

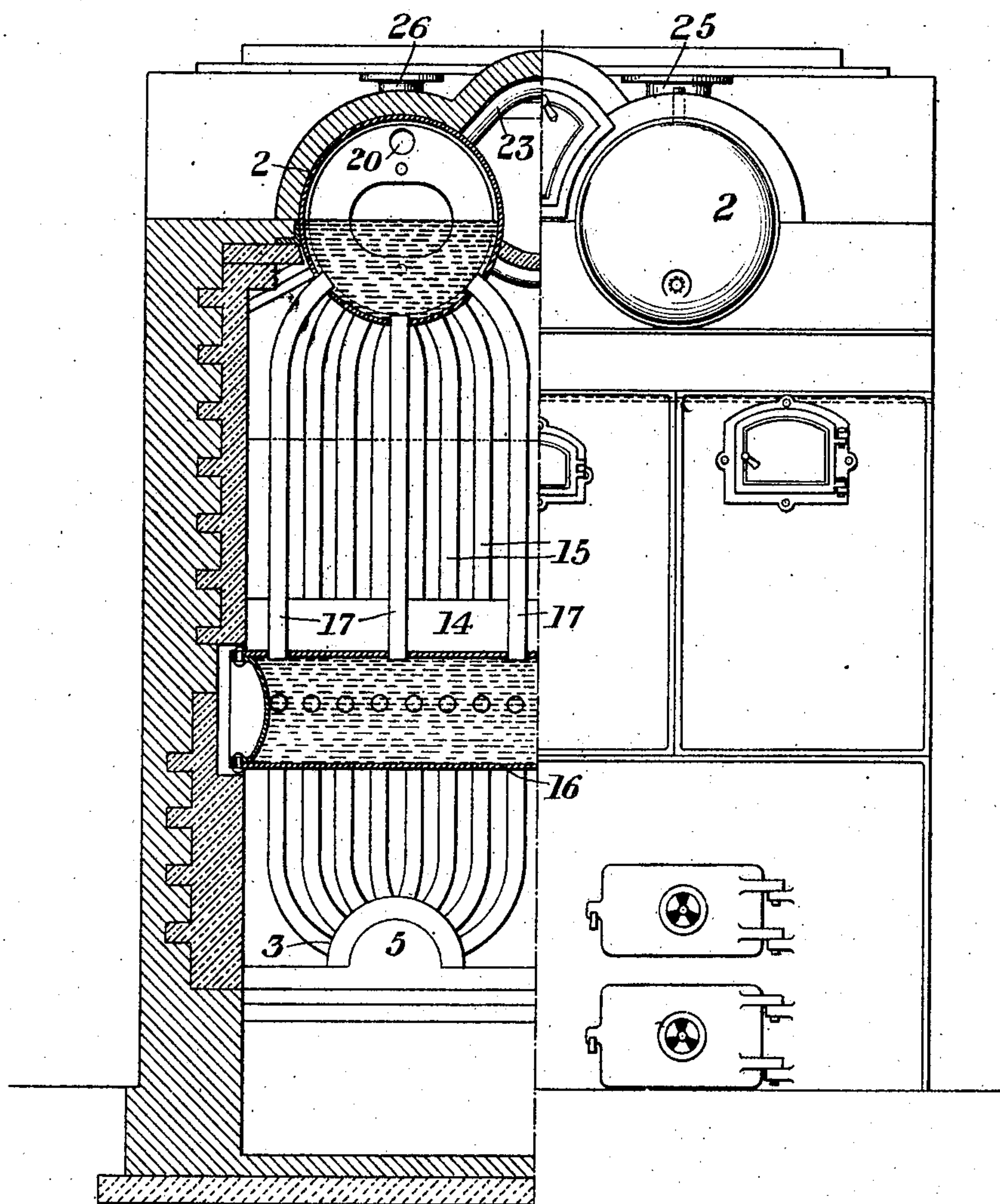
No. 846,737.

PATENTED MAR. 12, 1907.

