

No. 616,156.

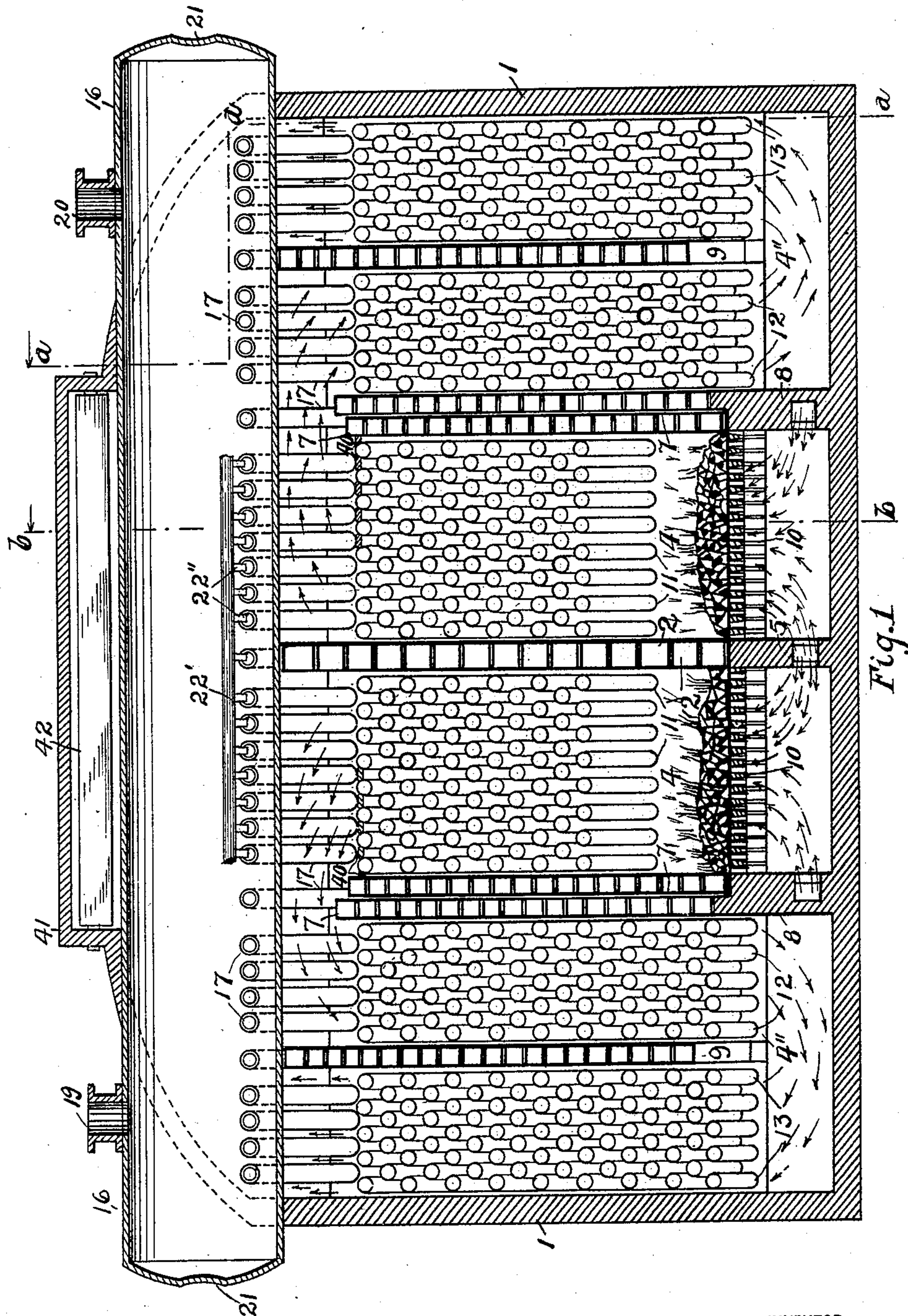
Patented Dec. 20, 1898.

J. A. STEVENS.
STEAM BOILER.

(Application filed June 14, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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3 Sheets—Sheet 2.

