

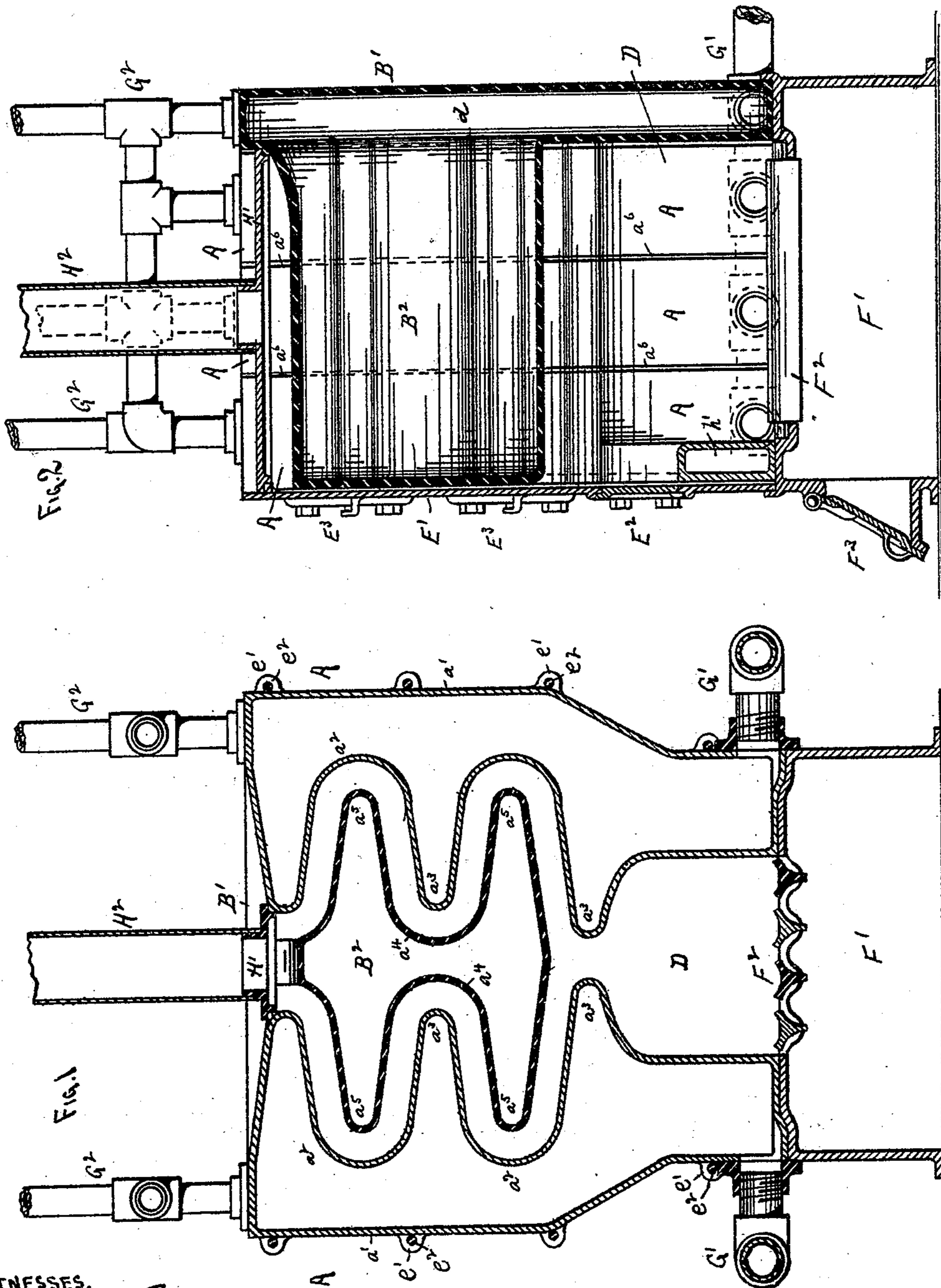
(No Model.)

5 Sheets—Sheet 1.

D. A. DICKINSON.  
STEAM AND HOT WATER GENERATOR.

No. 518,184.

Patented Apr. 10, 1894.



WITNESSES.

*J. L. Lacey*  
*H. Swanton*

Daniel A. Dickinson, INVENTOR.  
By Charles N. Woodward ATTORNEY.

