

No. 616,154.

Patented Dec. 20, 1898.

J. A. STEVENS.
BOILER.

(Application filed Mar. 11, 1898.)

(No Model.)

2 Sheets—Sheet 1.

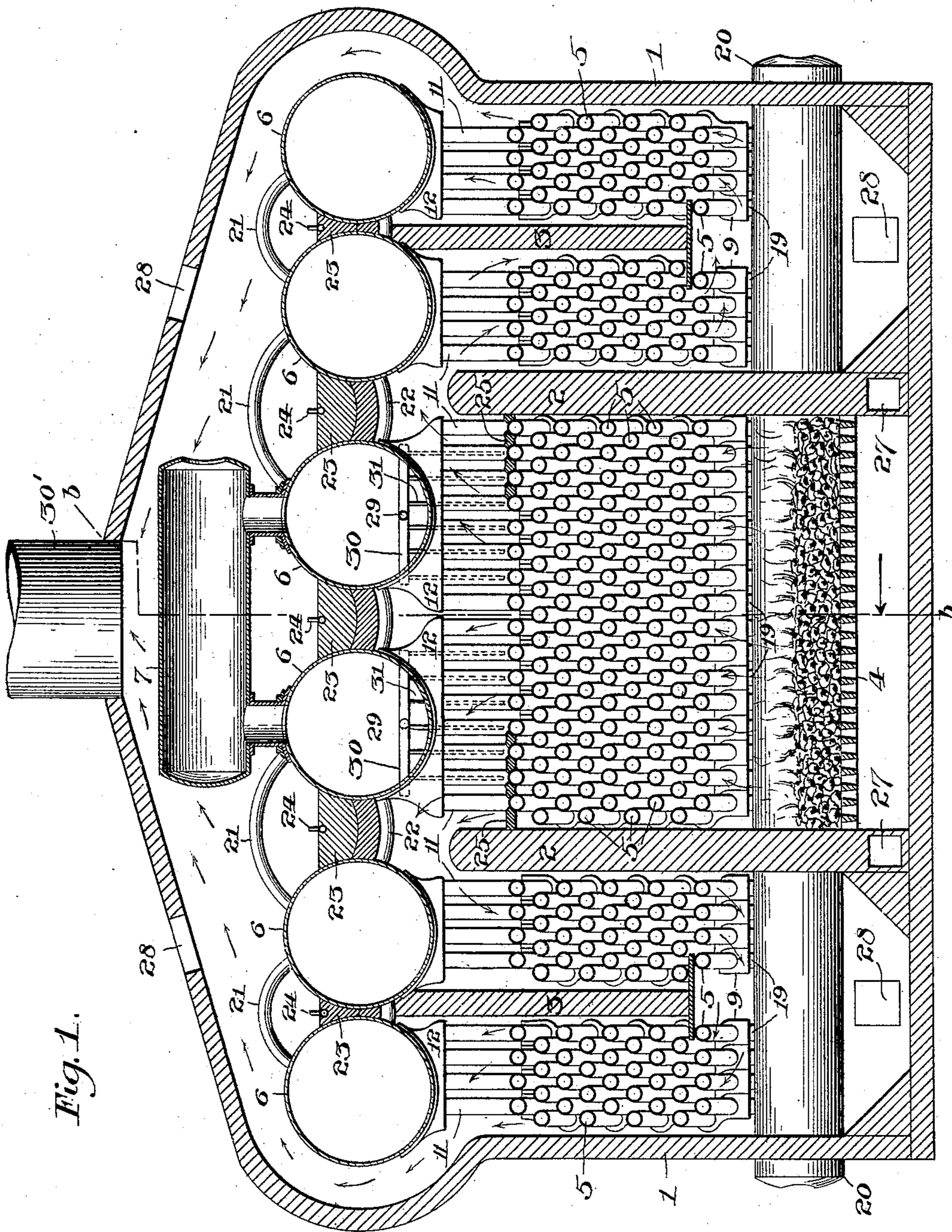


Fig. 1.