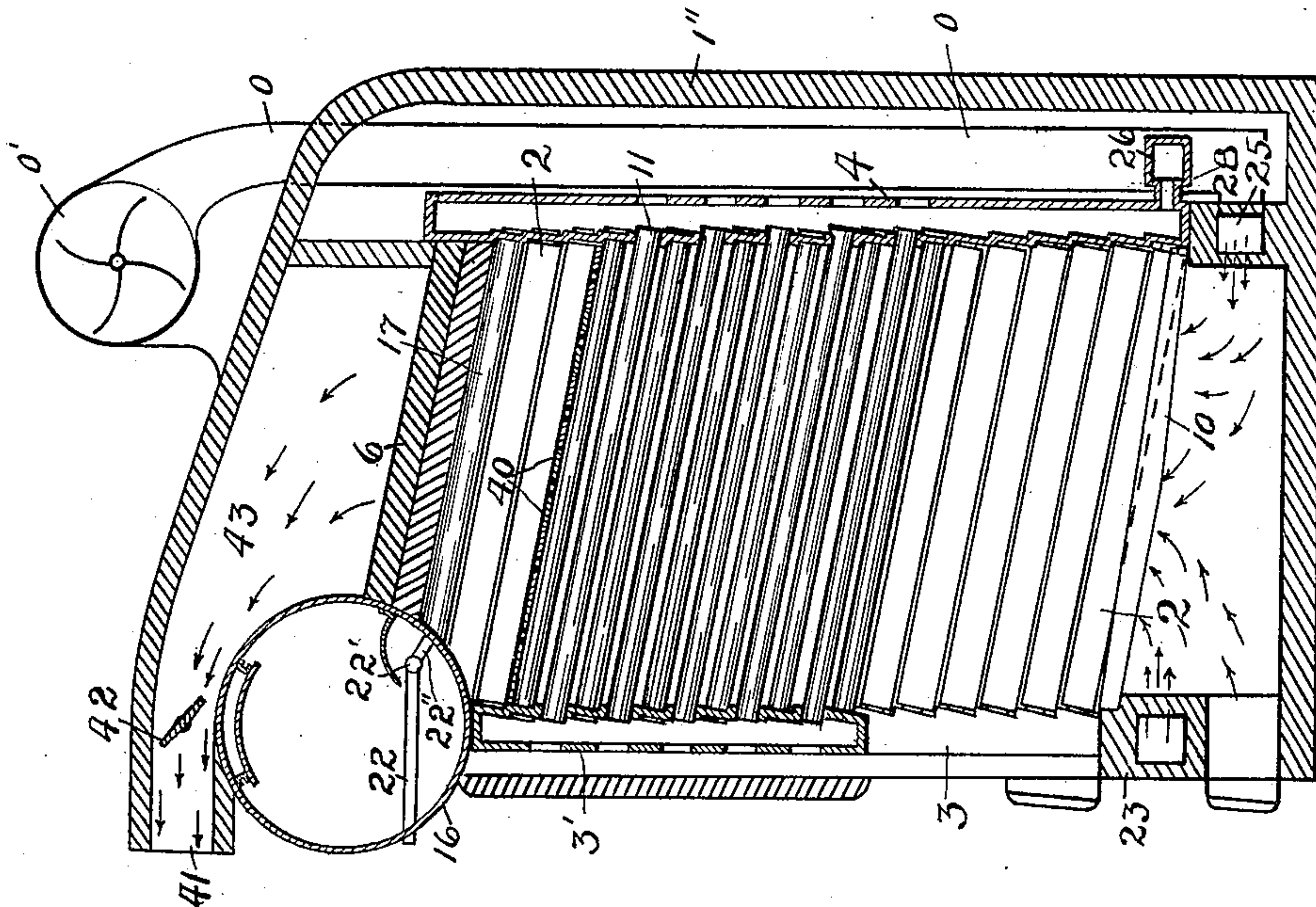


Fig. 3

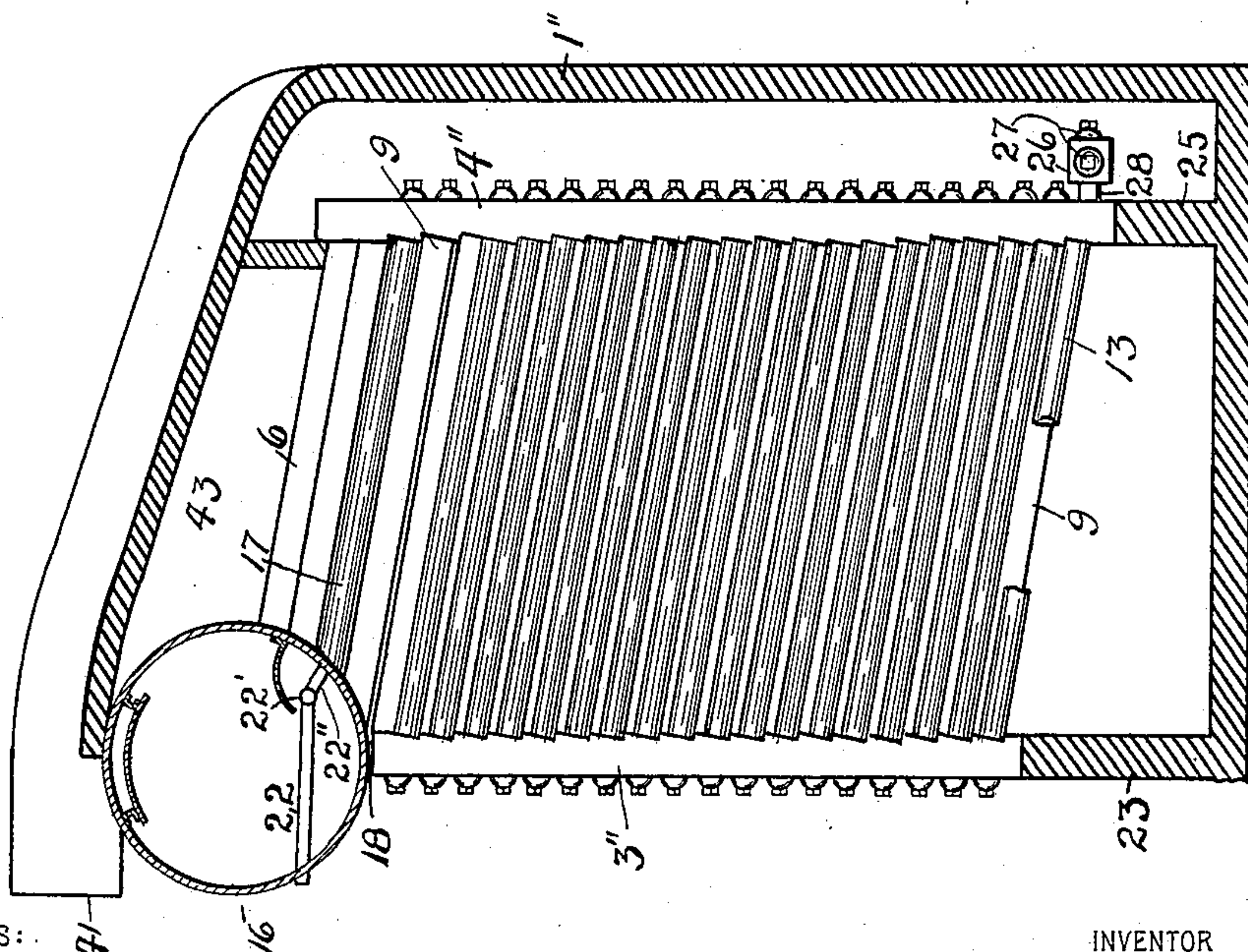


Fig. 2

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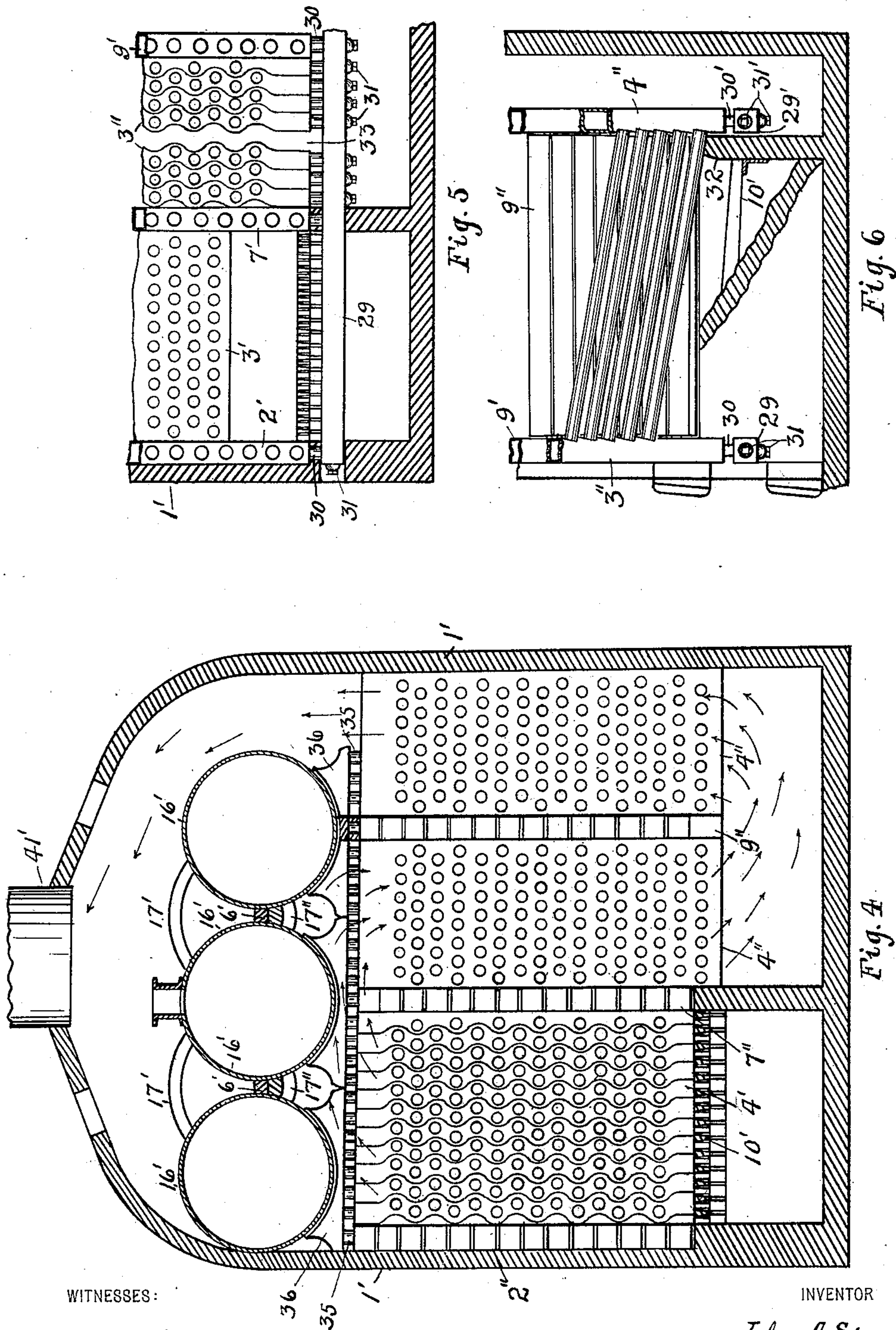
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

JOHN A. STEVENS, OF LOWELL, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 616,156, dated December 20, 1898.

Application filed June 14, 1898. Serial No. 683,432. (No model.)

To all whom it may concern:

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

This invention is more particularly an improvement in water-tube boilers and furnaces therefor, whether land or marine, and relates to my former inventions, in which the baffle-walls are arranged parallel to the vertical planes of the tubes.

The objects of my present invention are primarily to provide for the utilization of either half of the furnace independently of the other, to increase the heating-surface of the boiler, to secure the equal distribution of the heating-gases, to save space and utilize the heat of the gases until they have escaped, to facilitate cleaning and repair, and generally to secure increased economy, efficiency, and convenience of operation.

In the construction the heating-space or furnace is divided into two distinct compartments, preferably by a water-box wall, so that either half may be worked at will while the other is developing full power. By this arrangement in case of accident to the water-circulating and steam-generating system but one-half of the total fire will act to evaporate the leakage and produce scalding steam. The action of the boiler will be rendered more even than when one large furnace is employed, and the liability of priming will be decreased since the flow of generated steam will be more constant. The increase in the heating-surface and the economical advantage in the manner of utilizing the heat of the furnace-gases will more fully appear, as will also the general advantage of the construction, by reference to the accompanying drawings and description.