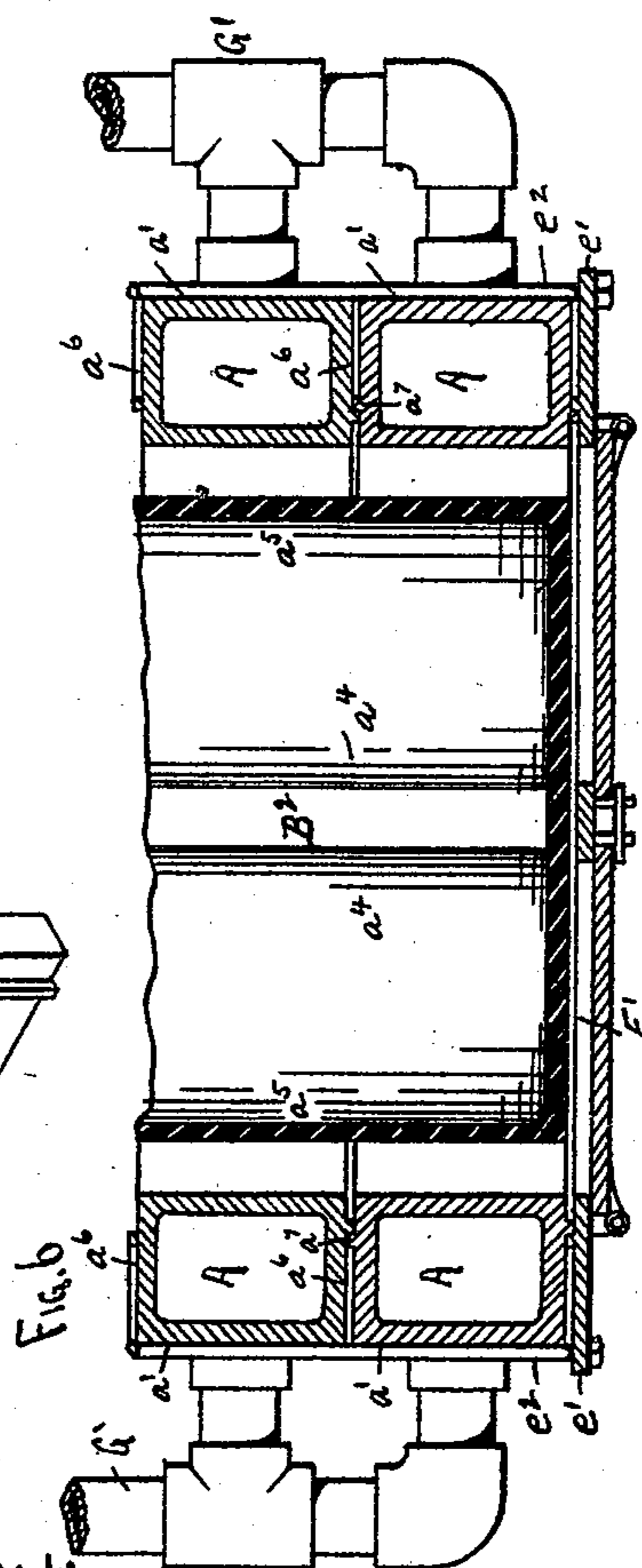
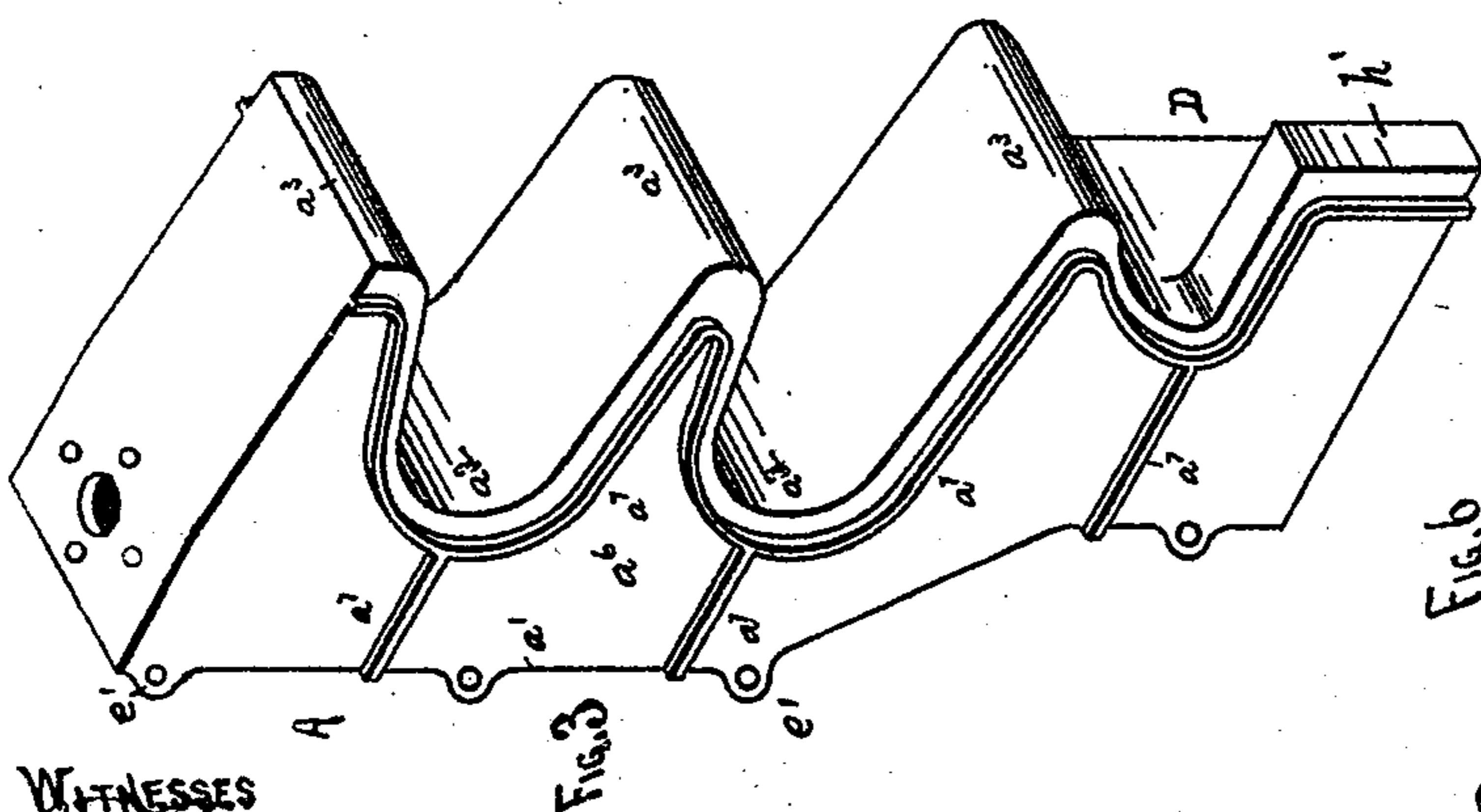