WITNESSES:

A. V. Groupe
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INVENTOR

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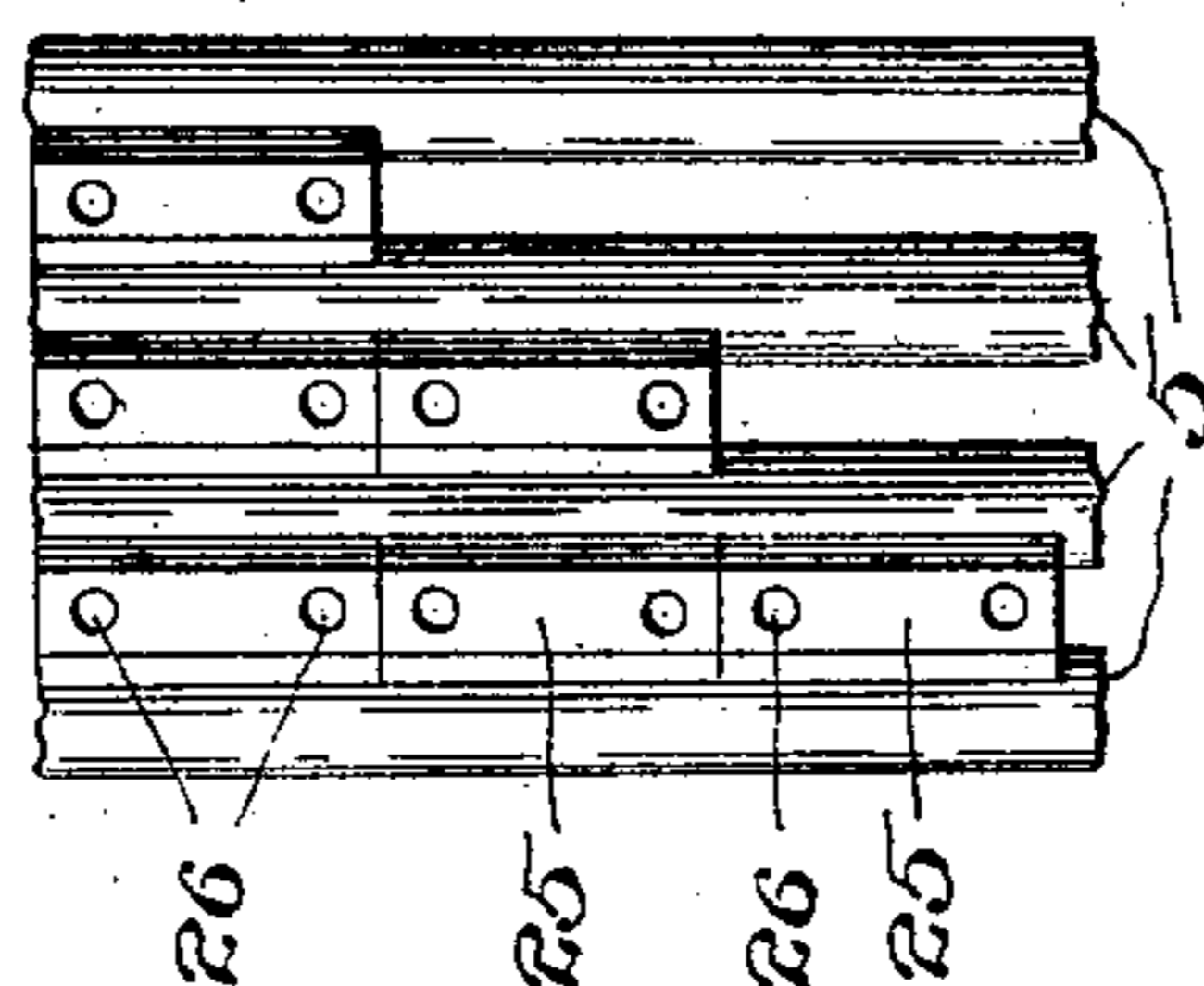