W. S. ELLIOTT.
WATER TUBE BOILER.
APPLICATION FILED SEPT. 14, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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Warren W. Swartz

INVENTOR

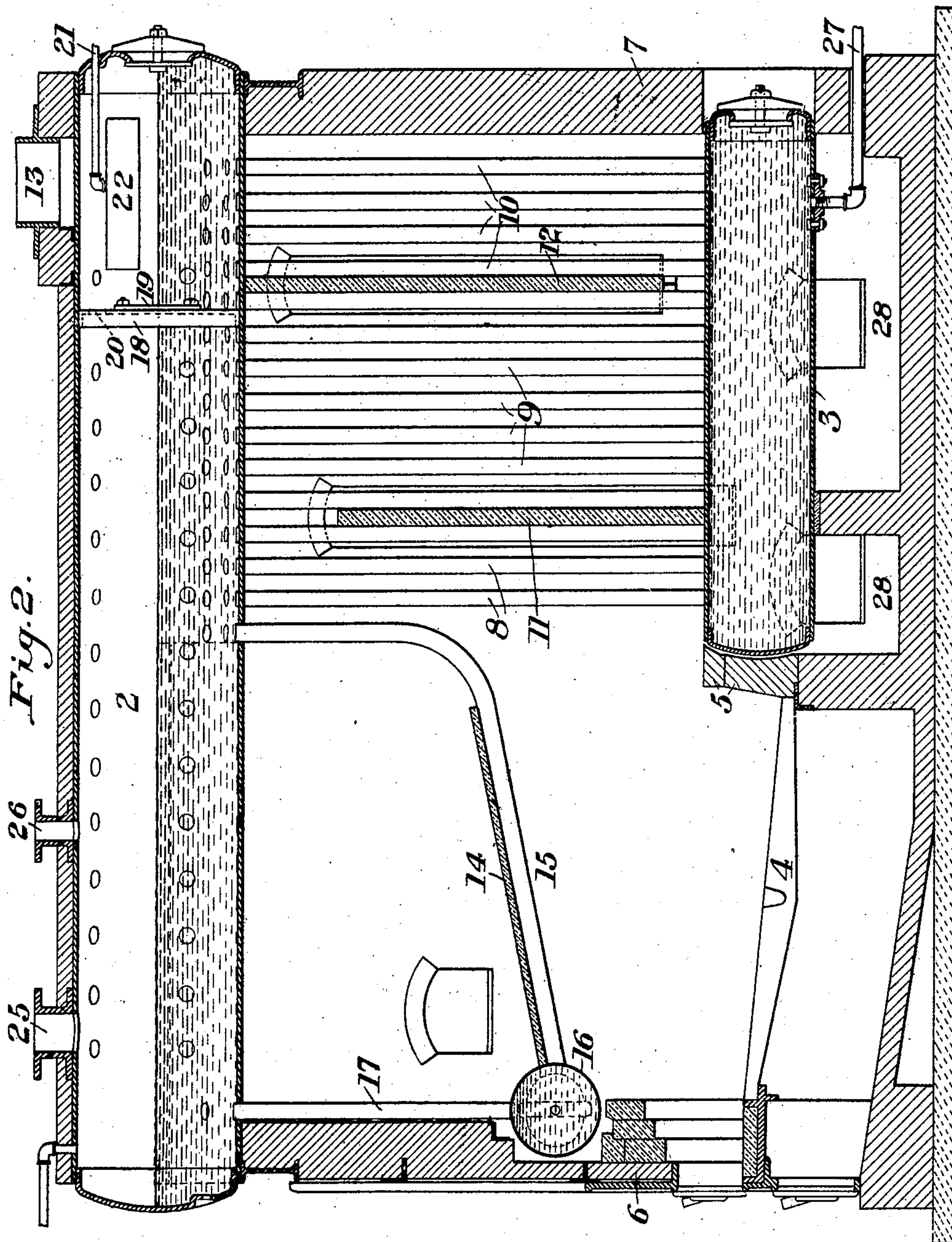
William S. Elliott
by B. A. S. Jones
his attys

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2 SHEETS—SHEET 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM S. ELLIOTT, OF PITTSBURG, PENNSYLVANIA.

WATER-TUBE BOILER.

No. 846,737.

Specification of Letters Patent.

Patented March 12, 1907.

Application filed September 14, 1905. Serial No. 278,438.

