

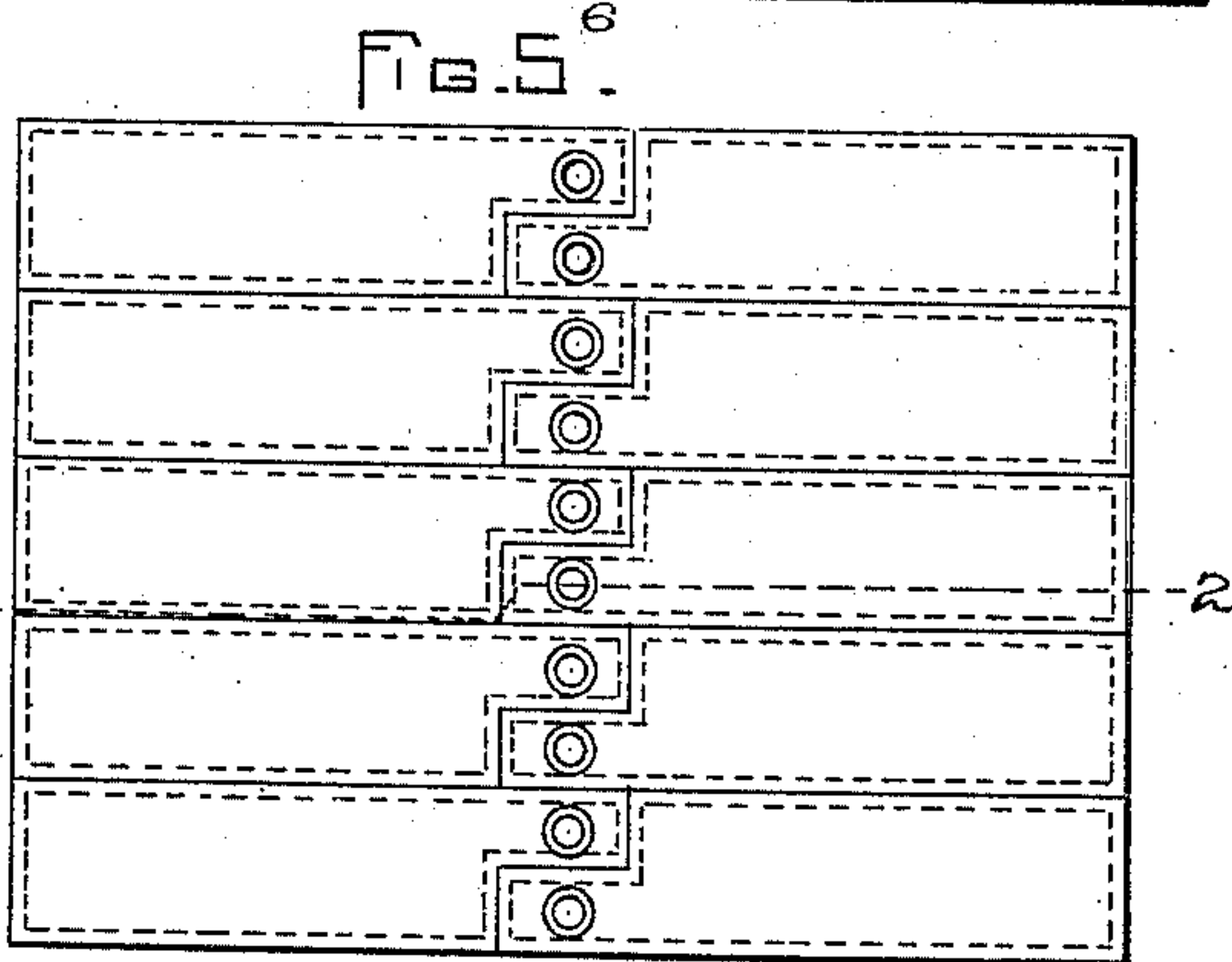
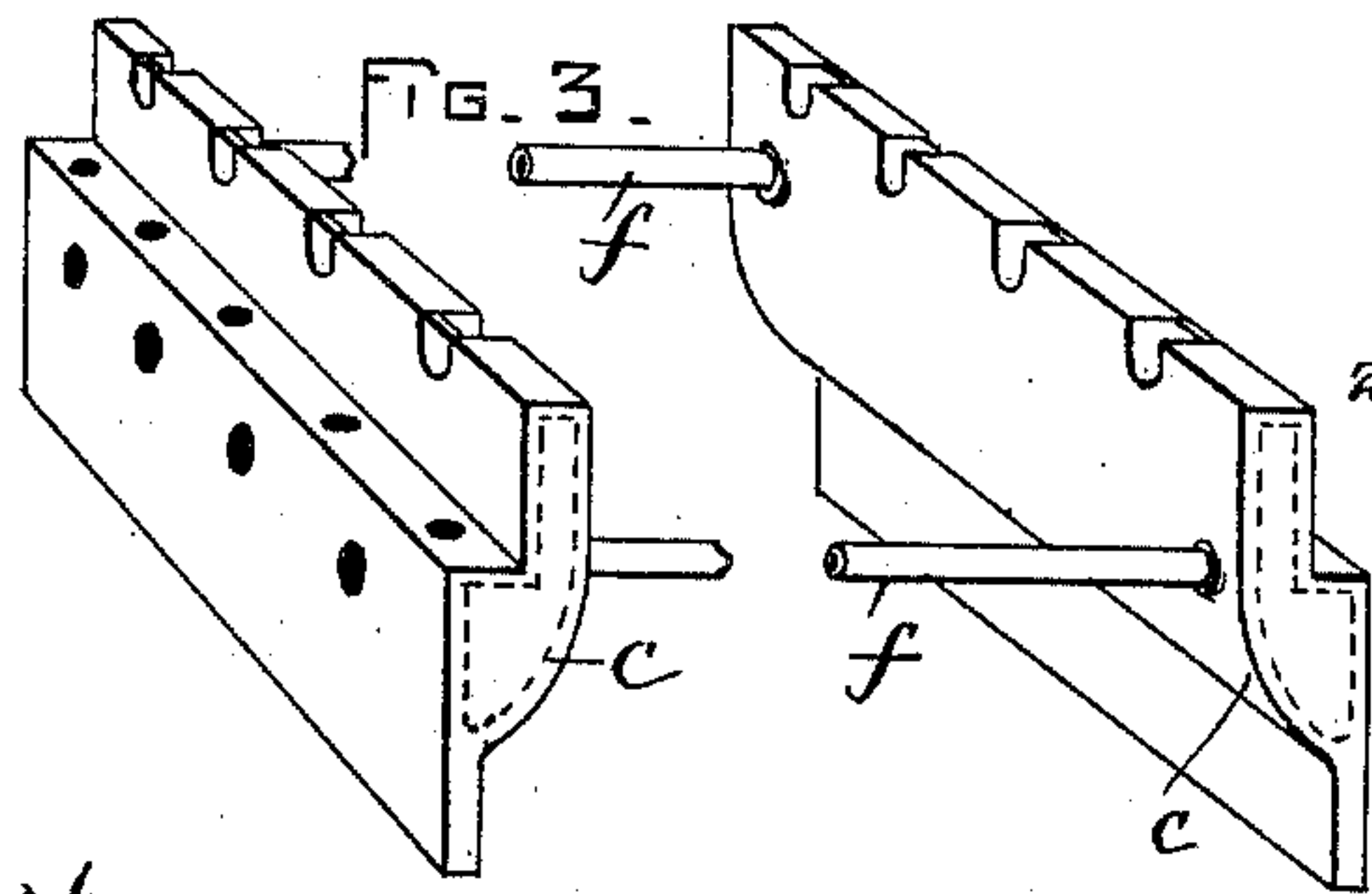
