

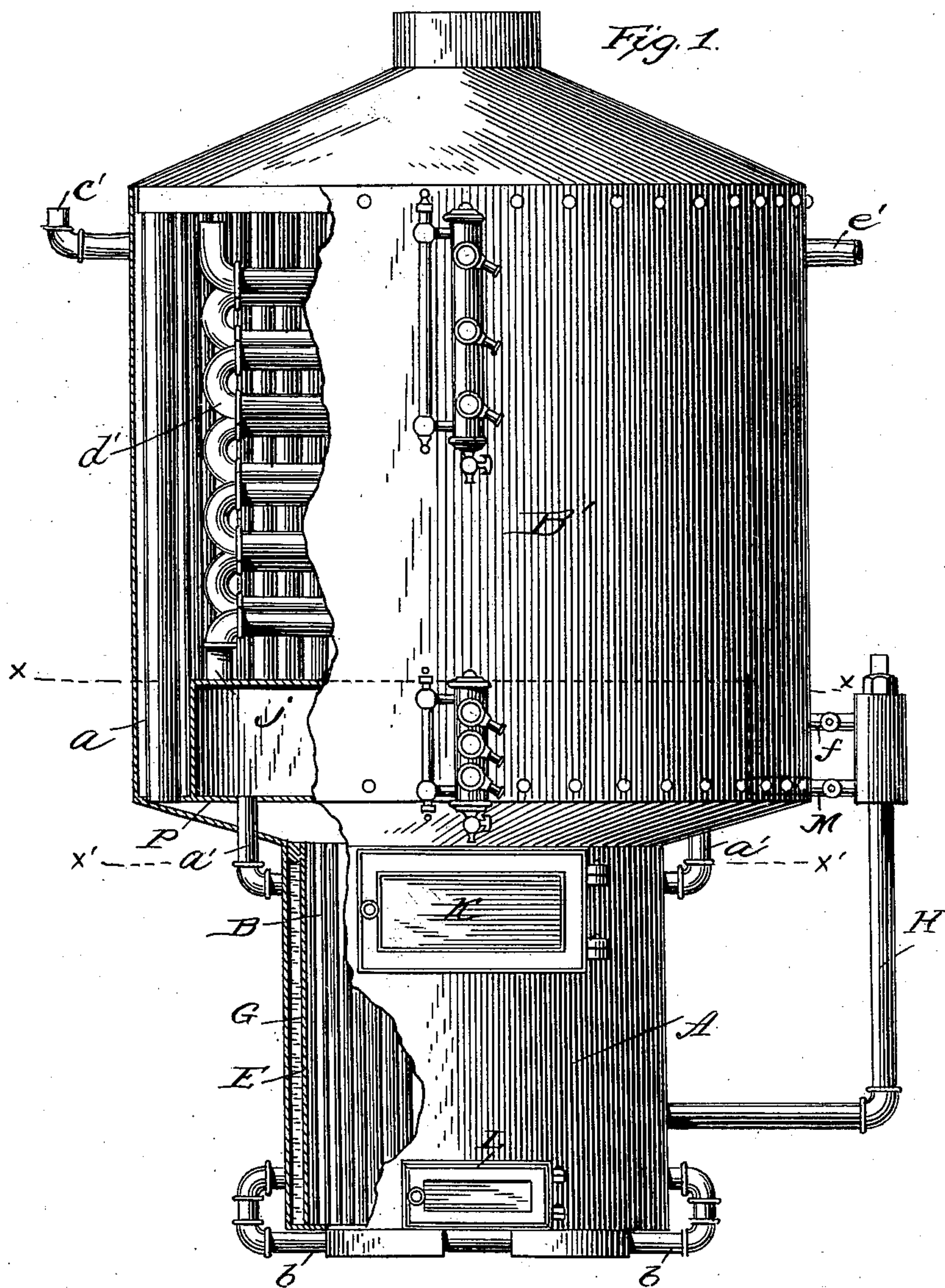
(No Model.)

2 Sheets—Sheet 1.

A. B. THOMAS.
STEAM GENERATOR.

No. 375,580.

Patented Dec. 27, 1887.