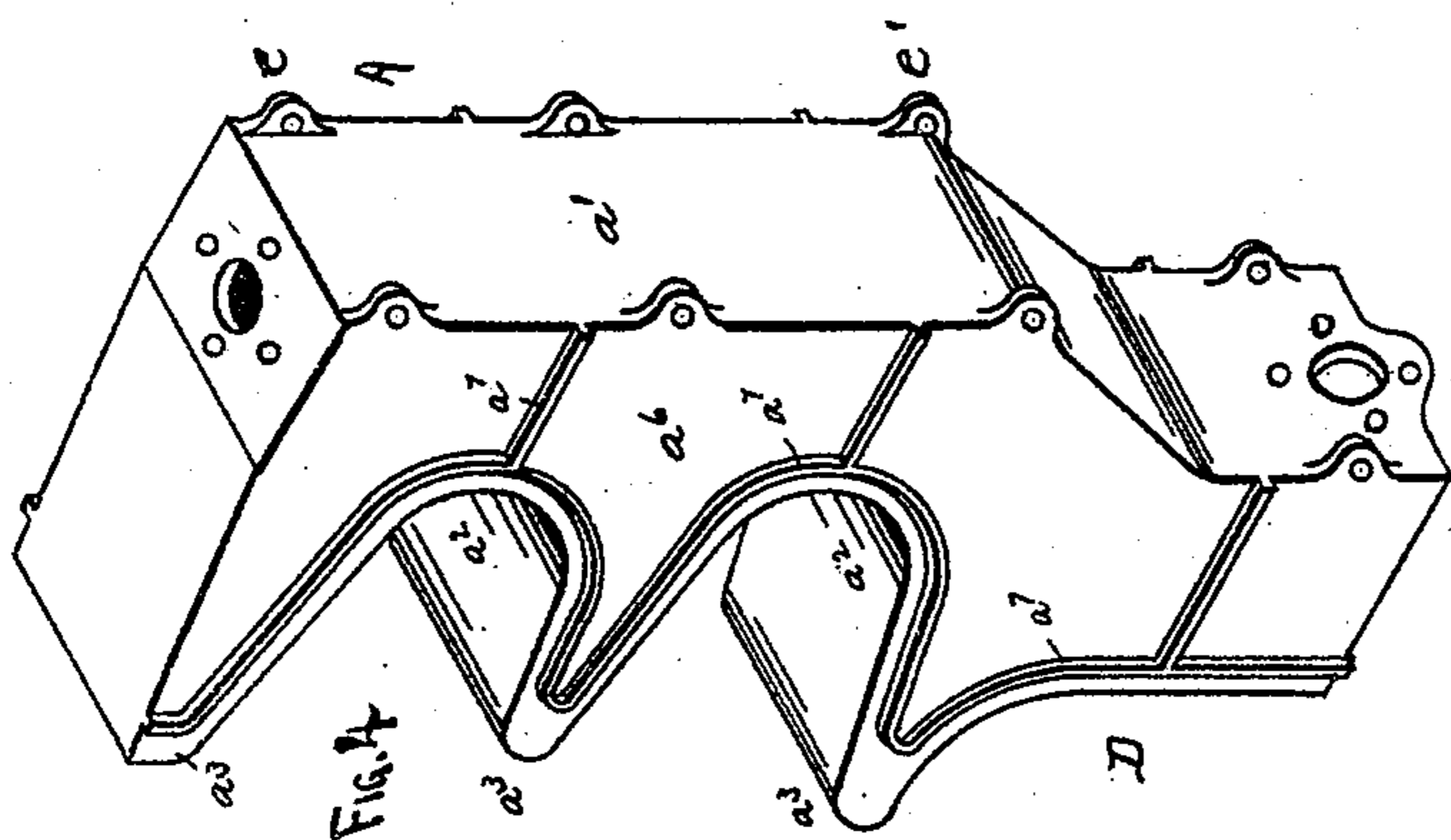
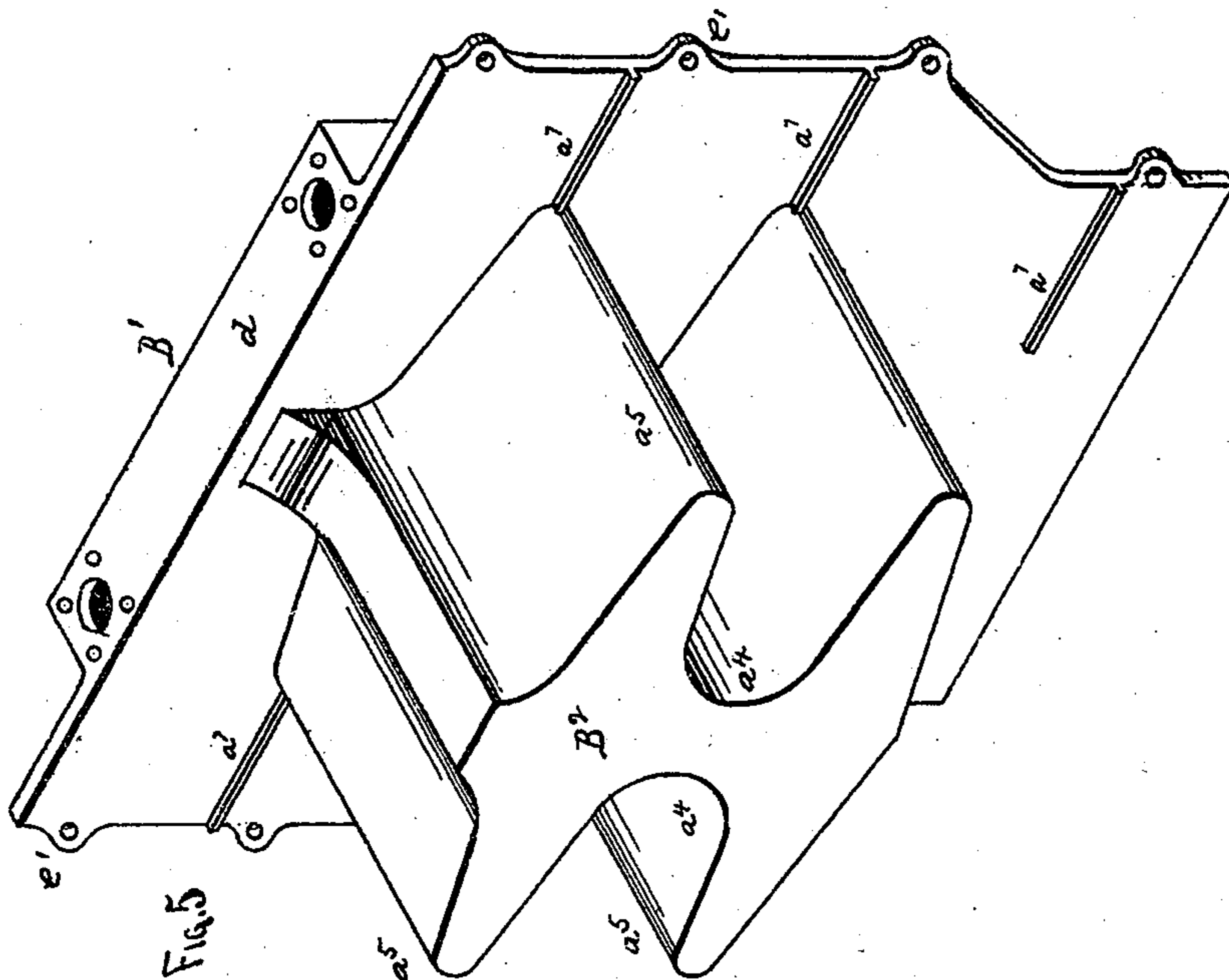
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5 Sheets—Sheet 2.