In the accompanying drawings, illustrating my invention, Figure 1 is a transverse sectional view of the construction in front elevation. Fig. 2 is a vertical sectional view on the line *a a* of Fig. 1. Fig. 3 is a vertical sectional view on the line *b b* of Fig. 1. Fig. 4 is a transverse sectional view, in front elevation, of a modified form of the invention. Fig. 5 is a front elevation of the invention, partially in section, in illustration of a modi-

fied form of header and connections. Fig. 6 is an end elevation, partially in section, of the modification shown in Fig. 5.

As shown in the drawings, the chamber, limited by the containing-walls 1, is divided into two distinct main compartments by a wall 2, preferably composed of water-boxes extending between and communicating with corresponding front and rear water-legs and rising from a suitable foundation 5 to the roof-baffle 6. Each of these main compartments is divided into three passes by a primary baffle-wall 7 and a secondary baffle-wall 9. The baffle-wall 7, preferably composed of water-boxes extending between and communicating with corresponding front and rear water-legs, rises from a foundation 8 toward the roof-baffle 6. The baffle-wall 9, preferably composed of water-boxes extending between and communicating with corresponding front and rear water-legs, extends downward from the roof-baffle 6. In each division or main compartment the first of these three passes contains a grate 10, suitably supported, and a bank of water-circulating and steam-generating tubes 11, extending parallel to the baffle-walls and having their respective ends expanded into the front and rear headers 3' and 4'. The second and third passes contain, respectively, the banks of tubes 12 and 13, extending parallel to the baffle-walls and having their respective ends expanded into the front and rear headers 3'' and 4''.

The rear headers and water-legs are connected with the steam-drum 16 by means of the tubes 17, expanded in place, and the front headers are connected therewith by nipples 18. This drum is provided with the take-off and escape-valve connections 19 and 20 and with any conveniently-placed manholes, as 21. The feed-water supply may be introduced through this drum by means of the pipes 22 22' and nipples 22'', which register with the tubes 17. The tubes 17 may support the roof-baffle 6, which is formed of any suitable non-conducting material and extends between the baffle-walls 9 9, or to such distance as to provide a sufficient escape from the end passes for the waste gases. The banks of tubes in the first passes are baffled by means of perforated tiles 40 to the extent found necessary. The waste gases escape be-

tween the tubes 17 of the end passes and pass thence by the channel 43 through the breeching 41, which is placed above the drum 16, the escape being regulated by means of a damper 42.

The space between the rear headers and the wall 1' permits access for cleaning and repair and provides a dry air-space, which prevents radiation. Air-ducts, as 0, made removable, may be placed in this space, through which air may be forced by a fan 0' to the lower part of the grate 10 when hot draft is used. This location of such ducts effects the heating of the air passing therethrough, which tends to increase the economy of the generator. The front headers and water-legs may rest directly upon a supporting-wall 23, excepting the front headers 3' for the first passes, which are made short to permit charging the fuel. The rear headers and water-legs may rest directly on the supporting-wall 25. A water-box 26, provided with hand-hole caps 27, is connected with the rear headers and water-legs by the nipples 28, by means of which the tubes and headers may be blown out; but the details of construction may be modified in accordance with the details of the modifications illustrated in Figs. 4, 5, and 6, in which parallel steam-drums are arranged parallel with the planes of the division and baffle walls. These drums are provided with water-boxes 36, which are connected by means of the nipples 35 with the headers or legs, into which the tubes and water-boxes are expanded, as in the case of the parts 4' 4''. Similar connections are provided for the water-legs or headers 2' 7' 9' 3' 3''. The upper or steam spaces of the drums are connected by the tubes 17', and the lower or water spaces of the drums are connected by the tubes 17'', by means of which the steam and water of the several drums are equalized. Suitable non-conducting material 6' covers the spaces between the drums and forms a baffle therewith.

A water-box 29 is placed beneath the front headers and water-legs and is connected thereto by the nipples 30, the hand-hole caps 31 permitting access for blowing out and cleaning. The rear headers and water-legs may be similarly connected with a water-box 29', placed beneath them and connected therewith by the nipples 30', the hand-hole caps 31' permitting access for blowing out and cleaning. In this construction the grate 10' is provided with a bridge-wall 32 at the rear end thereof.

As illustrated in Figs. 4 and 5, the headers may be either of the box type 3' 4'' or of the sectional sinuous type 3'' 4'.

