

No. 760,267.

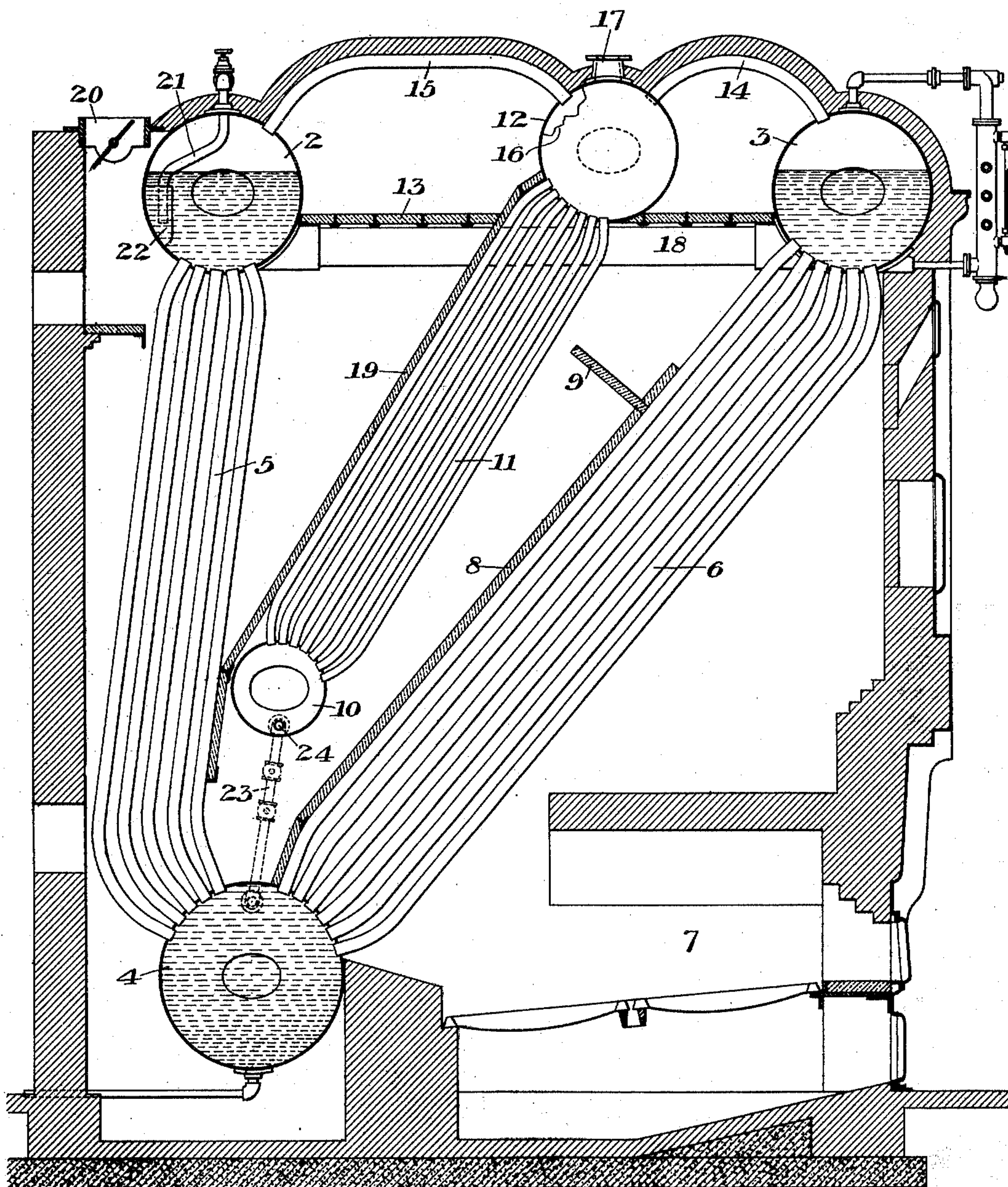
PATENTED MAY 17, 1904.

J. P. SNEDDON.
WATER TUBE BOILER.
APPLICATION FILED APR. 14, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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J. M. Corwin

INVENTOR

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his attys

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2 SHEETS—SHEET 2.

Fig. 3.