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WITNESSES  
*[Signature]*  
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Daniel A. Dickinson INVENTOR.  
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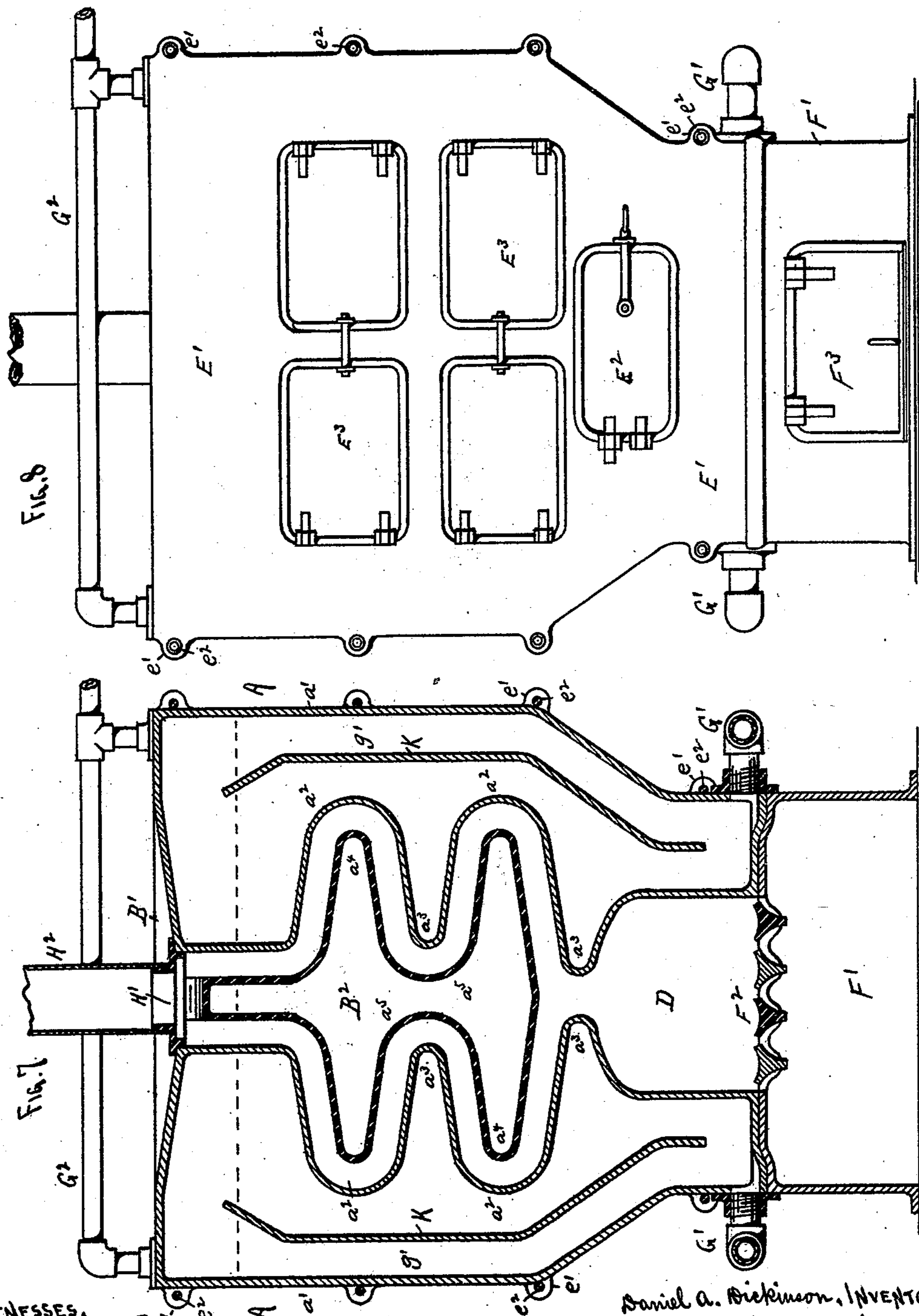
(No Model.)

