

No. 616,155.

Patented Dec. 20, 1898.

J. A. STEVENS.

BOILER.

(Application filed Mar. 11, 1898.)

(No Model.)

3 Sheets—Sheet 1.

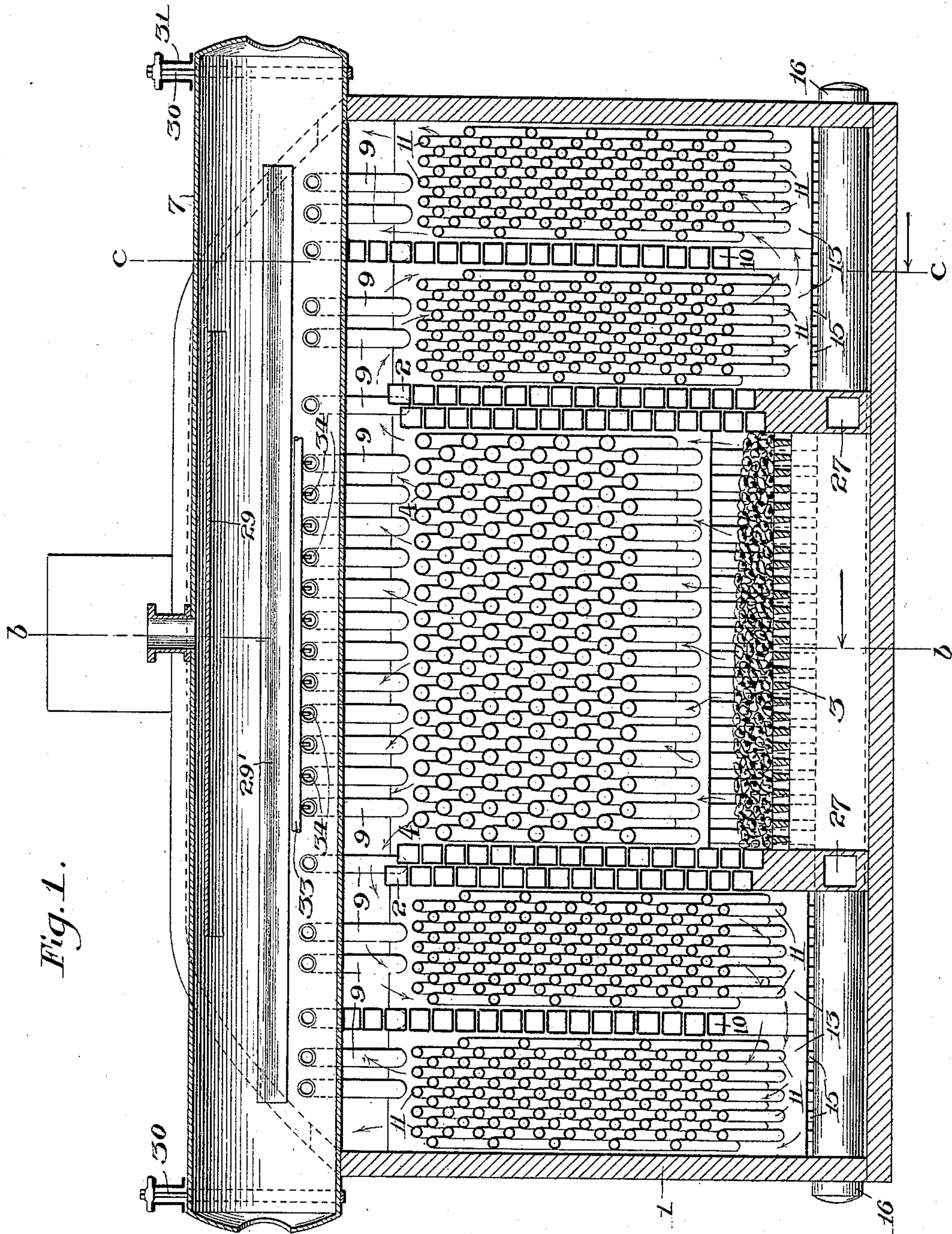


Fig. 1.