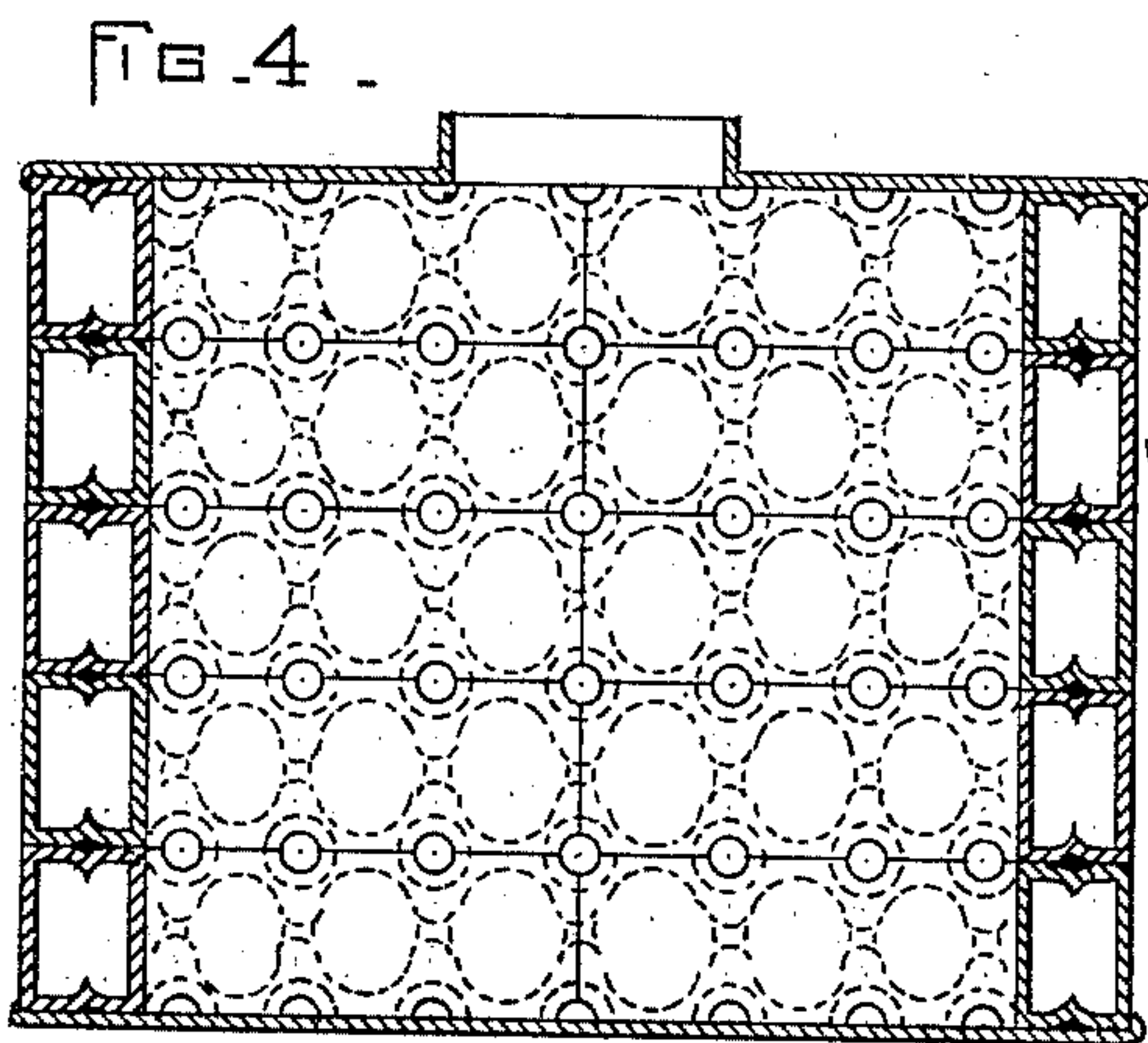
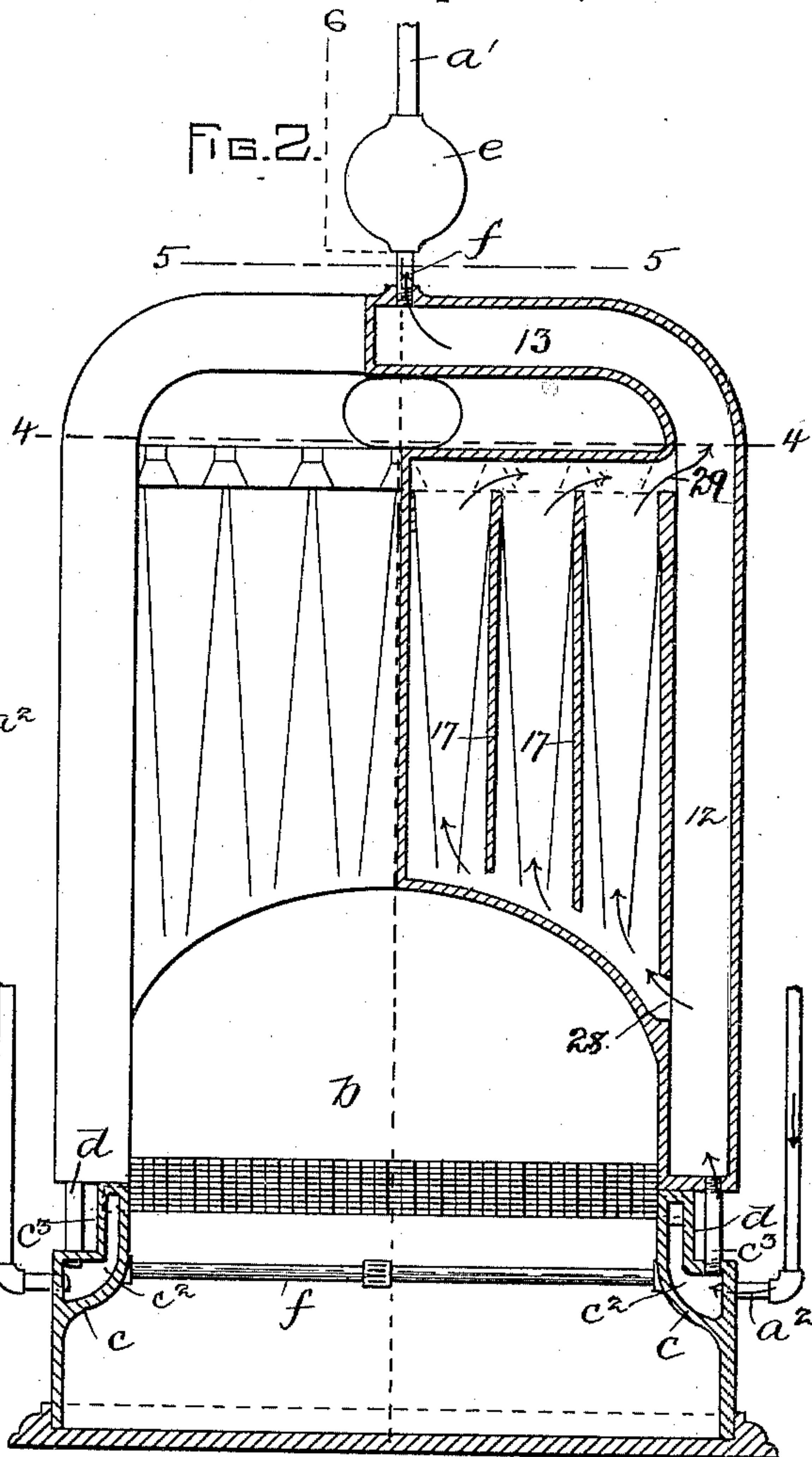