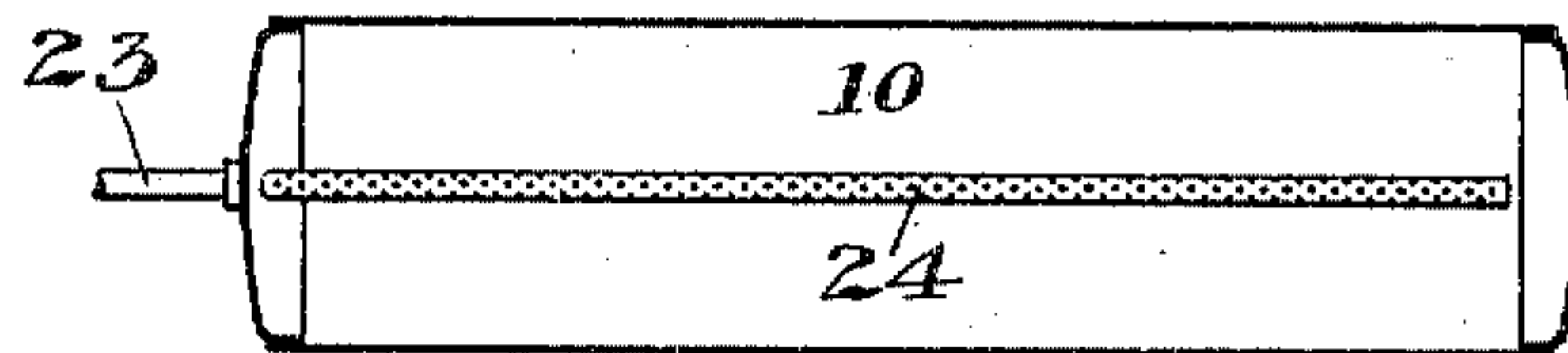
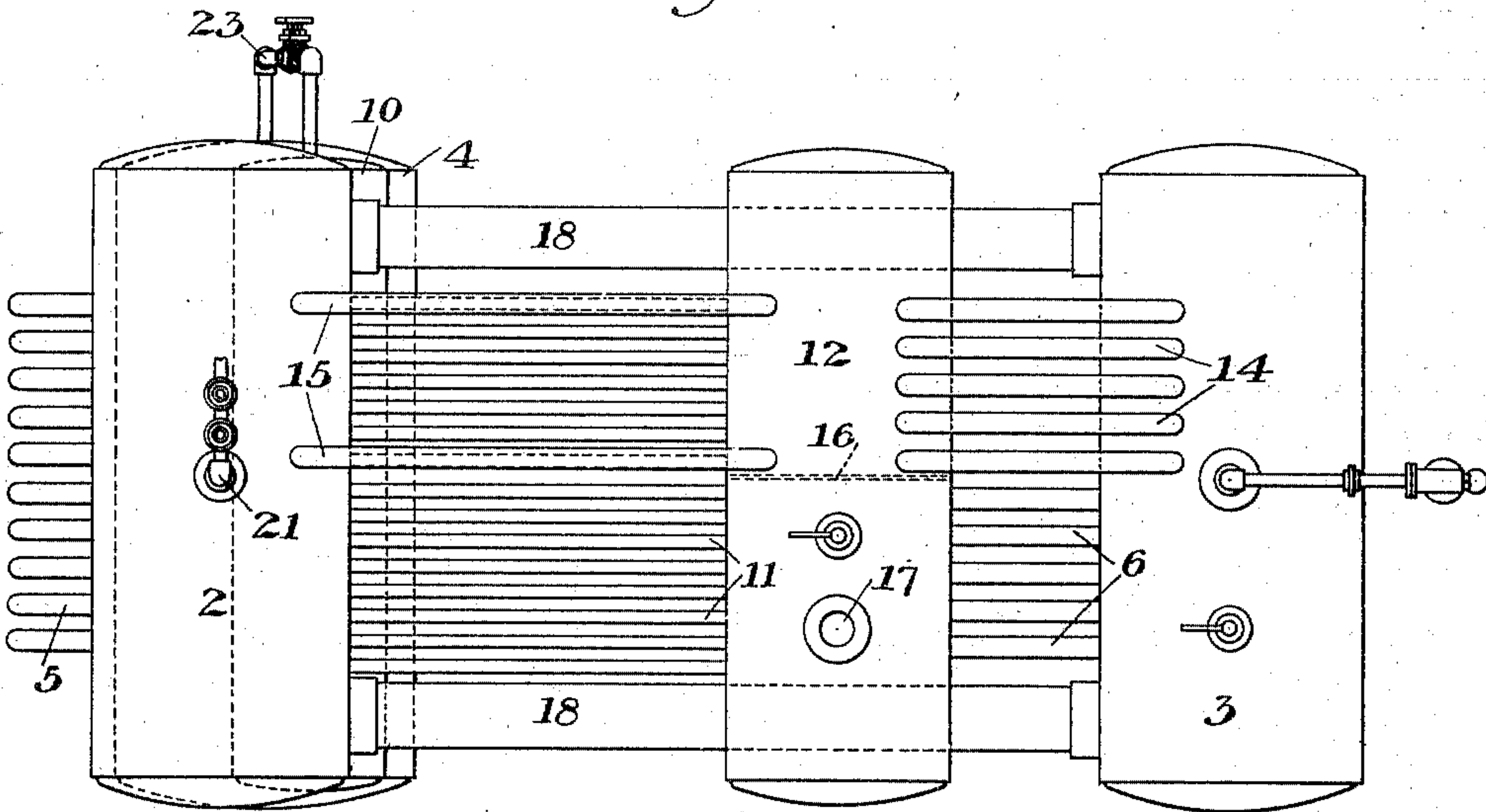


Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES P. SNEDDON, OF BARBERTON, OHIO, ASSIGNOR TO THE STIRLING COMPANY, A CORPORATION OF NEW JERSEY.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 760,267, dated May 17, 1904.