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No. 518,184.

Patented Apr. 10, 1894.



WITNESSES.

*John C. [Signature]*  
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Daniel A. Dickinson, INVENTOR.  
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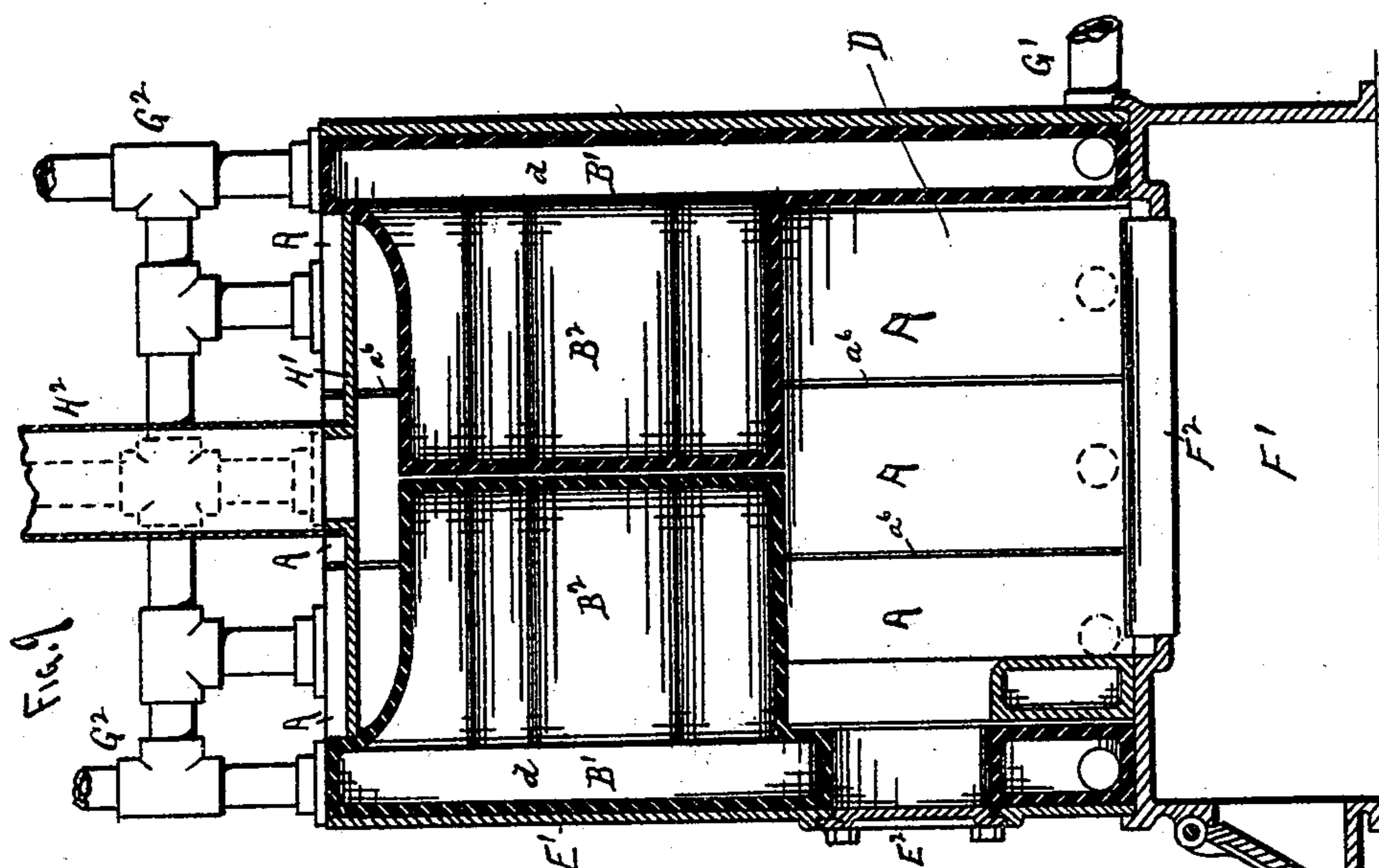
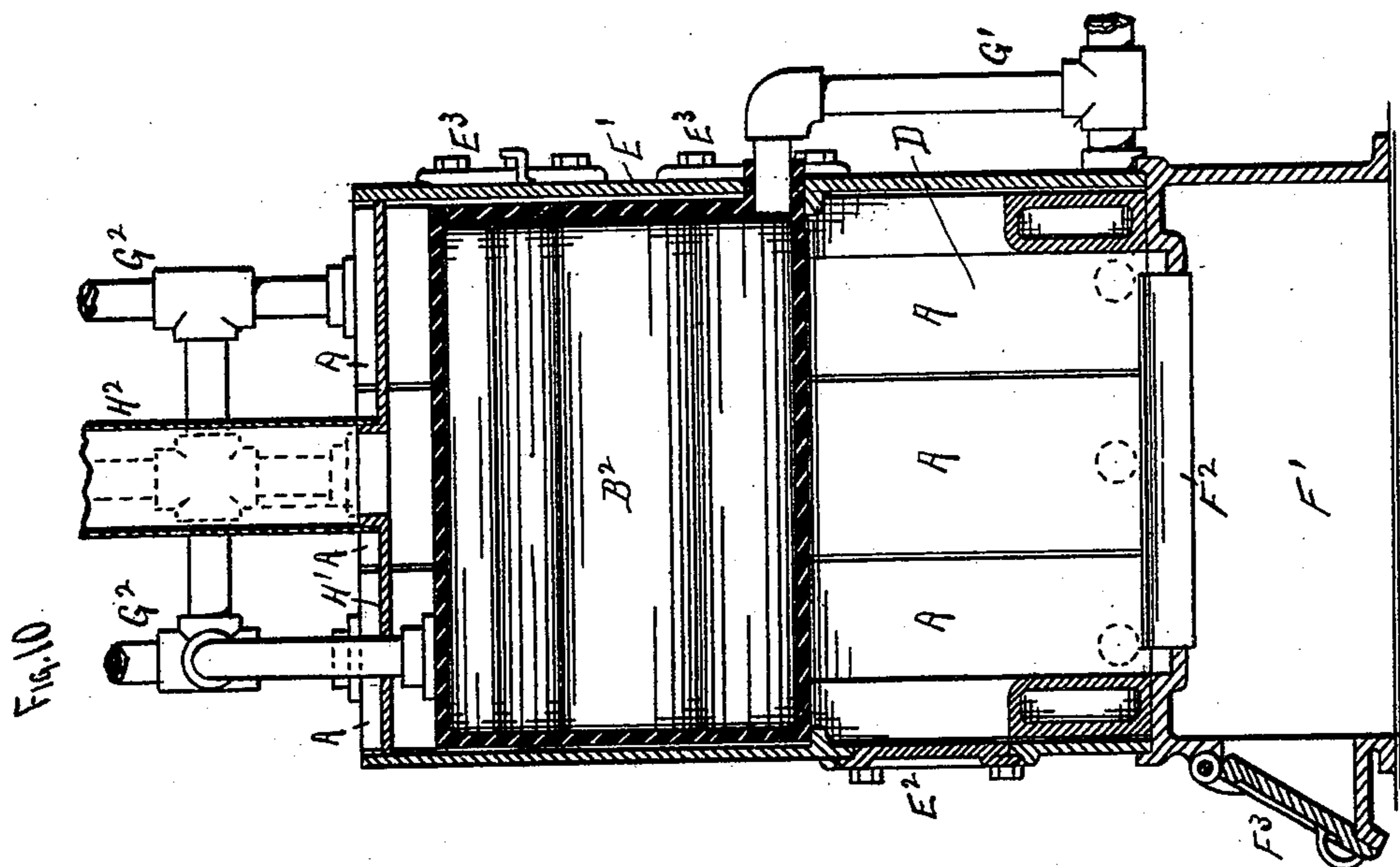
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5 Sheets—Sheet 4.

D. A. DICKINSON.  
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No. 518,184.

Patented Apr. 10, 1894.



WITNESSES,  
D. G. Pinner  
H. Webster.

Daniel A. Dickinson,  
INVENTOR,  
By Charles N. Woodward Atty.

