

(No Model.)

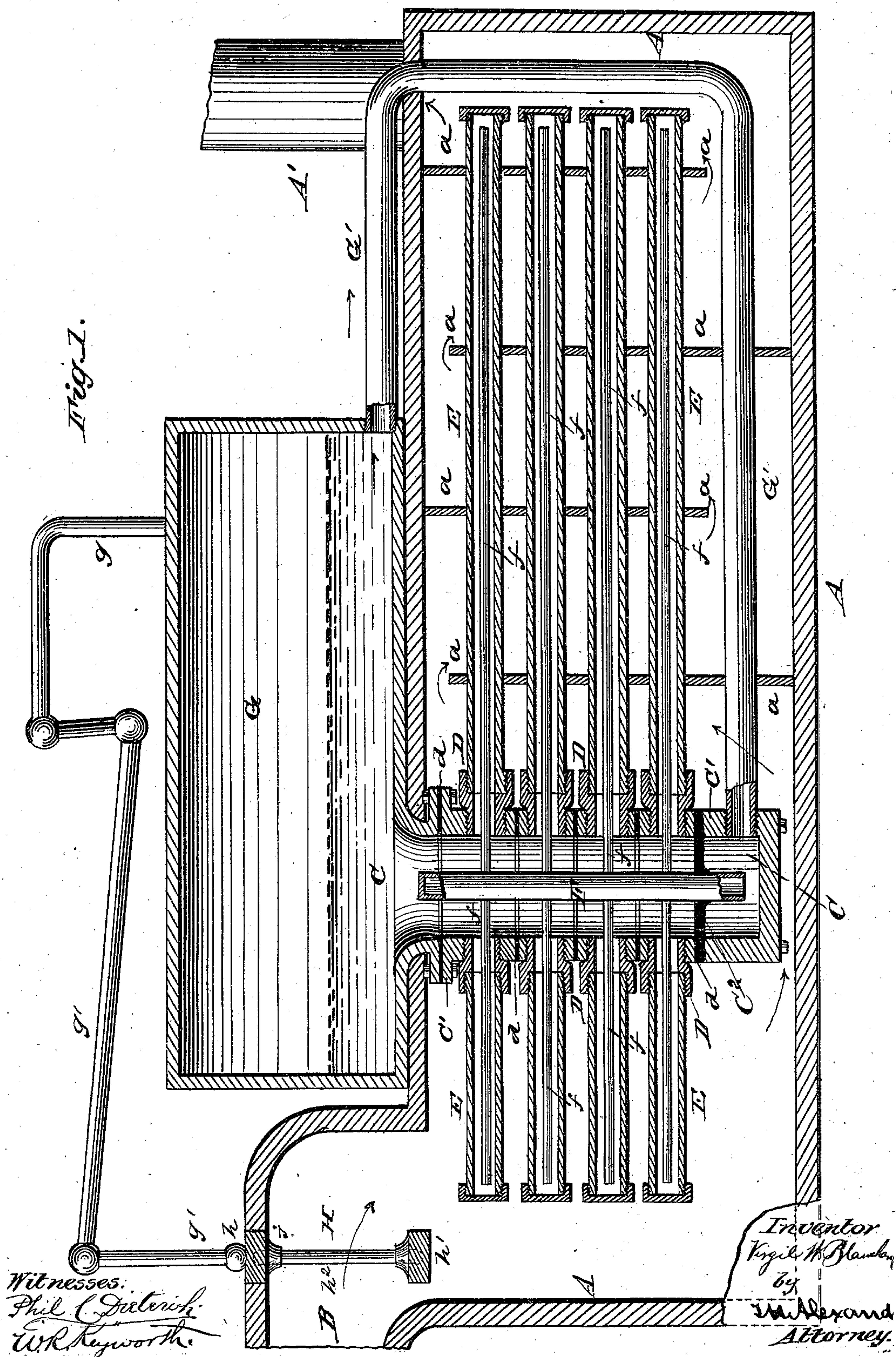
4 Sheets—Sheet 1.

V. W. BLANCHARD.

STEAM BOILER.

No. 289,962.

Patented Dec. 11, 1883.



(No Model.)

V. W. BLANCHARD.
STEAM BOILER.

4 Sheets—Sheet 2.

No. 289,962.

Patented Dec. 11, 1883.

Fig. 2.