WITNESSES:

A. V. Groupe
C. R. Standish

INVENTOR

BY John A. Stevens
Charles W. Butler
ATTORNEY.

No. 616,155.

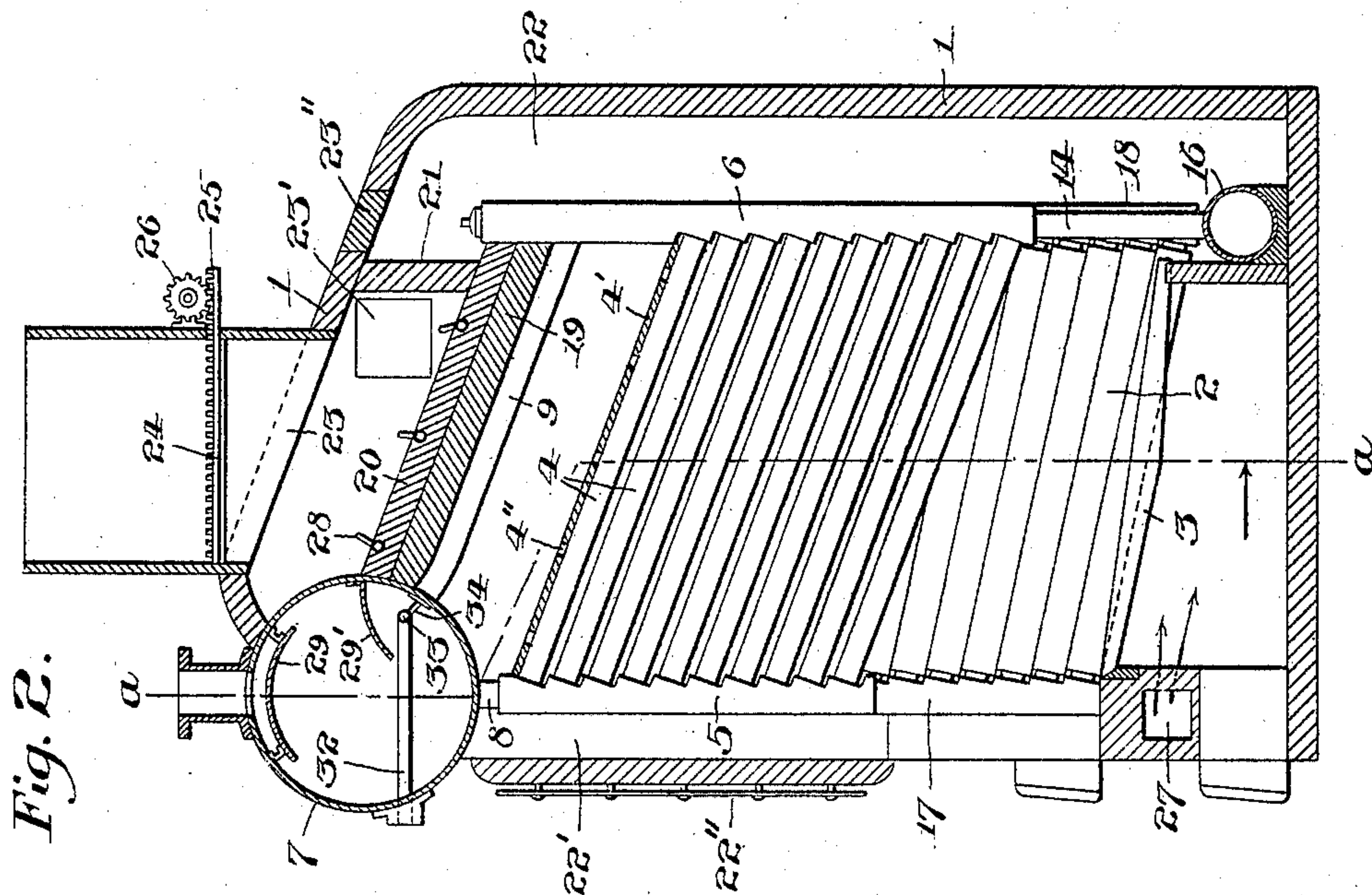