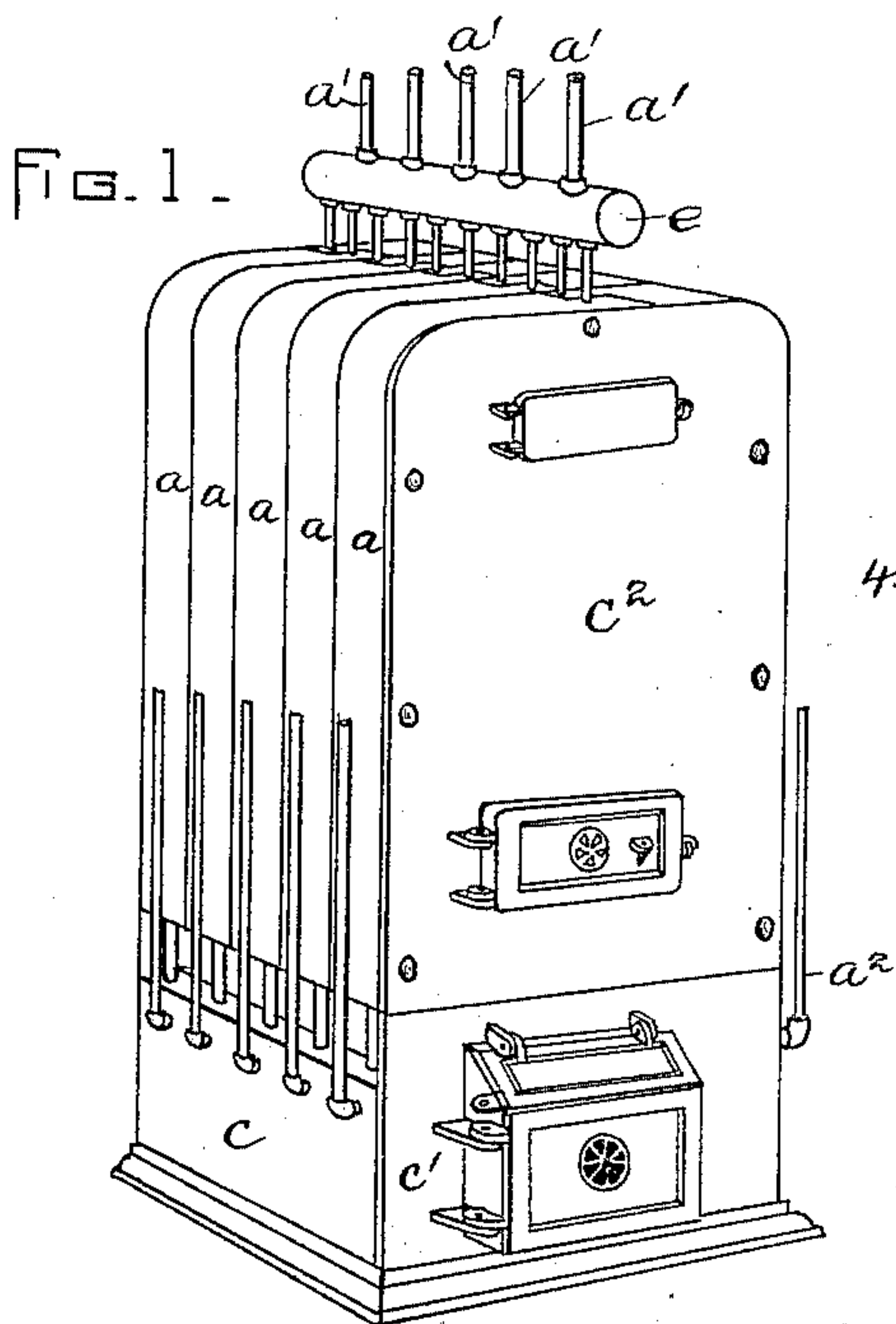
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3 Sheets—Sheet 1.