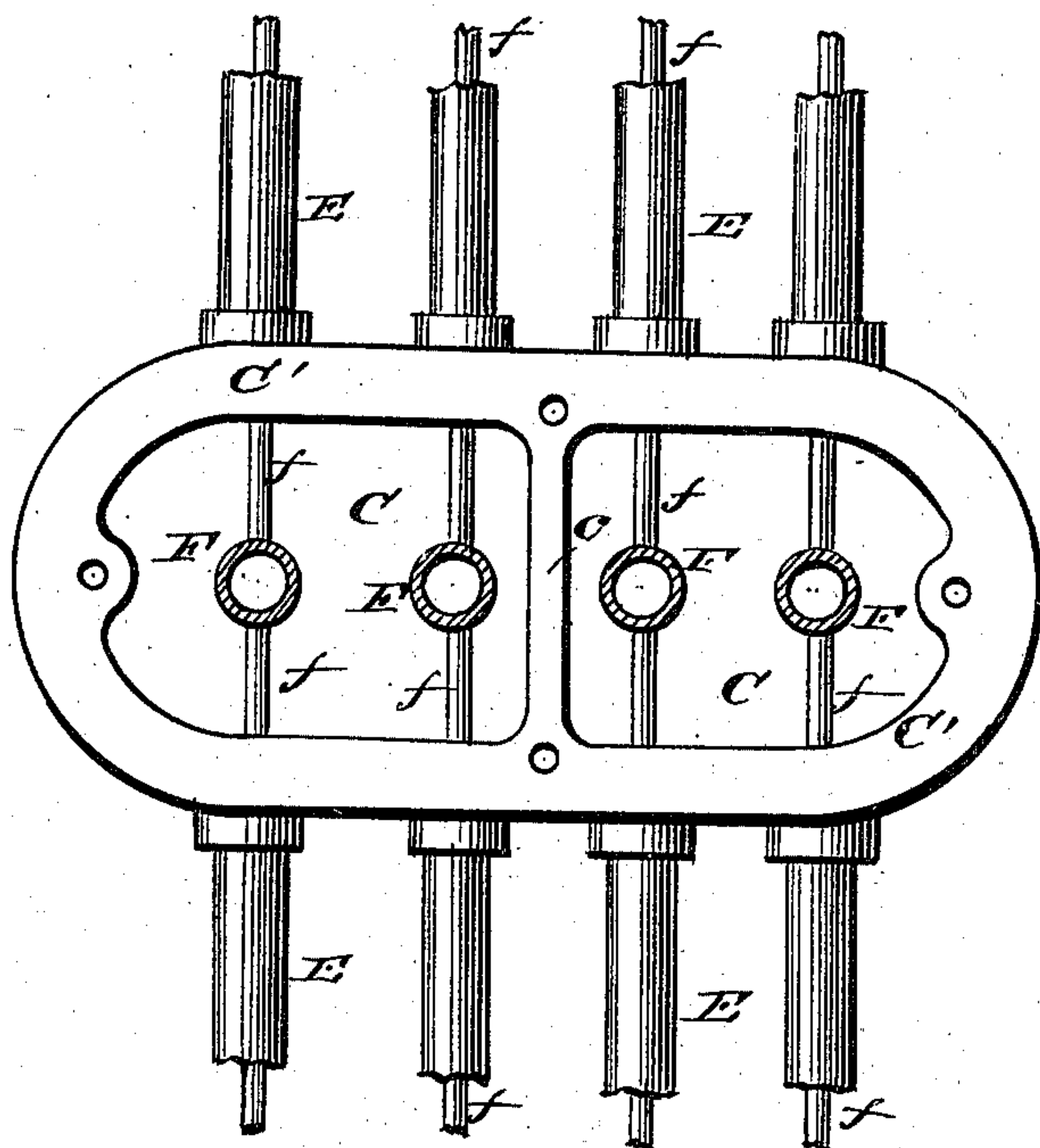
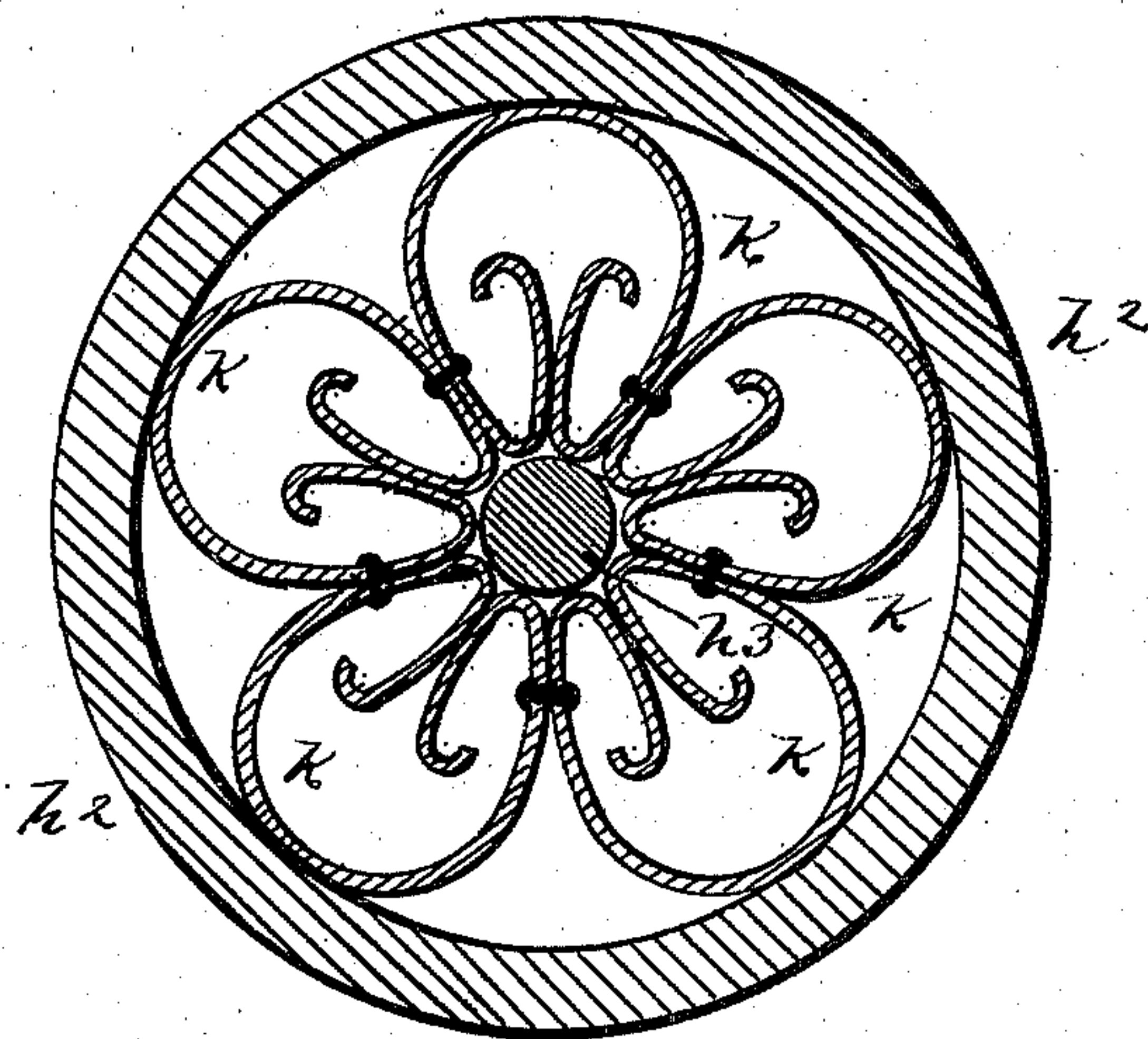