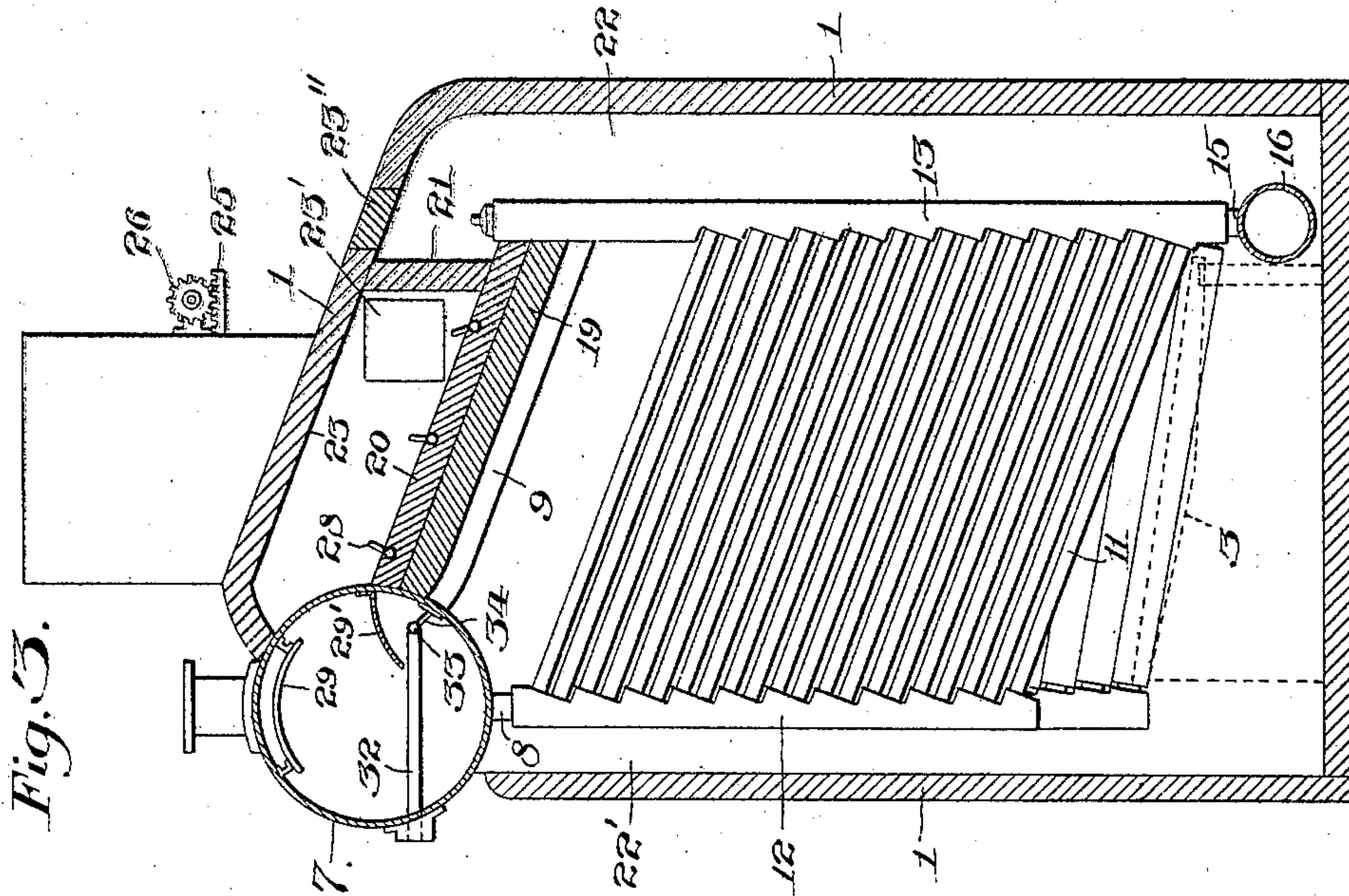
Patented Dec. 20, 1898.

J. A. STEVENS.
BOILER.

(Application filed Mar. 11, 1898.)