In constructing the boiler spaces 33 may be left between the sectional headers at the desired intervals for the insertion of a hose to clear off soot and similar deposits upon the heating-surfaces.

When the requirements of the boiler and furnace are limited, the principle of the invention may be embodied as in the modifica-

tion illustrated in Fig. 4, in which the chamber, limited by the walls 1', is divided into three passes by the side-wall water-boxes 2'', water-box baffle-wall 7'', and water-box baffle-wall 9'', which water-boxes are expanded into front and rear water-legs, as illustrated by the parts 2' 7' 9'.

In the operation of the main construction the gaseous products of combustion rise from the grates 10, heating the water-boxes 2 and 7, the tubes 11 and 17, their connecting-headers, and the steam-and-water drum. Being baffled by the tile-baffle 40 and deflected by the roof-baffle 6, they pass above the respective baffle-walls 7 of these first passes and transversely thereto, into and down the second passes, heating the water-boxes 7 and 9, the tubes 12, the drum, and the headers. Following the direction of the arrows, they pass below the baffle-walls 9, thence upward through the third passes, heating the water-boxes 9, the tubes 13 and 17, their headers, and the drum. Escaping between the tubes 17 of the third passes, they are conducted along the drum by the passages 43 and out through the breeching 41. By this course the heat of the gases is utilized in heating the water-circulating and steam-generating system up to the point when such gases finally escape through the breeching.

In the modified construction illustrated in Fig. 4 the heated gaseous products rise from the grate 10', heating the water-boxes 2'' 7'', the tubes, headers, and drums of the first pass. Being deflected thence in the direction of the arrows by the drums and roof-baffle, they are carried over the baffle-wall 7'' into the second pass and, descending, transmit their heat to the water-boxes 7'' 9'', the tubes and headers of the second pass, and the drums connected therewith. They pass thence under the baffle-wall 9'' and upward through the outer pass, thence through the breeching 41, giving up their heat to the water-boxes 9'', the tubes, headers, and drums in their path.

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

1. In the combination of a boiler and furnace, a division-wall which separates the furnace into two distinct compartments, a baffle-wall parallel with said division-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and baffle walls, headers for said tubes, a steam-and-water drum connected with said headers, a grate in each of said passes, and an escape from each of said passes located above the respective baffle-walls and transverse thereto, substantially as specified.

2. In the combination of a boiler and furnace, a water-box division-wall which separates the furnace into two distinct compartments, a water-box baffle-wall parallel with said water-box division-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and

baffle walls, headers for said tubes and water-boxes, a steam-and-water drum connected with said headers, a grate in each of said passes, and an escape from each of said passes located above the respective baffle-walls and transverse thereto, substantially as specified.

3. In the combination of a boiler and furnace, a water-box division-wall which separates the furnace into two distinct compartments, a water-box baffle-wall parallel with said water-box division-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and baffle walls, headers for the respective ends of said tubes and water-boxes, a steam-and-water drum located above one set of said headers and connected thereto, a series of tubes connecting said steam-and-water drum and the other set of said headers, a roof-baffle located above said passes, and an escape-passage from each of said passes between said roof-baffle and said baffle-walls, substantially as specified.

4. In the combination of a boiler and furnace, a division-wall which separates the furnace into two distinct compartments, a baffle-wall parallel with said division-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and baffle walls, headers for the respective ends of said tubes, a steam-and-water drum located above one set of said headers and connected thereto, a series of tubes connecting said steam-and-water drum and the other set of said headers, a roof-baffle located above said passes, and an escape-passage from each of said passes between said roof-baffle and said baffle-walls, substantially as specified.

5. In a boiler and furnace, a division-wall which separates the furnace into two distinct compartments, a baffle-wall parallel with said division-wall in each of said compartments, a second baffle-wall parallel with said first baffle-wall in each of said compartments, an escape-passage from each of the passes formed by said division and first baffle walls located above said first baffle-walls, and an escape-passage from each of the passes formed by said first and second baffle-walls located beneath said second baffle-walls, substantially as specified.