Fig. 3.



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4 Sheets—Sheet 3.

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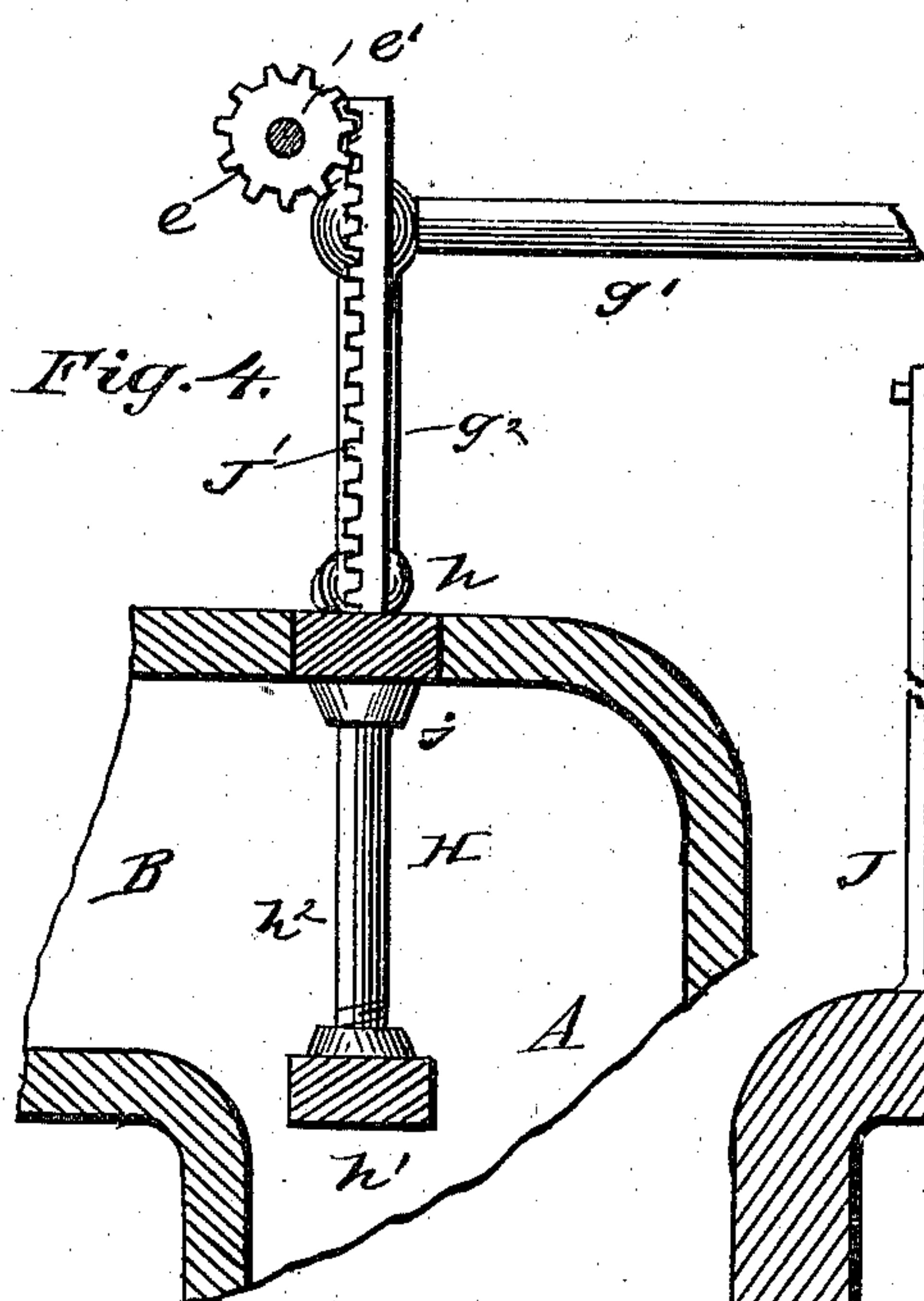