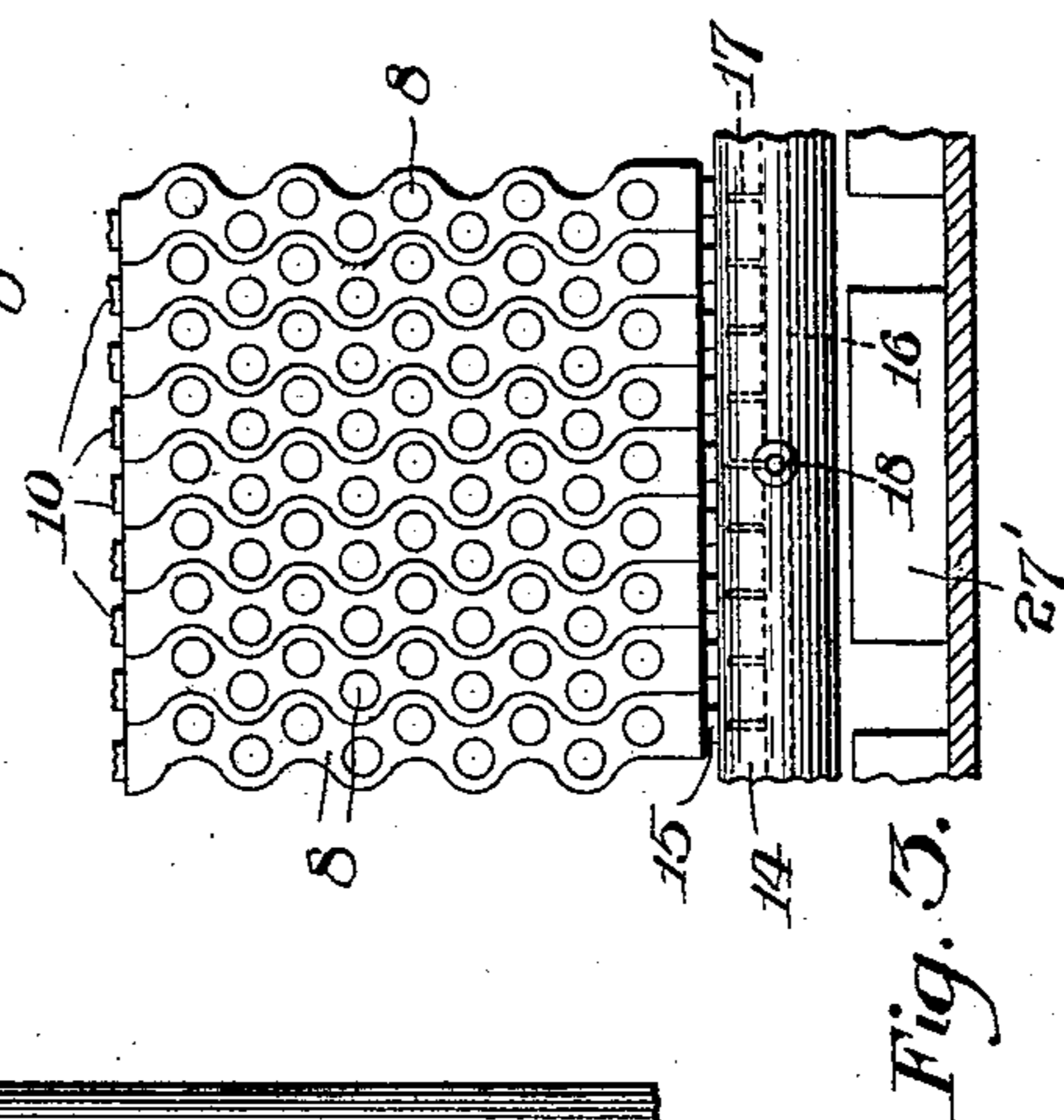
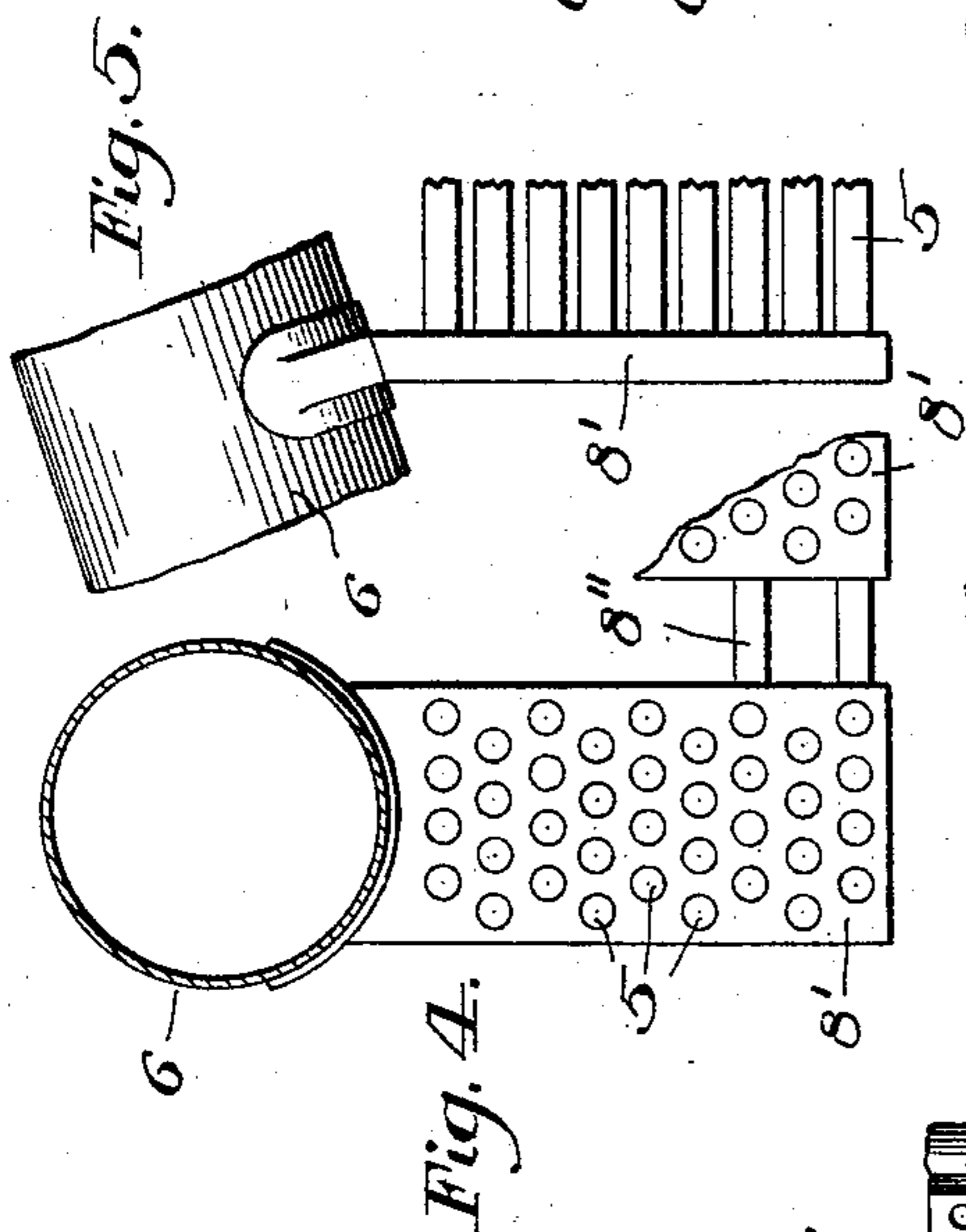