To all whom it may concern:

Be it known that I, WILLIAM S. ELLIOTT, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Water-
5 Tube Boiler, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation, partly broken
10 away, showing one form of my improved boiler; and Fig. 2 is a sectional side elevation of the same.

My invention relates to that class of water-tube boilers wherein the drums are longitudinal of the setting and the flame and gases
15 flow from a front fireplace or a source of heat through up-and-down passes over successive tubes connecting upper and lower drums.

The object of the invention is to provide a
20 simple, efficient, and economical boiler of this type.

It is also designed to provide heating-surface forming at least a part of the roof of the combustion-chamber, to provide an independent
25 circulation for the water which is thus heated, to give easy action to the tubes, and to provide a moderate circulation in the rear portion of the boiler near the exit-flue.

In the drawings, in which I show a duplex
30 form of the boiler—that is, nesting with two of my improved units side by side therein—2 2 represent the upper longitudinal steam and water drums, and 3 3 the lower longitudinal mud-drums. The steam and water
35 drums are longer than and preferably of greater diameter than the mud-drums. The steam and water drums extend from the front to the rear wall of the setting and preferably over the entire length of the combustion-chamber. Thus I show the combustion-chamber as formed with grates 4, which
40 extend continuously across the setting for its full width between the bridge-wall 5 and the front wall 6. The mud-drums 3 extend from the rear wall 7 to the bridge-wall 5. That
45 portion of each upper drum which is above the corresponding mud-drum is connected therewith by tubes 8, 9, and 10. These tubes may be of any desirable number and
50 may be connected into the drums by curving their ends or by using straight tubes with struck-up tube-seats. The three sets of tubes 8, 9, and 10 are separated by the baffles 11 and 12, the baffle 11 extending up-

wardly to a short distance below the upper
end of the tubes, while the baffle 12 extends
downwardly, thus directing the gases through
three up-and-down passes among the tubes
connecting the upper and lower drums be-
fore they reach the outlet-flue 13. 55

The roof of the combustion-chamber is preferably formed of tiles or refractory bricks 14, which lie upon a series of bent tubes 15, which extend from the front transverse water-drum header or chamber 16 upwardly and
65 rearwardly, the rear portions of the tubes being bent and joined into the upper drum. The water-chamber 16 is connected to the forwardly-extended portions of the upper drums by vertical pipes or tubes 17, of which
70 I have shown three for each upper drum. The number of these tubes may be varied; but I prefer to make them less in number than the tubes 15. I may use more than one
75 row of tubes 15 and also more than one row of tubes 17, connecting them to the same chamber or individual chamber. The chamber 16 may be entered by suitable manholes and manhole-plates at the ends if drums are
80 employed, or hand-hole plates may be used on the sides if the chamber is of header form.

Each steam and water drum 2 is preferably provided in its rear portion with a transverse separating-partition 18, which is provided
85 with a manhole and manhole-plate 19 and with an upper hole 20, which equalizes the steam-pressure between the front and rear chambers of each steam and water drum. The partition 18 is preferably placed slightly
90 ahead of the baffle 12, so that some of the tubes 9 in front of the baffle 12 will be between this baffle and the plane of the diaphragm 18. This arrangement causes a moderate circulation up through the rear
95 tubes of the set 9 and down through the tubes 10. The deposition of sediment is thus lessened and the boiler is improved in this regard over many boilers of the general
100 type, in which there is practically no circulation among the rear tubes, and consequently there is a heavy deposition of sediment through the tubes in this part.

In the form shown the feed-water enters through pipe 21 and overflow-pan 22.

Below the mud drum or drums I provide
105 one or more chambers 28, which are reached through holes in the side walls. By entering these chambers the operator can reach any of

the tubes for removal and replacing. For the same purpose I provide spaces between the side tubes and the side wall of the setting and also between the adjacent side tubes of the units, in case two or more units are used, these spaces being wider than the diameter of a tube. In this way I am enabled to provide for the easy removal or replacing of any of the water-tubes.

The mud-drums are preferably supported by the water-tubes—that is, they hang on the tubes and are supported independently of the setting. This provides for expansion and contraction independent of the walls and avoids strains on the setting.