Fig. 5.

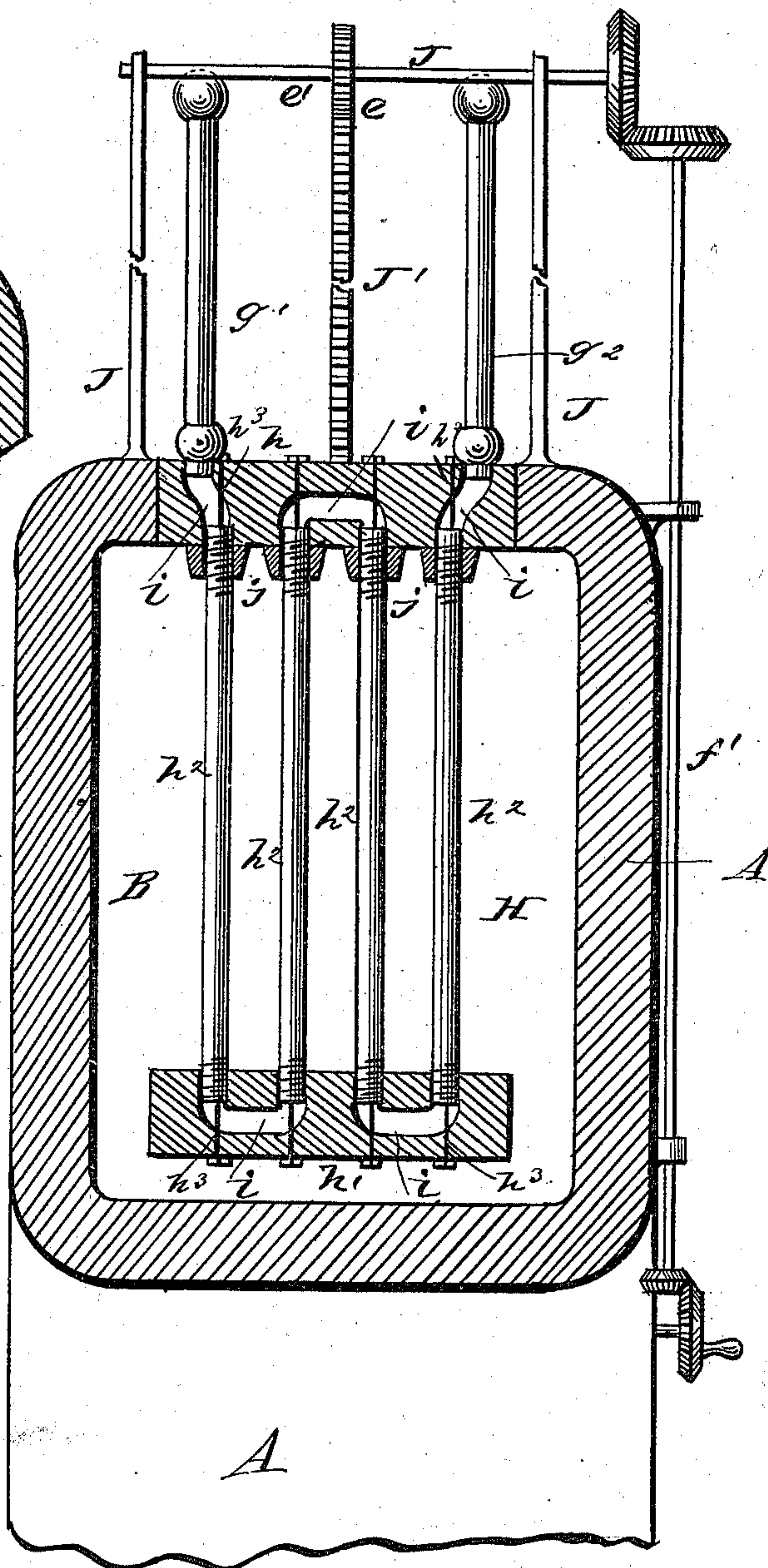
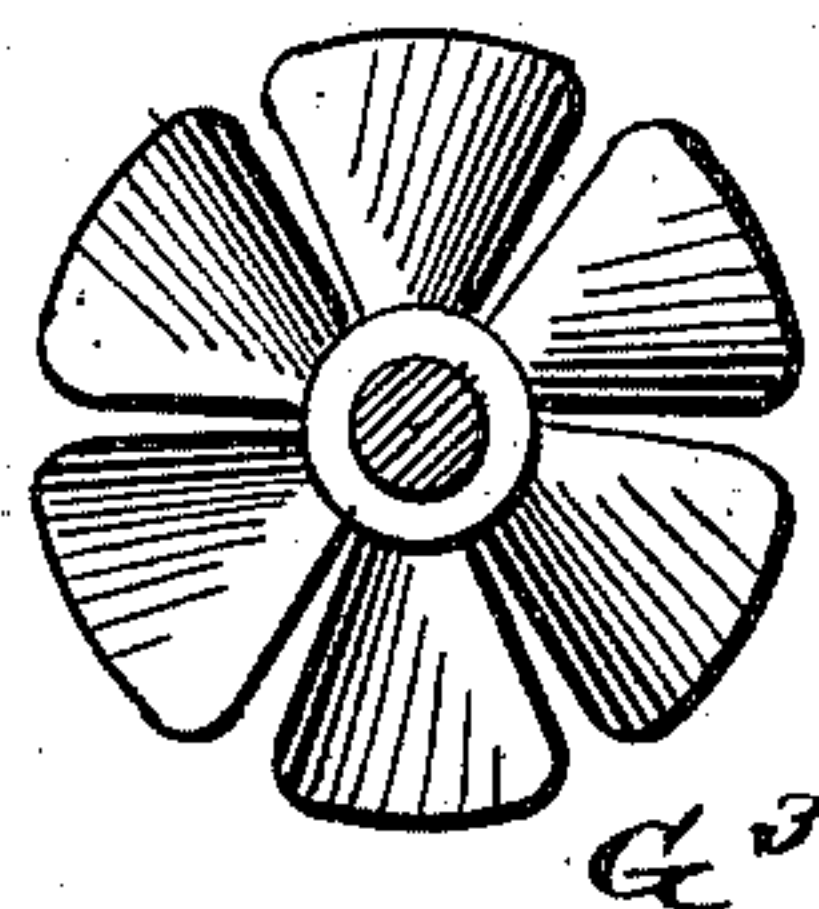