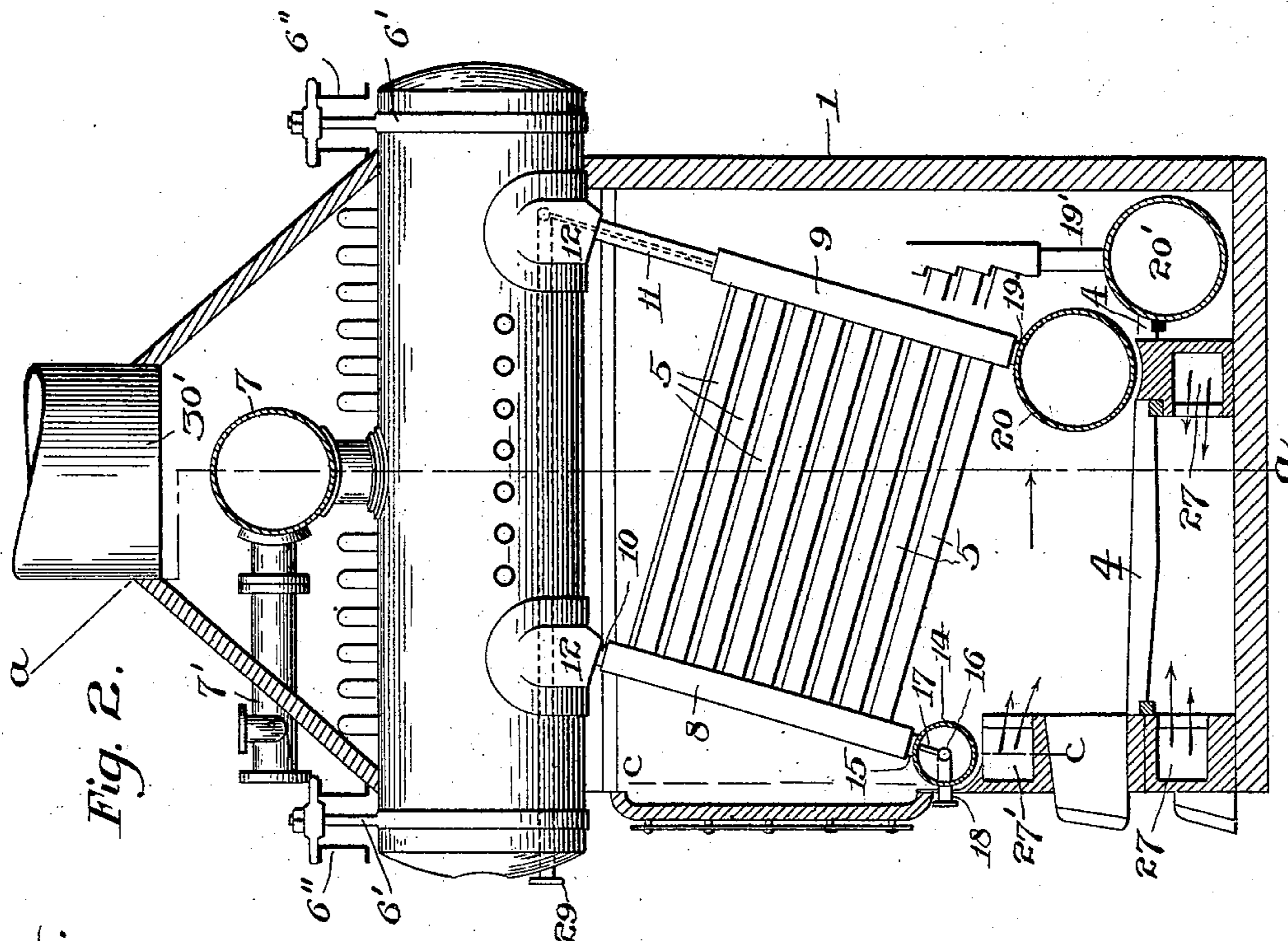
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2 Sheets—Sheet 2.