Attest:
Walter D. Mason
J. L. Middleton.

Inventor
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by *Ellis Spear*
Atty.

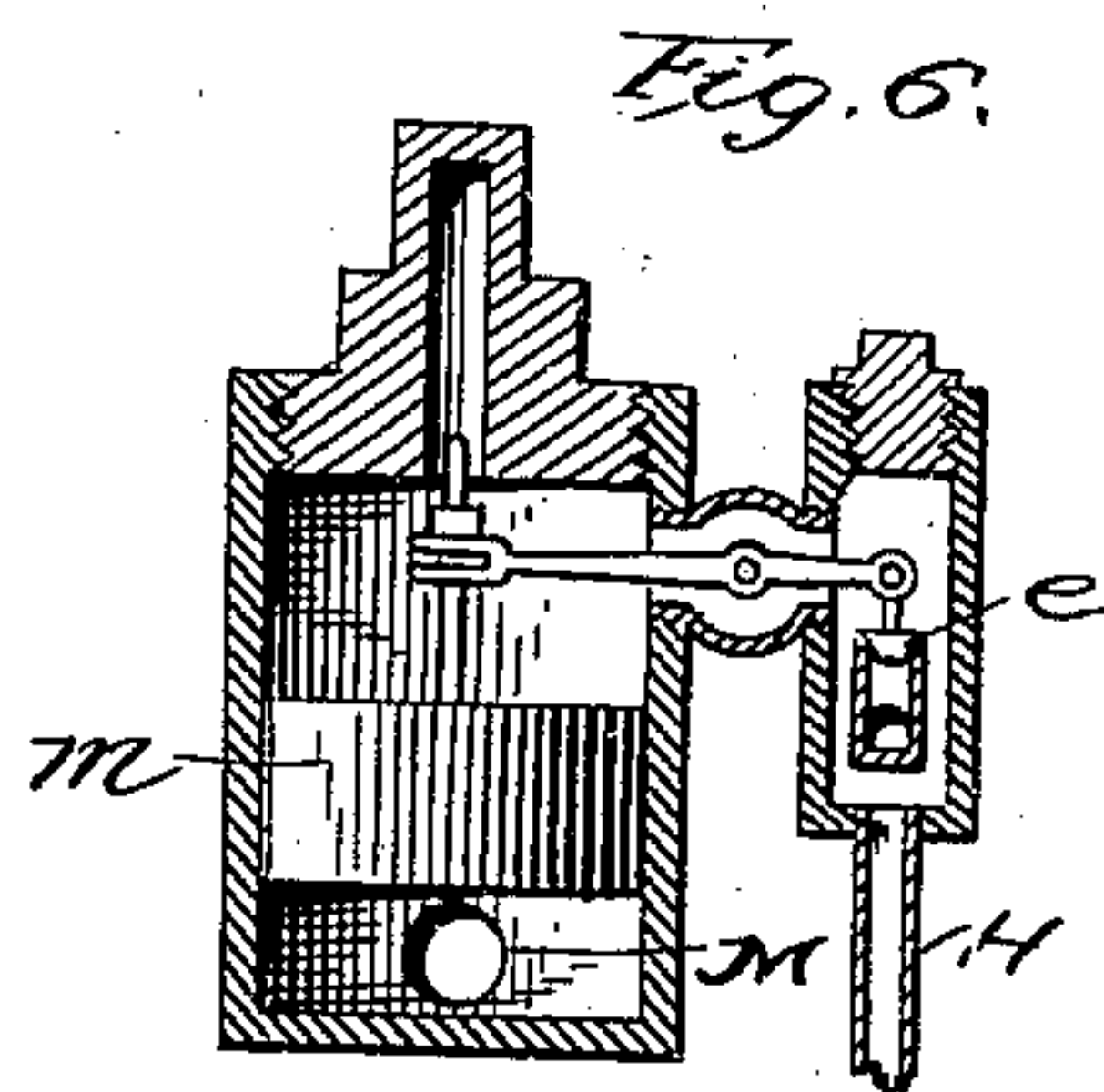