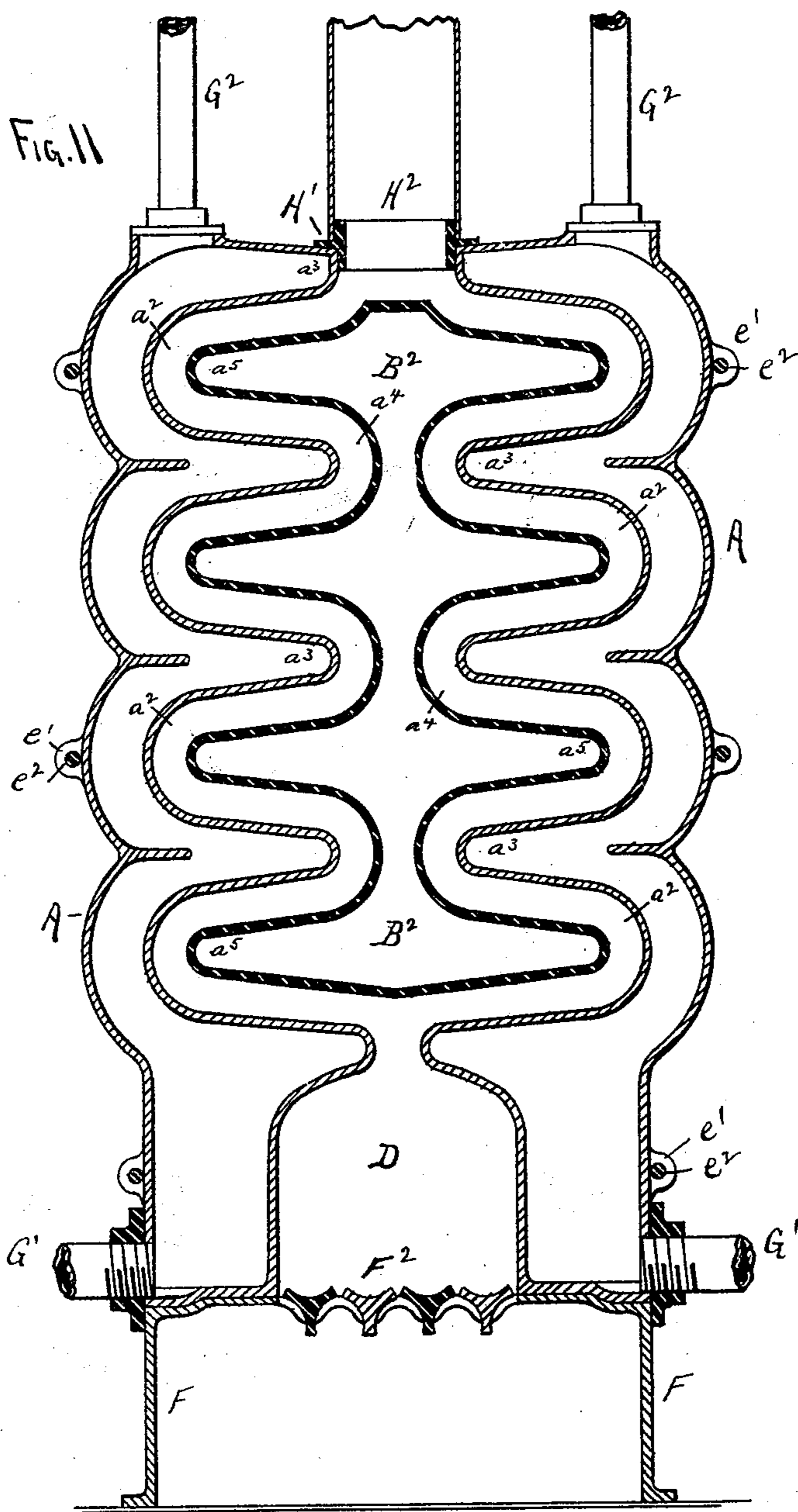
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5 Sheets—Sheet 5.

D. A. DICKINSON.  
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Patented Apr. 10, 1894.



WITNESSES.

J. V. Lamb.  
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Daniel A. Dickinson.

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Atty.

# UNITED STATES PATENT OFFICE.

DANIEL A. DICKINSON, OF ST. PAUL, MINNESOTA.

## STEAM AND HOT-WATER GENERATOR.

SPECIFICATION forming part of Letters Patent No. 518,184, dated April 10, 1894.

Application filed May 20, 1893. Serial No. 474,935. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL A. DICKINSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Steam and Hot-Water Generators, of which the following is a specification.

This invention relates to steam and hot water generators, and consists in the construction, combination, and arrangement of parts, as hereinafter shown and described, and specifically pointed out in the claims.

In the drawings,—Figure 1 is a sectional front elevation. Fig. 2 is a longitudinal sectional side elevation. Fig. 3 is a perspective view of one of the front or fire door external sections. Fig. 4 is a perspective view of one of the intermediate external sections. Fig. 5 is a perspective view of the combined back section and internal section. Fig. 6 is a cross sectional view of a portion of the front part of the generator. All these views show the apparatus when used as a hot water generator. Fig. 7 is a sectional front elevation, showing the modifications necessary to adapt the apparatus to the generation of steam. Fig. 8 is a front elevation, showing the arrangement of the feed doors, ash pit doors, and the section cleaning doors. Figs. 9 and 10 are sectional views similar to Fig. 2, illustrating some modifications in the construction. Fig. 11 is a sectional front elevation, similar to Fig. 1, illustrating another modification in the construction.

The body of the generator is built up of a series of external hollow sections A, and a combined back section B' and internal section B<sup>2</sup>. The external or side sections are formed with straight outside walls  $a^1$  and with alternating recesses  $a^2$  and projections  $a^3$ , while the internal section B<sup>2</sup> is formed with corresponding recesses  $a^4$  and projections  $a^5$ , the projections  $a^5$  of the internal section projecting into the recesses  $a^2$  of the external sections, while the projections  $a^3$  of the external sections projecting into the recesses  $a^4$  of internal sections, as shown in Figs. 1 and 7. The external or side sections are reduced in size at their lower portions forming when a number of the sections are set up together as shown in Figs. 1, 2 and 7, a fire pot or chamber D.