Fig. 7.



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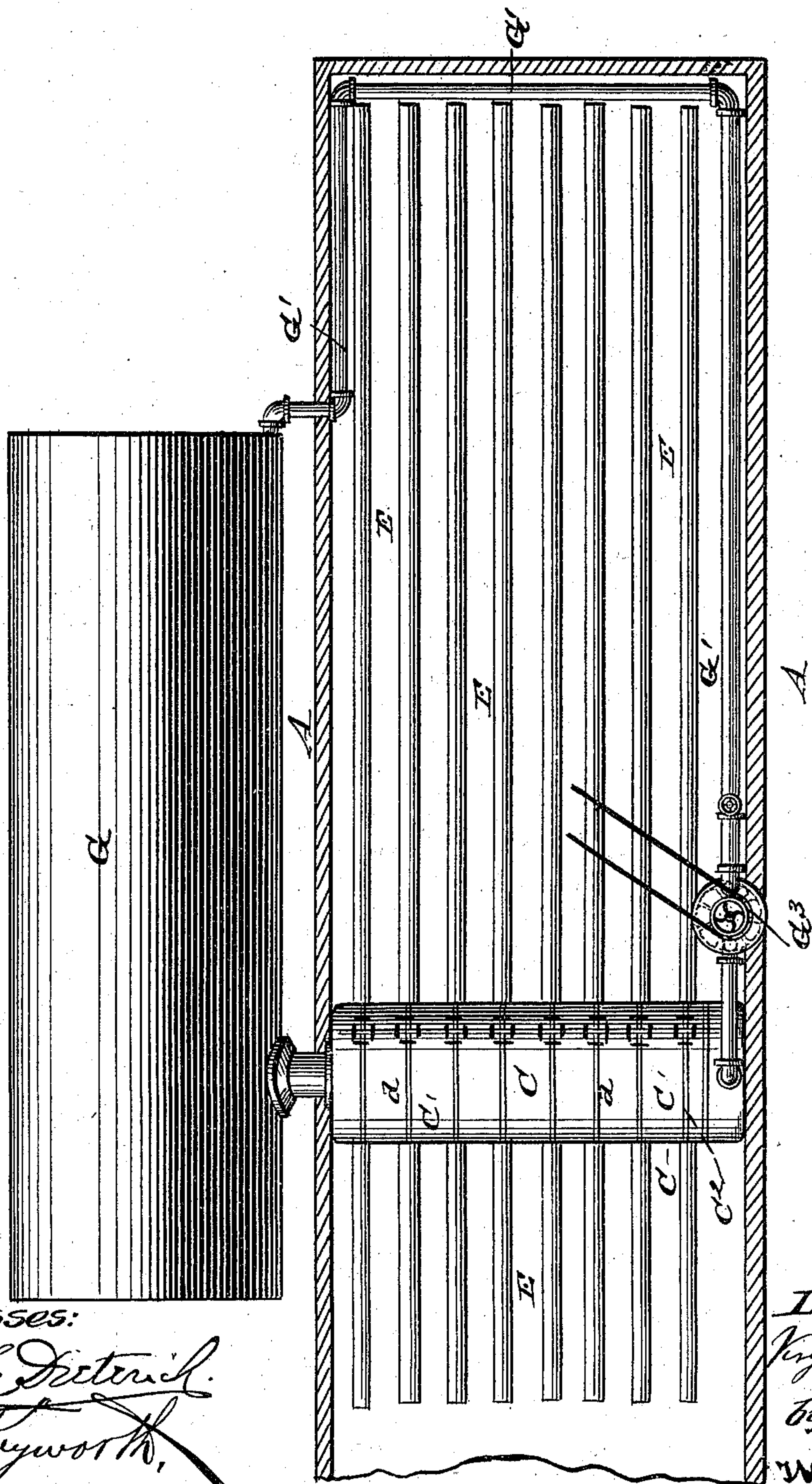
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Fig. 6.