Application filed April 14, 1903. Serial No. 152,541. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. SNEDDON, of Barberton, Summit county, Ohio, have invented a new and useful Water-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 sectional side elevation showing a boiler of the Stirling type constructed in accordance with my invention. Fig. 2 is a top plan view of the boiler structure, and Fig. 3 is a sectional plan view of the lower superheater-drum.

My invention relates to combining a superheater with a water-tube boiler by arranging the superheater in the boiler-setting in such a position as to give high thermal efficiency, to allow regulation of the degree of superheat, to give the proper amount of heating-surface relative to the area of grate-surface, and to provide a superheater which may be used as an auxiliary boiler when desired.

In the drawings, 2 and 3 represent the upper transverse steam and water drums, and 4 a lower transverse mud-drum, which is connected with the steam and water drums by banks of tubes 5 and 6. I have shown the combustion-chamber 7 as located below the overhanging front bank 6, this bank having the usual baffle 8 extending upwardly to near its upper end and preferably having a projecting baffle 9.

In the form shown I replace the middle bank of tubes and the middle steam and water drum of the ordinary type of Stirling boiler by a superheater which consists of a lower transverse drum 10 above the mud-drum and between the banks of tubes 5 and 6, this drum being connected by superheater-tubes 11 to an upper steam-drum 12, which extends transversely between the steam and water drums 2 and 3 and preferably above the horizontal tiling 13. The steam-drum 12 is connected by upwardly-curved tubes 14 and 15 with the steam-spaces of the drums 2 and 3, and the number of the tubes 14 is preferably in ex-

cess of the tubes 15 on account of the greater steam-generating power of the front bank. I have shown this proportion as five to two.

The drum 12 is divided into two compartments or chambers by a central transverse partition 16, and the inlet-tubes 14 and 15 lead into the same compartment at one side of the partition. The steam-offtake 17 enters the other compartment on the opposite side of the partition, so that the steam entering the one chamber is compelled to pass downwardly through part of the tubes 11, and then along within the drum 10, and upwardly through the remaining tubes 11 into the other chamber before taking to the point of use.

To provide an efficient triangular circulation for the water, I preferably connect the water-spaces of the drums 2 and 3 by large pipes 18, entering these drums near their ends. It will be understood, however, that the circulation may be obtained by other connections or in other ways, though I prefer the form shown.

I have shown the superheater-tubes as inclined upwardly and forwardly, a baffle 19 extending over the back of this bank to compel the gases to pass down among the tubes and below the drum 10, whence they rise among the tubes of the bank 5 to the outlet 20.

I have shown the feed-pipe 21 as leading into a pocket or chamber 22 in the rear drum 2, though the manner of feeding the water may be changed as desired.

When the boiler is in operation, the flame and gases from the furnace rise among the tubes of the front bank and heat the water therein, thence passing downwardly in the reverse direction among the superheating-tubes to superheat the steam circulating therein. They then rise among the tubes of the rear bank and then pass to the outlet. In order to control the amount of superheat and also to flood the superheater with water when desired, I connect the lower drum of the superheater with the mud-drum by an external valve-pipe 23, this pipe connecting with a spray-pipe 24, extending through the lower

part of the drum 10. By spraying water into this drum I can regulate the amount of the superheat.

It will be noted that on account of the location of the upper steam-drum 12 this drum will act as a steam and water drum when the superheater is supplied with water, and hence the superheater may be used as a supplemental or auxiliary boiler when desired, the tubes then becoming water-tubes and the drum 10 a supplemental lower water-drum.

An important feature of my invention lies in passing the gases over a single set or bank of water-tubes, and then after they leave these tubes passing these gases over a set of superheating-tubes which form the major portion and preferably the entire heating-surface of the second pass, and then passing the gases after they leave the superheater-tubes over another set of tubes. The advantage of this is that by varying the number of tubes in the front bank I can regulate the amount of superheat, since the more heat that is absorbed by the front bank of water-tubes the less heat will be available for superheating, and vice versa. I find that in the ordinary three-bank Stirling boiler the front bank evaporates about seventy or seventy-five per cent. of the water, the middle bank about twenty per cent., and the rear bank about ten per cent. By placing the superheater in its own pass, so that it is acted upon by the furnace-gases after they leave the front bank, and varying the number of rows of tubes in the front bank I can vary the superheat to give any degree of superheat demanded in practice, and this without changing the rear set of water-tubes unless desired. In this same manner I can prevent the overheating of the superheater-tubes, and for this purpose I preferably increase the number of tubes ordinarily used in the front bank.