(No Model.)

3 Sheets—Sheet 2.



WITNESSES:

A. V. Groupe
C. R. Smith

INVENTOR

BY John A. Stevens
Charles N. Butler
ATTORNEY.

No. 616,155.

Patented Dec. 20, 1898.

J. A. STEVENS.
BOILER.

(Application filed Mar. 11, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 4.

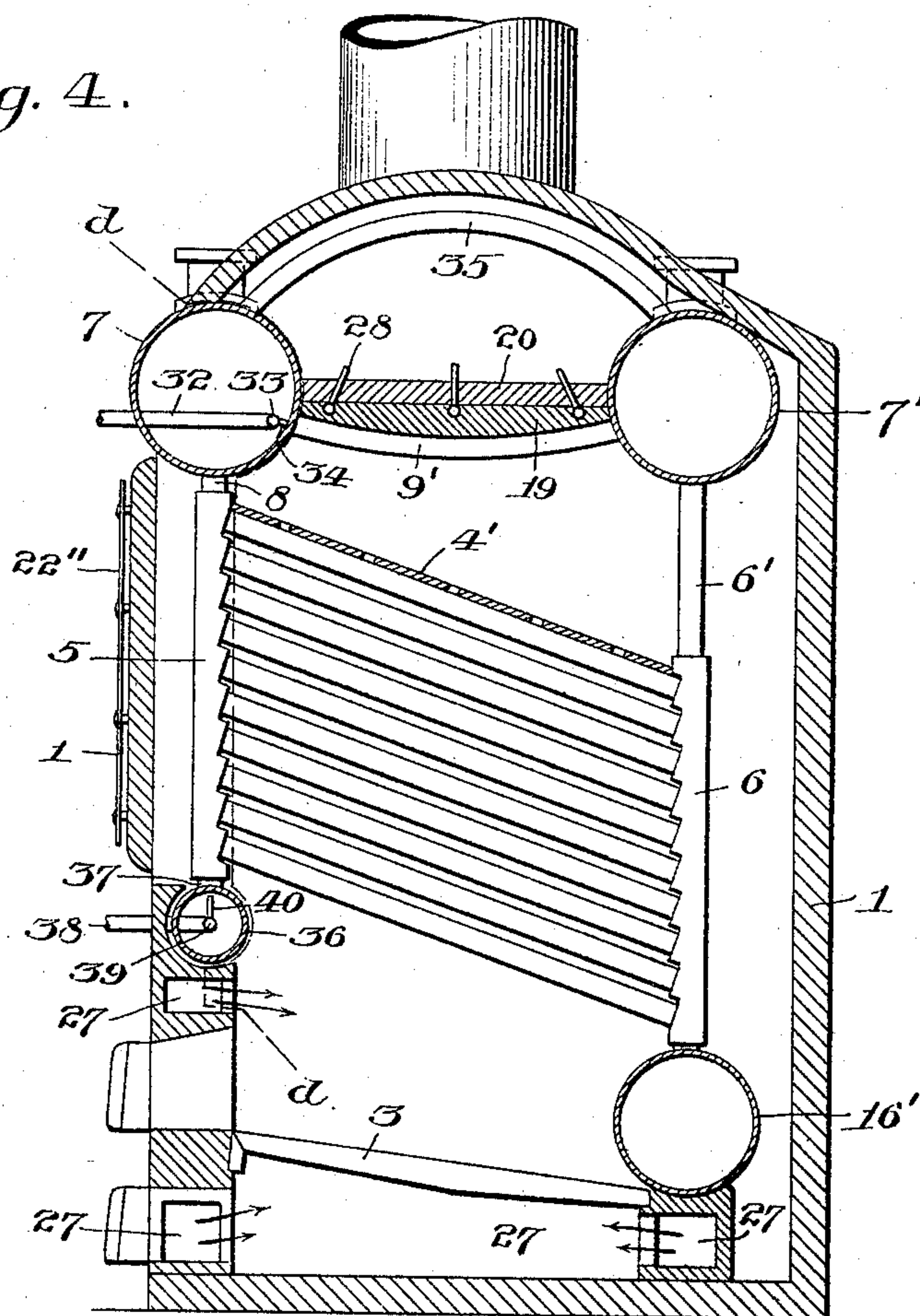
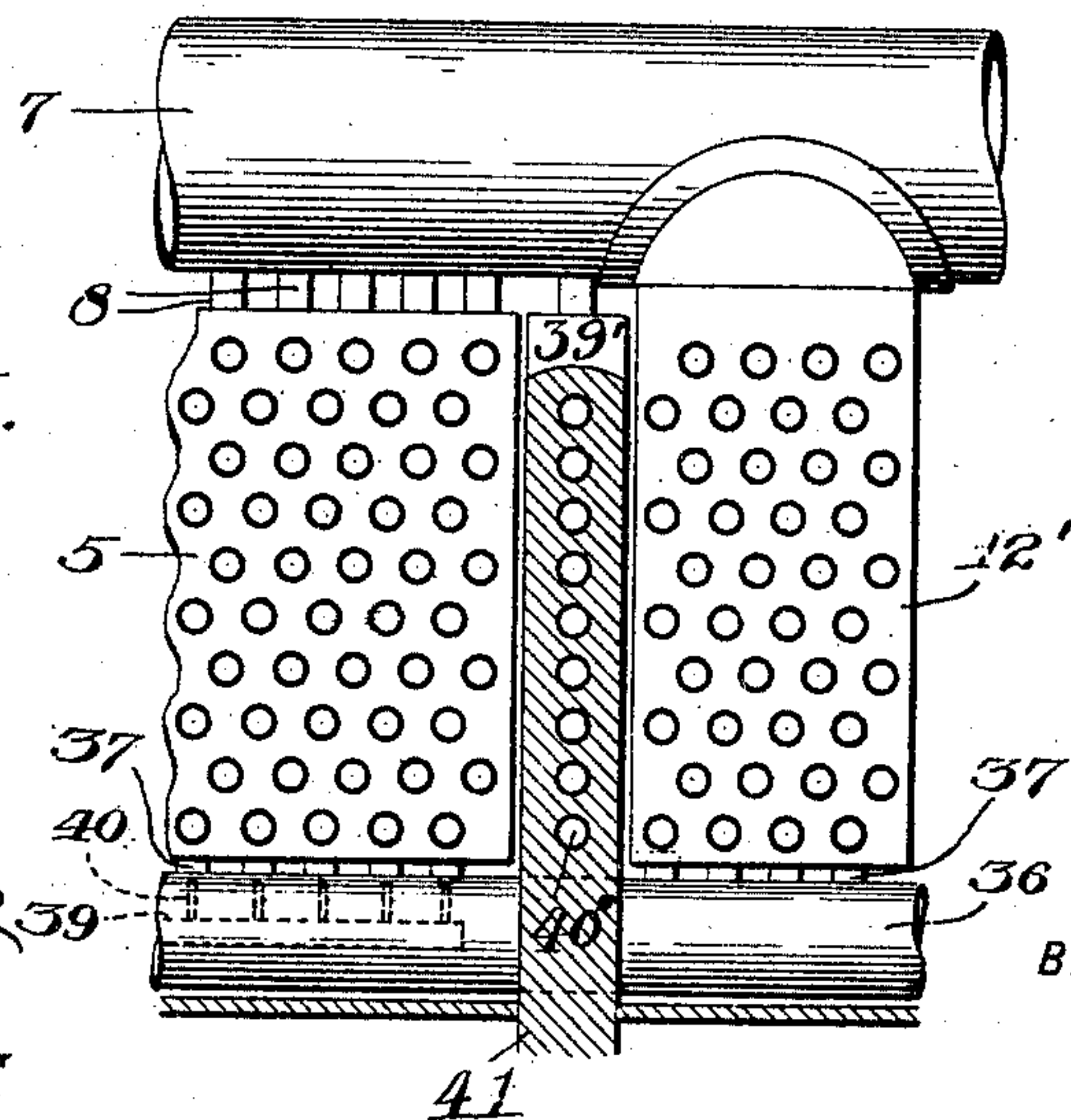


Fig. 5.