J. N. & E. N. GATES.
HEATING APPARATUS.

No. 482,679.

Patented Sept. 13, 1892.



WITNESSES:

A. S. Harrison
H. A. Hall.

INVENTORS

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E. N. Gates
by Night Brown & Co. Attys

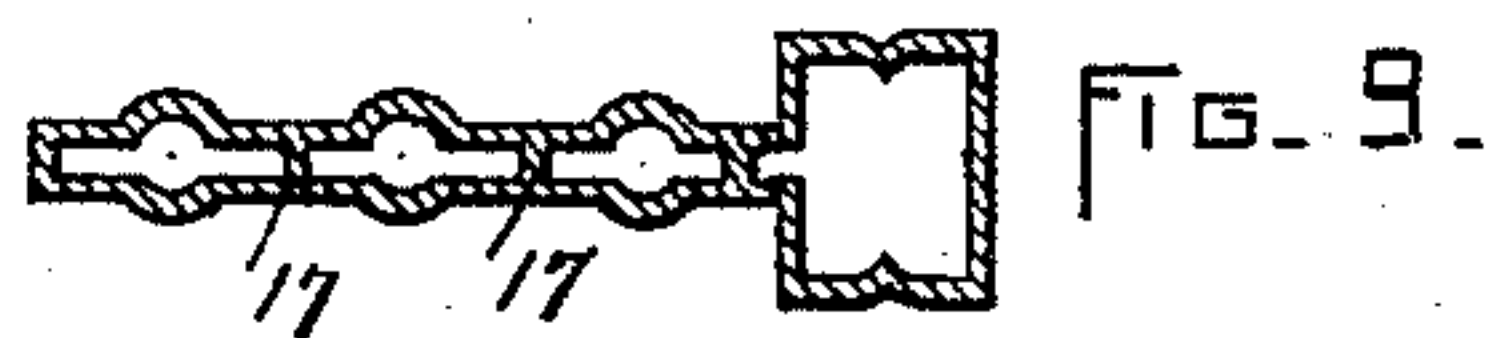
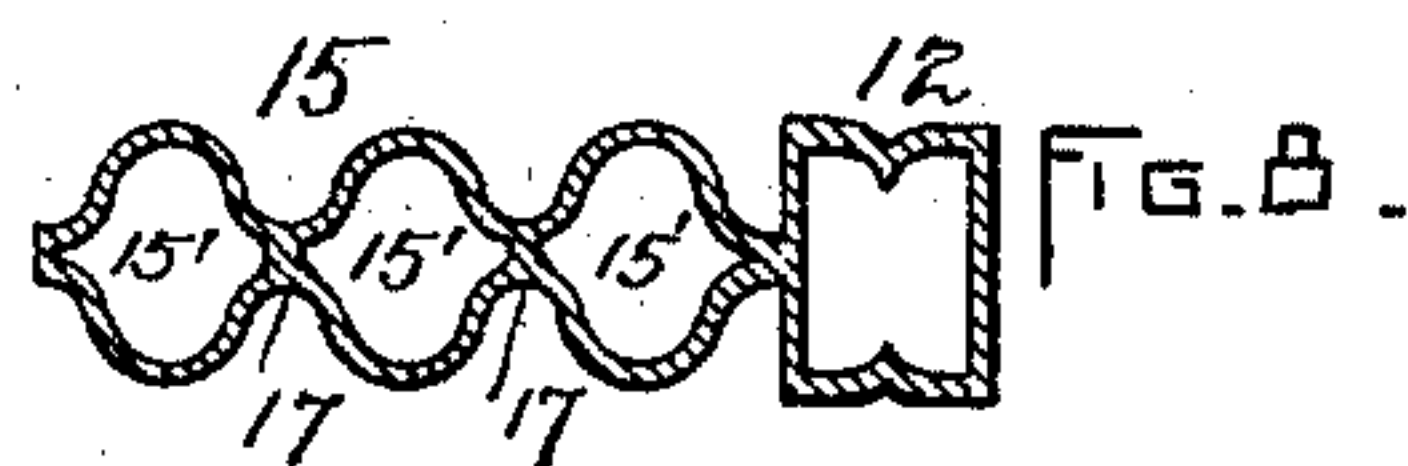
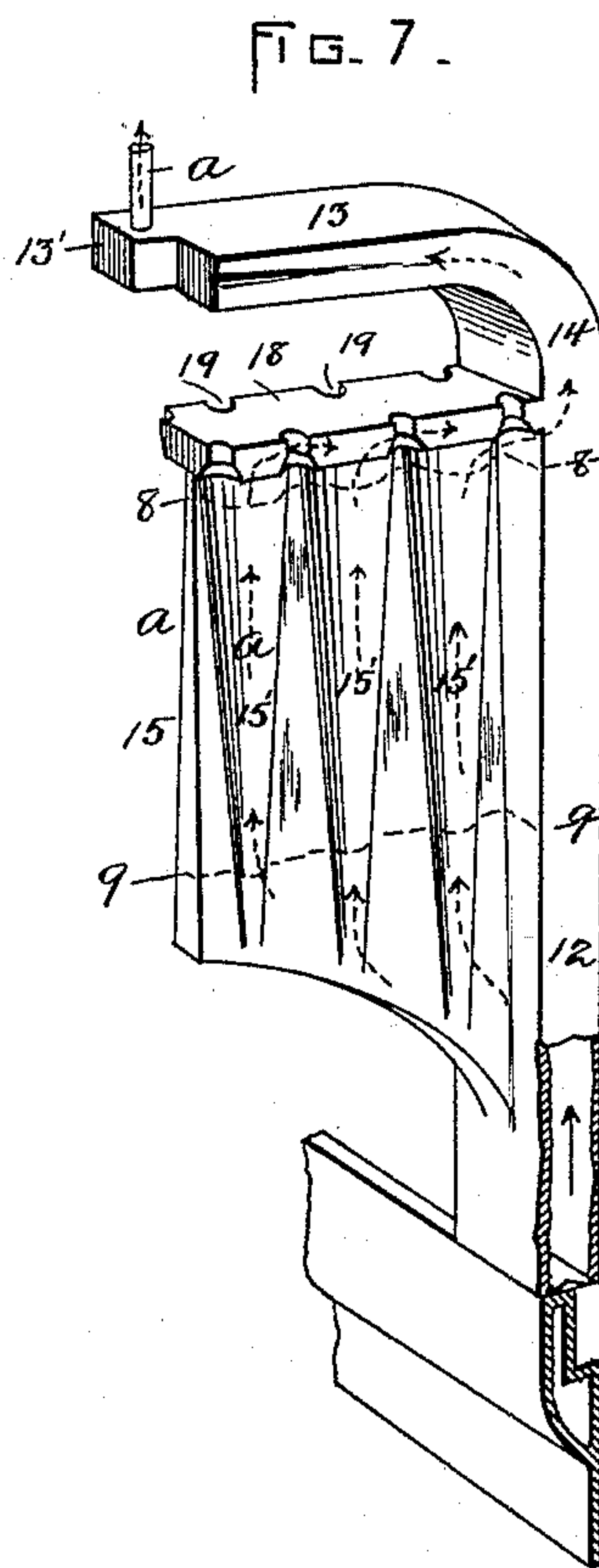
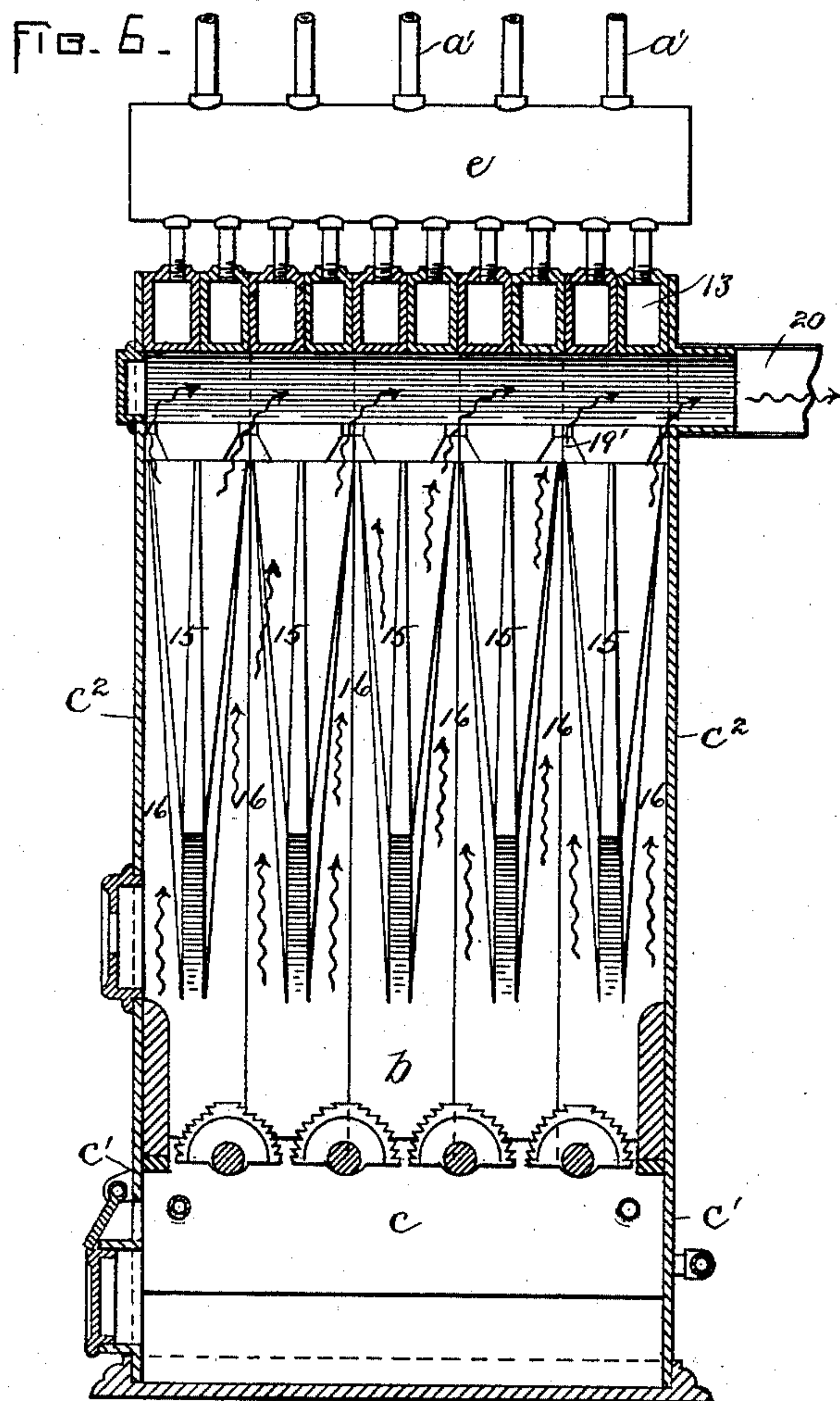
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HEATING APPARATUS.