6. In a boiler and furnace, a water-box division-wall which separates the furnace into two distinct compartments, a water-box baffle-wall parallel with said division-wall in each of said compartments, a second water-box baffle-wall parallel with said first baffle-wall in each of said compartments, an escape-passage from each of the passes formed by said division and first baffle walls located above said first baffle-walls, an escape-passage from each of the passes formed by said first and second baffle-walls located beneath said second baffle-walls, in combination with a water-circulating and steam-generating system, substantially as specified.

7. In a boiler and furnace, a water-box division-wall which separates the furnace into two distinct compartments, a water-box baffle-wall parallel with said division-wall in each of said compartments, a second water-box baffle-wall parallel with said first baffle-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and baffle walls, headers for the respective ends of said tubes, a steam-and-water drum located above one set of said headers and connected thereto, a series of tubes connecting said steam-and-water drum and the other set of said headers, a roof-baffle located above said passes, an escape-passage between said roof-baffle and each of said first baffle-walls, and an escape-passage beneath each of said second baffle-walls, substantially as specified.

8. In a boiler and furnace, a water-box division-wall which separates the furnace into two distinct compartments, a water-box baffle-wall parallel with said division-wall in each of said compartments, a second water-box baffle-wall parallel with said first baffle-wall in each of said compartments, combining with end walls to divide each compartment into three passes, a steam-and-water drum connected with said water-boxes, a roof-baffle located above said passes, an escape-passage located between said roof-baffle and each of said first baffle-walls, an escape beneath each of said second baffle-walls, and an escape-passage from said third pass, substantially as specified.

9. In a boiler and furnace, a division-wall which separates the furnace into two distinct compartments, a baffle-wall parallel with said division-wall in each of said compartments, a second baffle-wall parallel with said first baffle-wall in each of said compartments, combining with end walls to divide each compartment into three passes, a bank of tubes parallel to said walls in each of said passes, headers for the respective ends of said tubes, a steam-and-water drum located above one set of said headers and connected thereto, a series of tubes connecting said steam-and-water drum and the other set of said headers, a roof-baffle located above said passes, an escape from the first of said passes located between said roof-baffle and said first baffle-wall, an escape from the second of said passes located beneath said second baffle-wall, and an escape from the third of said passes adjacent to said steam-and-water drum, substantially as specified.

10. In a boiler and furnace, a division-wall which separates the furnace into two distinct compartments, a baffle-wall parallel with said division-wall in each of said compartments, a bank of tubes parallel to said walls in each pass formed by said division and baffle walls, headers for the respective ends of said tubes, a steam-and-water drum connected with said headers, an escape-passage above each of said baffle-walls and beneath said steam-and-

water drum, and a water-box connected with the base of said headers, substantially as specified.

11. In the combination of a boiler and furnace, a pass or combustion-chamber and water-boxes closing one side thereof, a water-box baffle-wall parallel with the aforesaid side of said chamber, a second water-box baffle-wall parallel with said first baffle-wall, said baffle-walls and the end walls forming three communicating passes, a roof-baffle located above said passes, a bank of tubes in each of said passes, headers for the respective ends of said tubes, and a steam-and-water drum connected with said headers, substantially as specified.

12. In a boiler and furnace, a pass or combustion-chamber and water-boxes closing one side thereof, a water-box baffle-wall parallel with the aforesaid side of said chamber, a second water-box baffle-wall parallel with said first baffle-wall, a bank of tubes located in each of said passes, headers for the respective ends of said tubes, a steam-and-water drum connected with said headers, and a water-box connected with the base of the respective headers, substantially as specified.

13. In a boiler and furnace, a combustion-chamber and a wall closing one side thereof,

a baffle-wall parallel with the aforesaid side of said chamber, a second baffle-wall parallel with said first baffle-wall, combining with an end wall to form three communicating passes, a bank of tubes located in each of said passes, headers for the respective ends of said tubes, a steam-and-water drum connected with said headers, and a water-box connected with the base of the rear headers, substantially as specified.

14. In a boiler and furnace, a combustion-chamber and a wall closing one side thereof, a baffle-wall parallel with the aforesaid side of said chamber, a second baffle-wall parallel with said first baffle-wall, combining with an end wall to form three communicating passes, a bank of tubes located in each of said passes, headers for the respective ends of said tubes, and communicating steam-and-water drums connected with said headers and forming a roof-baffle for said passes, as specified.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses.

JNO. A. STEVENS.

Witnesses:

PHILIP R. COATS,
FRANK E. KNOWLES.