, which discharges into the upper part of the boiler-casing and over the tubes 12. Obviously the combustion-chamber 15, which is  
65 not broadly new, can be arranged on either end of the boiler, according to circumstances.

When the boiler is constructed with less than five tubes, one above the other, the combustion-chamber or flue is preferably  
70 placed on the rear end, and when there are more than five tubes, one above the other in series, it is better to have the flue on the front end of the boiler. The lower headers connect, as shown at 16, with mud-drums 17,  
75 and these are connected together by cross-tubes 17<sup>a</sup>. The boiler has vertical water-legs 18 at the corners, which connect by tubes 19 and which are connected also to the mud-drums, as shown at 20.  
80

The most important features in my invention are shown near the top of the boiler and comprise in part the water and steam drum 21, which has extending through it a series of  
85 fire-tubes 22, which connect with the combustion-chamber or flue 15 and with the stack 23. I have shown the drum 21 having these fire-tubes in the lower half only; but obviously they may extend through the upper  
90 part of the drum as well, if it is found desirable. The drum 21 connects with the upper parts of the headers by tubes 24, and underneath the drum, and preferably near the  
95 ends, are water-legs 25, which connect directly with it and which connect by tubes 26 with the upper parts of the water-legs 18. The top 21<sup>a</sup> of the boiler comes opposite the drum 21. As shown in Fig. 1, the water-legs  
100 25 are not connected; but they can be connected, if desired, by tubes 27, extending parallel with the drum 21, as shown in Figs. 3 and 4.

Above the water and steam drum 21 is a steam dome or superheater 28, which connects with the drum 21 by the pipes 29, and a  
105 fire-tube 30 extends longitudinally through the dome 28, this tube connecting at one end by the pipe 31 with the flue or chamber 15, and the passage through the pipe is controlled by a suitable damper 32, so that a portion of  
110



the products of combustion can be permitted to pass through the pipes 30 or not, as is found desirable. The tube 30 connects, as shown at 33, with the stack 23, and a flap-damper 34 can be provided to close the discharge into the stack. The whole boiler can be covered with a suitable casing, as shown in Fig. 1.

From the foregoing description it will be seen that I conserve the heat from the fire to the greatest extent, that the rising gases pass through the tube 13, through the flue 15, back over the tubes 12 and fire-tubes 22, and that, if desired, a part of the gases may pass through the tube 30, so that when the smoke enters the stack the heat has been pretty nearly utilized. It will be seen also that the boiler has its parts readily accessible. It will also be understood that the superheater 28 can be dispensed with, if desired, and that the drum 21 can be used without the fire-tubes and the steam-drum, or it can be used as shown and the steam taken direct from the upper part of the drum without using the superheater or dome 28.

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

1. A cross-tube sectional boiler having side headers, a series of cross-tubes connecting the opposed headers, a steam-drum to contain steam and water and lying above the cross-tubes, connections between the steam-drum and the headers, and a baffle above the tubes leading from the steam-drum to the headers.

2. A cross-tube sectional water-tube boiler, having in combination a series of headers forming the boiler sides, cross-tubes connecting the opposed headers, a drum to contain steam and water, the said drum lying above the series of cross-tubes, fire-tubes extending longitudinally through the drum, connections between the drum and the upper parts of the headers, and downtake-pipes leading from the drum to the lower part of the boiler circulation system.

3. A cross-tube sectional water-tube boiler, having a steam-drum included in the circulation system and provided with longitudinal fire-tubes, a steam-dome above and connected with the steam-drum, and means for diverting a part of the products of combustion

into a tube extending longitudinally through the steam-dome.

4. In a boiler of the kind described, the combination of the steam-drum included in the boiler circulation, the steam-dome connected with the steam-drum and having a fire-tube therethrough, and a connection between the fire-tube of the steam-dome, and the furnace whereby the products of combustion may be diverted through the fire-tube.

5. In a boiler of the kind described, the combination of the steam-drum connected with the boiler circulation, the steam-dome connected with the drum and having a fire-tube therethrough, and a damper-controlled flue leading from the combustion-chamber of the boiler to the fire-tube of the steam-dome.

6. In a boiler of the kind described, the combination of the steam-drum, the mud-drums, the corner water-legs connected to the mud-drums, the water-legs beneath the steam-drum, and connections between the last-named water-legs and the corner water-legs.

7. In a boiler of the kind described, the combination with the steam-drum, the corner water-legs, and the mud-drums connected with the corner water-legs, of water-legs underlying the steam-drum and connected therewith, tube connections between the said underlying water-legs, and tube connections between the said underlying water-legs and the corner water-legs.

8. A boiler of the kind described, comprising upper and lower opposed headers, upper and lower series of cross-tubes connecting the headers, a baffle between the upper and lower series of cross-tubes, a combustion-chamber leading from below the baffle and discharging above the baffle, a steam-drum having fire-tubes therethrough, said fire-tubes connecting with the combustion-chamber, water-legs at the corners of the boiler, mud-drums connected with the water-legs and with the lower headers, water-legs underlying the steam-drum and connected therewith, and connections between the last-named water-legs and the corner water-legs.

HARRY DEL MAR.

Witnesses:

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