No. 482,679.

Patented Sept. 13, 1892.



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(No Model.)

3 Sheets—Sheet 3.

J. N. & E. N. GATES.
HEATING APPARATUS.

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FIG. 10.

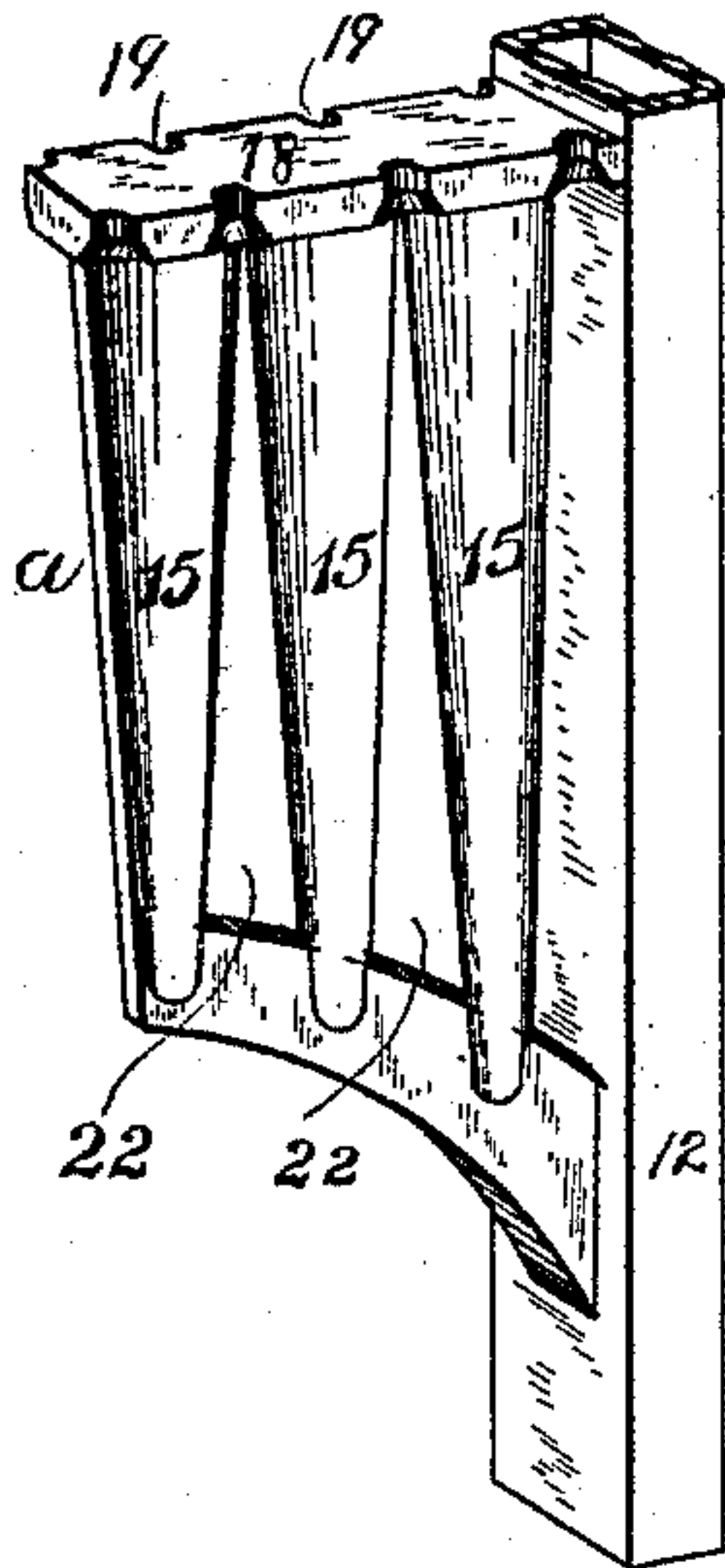


FIG. 11.