WITNESSES:

A. V. Grouper
C. R. Harsh.

INVENTOR

John A. Stevens

BY

Charles N. Butler

ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN A. STEVENS, OF LOWELL, MASSACHUSETTS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 616,155, dated December 20, 1898.

Application filed March 11, 1898. Serial No. 673,487. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. STEVENS, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to water-tube boilers and furnaces therefor adapted for either land or marine service. Its objects are to effect complete combustion of the fuel, to secure the economical distribution and utilization of the heated products of combustion, to augment the circulation of water in the steam-generating system and the creation of steam therefrom, to provide large storage capacity internal to the containing-walls for steam and water, to effect advantageous precipitation and removal of matter tending to obstruct the circulation, to keep the heating passages and surfaces free from obstructions, to prevent radiation, and generally to attain a high degree of economy, efficiency, and stability, as will appear from the following detail description.

The invention is illustrated in the accompanying drawings, of which—

Figure 1 is a vertical sectional view of the construction on the line *a a* of Fig. 2. Fig. 2 is a vertical sectional view on the line *b b* of Fig. 1. Fig. 3 is a vertical sectional view on the line *c c* of Fig. 1. Fig. 4 is a vertical sectional view illustrating a modification of the construction shown in Figs. 1 to 3, inclusive. Fig. 5 is a partial sectional view on the line *d d* of Fig. 4.

In the construction the chamber formed by the containing-walls 1 is divided into three compartments by the baffle-walls 2. The central compartment or pass contains the fire-bars or grate 3 and the water-circulating and steam-generating tubes 4, expanded in headers 5 and 6. The front header 5 is connected with a drum 7, extending transversely to the direction of the tubes, by nipples 8, and the rear header 6 is connected to said drum by the tubes 9.

Each of the end compartments or passes is divided by a baffle-wall 10 and contains two banks of water-circulating and steam-generating tubes 11, which are expanded into headers 12 and 13. The tubes in the end passes

may be of the same size as the tubes of the central pass or they may be smaller for the more complete utilization of the heating products. The front headers are connected with the drum 7 by the nipples 8 and the rear headers are connected to the said drum by the tubes 9. The outer banks of tubes and connections in the end passes may be omitted, thus shortening the structure.

The rear headers 6 and 13 are connected, respectively, by nipples 14 and 15 with a precipitation-drum 16, which lies below the fire-bars and to the rear thereof, the said headers and nipples forming a bridge-wall at the rear of the grate.

The baffle-walls 2 and 10 are preferably constructed of water-circulating boxes or tubes, which are connected with the water-legs or header-sections 17 and 18. The water-legs 17 and 18 are connected by the nipples 8 and tubes 9 with the drum 7 and by the nipples 15 with the precipitation-drum 16. It will be understood, however, that the baffle-walls are not limited to this construction, as tile or brick may be employed, either in combination with the said boxes or alone.

The water-circulating and steam-generating system is insulated by means of a layer of tiles or bricks 19, supported upon the tubes 9, and a layer of plastic material 20, covering the said layer of bricks or tiles, by a dry-air space 22 between the rear headers, the partition 21, and the containing-walls, and by a dry-air space 22' between the front header and containing-wall, having the radiation-plate 22'' for diminishing radiation.

A baffle 4', of tile or other suitable material, having perforations 4'' to permit the passage of the gases, partially covers the top row of tubes 4 to focus the products of combustion.

The ducts 27 supply air to the furnace to facilitate combustion.

The breeching 23 has its communication with the stack controlled by the damper 24, regulated by the rack 25 and the gears 26; by means of which the gases may be directed toward the steam-drum 7 and the steam contained therein superheated.

The steam-drum 7 is provided with baffle-plates 29 and 29' to control the violence of ebullition, to prevent priming, and to cause

the steam to travel next to the superheating side of the drum and in the direction of the water-currents. The drum rests in hangers or yokes 30, depending from channel-beams 31, the entire construction being rigidly supported.