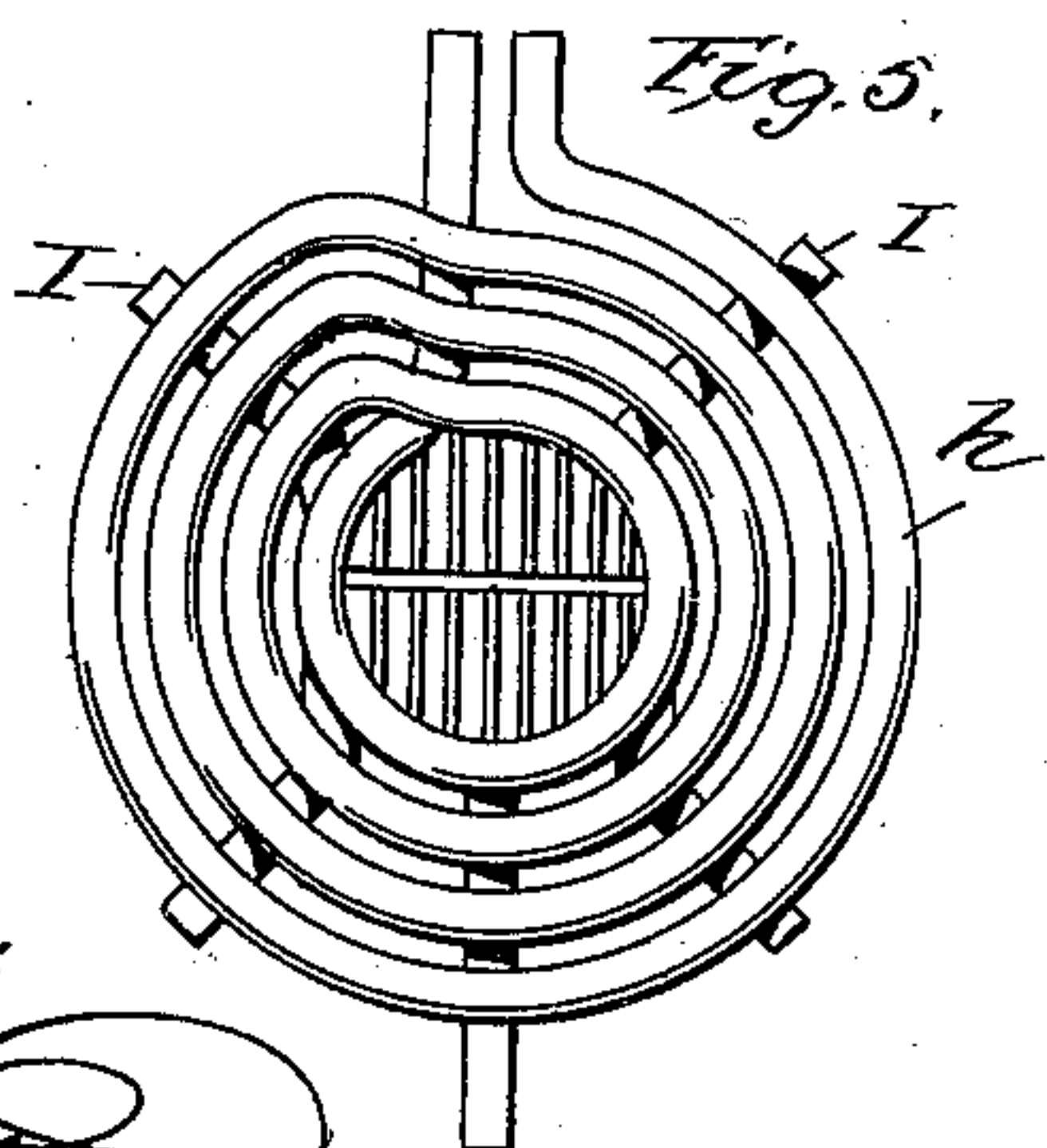
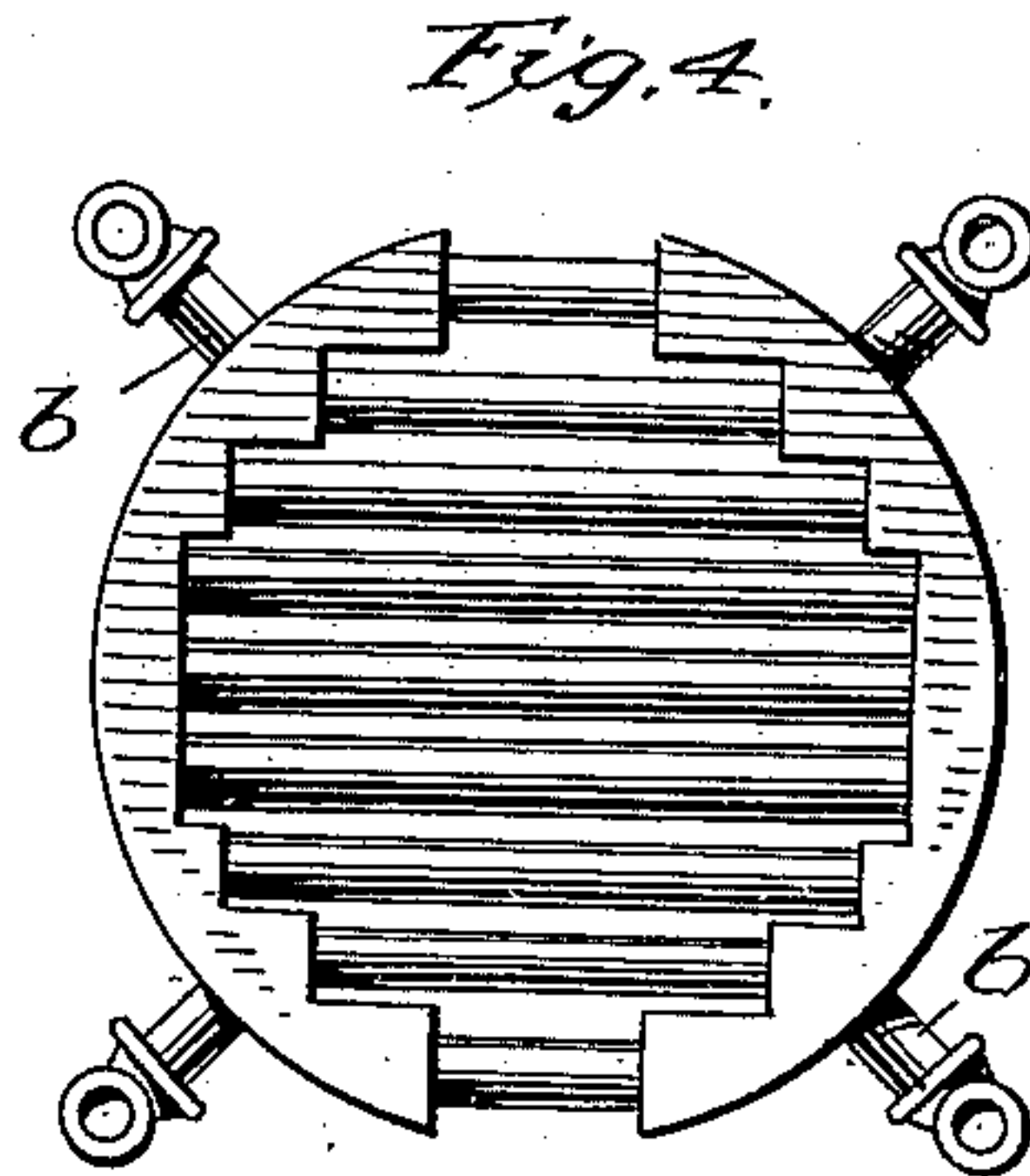