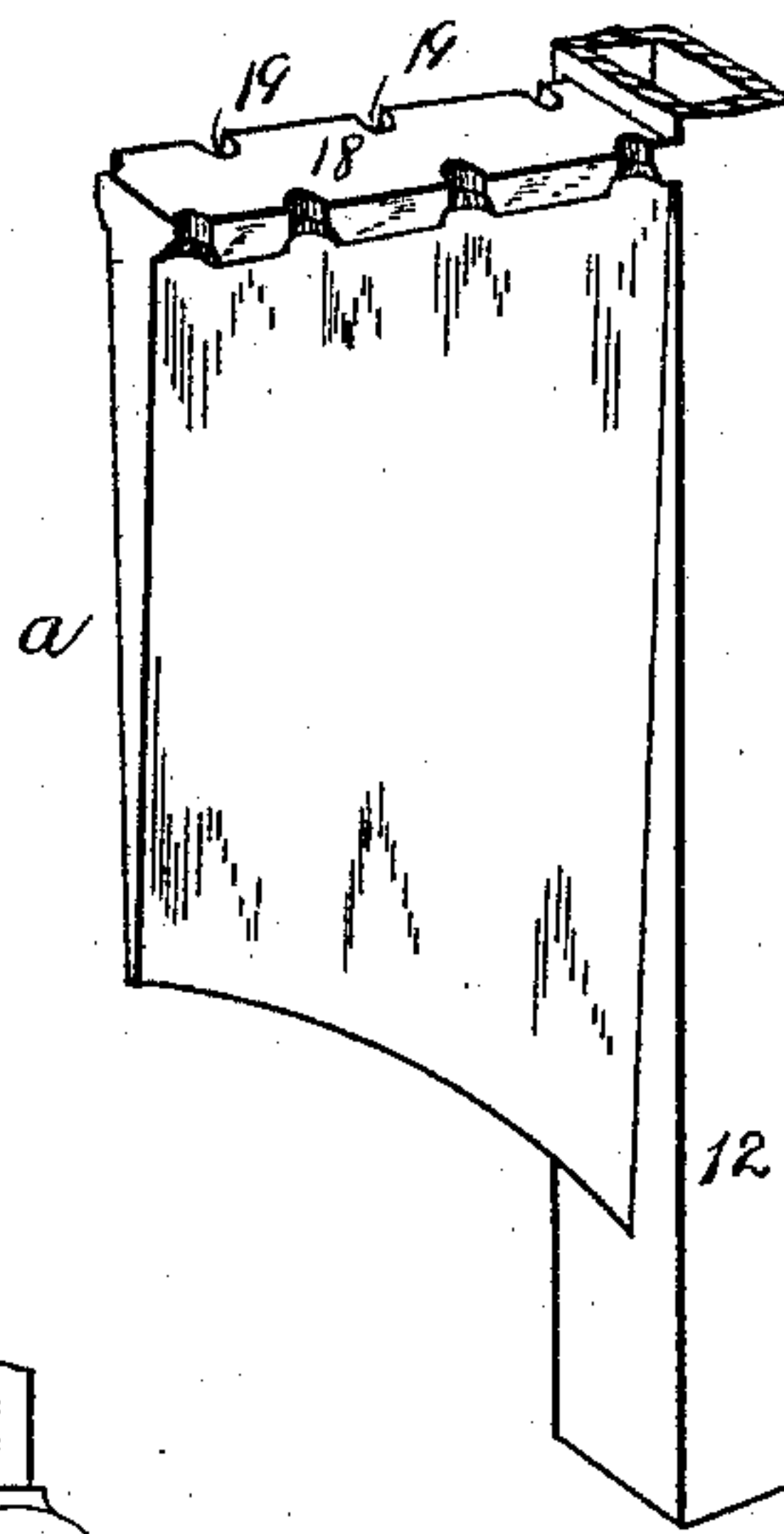


FIG. 12.

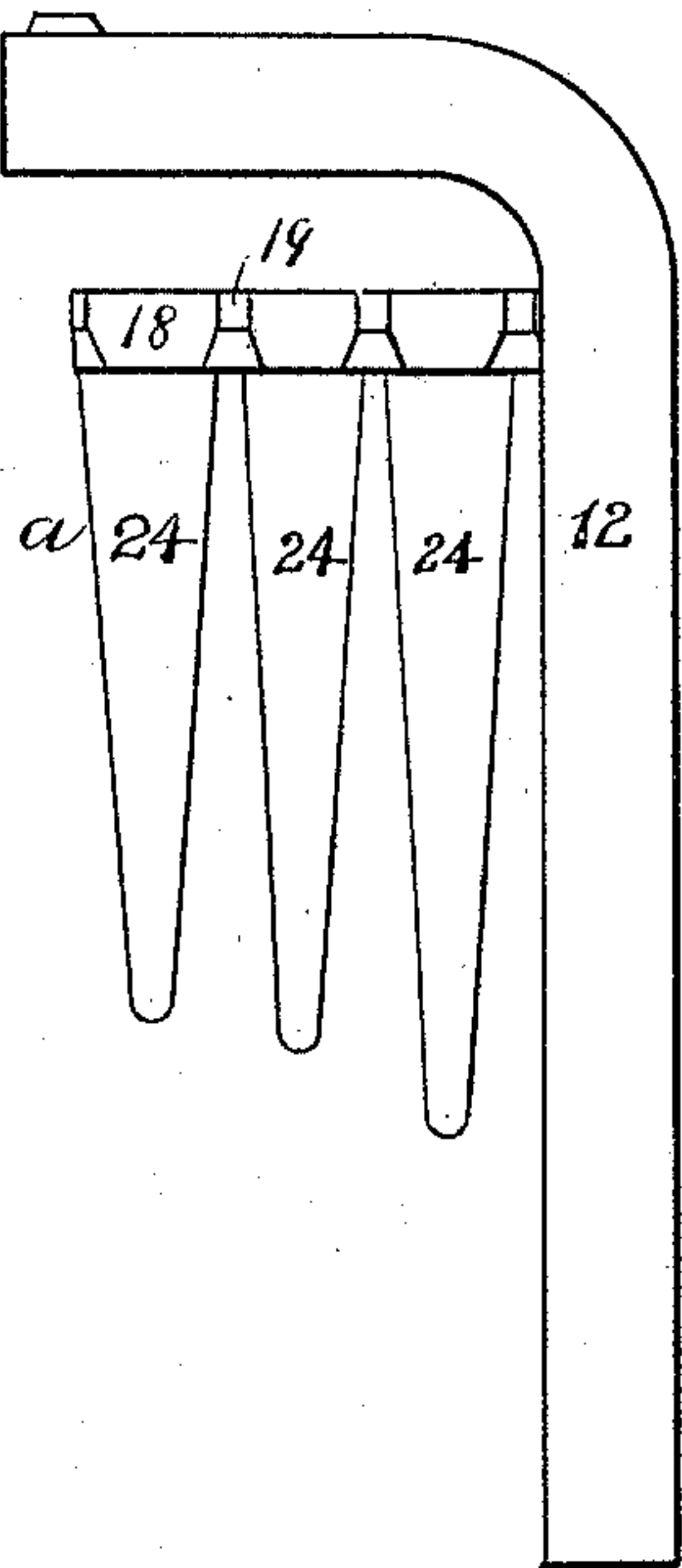
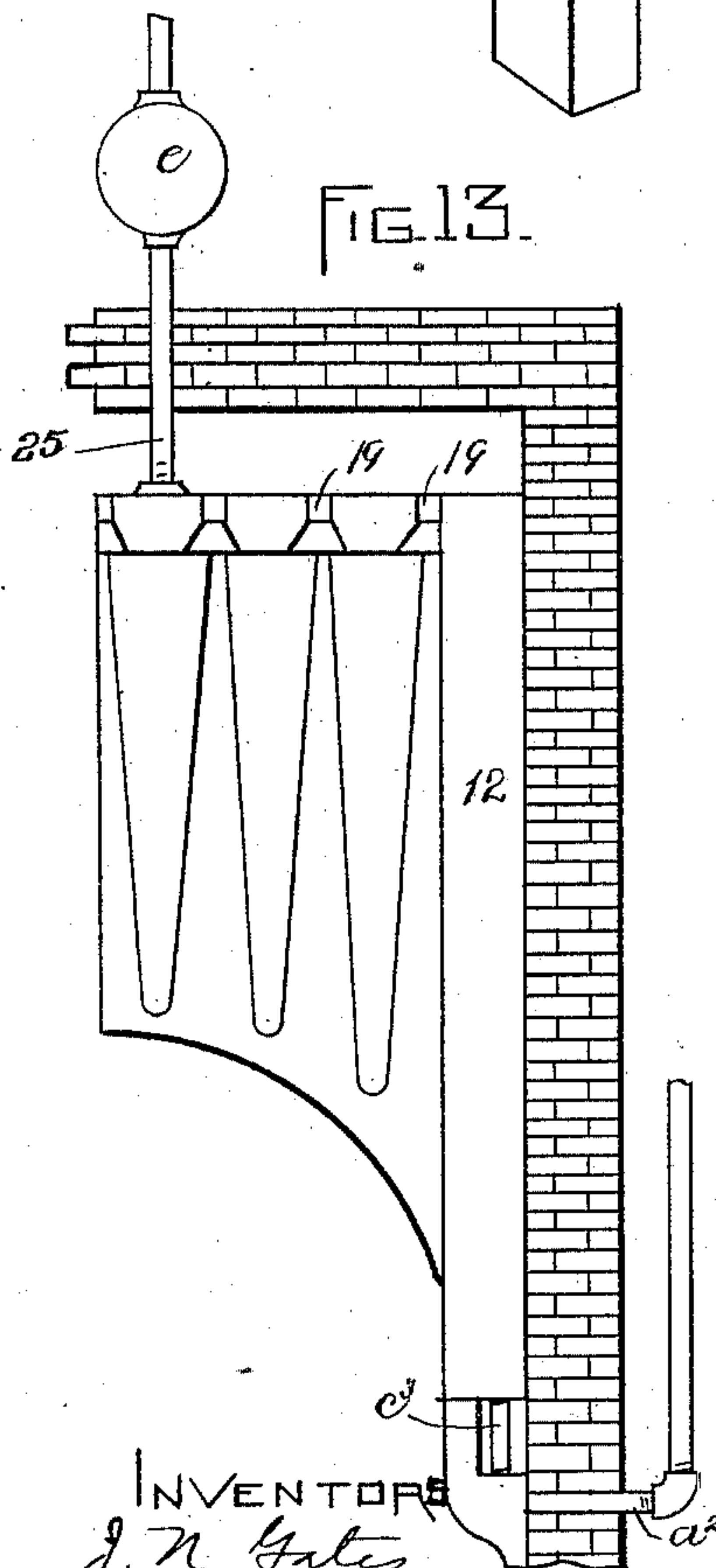