The feed-water is introduced through the tubes 32 and 33, the latter extending parallel with the axis of the drum and having nozzles 34, which distribute water to the tubes 9. By thus introducing the feed-water through the boiler I am enabled to augment the circulation, and I have found that this may be done without materially affecting the evaporation per pound of coal. The water passes down the tubes 9 and headers 6, 13, and 18, which communicate with the tubes 2, 4, 10, and 11 and with the precipitation-drum 16, which is located in the lowest part of the circulating system for the subsidence and collection of foreign matter tending to obstruct the passages. The tubes 2, 4, 10, and 11 conduct the water and steam upward to the headers 5, 12, and 17, which communicate with the steam-drum.

The gaseous products of combustion rising from the grate 3 communicate their energy to the heating-surfaces of the central pass, which comprise the water-boxes of the baffle-walls 2, the tubes 4, the headers therefor, and their connections. They pass thence through the apertures in the baffle 4' in the direction of the arrows and communicate heat to the steam-drum 7, the tubes 9, and the heating-surfaces of the end passes, comprising water-boxes 2 and 10, tubes 11, the headers, and the connections therefor, escaping thence to the breeching and the stack.

Blowers 28 are employed to move the soot toward the breeching, and doors 23' and 23'' afford facility for cleaning, examination, and repair.

In the modification illustrated in Figs. 4 and 5 a second drum 7' is placed in the rear of the drum 7, above the rear headers. These drums are connected by the tubes 9' and 35, which facilitate the circulation of steam and water and equalize the pressure in the two drums. The drum 7' is connected with the rear headers by the tubes or nipples 6'.

The precipitation-drum 16' is supported at the rear of the grate 3, so as to form a bridge-wall therefor, said drum serving to supply water to the circulating system as displacement occurs. A second precipitation-drum 36 is placed beneath the front headers and communicates therewith through the nipples 37. A blowing and feed-water apparatus consisting of a tube 38, connected with a tube 39, having nozzles 40, so placed within the drum as to permit the nozzles to register with the passages to the front header, is used for blowing out the passages and supplying feed-water. The precipitation-drums, being placed out of the direct circuit of the steam-generating system, effect the separation of sedi-

ment from the circulating water and permit its ready removal.

The headers may be of the box construction, as in the case of the header 5, which is connected with the drum 7 by the nipples 8 and permits direct communication between the corresponding ends of each bank of tubes, or this box construction may be directly connected with the drum, as shown in the header 12', or each staggered vertical row of tubes may have their corresponding ends expanded into separate sectional headers 39', as in the case of the tubes 40' of the baffle-wall 41, which is composed of combined brick or tile work and water-tubes.

A feature of the construction is its steadiness in seaway when the boiler is used on shipboard. It will be evident that the main combustion-chamber of the furnace need not be placed central to the tube system, but may be at one side thereof and the number of passes used that may be required. The construction permits the use of the usual attachments, gage-cocks, blow-off cock, and the like.

Having thus described my invention and the manner in which the same is to be performed, I claim—

1. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and a bank of tubes therein, a baffle-wall separating said combustion-chambers and substantially parallel to the vertical planes of said tubes, a drum extending transversely to the direction of said tubes, and headers for said tubes connected with said drum, as specified.

2. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and a bank of tubes therein, a water-box baffle-wall between said combustion-chambers and substantially parallel with the vertical planes of said tubes, headers for said tubes and drum connected with said headers.

3. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and a bank of tubes therein, a water-box baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes, a drum extending transversely to the direction of said tubes, and headers for said tubes connected with said drum, as specified.

4. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes, a second water-box baffle-wall dividing said second combustion-chamber

and substantially parallel to the vertical planes of said tubes, headers for said tubes and a drum connected with said headers.

5. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and a bank of tubes therein, a baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes, a second baffle-wall dividing said second combustion-chamber and substantially parallel to the vertical planes of said tubes, headers for said tubes and a drum extending transversely to said tubes and connected with said headers.

6. In the combination of a boiler and furnace, a main pass or combustion-chamber, a grate and a bank of tubes therein, a second pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes, a second water-box baffle-wall dividing said second combustion-chamber and substantially parallel to the vertical planes of said tubes, headers for said tubes and a drum connected with said headers and extending transversely to the direction of said tubes, as specified.