In the operation of the boiler the flame and gases rise from the fuel on the grate, heat the water in the pipes 15, and thence flow rearwardly through the three up-and-down passes among the connecting-tubes of the upper and lower drums to the outlet. There will be a circulation of water up through the tubes 15 and down through the tubes 17. There will also be a strong circulation up through the tubes 8 and down through the tubes 9, and these two circulations are additionally made a moderate or rather slow circulation.

In order to equalize the steam-pressure when two or more units or sections are employed side by side, I provide the cross steam-pipes 23, and also preferably employ cross water-pipes 24 between the water-spaces of the steam and water drums. I may also use cross water-tubes between the mud-drums for the same purpose, or I may use cross water-tubes both between the water-drums and the mud-drums.

In Fig. 2, 25 represents the steam-outlet, and 26 the point of attachment of the safety-valve.

27 represents a blow-off connection for the mud drum or drums.

The advantages of my invention result from the separate circulations which are obtained, from the cheapness of the structure, from the circulating of the water in the rear portion of the boiler, from the heating of water in pipes or tubes forming a part of the roof of the combustion-chamber, and from the compactness of the setting. By extending the steam and water drums forwardly beyond the front ends of the mud-drums I provide for the water-pipes over the combustion-chamber and obtain increased economy. The amount of water-space and steam-space is also largely increased, thus giving greater storage capacity.

It will be understood that the invention may be employed by using one unit or placing as many of the units side by side as may be desired, the unit consisting of the upper drum with its mud-drum and supplemental water-chamber, &c. In case two or more

of the units are used side by side the chamber 16 may be formed as a continuous chamber or drum the entire width of the setting or it may consist of two or more sections arranged end to end.

Many other variations may be made in the form and arrangement of the parts without departing from my invention.

I claim—

1. In a water-tube boiler, a longitudinal upper steam and water drum, a lower longitudinal mud-drum which is shorter than the upper drum, tubes connecting the two drums, transverse baffles between said tubes, and a front transverse water-chamber having tubes connecting it to the steam and water drum; substantially as described.

2. In a water-tube boiler, a longitudinal upper steam and water drum, a lower longitudinal mud-drum which is shorter than the upper drum, tubes connecting the two drums, transverse baffles between said tubes, and a front transverse water-chamber having tubes connecting it to the steam and water drum with a baffle lying on said tubes over the furnace-chamber; substantially as described.

3. A longitudinal-drum boiler of the water-tube type having a transverse partition in the steam and water drum extending above the water-level, and a baffle in the rear of the partition arranged to cause a moderate up-and-down circulation in the rear of said partition; substantially as described.

4. In a water-tube boiler, a longitudinal upper steam and water drum, a lower longitudinal mud-drum, tubes connecting the two drums, baffling between said tubes, and a front transverse water-chamber between the levels of the steam and water drum and the mud-drum and having tubes connecting it to the steam and water drums; substantially as described.

5. In a water-tube boiler, a longitudinal mud-drum, a longer longitudinal steam and water drum extending in front of the mud-drum and connected thereto by water-tubes, a furnace in front of the mud-drum and under the steam and water drum, a transverse water-chamber near the front wall, and tubes connecting the chamber with the steam and water drum and extending over the furnace; substantially as described.

6. In a water-tube boiler, a longitudinal mud-drum, a longer longitudinal steam and water drum extending in front of the mud-drum and connected thereby by water-tubes, a furnace in front of the mud-drum and under the steam and water drum, a transverse water-chamber near the front wall, tubes connecting the chamber with the steam and water drum and extending over the furnace, and baffling lying on said tubes and over the furnace; substantially as described.

7. In a longitudinal-drum water-tube boiler, a mud-drum which is shorter than the

steam and water drum, a furnace in front of the mud-drum and under the steam and water drum, and a front transverse water-chamber having at least two sets of tubes connecting it to the upper steam and water drum, one set of tubes forming at least part of the roof of the furnace; substantially as described.

8. In a longitudinal-drum water-tube boiler, a mud-drum which is shorter than the steam and water drum, a furnace in front of the mud-drum and under the steam and water drum, and a front transverse water-chamber having at least two sets of tubes connecting it to the upper steam and water drum, one set of tubes forming at least part of the roof of the furnace and having baffling lying thereon; substantially as described.