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UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 289,962, dated December 11, 1883.

Application filed January 29, 1883. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a vertical diametrical section through a steam-boiler of my improved construction, showing my improved superheater applied to it, which forms the subject of another application filed January 2, 1883. Fig. 2 is a horizontal view, in detail, of the well, showing portions of the steam and water pipes connected thereto, and also the several vertical pipes which are connected to the internal pipes of the horizontal steam-pipes. Fig. 3 is an enlarged cross-section of one of the superheating-pipes and its internal heat-radiating flanges. Fig. 4 is a vertical diametrical section of the superheater. Fig. 5 is a transverse vertical section of the same. Fig. 6 is a vertical section, illustrating mechanical means for causing a positive circulation of the water from and to the dome of a steam-generator; and Fig. 7 is a view of one form of pump or propeller which may be used to create a circulation of water.

The main object of this invention is to construct a steam-boiler in which there shall be a constant circulation of the water contained therein, in combination with a steam circulation, the boiler and its several parts being so constructed that there will be no interference between the water circulation and the steam circulation, as will be fully described and set forth in the annexed drawings.

Before giving a particular description of my new improvements in steam-boilers, I will state that I secure cheapness, and make a steam-generator which is not liable to get out of order or start joints in the pipes by expansion and contraction. I further so construct the generator that the products of combustion from the furnace shall be retarded in their outward passage as long as they can be made to serve a useful purpose. I finally provide means whereby the water to be heated, though con-

siderable in total volume, is yet so distributed and circulated in thin streams that the best results are obtained in the production of steam. 55

It is well known that a free circulation under a given heat produces the best results in the carrying off of steam into a steam space, dome, or chamber, from which it can be drawn for practical use by means of a throttle-valve, cock, or other device. Now, the main object of my invention is to create such a free circulation in a steam-generator that the water shall be in constant circulation and ebullition and the vapor or steam shall be given off without interruption, and shall have a free exit into the steam-space above the water-line. 60

A designates the outer shell of my furnace, which is composed of furnace-brick or any other suitable refractory material. This furnace should be suitably bound and stayed with iron, and it has an inlet, B, leading from the furnace proper, through which the flame and other products of combustion pass for the purpose of heating the water-pipes and producing steam therein. 65

At the end of the furnace-chamber A opposite the flue B is an outlet flue, pipe, or chimney, A', which is the common uptake of the furnace-chamber A. 70

Within the outer shell, A, is a well, C, which is composed of horizontal sections of cast metal (iron being preferred) of the flat ellipsoidal form shown in Fig. 2. This well-wall is braced by a bar, c, cast or otherwise applied across the center of it, as shown in Fig. 2. These sections are cast of a suitable height and thickness, and the abutting edges are dressed by planing. They are then placed one on top of the other, with plates or washers d, of thin copper, placed between them, and the whole bound together by means of tie-bolts running perpendicularly through the castings and washers. Each casting C', before it is joined to the others, is provided with a suitable number of holes bored in each side, and in these holes are screwed the nipples or couplings D, into which are screwed the length of pipes E, which are closed by suitable caps at their outer ends, as shown in Fig. 1. The interior of this well C is provided with a row of perpendicular pipes, F, corresponding in number and position to the pipes upon one side of a section of the well. These pipes F are open 75 80 85 90 95 100

at the bottom and closed at the top, and they are provided with smaller branch pipes f , running centrally into the pipes nearly to their closed ends, as clearly shown in Fig. 1.

5 The well C forms a partition across the shell of the furnace, and the draft passes under it and under and over a series of alternating vertical divisions, a , which compel the products of combustion to take an up-and-down zigzag course between the pipes E. I am thus
10 able to secure a very large amount of heating-surface in a comparatively small space.

