

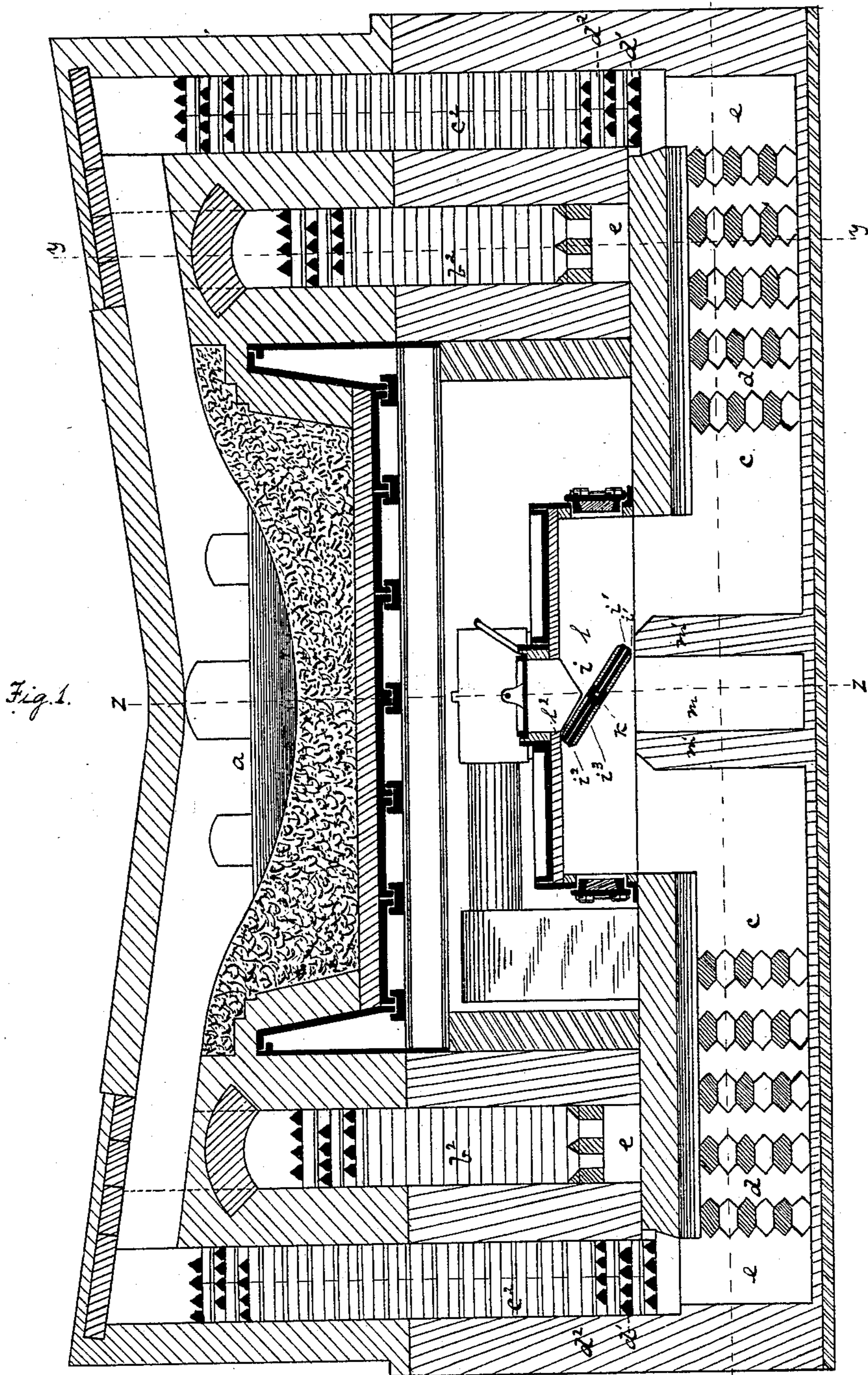
(No Model.)

4 Sheets—Sheet 1.

W. SWINDELL.
REGENERATIVE FURNACE.

No. 285,522.

Patented Sept. 25, 1883.