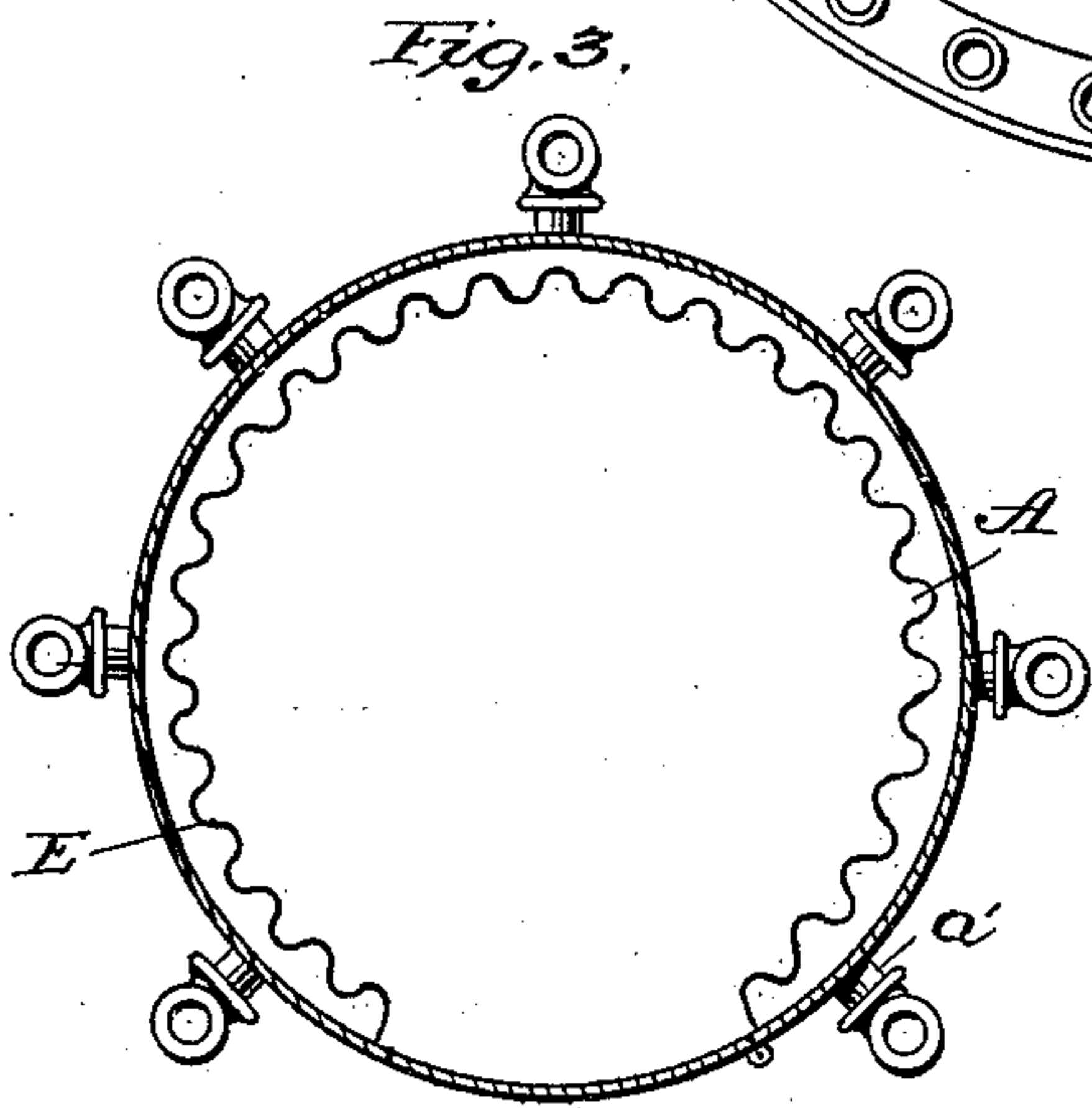
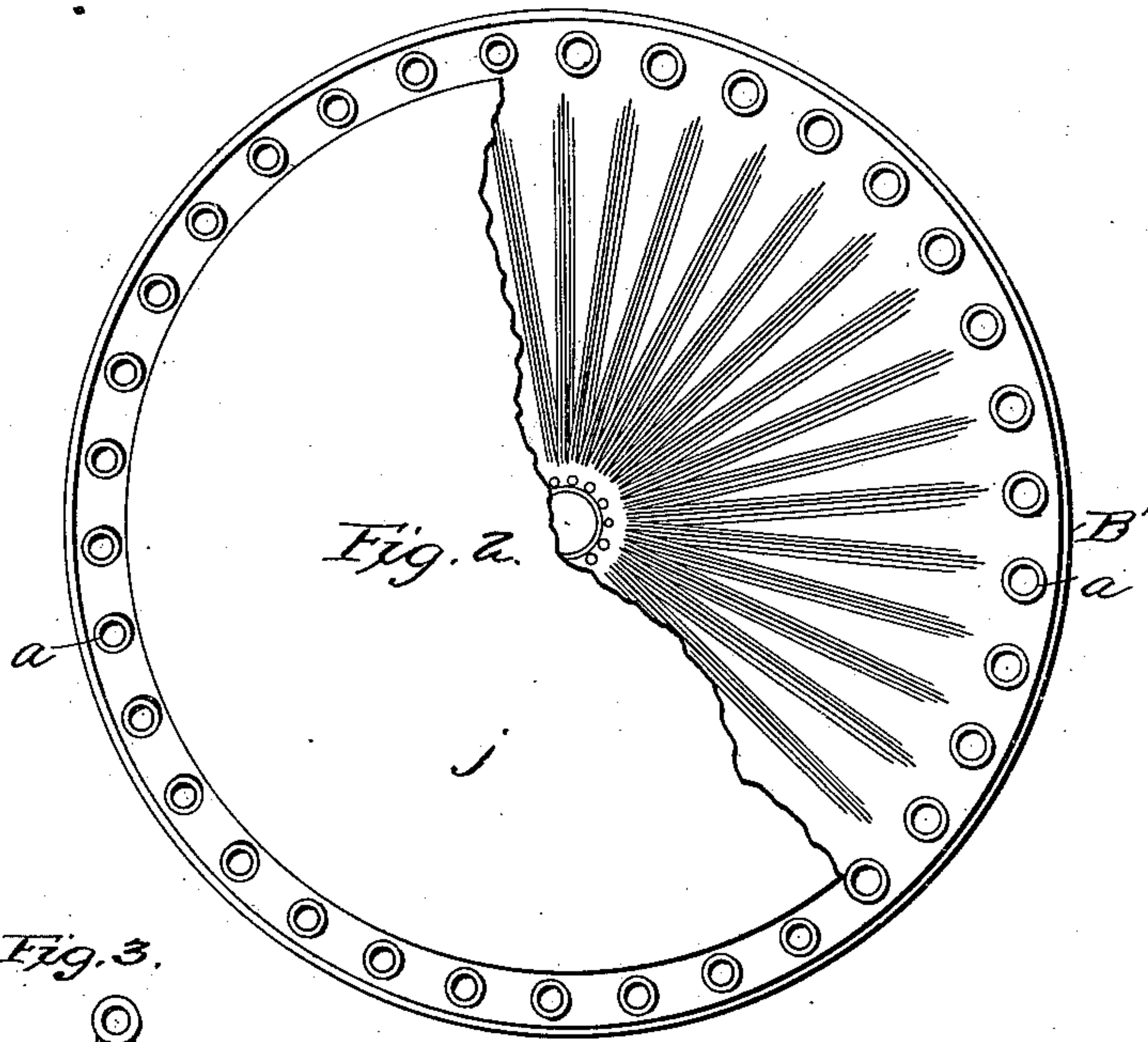
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UNITED STATES PATENT OFFICE.