WITNESSES:

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Fig. 6.

INVENTOR

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UNITED STATES PATENT OFFICE.

JOHN A. STEVENS, OF LOWELL, MASSACHUSETTS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 616,154, dated December 20, 1898.

Application filed March 11, 1898. Serial No. 673,486. (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.

My invention relates more particularly to tubular steam-boilers and furnaces therefor adapted for both marine and land service.

The principal objects of my improvements are to effect complete combustion of the fuel, to secure economical distribution and utilization of the products of combustion, to provide a large heating-surface for the generation of steam, to arrange steam and water drums in the paths of the heated products of combustion for increasing the heating-surface and producing dry or superheated steam, to augment the circulation throughout the steam-generating system and secure free circulation therethrough, to provide for the precipitation of obstructing matter contained in the circulating water as well as for the removal thereof, to keep heating-surfaces and passages free from deposits and obstructions, to prevent radiation, and generally to attain a high degree of efficiency, economy, and stability, as will more fully appear from the following description of the construction and operation.

My 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 partial vertical sectional view on the line *c c* of Fig. 2. Fig. 4 is a front elevation, and Fig. 5 is a side elevation, illustrating a form of header construction. Fig. 6 is a plan of the baffle construction employed in the central pass.

In the construction the chamber formed by the containing-walls 1 is divided by baffle-walls 2 into a central compartment or pass, forming the main combustion-chamber, and two end compartments or passes, respectively divided by the baffle-walls 3. The central compartment is provided with the furnace-grate or fire-bars 4 and contains the banks of water-circulating and steam-generating tubes 5, connected with the headers 8 and 9.

The said headers are connected with the two central steam and water drums 6 by the respective nipples 10 and 11 through the corresponding water-boxes 12. The front headers 8 preferably communicate with a precipitation-drum 14 through the nipples 15. The said precipitation-drum is provided with a tube 16, having nozzles 17, which register with the respective nipples 15 and permit the circulating system to be blown out by an attachment to the connection 18 and provides an auxiliary inlet for feed-water. It will be understood that this precipitation-drum and its connections may be omitted. The rear headers 9 are connected by the nipples 19 with a large precipitation-drum 20, which is placed at the rear of the grate and forms a bridge-wall therefor. This drum may be placed below the level of the grate-surface and to the rear thereof, as illustrated by the drum 20', which forms an abutment for the grate and is connected with the rear headers by the nipples 19'. Air-ducts 27 and 27' are employed to facilitate combustion.

The end compartments or passes are each provided with two banks of tubes 5, separated by the baffle-walls 3, which tubes are connected with the headers 8 and 9. The headers for the respective banks of tubes of the end passes are connected to corresponding steam and water drums 6 by their nipples 10 and 11 and water-boxes 12. The outer banks of tubes and their connections in the end passes may be omitted and the structure accordingly shortened.

The drums 6 are supported in hangers 6', suspended from channel-beams 6'', which are built into the framework. The said drums have their upper or steam spaces connected by the tubes 21 and their lower or water spaces connected by the tubes 22, which facilitate the circulation and equalize the pressure therein. The two central drums 6 are connected with an auxiliary drum 7, which is employed for the collection and storage of dry or superheated steam and from which steam is taken off by the take-off pipe 7'. The spaces between the drums 6 are covered by bridges or baffles of non-conducting material 23, which may consist of a foundation layer of tile or brickwork covered by a layer of

plastic non-conducting material. Blowers 24 are supported by the parts 23 and serve to keep the soot moving toward the stack.

The baffle-walls 3, extending downward from the corresponding bridges 23, may be supported in any suitable or conventional manner. These baffles 2 and 3 may be constructed of refractory material; but I do not limit myself to this construction, as water-boxes or a combination of water-boxes and refractory material may be employed.

The central pass is partially covered by baffle-tiles 25, having perforations 26 there-through, their shapes being such that the spaces between the tubes of the top row are partially covered, while the tubes themselves are substantially uncovered. This baffle effects a focusing of the products of combustion in the central pass. It will be evident that substantially the same function will be performed by supporting a construction of baffle-tiles above or below the top row of tubes of the central pass, and I may employ such construction when found expedient.

The doors 28 are employed for cleaning, examination, and repair.

The feed-water is introduced through the tubes 29 within the drums 6 and the branch tubes 30, having the nozzles 31, which communicate with the corresponding nipples 11. The water passes from these nipples down the headers 9 to the drum 20 or 20' and through the tubes 5, passing thence to the drum 14 and up the headers 8 to the drums 6.

The positions of the precipitation-drums, out of the direct circuit of the circulating water and at the lowest parts of the boiler, secure a precipitation of the sediment carried by the water, which may readily be blown off. These drums also serve to hold the headers steady in seaway when the boilers are used on shipboard. The location of the drum 20' will avoid counter-currents and the admixture of steam and water in the supply of the tubes of the central pass, which would cause them to deteriorate as the result of a high rate of combustion.

The gaseous products of combustion rising from the grate in the central pass are directed by the baffle-walls and baffles in the direction of the arrows, the waste products passing out by the breeching 30'. It will be observed that the course of the heated gases is transverse to the direction of the tubes and the several members of the water-circulating and steam-generating system, the locations of which are such as to receive the direct influence of the heat throughout its entire course.