Witnesses—
J. K. Smith
Robert C. Golden

Inventor—
William Swindell
by his attorney
Beakwell & Kerr

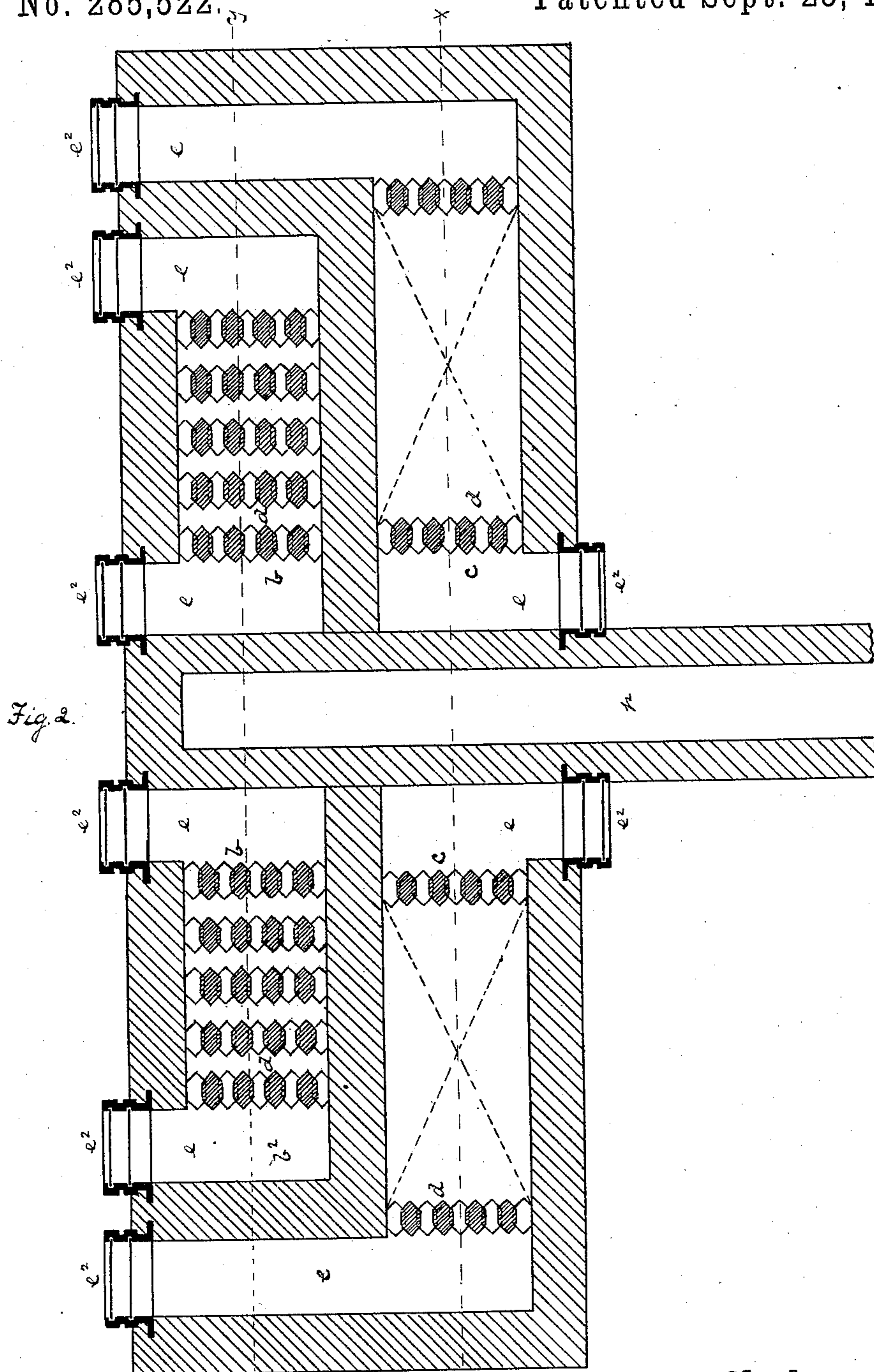