ALMER B. THOMAS, OF WEST RANDOLPH, VERMONT.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 375,580, dated December 27, 1887.

Application filed May 13, 1887. Serial No. 238,071. (No model.)

To all whom it may concern:

Be it known that I, ALMER B. THOMAS, of West Randolph, in the county of Orange and State of Vermont, have invented a new and useful Improvement in Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to steam-generators; and the object of the invention is to provide a generator, either for use as a horizontal or vertical boiler, which will generate and keep the steam up with a minimum amount of fuel.

The second object is to provide such a construction and arrangement of parts that all heat from the fire and from the steam-generator immediately about the fire will be utilized and none wasted.

The third object is to heat the main portions of the water in the boiler by passing steam through pipes contained within the water and by the condensation of the steam within the said pipes.

The invention consists, primarily, of a fire-box having a water-chamber surrounding the same, a water-chamber above the fire-box in connection with the water-space around the same, a series of pipes or coils connecting with the second water-chamber and adapted to receive the steam therefrom, and a water-space surrounding the said coils of pipes, the water therein being heated by the steam and the condensation of the same contained within the coil or coils.

The invention further consists of a fire-box having a hollow or tubular grate, a water-space surrounding said box, connections between said water-space and the tubular grate, whereby the water is heated by the fire resting upon the grate, and connections between the water-space and the main boiler.

Further, the invention consists of a fire-box, a water-chamber surrounding the same, a smoke-chamber above the same in connection with a series of flues around the periphery of the main boiler for carrying off the products of combustion, a water-chamber above the smoke-chamber having pipe-connections with the water-space surrounding the fire-box, a coil of pipes above the second water-chamber for receiving the steam, and a water-chamber surrounding the coil of pipes and surrounding the flues.

Finally, the invention consists in the details of construction, all as herein set forth.

In the drawings, Figure 1 represents a front elevation of the boiler arranged vertically, with a portion of its outer shell broken away to show the interior thereof. Fig. 2 is a section on line *x x* of Fig. 1, showing the upper plate of the supplemental water-chamber, one portion of it being broken away to show its corrugated bottom, the side flues being also shown in this figure. Fig. 3 is a horizontal section of the fire-chamber and the water-chamber around the same, with pipe-connections to the upper water-chambers, the section being taken on line *x' x'*, Fig. 1. Figs. 4 and 5 represent the tubular grate, one being a modification. Fig. 6 is a sectional view of the regulator for feeding the water to the generator.

In the drawings, the fire chamber is represented at A. It has the ordinary fire-door, K, and door L, for the removal of ashes, &c. Extending around its inner periphery, within a short distance of the wall thereof, is a metal casing, E, which I have shown corrugated, as this presents the most heating-surface. Between this casing and the periphery a chamber, G, is formed, which is in connection with the water-supply, as hereinafter described. As the walls of this chamber are directly exposed to the full action of the heat within the fire-chamber, it will be obvious that the generation of steam at this point is a matter of very few moments, especially in view of the fact that, by reason of the diameter of the chamber, only a thin sheet of water is presented to the action of the heat within the chamber. In order to still further accelerate the generation of steam, I have made the grate of tubular sections, as shown in Figs. 4 and 5, and connect them by means of pipes *b b* with the water-space G.

In Fig. 4 I have shown the grate as composed of horizontal tubes connected at their ends by hollow segmental rings F, with pipes running from these rings to the outside, being suitably connected by elbows with the water-space G.

In Fig. 5, instead of the short sections of tubes, I have shown the grate composed of a center part having suitable supporting-arms, I, with a tubing, *h*, coiled around the center part, with the two ends of the tube having con-

nection with the water-space by suitable pipes. Thus it will be seen that the fire rests directly upon a grate which constitutes in itself a water-chamber, and this is in direct connection
5 with the water-chamber surrounding the fire.

I have shown in Fig. 1 the boiler as being enlarged in diameter above the fire-chamber and with an inclined body portion extending down to and connected with the part B. At
10 the bottom of the enlarged portion of the boiler I provide a diaphragm, *p*, which may be corrugated, as shown in Fig. 2, so as to provide the greatest amount of service. The heat from the chamber B and the products of
15 combustion rising against this diaphragm are deflected to the sides of the chamber of the main boiler B', around the periphery of which are arranged flues *a*, arranged a suitable distance apart. These flues connect at their up-
20 per ends with a smoke-chamber which is in connection with the chimney. In the bottom of the main boiler B', I arrange a water space or chamber, *j*, the bottom of which is formed by the diaphragm *p*, or the chamber may be
25 formed entire and inserted. Pipes *a'* at intervals extend from the water-chamber around the fire-box through the smoke-chamber into the water-chamber *j*, which is filled with water to a suitable height when the fire is started.
30 Above this chamber a coil or coils of pipe, *d'*, is or are arranged, extending upward in any desirable manner to the top of the main boiler above the water-line. This coil or coils is in connection with the chamber *j*, and around the
35 chamber *j*, the coil or coils, and the flues *a* a water-space is formed, which constitutes the main boiler. By this construction it will be seen that the water around the fire-box will be generated into steam very quickly, and will
40 pass up into the chamber *j* and through the coils of pipes, thus heating the water around the coils not only in the ascent through the coils as steam, but after it has been condensed, thus imparting much more of its heat to the
45 water surrounding the coils than if the steam were directly forced into the body of the water, as has been heretofore done. The water in the main boiler, also, is heated by contact with the top and sides of the chamber *j* and by contact
50 with the flues *a* by the passage of the products of combustion through the same. In Fig. 1^a pipe H is shown as communicating with the water-space G, for supplying said space with water. This pipe is connected with a regu-
55 lator secured to the side of the boiler and in connection with the chamber *j* and with the main boiler B', from which the water is taken to supply the generator.