The header construction may be that illustrated in Fig. 3, in which each vertical row of staggered tubes is expanded into sectional non-communicating headers 8, or each bank of tubes may be expanded into box-headers 8', riveted or welded directly to the drums 6 and connected together by the tubes 8'', as shown in Figs. 4 and 5.

It will be understood that various modifi-

cations in the nature of equivalents may be made in the details of the construction illustrated and described without departing from the spirit of my invention, and I do not therefore wish to be understood as limiting myself to such specific details.

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

1. In the combination of a boiler and furnace, a pass or combustion-chamber and a grate therein, one or more banks of tubes therein, headers for said tubes, one or more drums connected with said headers and extending substantially parallel with the vertical planes of said tubes, a baffle-wall extending substantially parallel to the vertical planes of said tubes, and means for directing the gaseous products of combustion into active contact with said tubes and drum or drums and transversely thereto.

2. In the combination of a boiler and furnace, a pass or combustion-chamber and a grate therein, a bank of tubes in said combustion-chamber, headers for said tubes, a drum connected with said headers, a second pass or combustion-chamber, a bank of tubes in said second combustion-chamber and headers therefor, a drum connected with said second headers, a baffle-wall substantially parallel to the vertical planes of said tubes, and means for directing the gaseous products of combustion into active contact with said tubes and transversely thereto, as specified.

3. In the combination of a boiler and furnace, a pass or combustion-chamber, one or more banks of tubes in said combustion-chamber and headers for said tubes, one or more drums connected with said headers and extending substantially parallel to the vertical planes of said tubes, a second pass or combustion-chamber, one or more banks of tubes in said second combustion-chamber and headers therefor, one or more drums connected with said second headers and extending substantially parallel to the vertical planes of said tubes, a baffle-wall between said combustion-chambers substantially parallel to the vertical planes of said tubes, and a passage from said first to said second combustion-chamber located between said drums and baffle-wall for the gaseous products of combustion, said gaseous products acting transversely to said tubes and drums and in direct contact therewith.

4. In the combination with a boiler and furnace, a pass or combustion-chamber, one or more banks of tubes in said combustion-chamber, headers for said tubes, one or more drums connected with said headers, a second combustion-chamber, one or more banks of tubes in said second combustion-chamber and headers therefor, one or more drums connected with said second headers, a baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes for directing the gaseous products

of combustion upward into active contact with said heating-surfaces, and a baffle-wall dividing said second combustion-chamber and substantially parallel to the vertical planes of said tubes for directing the gaseous products of combustion downward into active contact with said heating-surfaces.

5. In the combination of a boiler and furnace, a pass or combustion-chamber, one or more banks of tubes in said combustion-chamber, headers for said tubes, one or more drums connected with said headers and extending substantially parallel to the vertical planes of said tubes, a second combustion-chamber, one or more banks of tubes in said second combustion-chamber and headers therefor, one or more drums connected with said second headers and extending substantially parallel to the vertical planes of said tubes, a baffle-wall between said combustion-chambers and substantially parallel to the vertical planes of said tubes for directing the gaseous products of combustion upward into active contact with said heating-surfaces, and a baffle-wall dividing said second combustion-chamber and substantially parallel to the vertical planes of said tubes for directing the gaseous products of combustion downward and into active contact with said heating-surfaces.

6. In the combination of a boiler and furnace, a pass or combustion-chamber and a grate therein, a second pass or combustion-chamber, a baffle-wall between said combustion-chambers and baffles for directing the gaseous products of combustion upward and into said second combustion-chamber, a second baffle-wall in said second combustion-chamber substantially parallel with said first baffle-wall and baffles for directing the gaseous products of combustion downward, an escape-pass leading from said second chamber, a bank of tubes in said first chamber substantially parallel to said baffle-walls, a bank of tubes in said second chamber substantially parallel to said baffle-walls, headers for said tubes, and communicating steam-drums connected with said headers, as specified.