To the top of the well is bolted by a ground joint and suitable bolts (or it may be secured
15 by rivets) a steam-dome, G. This dome is connected at one end by a pipe, G' , which passes down through the shell A and communicates with the bottom of the well, as shown in Fig. 1.

The well C and part of the dome G are filled
20 with water, and, a fire being started in the furnace, the products of combustion entering the shell A at B follow the course of the arrows already described, and the water, filling the pipes and well, is spread in such thin streams
25 over such a large heating-surface that steam is generated very quickly. When the water begins to boil, a circulation is started from the dome through the pipe G' into the lower end of the well. There it enters the lower ends
30 of the pipes F below a horizontal partition, C^2 , and passes out into the small pipes f , and out of these pipes to the outer ends of the pipes E, when it returns to the well C, and thence passes up into the dome again. It will
35 thus be seen that I am able to maintain a constant circulation of the water through pipes having a large heating-surface.

From the top of the steam-dome passes a steam-pipe, g , which is connected by movable
40 or hinged joints g' to the superheater H, located in the neck B, where the products of combustion, fresh from the furnace proper, enter the interior of the shell A. This superheater is constructed as follows: h h' represent two horizontal cast heads, which are connected by pipe-sections h^2 , forming a coil,
45 through which the steam passes from the pipe g , and escapes to the engine through a pipe, g^2 . The cast heads are cored out, so as to leave steam-channels i , that form communications between the ends of the pipes h^2 and the steam inlet and outlet pipes g g^2 . The pipes
50 h^2 screw into the lower head h' ; but their upper ends enter the casting h , and are provided with screw-collars and copper washers j , as shown in Fig. 5.

In order to secure as much heat-conducting surface as possible in my superheater, I provide the interior of the pipes h^2 with short
60 sections k , of sheet-copper, but in the form of tubes and flanges, as shown in the enlarged cross-section, Fig. 3, and so adjusted as to touch the sides of the pipes h^2 , to touch each other, and also to impinge against steel rods
65 h^3 , that are used for securely tying the heads and tubes of the superheater together.

The above-described feature will be found

more fully set forth in a patent bearing date even with this, the application for which was filed January 2, 1883, Serial No. 80,685. 70 The heat is so intense in the position occupied by the superheater that when the engine is stopped and there is no circulation through it it is necessary to remove it from exposure to the heated products of combustion passing through the neck B. To
75 do this I make the heads h h' of equal size, so that one will fill the space of the other through the shell A, and to the upper head, h , I apply a light frame, J, which is suitably guided. The fixed standards of the frame J
80 rise from the top of the neck B of shell A, and secured to the center of the upper head, h , is a vertical rack, J' , the teeth of which engage with a pinion, e , keyed on a horizontal rod, e' ,
85 which is journaled in the upper ends of the frame J. (Shown in Fig. 3.) On one end of the rod e' is keyed a bevel spur-wheel, which engages with a corresponding wheel keyed on the upper end of a vertical rod, f' , journaled
90 in brackets on the side of the neck B, and provided at its lower end with a pinion bevel-gear that meshes with another bevel-gear having a crank-handle applied to it. By turning the crank-handle the superheater may be raised
95 out of the flue-space B, and the head h' caused to fill the space occupied by the head h . The superheater can be lowered into the flue-space at pleasure. I thus avoid all danger to the superheater from intense heat when steam is
100 not circulating through it.

I shall now describe the figures represented on Sheet 4. The shell A, the steam-dome G, and the well, with its system of communicating pipes, may all be constructed as I have
105 above described; but for the purpose of more fully explaining what follows I will recapitulate. The well C is constructed with an apartment at its lower end, formed by the horizontal partition C^2 , with which apartment the lower
110 open extremities of the vertical pipes F in said well communicate at a suitable point. In the course of the pipe G' , I apply a forcing-engine or propeller, G^3 , which is inclosed in a case and rotated by means of pulleys and a belt
115 driven from the engine or other prime motor.

It will be observed that the pipe G' enters the case or shell of the propeller in front and leaves it at the rear, so that when the propeller is in motion a current of water will be
120 forcibly drawn from the dome G and impelled into the well C at its lower end, and from thence forced up through the vertical tubes F, through the horizontal tubes f , and caused to return through the inclosing-pipes E to the
125 well again.

It will be clearly seen, by reference to Fig. 7, that when the propeller or forcing-engine is at rest a current of water may freely pass between its blades or wings from the dome G
130 into the apartment at the lower end of the well C, and from thence up the vertical tubes F, as above described. The intense heat resulting from the rapid combustion thereof

makes it necessary to have the most rapid circulation of water in those parts of the generator which are directly exposed to said heat, and this is effected in a most perfect manner by means of the propeller-pump; as above specified.

I do not confine myself to the precise form or construction of pump herein described; as any forcing-engine may be adopted which will produce the result specified—to wit, a rapid circulation or rotation of the water in the boiler, and a consequent rapid generation of steam. I however prefer to adopt the radial feathered-blade propeller G³. (Shown in Fig. 5.)