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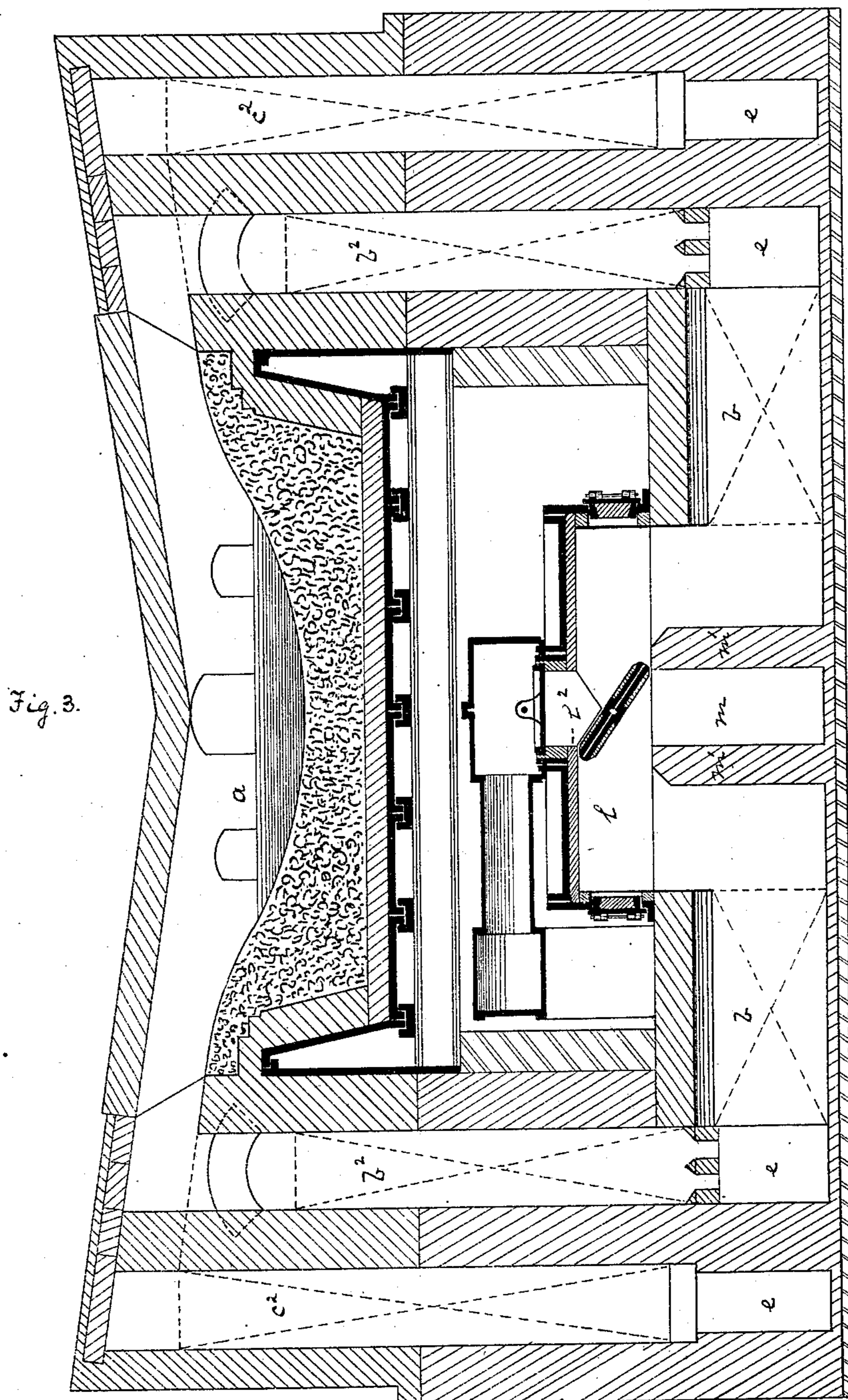
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Fig. 4.