The advantages of my invention result from the peculiar location of the superheater, by which the superheating-tubes are protected from overheating and the degree of superheat can be regulated. The amount of heating-surface can be properly proportioned to the area of grate-surface according to well-known rules, and the superheater may be used as an auxiliary boiler when desired. A circulation is insured through the superheater-tubes, and a strong circulation is caused through the water-tubes.

The number of the steam and water drums may be varied, one or more lower mud-drums may be used, the number of banks of tubes may be varied, and many other changes may be made in the form and arrangement of the drums, the tubes, the baffles, and general arrangement without departing from my invention. Other banks of tubes may be placed in front of the bank which is in front of the super-

heater-tubes, and by the word "front" bank in my claims I mean the set of tubes next in front of the superheater-tubes and between them and the furnace.

I claim—

1. A water-tube boiler having at least two banks of water-tubes, a superheater having tubes arranged between the two banks of water-tubes, and in the direct main path of the gases and baffles between the superheater and the banks of water-tubes in front of and behind it, the superheater forming at least the major part of the heating-surface in its pass between the baffles; substantially as described.

2. A water-tube boiler having a plurality of upper transverse steam and water drums connected by banks of tubes to at least one mud-drum, a superheater having tubes in the direct main path of the gases and between two of the sets of water-tubes, and baffles in front and in the rear of the superheater and arranged to give the gases at least three passes; substantially as described.

3. A water-tube boiler having an upper steam and water drum connected by a bank of tubes to a lower or mud drum, a baffle extending along the back of said bank of tubes, a superheater having tubes forming substantially the entire heating-surface of the next main pass of the gases after they leave the said bank of water-tubes, and a bank of water-tubes in the rear of the superheater and in the path of the gases; substantially as described.

4. A water-tube boiler having at least two upper steam and water drums connected by banks of tubes to at least one mud-drum, a baffle extending along the rear of one bank of water-tubes, a superheater having tubes between the banks of water-tubes and forming substantially the entire heating-surface of the next main pass of the gases, and a baffle in the rear of the superheater-tubes arranged to direct the gases to the next bank of water-tubes; substantially as described.

5. A water-tube boiler having a plurality of steam and water drums having water-tubes arranged in successive passes of the gases, a superheater having an upper steam-drum and provided with tubes forming the major part of the heating-surface in its pass, and steam-pipes leading from the steam-spaces of all the steam and water drums to the steam-drum of the superheater; substantially as described.

6. A boiler having front and rear steam and water drums, a superheater having a steam-drum, and steam-pipes connecting the steam and water drums to the steam-drum of the superheater; the cross-sectional area of these steam-pipes from the front steam and water drum being greater than those from the rear steam and water drum; substantially as described.

7. A water-tube boiler having a plurality

of transverse steam and water drums connected by banks of tubes to at least one mud-drum, a superheater located between the banks of tubes and connected to the steam and water drums, and circulating-tubes arranged to cause the circulation through the front bank of water-tubes; substantially as described.

8. A water-tube boiler having two upper transverse steam and water drums each connected by a bank of tubes to at least one mud-drum, the banks of tubes being arranged in successive passes of the furnace-gases, circulating-pipes directly connecting the water-spaces of the two drums, and a superheater located between the two banks and having an upper steam-drum connected with both of the steam and water drums; substantially as described.

9. A water-tube boiler having a steam and water drum, a superheater located in the boiler structure and having a lower steam-drum below the water-level, and a valved pipe extending between the mud-drum and said steam-drum of the superheater; substantially as described.

10. A water-tube boiler having a steam and water drum, a superheater in the boiler-setting having a drum extending partially above and partially below the water-level of the boiler, and provided with superheating-tubes,

and means for flooding the superheating-tubes; substantially as described.

11. A boiler of the Stirling type having a plurality of steam and water drums, at least one of said drums having superheating-tubes leading into it, and means for flooding the superheating-tubes; substantially as described.

12. A water-tube boiler of the Stirling type having three upper drums with banks of tubes connecting them to at least one lower drum, water-tubes connecting the water-spaces of the front and rear steam and water drums, and a superheater having tubes between two of the banks of water-tubes and in the direct path of the gases; substantially as described.

13. A water-tube boiler of the Stirling type having a plurality of steam and water drums, a superheater having a separate steam-drum between the steam and water drums, and extending partially above and partially below the water-level, and tubes directly connecting the water-spaces of the steam and water drums; substantially as described.

In testimony whereof I have hereunto set my hand.

JAMES P. SNEDDON.

Witnesses:

W. T. LUCAS,
J. C. FRANK.