9. A longitudinal-drum water-tube boiler having an upper longitudinal steam and water drum provided with a transverse partition extending above the water-level, and baffles in front of and in the rear of the partition arranged to cause longitudinal circulations on both sides of the partition.

10. In a longitudinal-drum boiler of the water-tube type, a steam and water drum extending in front of the mud-drum, and a front transverse water-chamber hung above the grate-level by water-tubes from the steam and water drum and having at least part of its tubes extending over the furnace; substantially as described.

11. In a water-tube boiler, a longitudinal upper steam and water drum, a lower longitudinal mud-drum, tubes connecting the two drums, baffles between said drums, a furnace in front of the front end of the mud-drum, and a roof over the furnace consisting of water-tubes supporting baffles; substantially as described.

12. In a longitudinal-drum water-tube boiler, a steam and water drum having a transverse partition dividing it into compartments, and baffling between the tubes in each compartment to give a circulation in each side of said partition; substantially as described.

13. In a longitudinal-drum water-tube boiler, a steam and water drum having a transverse partition dividing it into compartments, and baffling between the tubes in each compartment to give a circulation on each side of said partition, the baffles dividing each set of tubes into sets of unequal numbers; substantially as described.

14. In a longitudinal-drum boiler, a steam and water drum having an intermediate transverse partition extending above the water-level, a feed-water inlet in the rear water-compartment, and a baffle among the tubes in the rear of the partition and arranged to cause circulation in the water-tubes entering said rear compartment; substantially as described.

15. In a water-tube boiler, an upper steam-drum and a lower mud-drum parallel therewith, tubes connecting said drums, and a front transverse water-chamber located between the levels of the steam-drum and the mud-drum having tubes connecting it to the steam and water drums; substantially as described.

16. In a water-tube boiler, a steam and water drum, a lower mud-drum parallel therewith, tubes connecting the drums, baffles between said tubes, a water-chamber over the front of the furnace, said chamber being below the level of the steam and water drum and above the level of the mud-drum, and water-tubes connecting the water-chamber to the steam and water drum and forming at least a part of the roof of the furnace; substantially as described.

17. In a water-tube boiler, an upper steam-drum, a lower mud-drum parallel therewith, tubes connecting the two drums, water-tubes longitudinal with the furnace, forming at least a part of the roof of the furnace, and having their front ends connected to the upper steam and water drums, their rear ends connected to a water-chamber located between the levels of the steam and water drums and the mud-drum a set of tubes connecting the water-chamber with the steam and water drums; substantially as described.

18. In a water-tube boiler, having steam and water drums connected to parallel mud-drums by water-tubes, a furnace in front of the mud-drum, a water-chamber near the front wall, and tubes connecting the chamber with the steam and water drums and extending over the furnace; substantially as described.

19. In a water-tube boiler, having steam and water drums connected to parallel mud-drums by water-tubes, a furnace in front of the mud-drum, a water-chamber near the front wall, tubes connecting the chamber with the steam and water drums and extending over the furnace, and baffle-plates above the tubes and over the furnace; substantially as described.

20. In a longitudinal-drum water-tube boiler, a mud-drum and a steam and water drum, a furnace in front of the mud-drum, a front water-chamber located between the levels of the mud-drum and the steam and water drum having at least two sets of tubes connecting it to the upper steam and water drum, one set of tubes forming at least a part of the roof over the furnace; substantially as described.

21. A water-tube boiler having a lower mud-drum, an upper steam and water drum parallel therewith, water-tubes connecting said drums, and water-tubes supporting and forming at least a part of the roof of the furnace-chamber and having connections at two

different points into the steam and water drum whereby a circulation is introduced therethrough; substantially as described.

22. In a boiler of the water-tube type, a
5 steam and water drum over the furnace in front of the mud-drum, and connected therewith, a source of heat below the steam and water drum and in front of the mud-drum, a
10 water-chamber under the steam and water drum, tubes connecting said water-chamber with said steam and water drum, so as to

form a complete cycle of circulation independent of the circulation due to the tubes connecting the steam and water drum with the mud-drum; substantially as described. 15

In testimony whereof I have hereunto set my hand.

WILLIAM S. ELLIOTT.

Witnesses:

G. M. VIERS,
H. M. CORWIN.