In Fig. 6 I have shown a detail of this regu-
60 lator, which consists of a chamber having a pipe-connection, M, with the chamber *j*, with the float *m* in the regulator-chamber adapted to rise and fall with the rise and fall of the water in the chamber *j*. The valve-stem of this
65 float is connected by means of a lever with a valve, *e*, controlling the supply to the pipe H,

and this valve regulates, by means of the rising and falling of the float, the flow of water through the pipe H to the water-space around the fire-box. The supply of water is drawn
70 through pipe *f* from the upper boiler. A nut on the float-stem may be adjusted to permit the float to open the valve or close it at any determined height of the water in chamber *j*.

Ordinary or suitable gages for both the up-
75 per and lower chambers will of course be provided, as shown in the drawings.

While I have shown the invention as applied to a vertical boiler, I desire it understood that I do not limit myself in this respect, nor
80 to the details of construction, as these may be varied materially without departing from the spirit of my invention.

The steam-exit pipe is shown at *e'*, and the feed-water supply at *c'*.
85

I claim as my invention—

1. In a steam-generator, a fire-chamber, a water-space formed between the walls thereof, an independent water-chamber located in the main boiler, a coil or coils of pipe ex-
90 tending through said water-chamber, and an intermediate chamber in connection with the water-space around the fire-chamber and with the coil or coils in the main boiler, whereby the steam and water of condensation
95 passing through said pipes will give out all their heat to the water in the boiler and generate steam therein quickly and economically, substantially as described.

2. In a steam-generator, a fire-chamber, a
100 water-space surrounding the same, a second water-chamber above the first and in connection therewith, and a coil or coils extending from said second water-chamber through the water-space of the main boiler to above the
105 water-line thereof, substantially as described.

3. In a steam-generator, a fire-chamber, a water-space surrounding the same, a smoke-chamber immediately above the fire-chamber, a main boiler having flues around its periph-
110 ery in connection with the smoke-space, a closed water-chamber above the smoke-chamber and in connection with the water-chamber around the fire, a third water-chamber
115 above the closed chamber, and a steam-coil in connection with the closed chamber extending through the water-space of the main boiler, substantially as described.

4. In a steam-generator, a fire-chamber, a water-space surrounding the same, a tubular
120 grate in connection with the water-space, a closed water-chamber in connection with the chamber around the fire and the flues in the main boiler for the products of combustion, and the coil or coils connected with the closed
125 water-chamber and extending through the water-space of the main boiler B', substantially as described.

5. In a steam-generator, a fire-chamber, a water-space surrounding the same, a closed wa-
130 ter-chamber, and the main boiler provided with coil or coils of pipes within the same, in con-

nection with the closed chamber, combined
with an automatic regulator connected with
the closed chamber and with the water-space of
the main boiler, and adapted to regulate the
5 feed of water to the water-space around the
fire-box from the main boiler by the height of
the water within the closed chamber, substan-
tially as described.

In testimony whereof I have signed my name
to this specification in the presence of two sub- 10
scribing witnesses.

ALMER B. THOMAS.

Witnesses:

JOSEPH D. DENISON,
W. S. CURTIS.