7. In the combination of a boiler and furnace, a main pass or combustion-chamber and a bank of tubes therein, a second pass or combustion-chamber and a bank of tubes therein, a baffle-wall between said first and second chambers and substantially parallel to the vertical planes of said tubes, a baffle-wall dividing said second chamber and substantially parallel to the vertical planes of said tubes, a third pass or combustion-chamber and a bank of tubes therein, a baffle-wall between said first and third chambers and substantially parallel to the vertical planes of said tubes, a baffle-wall dividing said third chamber and substantially parallel to the vertical planes of said tubes, headers for said tubes, and one or more drums connected with said headers and extending transversely to said tubes, as specified.

8. In the combination of a boiler and furnace, a main pass or combustion-chamber and a bank of tubes therein, a second pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said first and second combustion-chambers and substantially parallel to the vertical planes of said tubes, a water-box baffle-wall dividing said second combustion-chamber and substantially parallel to the vertical planes of said tubes, a third pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said first and third combustion-chambers and substantially parallel to the vertical planes of said tubes, a water-box baffle-wall dividing said third combustion-chamber and substantially parallel to the vertical planes of said

tubes, headers for said tubes and one or more drums connected with said headers, as specified.

9. In the combination of a boiler and furnace, a main pass or combustion-chamber and a bank of tubes therein, a second pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said first and second chambers and substantially parallel to the vertical planes of said tubes, a water-box baffle-wall dividing said second chamber and substantially parallel to the vertical planes of said tubes, a third pass or combustion-chamber and one or more banks of tubes therein, a water-box baffle-wall between said first and third chambers and substantially parallel to the vertical planes of said tubes, a water-box baffle-wall dividing said third chamber and substantially parallel to the vertical planes of said tubes, headers for said tubes, and one or more drums connected with said headers and extending substantially at right angles to said baffle-walls, as specified.

10. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes therein and headers for said tubes, a drum connected with said headers and extending transversely to said tubes, a water-box baffle-wall parallel to the vertical planes of said tubes, and communicating with said headers, a feed-water pipe within said drum and connections therefor which communicate with the downcomers of said headers, for the purpose set forth.

11. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes therein, a baffle therefor comprising perforated tiles which partially cover the spaces between the supporting row of tubes and leave the upper surfaces of said tubes exposed, headers for said tubes, one or more drums connected with said headers and extending transversely to said tubes, and a feed-water pipe within one of said drums and connections therefor which communicate with the downcomers of said headers.

12. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes and headers therefor, one or more drums connected with said headers and extending transversely to said tubes, a precipitation-drum at the rear of said combustion-chamber and connected with the rear headers of said tubes, and a precipitation-drum at the front of said combustion-chamber and connected with the front headers of said tubes, and a grate in said combustion-chamber extending rearwardly to said first precipitation-drum, as specified.

13. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes therein and headers therefor, a water-box baffle-wall parallel to the vertical planes of said tubes and headers therefor, a grate in said combustion-chamber, a precipitation-

drum connected with said headers and forming with said headers a bridge-wall for said grate, substantially as specified.

14. In the combination of a boiler and furnace, a combustion-chamber and a grate therein, a bank of tubes in said combustion-chamber and headers therefor, drums connected respectively with the front and rear headers for said tubes and extending transversely thereto, passages connecting said drums, a precipitation-drum connected with said rear headers and forming therewith a bridge-wall for said grate, as specified.

15. In the combination of a boiler and furnace, a combustion-chamber and a grate therein, a bank of tubes in said combustion-chamber

ber and headers therefor, one or more drums connected with the front and rear headers for said tubes and extending transversely thereto, a baffle covering the top of said combustion-chamber and extending between said front and rear headers, a precipitation-drum connected with said rear headers and forming therewith a bridge-wall for said grate, as specified.

In testimony whereof I have hereunto set my hand this 7th day of March, A. D. 1898.

JNO. A. STEVENS.

Witnesses:

PHILIP R. COATS,
JOHN L. MACVICAR.