I would be understood to describe the partition C, the apartment at its base, and the forcing-engine, not as indispensable elements to the invention, but as very valuable auxiliaries when the heating-tubes of the boiler are exposed to a very intense heat from the combustion of fuel, as they are by a rapid circulation of water in a steam-boiler, which injurious effects to the fire-exposed heating-surfaces are prevented.

I have above described my improved superheater in connection with my improved steam-boiler for the purpose of showing a complete steam-generator; but I do not claim, under this application, the superheater, as it forms the subject of a separate application for Letters Patent, filed January 2, 1883.

I would remark thus, though I prefer in practice to construct the well C of sections of cast metal in the manner heretofore already set forth, still it may be constructed of sheet metal adapted for boiler-making, properly riveted and braced by stay-bolts. I would be understood to embrace this method of construction when it may be deemed desirable in practice.

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

1. A steam-boiler consisting of a series of horizontal pipes closed at their outer ends, and opening at their inner end into a well, which extends transversely across the combustion-chamber, which is closed at its lower end and opens at its upper end into a steam-dome, in combination with a pipe leading from the water-space of the said dome into the said well, a series of vertical pipes open at their lower ends and closed at their upper ends, and arranged in the well and communicating with the pipes applied in the said horizontal pipes, and a suitable furnace-chamber, all constructed and adapted to operate substantially in the manner and for the purposes described.

2. In combination with the inclosing furnace-shell, the vertical water-heating well, the vertical pipes F, open at their lower ends and closed at their upper ends, the partition C, which extends transversely across the combustion-chamber, the horizontal pipes, the pipe G³,

and the steam-dome communicating with this well, and the vertical partitions a, arranged in said furnace-shell, all adapted to operate substantially as described.

3. The combination of the elongated well C, pipes communicating therewith, closed at their outer ends, pipes arranged in this well and having branch pipes radiating from them, a steam-dome, and a pipe leading from this dome to the bottom of the said well, all adapted to operate substantially in the manner and for the purposes described.

4. In a steam-boiler, a deep well extending transversely across the combustion-chamber, closed at its lower end and opening at its upper end into a steam-dome, pipes E, radiating from this well, closed at their outer ends, a series of vertical pipes, F, closed only at their upper ends, and a series of horizontal pipes arranged in pipes E, open at their outer ends and opening at their inner ends into pipes F, all constructed and adapted to operate substantially in the manner and for the purposes described.

5. The combination of the vertical well extending across the combustion-chamber, and provided with vertical pipes closed at top and open at bottom, the horizontal branch pipes, the partition C, pipe G, a steam-dome, and a flue-space beneath said well, all constructed and adapted to operate substantially in the manner and for the purposes described.

6. The boiler-furnace constructed with a narrow flue, B, leading through its crown at one end, in combination with a deep well having a flue-space beneath it, and the alternating partitions a, forming a zigzag flue leading to the chimney, all arranged to operate substantially in the manner and for the purposes described.

7. The combination of the deep well extended transversely across the combustion-chamber, the inclosing furnace-wall, the steam-dome, and a pipe leading from said dome through the furnace-shell, and communicating with the deep well at or near its bottom, substantially in the manner and for the purposes described.

8. The combination, with a steam-generator constructed substantially as described, and a steam-dome communicating with a deep well, of a shell, A, having a contracted inlet-flue and a superheater applied in this flue, and communicating with the said steam-dome, all adapted to operate substantially in the manner and for the purposes described.

9. The combination, in a steam-generator, of a well, C, which extends transversely across the combustion-chamber, and composed of sections in the form of rings, pipes F, closed at top and open at bottom, the horizontal pipes E, the pipes f, inclosed therein, and the flue-channel, substantially in the manner and for the purposes described.

10. The combination of the well extending across a combustion-chamber, with water-channels closed at the top and open at the

bottom, and a diaphragm located near the bottom of this well, and a flue-space below, substantially as described.

11. The combination, with the well extended transversely across the combustion-chamber, and provided with radiating outflow and return pipes, vertical pipes F, closed at top and open at bottom, the steam-dome, the pipe G, leading from the dome into the said well below a diaphragm, C, and a forcing-engine, all constructed and adapted to operate substantially in the manner and for the purposes described.

12. The combination of the partition C², the deep well extended transversely across the combustion-chamber, the return-pipe G', a propeller or forcing-engine, G³, the vertical pipes F, the horizontal pipes E, and the inclosed heating-tubes f, all adapted to operate conjointly substantially as described.

13. The combination of a combustion-chamber, A, a vertical well extending across the

same, but terminating above the bottom thereof, a steam-dome communicating with the top of said well, a pipe, G, forming a communication between the bottom of the well and the said dome, and a forcing-engine, all constructed and adapted to operate substantially in the manner and for the purposes described.

14. The combination of the combustion-chamber, the well and pipes arranged therein, the contracted inlet-flue B, and a vertical movable steam-superheater therein, flexibly connected by a pipe with the steam-dome, all constructed and adapted to operate substantially in the manner and for the purposes described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:

HENRY P. LISSON,
GEORGE F. WONSON.