When thus set up, two zig zag passages are formed for the products of the combustion between the external or side and internal sections, as shown by the arrows in Figs. 1 and 7. The sides  $a^6$  of the external or side sections are provided with ribs  $a^7$  adapted to interlock, so as to provide spaces for asbestos or other filling, to secure smoke and fire tight joints between the sections. The ribs  $a^7$  also serve another purpose, viz: to render the contact between the joints perfect and complete, even if the main side surfaces of the sections are warped, or otherwise out of alignment, as the narrow surfaces of the ribs can be readily dressed down to a true surface. The back section is made to conform in shape with the external or side sections when the latter are set up, as shown in Figs. 1, 2 and 7, and with its hollow portion  $d$  preferably of uniform width to the distance across the projections  $a^5$ , the interior of the internal sections opening into and formed integral with the back section, as shown in Fig. 2.

E' represents the front plate conforming to the shape of the external sections, as shown, and provided with the feed door E<sup>2</sup> leading to the fire place D, and with a series of doors E<sup>3</sup> opening into the spaces between the projections  $a^3$   $a^5$ , to render the smoke and flame passages accessible for the removal of accumulations of ashes and soot. The fire spaces are thus accessible throughout their entire extent for the purpose of cleaning. The external or side sections, the back section, and the front plate E' are each provided with lugs  $e^1$  so that they can be bound together with rods  $e^2$ . The united sections A B' B<sup>2</sup> and the front plate E', are arranged to be mounted upon a base F' which also forms the ash pit, and is provided with an ash pit door F<sup>3</sup>. The grate F<sup>2</sup> is also arranged in the top of this base F' beneath the fire pot D, as shown. The inlet pipes G' at the bottom will be connected together, as also will the out-flow pipes G<sup>2</sup> at the top, thus connecting the several water and steam chambers, and equalizing their action. There being no other union or connection between the independent water chambers or sections, all danger of leakage from defective joints is avoided. The external or side sections A are set opposite to each other, a short distance apart, as shown,

and over the space between their upper ends a plate  $H'$  is set and provided with an opening to which the smoke flue  $H^2$  is connected.

When used as a steam generator, all the sections are extended upward, as shown in Fig. 7, to provide steam spaces in the upper part of each of the sections. In this construction also division walls  $K$  may be arranged in the external sections, extending from above the water line to a point a few inches above the bottom line of the sections, to cause a more rapid and positive circulation of the water by providing for cooler outer portions  $g'$  for the descending cooler currents of the water, as shown by the arrows, the currents flowing downward outside the partitions to the bottoms and thence upward again in contact with the heating surfaces in the projections  $a^3 a^5$ . Each of the external or side sections is thus entirely independent and self contained, and in event of breakage can be removed and replaced by a new section without detriment to the others. The generator may be readily increased to any extent by adding pairs of external or side sections and increasing the length of the internal sections  $B^2$ . The external sections next to the front  $E'$  are each formed with a wing  $h'$  (Figs. 3 and 2) formed hollow and forming water chambers integral with the interiors of the sections to which they are attached, to form a water front to the fire chamber  $D$ . If required the front plate  $E'$  may be formed with a hollow water chamber similar to the back section, and if preferred with one half of the internal section  $B^2$  formed thereon, as shown in Fig. 9. The external or side sections being each tapped at their bottoms and tops for the inlet and outlet pipes, will require no other machine work or fitting for the purposes of combination, but will be simply placed in position side by side and the intervening spaces between the ribs  $a^7$  filled with asbestos or other suitable cement or filling, to exclude the air and to prevent the escape of the smoke or flame. The forming of the surfaces of the sections which are exposed to the action of the fire, to run alternately in and out in their upward course, preferably in "S" like form, greatly increases the extent of the surface exposed to the action of the fire, and presents all the heating surfaces in planes opposed to the direction and upward tendency of the currents of heat. The inner sides of the sections preferably trend at all points slightly upward, so as to facilitate the upward flow of the water and heat in contact therewith.

While I have shown in Fig. 1 two sets of the alternating recesses  $a^2$  and projections  $a^3$ , any required number may be employed to in-

crease the capacity in that direction, as indicated in Fig. 11. The outside walls of these external or side sections  $A$ , instead of being straight may be shaped like the inner or recessed walls of the same, thus narrowing the water space and compelling the water flowing upward to follow the recessed heating surfaces through their entire extent as indicated in Fig. 11.

Having thus described my invention, what I claim as new is—

1. In a steam or hot water generator, a series of hollow external independent sections having alternating projections and recesses, a hollow back section, and a hollow internal section connected into said back section and formed with projections and recesses conforming to and alternating with the projections and recesses of said external sections, substantially as and for the purpose set forth.

2. In a steam or hot water generator, a series of hollow external independent sections having alternating projections and recesses, a hollow back section, and a hollow internal section connected into said back section and formed with projections and recesses conforming to and alternating with the projections and recesses of said internal sections, said independent external sections connected at top and bottoms by piping  $G' G^2$ , substantially as and for the purpose set forth.

3. In a steam or hot water generator a series of hollow external independent sections having alternating projections and recesses, a hollow back section and a hollow internal section connected into said back section and formed with projections and recesses conforming to and alternating with the projections and recesses of said external sections, the front pair of said external sections having hollow wings integral therewith and forming the water front to the fire chamber, substantially as and for the purpose set forth.

4. In a steam or hot water generator a series of hollow external independent sections having alternating projections and recesses, and a hollow internal section formed with projections and recesses conforming to and alternating with the projections and recesses of said external sections, and with partitions  $K$  within said external sections to facilitate the circulation of the water therein, substantially as and for the purpose set forth.

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

DANIEL A. DICKINSON.

Witnesses:

C. N. WOODWARD,  
H. S. WEBSTER.