7. In the combination of a boiler and furnace, a pass or combustion-chamber, one or more banks of tubes therein, headers for said tubes, a second pass or combustion-chamber, a baffle-wall between said combustion-chambers, substantially parallel to the vertical planes of said tubes, a second baffle-wall for dividing said second combustion-chamber, substantially parallel to said first baffle-wall, a bank of tubes in each division of said second combustion-chamber, substantially parallel with said baffle-walls, headers for the tubes in said second chamber, and communicating steam-drums connected with said headers, as specified.

8. In the combination of a boiler and furnace, a pass or combustion-chamber, one or more banks of tubes therein, headers for said tubes, one or more drums substantially parallel to the vertical planes of said tubes and

connected with said headers, a second pass or combustion-chamber, a baffle-wall substantially parallel to the vertical planes of said tubes between said combustion-chambers, a second baffle-wall substantially parallel to said first baffle-wall which divides said second chamber into two compartments, a bank of tubes in each of said two compartments substantially parallel to said bridge-walls, headers for said tubes and drums extending parallel to the vertical planes of said tubes connected with said headers, substantially as specified.

9. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes therein and headers for said tubes, a baffle-wall extending substantially parallel to the vertical planes of said tubes, a drum connected with said headers, means for directing the gaseous products of combustion into active contact with said tubes and drum, and transversely to said tubes, a feed-water pipe within said drum and connections therefor which communicate with the downcomers of said headers, for the purpose set forth.

10. In the combination of a boiler and furnace, a combustion-chamber, one or more banks of tubes therein, headers for said tubes, a drum in said combustion-chamber connected with said headers, a baffle-wall extending substantially parallel to the vertical planes of said tubes, means for directing the gaseous products of combustion into direct contact with said tubes and drum and between said drum and baffle-wall, and a baffle supported by said tubes for focusing said gaseous products of combustion, substantially as specified.

11. In the combination of a boiler and furnace, a combustion-chamber, a bank of tubes and headers therefor, a drum connected with said headers and substantially parallel to the vertical planes of 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, substantially as specified.

12. In the combination of a boiler and furnace, a combustion-chamber and a grate therein, a bank of tubes therein, a drum, a rear header for said tubes connected with said drum, a front header for said tubes connected with said drum, a precipitation-drum connected with said rear header and forming a bridge-wall for said grate, and a feed-water pipe in said drum and connected with said headers.

13. In the combination of a boiler and furnace, a combustion-chamber and a grate therein, a bank of tubes therein, a drum substantially parallel to the vertical planes of said tubes, a rear header for said tubes connected with said drum, a front header for said tubes connected with said drum, a precipitation-drum connected with said rear header

and forming a bridge-wall for said grate, a feed-water pipe in said drum and connected with said headers, a second combustion-chamber, a bank of tubes therein and headers therefor, a second drum substantially parallel with said first drum and connected therewith, connecting-passages between said second drum and headers, and a baffle-wall substantially parallel to the vertical planes of said tubes and separating said combustion-chambers, as specified.

14. In the combination of a boiler and furnace, a series of substantially vertical and substantially parallel baffle-walls, a series of banks of tubes substantially parallel to said baffle-walls and separated thereby, a series of parallel drums above the combustion-chambers formed by said baffle-walls and connected with said tubes, passages connecting said drums, and bridges or baffles between the same, as specified.

15. In the combination of a boiler and furnace, a pass or combustion-chamber and a grate therein, a second pass or combustion-chamber, baffle-walls between said combustion-chambers and baffles for directing the gaseous products of combustion upward and into said second combustion-chamber, a baffle-wall within said second combustion-chamber

substantially parallel to said first baffle-wall and a baffle for directing the gaseous products of combustion downward, a third pass or combustion-chamber, a baffle-wall between said first and third chambers and baffles for directing the gaseous products of combustion upward and into said third combustion-chamber, a baffle-wall within said third chamber substantially parallel to said third baffle-wall for directing the gaseous products of combustion downward, and an escape, as specified.

16. In the combination of a boiler and furnace, a series of substantially vertical and substantially parallel baffle-walls, a series of banks of tubes substantially parallel to said baffle-walls and separated thereby, a series of parallel drums above the combustion-chambers formed by said baffle-walls and connected with said tubes, passages connecting said drums, bridges or baffles between the same, and a superheating-drum connected with said drums.

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.