FIG. 13.



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UNITED STATES PATENT OFFICE.

JOHN N. GATES, OF HOLYOKE, AND EUGENE N. GATES, OF FITCHBURG,
ASSIGNORS TO THE E. N. GATES HEATING COMPANY, OF BOSTON,
MASSACHUSETTS.

HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 482,679, dated September 13, 1892.

Application filed May 6, 1892. Serial No. 432,012. (No model.) Patented in Canada June 25, 1892, No. 39,213.

To all whom it may concern:

Be it known that we, JOHN N. GATES, of Holyoke, in the county of Hampden, and EUGENE N. GATES, of Fitchburg, in the county of Worcester, both in the State of Massachusetts, have invented certain new and useful Improvements in Heating Apparatus, (for which we have received a Canadian patent, No. 39,213, dated June 25, 1892,) of which the following is a specification.

This invention relates to heating apparatus using hot water or steam circulated through a system of pipes and radiators from a heater communicating with the circulating-pipes.

The invention has for its object, first, to provide a heater in which the heat-absorbing surfaces of the water-containing chambers or spaces that are exposed to the heat in the furnace or fire-box shall be arranged so that all parts of said surfaces shall be subjected to the same degree to the heat and products of combustion from the fire and to the direct action of the heat and products of combustion without covering or shading any considerable part of the heat-absorbing surfaces, and thus preventing the direct action of the fire upon them.

The invention also has for its object to so arrange the exposed surfaces of the water-chambers that accumulations of carbon in the form of soot will drop therefrom into the fire by gravitation.

The invention also has for its object to cause more perfect and complete combustion of the gases liberated from the fuel while in contact with the heat-absorbing surfaces.

The invention also has for its object to provide certain improvements in the construction of a heater composed of sections, each comprising a water-receptacle having heat-absorbing surfaces exposed to the fire, and to provide certain improvements in the construction of the ash-pit section or base which supports the said sectional chambers.

To these ends the invention consists in the improvements which we will now proceed to describe and claim.

In the accompanying drawings, forming part of this specification, Figure 1 represents a perspective view of a heater embodying our improvements. Fig. 2 represents a section

on line 2 2, Fig. 5. Fig. 3 represents a perspective view of the side portions of the ash-pit or base. Fig. 4 represents a section on line 4 4, Fig. 2. Fig. 5 represents a section on line 5 5, Fig. 2, and a plan view of the parts below said line. Fig. 6 represents a section on line 6 6, Fig. 2. Fig. 7 represents a perspective view of one of the water-heating sections and a portion of the base or ash-pit wall. Fig. 8 represents a section on line 8 8, Fig. 7. Fig. 9 represents a section on line 9 9, Fig. 7. Figs. 10, 11, 12, and 13 represent modifications in the construction of the heating-sections.

The same letters of reference indicate the same parts in all the figures.

In carrying out our invention we construct a water-heater in a number of sections a , each of which is connected with flow-pipes a' , arranged to conduct the heated water or steam to a radiator, and return-pipes a'' , arranged to return the water to the section after it has performed its office. The form of the sections may be variously modified, but the distinguishing feature of each is the inclined sides or surfaces which it presents to the heat and products of combustion over the fire-box b , the external or heat-absorbing surfaces of each section being arranged at an angle from a vertical line, the angles being such that the upper part of each surface overhangs the lower part, so that all parts of each surface are exposed alike to the heat radiated from the fire, there being no heat-absorbing surface which is in the shadow of any other heat-absorbing surface. The chief advantages resulting from this construction are as follows: first, the thorough utilization of the heat by direct radiation from the fire upon practically all parts of the heat-absorbing surfaces; second, the cleaning of said surfaces from accumulations of soot, &c., by gravitation, the inclination of the heat-absorbing surfaces being such that the soot will drop therefrom by its own weight without accumulating to any material extent, thus reducing to the minimum the labor required in keeping the heat-absorbing surfaces clean; third, the formation of tapering flues or spaces between the sections, said flues being of gradually-decreasing width from the lower to the upper ends of the sections. We find that tapering flues, ex-

tending in a substantially vertical direction from the fire upwardly and presenting walls the upper ends of which overhang the lower facilitate the combustion of the gases, and
 5 that the combustion continues throughout the entire length of such flues. When the flues or passages through which the gases pass from the fire between the heat-absorbing surfaces are of uniform width and are not tapered or gradually decreased in width as they
 10 recede from the fire, the combustion of the gases ceases in the lower portions of the flues and before the gases have extended along the entire length thereof, so that there is no combustion of the gases in the upper portion of
 15 the flues, the result being a waste or loss of heating power, which is obviated by our improved arrangement.

The preferred form of the sections *a* is
 20 shown in Figs. 1 to 9, each section comprising a substantially vertical casing 12, a substantially horizontal portion 13, connected to the portion 12 by a curved continuation 14, and a wing portion 15, projecting laterally from the
 25 portion 12. The portions 12, 13, and 14 have parallel sides, so that when assembled, as shown in Figs. 1, 4, 5, and 6, they form the sides and top of the main body of the heater, each of the horizontal portions 13 being of
 30 such length as to extend half-way across the top of the heater, and provided at its end with the offset 13', formed by making a corresponding recess in one side of the portion 13, which recess receives a similar offset on
 35 another section, as shown in Fig. 5, so that two of the sections *a* form what may be called an "arch," constituting portions of two sides and of the top of the main body of the heater. The wing portion 15 of each section has its
 40 sides inclined, so that when the sections are assembled tapering flues 16, Fig. 6, are formed between the adjacent sides of the wings 15, each flue being widest at its lower end and gradually contracted to its upper end, the inclination of the sides of the wings being such
 45 that the upper end of each inclined side overhangs the lower end and is subjected to the direct action of heat radiated from the fire in the fire-pit *b*. We prefer to make each wing
 50 15 with a series of enlargements 15', which are of tapering form and may be called "inverted conical enlargements," since their larger ends are at the top and their diameter decreases gradually toward their lower ends.
 55 The said enlargements are preferably separated by partitions 17, Figs. 2, 8, and 9, said partitions terminating short of the upper and lower ends of the wings, so that the upper and lower ends of the enlargements 15' communicate with each other, as shown in Fig. 2.
 60 Each wing communicates with the lower part of the vertical portion 12 through an opening 28 and the upper part of said portion through an opening 29, Fig. 2. Water entering the
 65 lower end of the portion 12 from the return-pipe *a*² through the hollow wall *c* of the base or ash-pit and a connecting-pipe *d* enters the

wing 15 through the opening 28 and passes upwardly through the wing to the upper end thereof and then passes out through the opening 29, and from thence through the portion 13 and a short pipe *f* to a horizontal header *e*, which is connected with the flow-pipes *a*'. The water passing through the wing 15 is subjected to the heat radiated upon the inclined
 75 sides of said wing, and owing to the described arrangement of said sides relatively to the fire the heat from the fire is utilized to a much greater degree than would be the case if the sides of the wings were vertical, as will be readily
 80 seen. The upper portion of each wing 15 is provided with a parallel-sided head or enlargement 18, which is of the same width as the portions 12 and 13, and is provided in its edges with semicircular recesses 19, said recesses coinciding
 85 with the like recesses in the adjoining sections in forming contracted outlets 19' for the gases and products of combustion at the upper ends of the flues 16 between the sections. The gases and products of combustion passing
 90 upwardly between the sections and through the outlets 19' enter the space between the heads 18 and the top portions 13 of the sections and pass from said space through the smoke pipe or flue 20. We prefer to make
 95 the outlets 19' of such size that their collective area will be about equal to that of the smoke pipe or flue 20, this arrangement preventing excessive draft in any of the flues 16 and equalizing the draft in all the flues.
 100

The ash-pit or base of the heater is composed of the side walls *c c* and the end walls or plates *c'*. The side walls *c* are provided with water-chambers *c*² and are recessed at their upper ends and at *c*³, so that the upper
 105 edges of the walls are offset inwardly from the plane of the sides or lower portions of the walls, as shown in Figs. 1, 2, 3, and 7. The object of the recesses *c*³ is to afford room for the pipes *d*, which connect the water-spaces
 110 *c*² with the lower ends of the portions 12 of the heating-sections. The return-pipes *a*² from the radiators enter the water-spaces *c*², as shown in Fig. 2, so that the water passes to the heating-sections through the water-spaces *c*² and connecting-pipes *d*.
 115

It will be seen that the ash-pit section or base, constructed as described and provided with the water-chambers *c*² and the recesses *c*³ in its sides, not only affords suitable support for the heating-sections, but also enables the connection between said heating-sections and the return-pipes to be conveniently made by means of the short connecting-pipes *d*, which pipes, being located within the recesses
 120 *c*³, are out of the way and can be readily reached and manipulated.

f f represent sections of pipe to equalize the flow of water between the two sides of the heaters formed by the half-sections and maintain a uniform level. The said pipes *f f* are
 125 attached at their ends to the side walls *c c* and serve to support the same laterally.

It will be seen that the described form of

the heating-sections, each having its outer and top portions made of uniform width, the top portions being recessed, as described, at their ends, enables all the sections to be made of the same form, so that one pattern answers for all the sections, this form enabling the sections to be assembled in the manner shown to form a continuous structure, which requires for its completion only the addition of the end plates c^2 c^2 and the base or ash-pit section.

We do not limit ourselves to the described form of the sections, and may variously modify the same. In Fig. 10 we show a construction similar to that in Fig. 7 in all respects, excepting that the enlargements 15' are separated, except at their upper and lower ends, by openings 22, the upper and lower ends of the enlargements being connected, as already described. In Fig. 11 the wing is composed of a continuous wedge-shaped section instead of being provided with alternating enlargements and narrower portions, the water entering the lower portion of the wedge and passing out through the upper, as in the constructions already described. In Fig. 12 we show a series of conical receptacles 24, entirely disconnected at their lower ends and connected at their upper ends by a head or enlargement similar to the head 18, the latter being connected to the vertical portion 12. In Fig. 13 we show a modification in which the portions 13 and 14 are omitted, the water passing from the wing through a vertical pipe 25 to the head e or elsewhere.

We claim—

1. In a hot-water or steam heating apparatus, the combination, with a fire-box, of a series of heating-sections overhanging the fire-box and comprising heads, such as 18, collectively forming a substantially horizontal partition or septum above the fire-box, tapering receptacles depending from said heads and having inclined heat-absorbing surfaces separated by tapering flues which gradually decrease in width from their lower to their upper ends, said heads having recesses, such as 19, which when the sections are assembled form contracted outlets from the tapering flues through the said partition or septum, as set forth.

2. In a hot-water or steam heating apparatus, the combination, with a fire-box, of a series of heating-sections, each comprising a side portion, such as 12, a top portion, such as 13, and a wing including a head 18, ex-

tending inwardly from said side portion, and tapering receptacles depending from the head, the said side and top portions forming the sides and top of the heater, while the heads form a substantially horizontal partition below the top, said heads being provided with outlet-openings connecting said space with the tapering flues between the tapering receptacles, as set forth.

3. A hot-water or steam heater comprising two rows of sections, each row constituting one-half of the fire-box-inclosing structure, each section comprising a side portion, such as 12, a top portion, such as 13, and a wing portion having a head projecting inwardly from the side portion and tapering receptacles depending from said head, the side and top portions of each row forming one side and a part of the top of the structure, while the wings of each row meet the wings of the other row over the center of the fire-box, the heads of the two rows forming a horizontal partition below the top of the structure, said partition having outlet-openings for the flues between the tapering receptacles, as set forth.

4. A hot-water or steam heater comprising two rows of sections, each row constituting one-half of the fire-box-inclosing structure, each section comprising a side portion, such as 12, a top portion, such as 13, recessed at its end, and a wing portion projecting inwardly from the side portion, the recess in the end of each top portion receiving the corresponding end of the opposite top portion, combined with a header or receptacle located over the meeting ends of the top portions and connected with said portions by tubes, said header being connected with the distributing-pipes, as set forth.

5. In a hot-water or steam heating apparatus, the base or ash-pit section having hollow walls, the outer sides of which are recessed to offset the upper edges of said walls, combined with heating-sections supported by said walls and connected with the latter by short pipes located in the recesses of the walls, as set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 15th day of April, A. D. 1892.

JOHN N. GATES.
EUGENE N. GATES.

Witnesses:

D. O. JUDD,
ORPHIR E. GENEST.