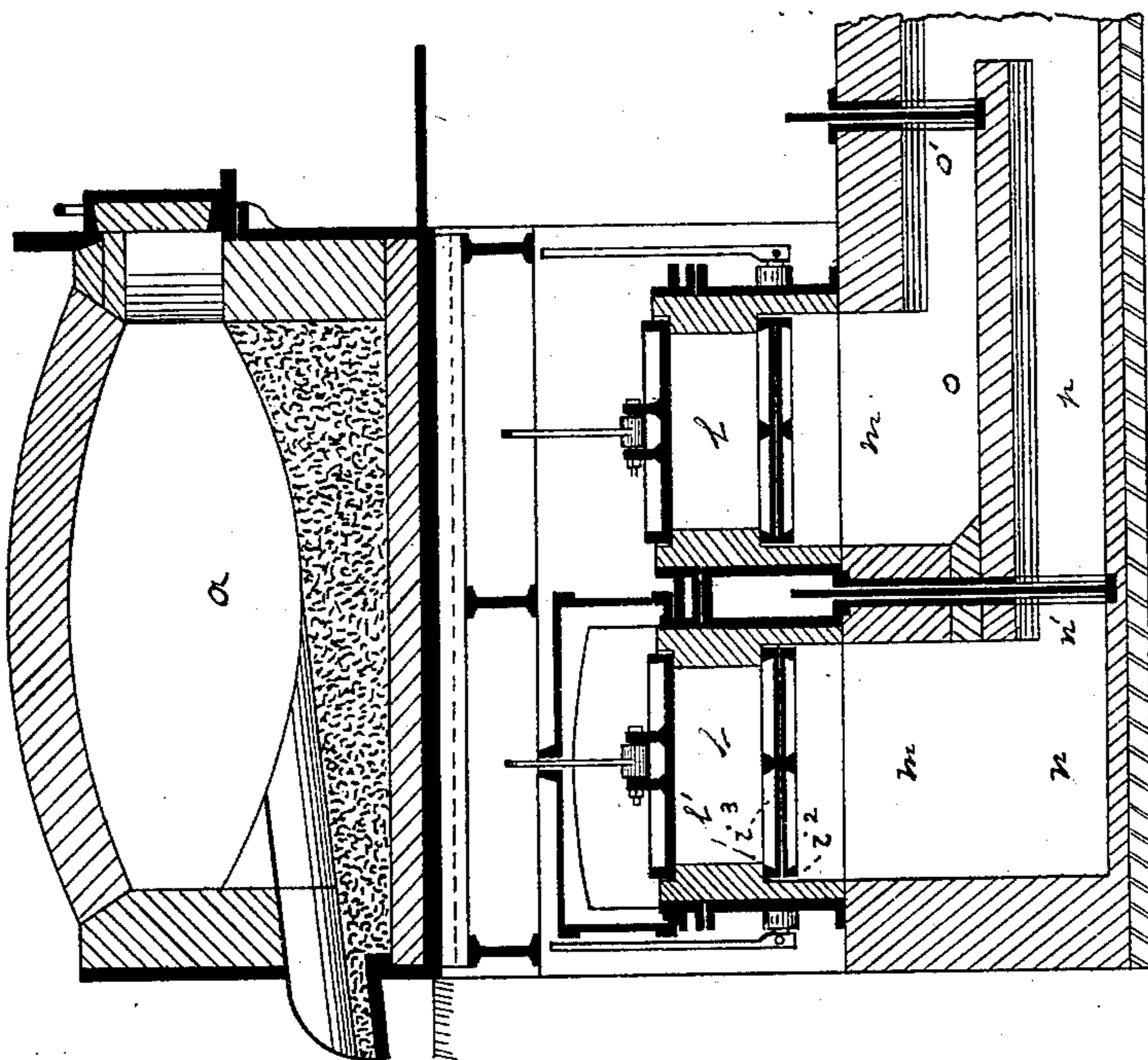
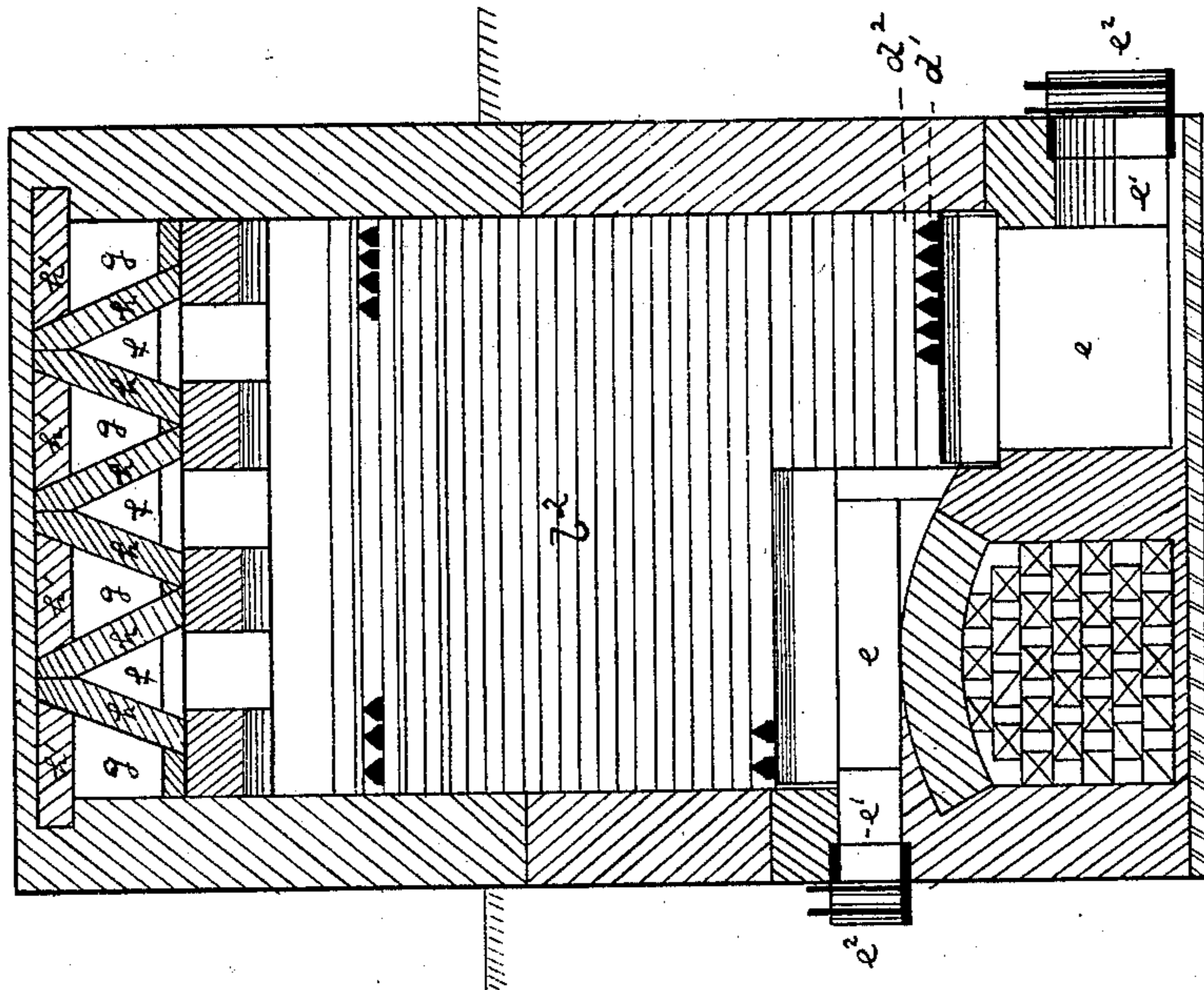


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF PITTSBURG, PENNSYLVANIA.

REGENERATIVE FURNACE.

SPECIFICATION forming part of Letters Patent No. 285,522, dated September 25, 1883.

Application filed August 8, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Regenerator-Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical longitudinal section of my improved furnace on the line $x x$ of Fig. 2. Fig. 2 is a horizontal section on the line $x x$ of Fig. 1. Fig. 3 is a vertical longitudinal section on the line $y y$ of Fig. 2. Fig. 4 is a vertical cross-section on the line $z z$ of Fig. 1. Fig. 5 is a vertical cross-section on the line $y y$, Fig. 1.

Like letters of reference indicate like parts in each.

The bed of the furnace is shown at a . Underneath the furnace I place a portion of the regenerators, b being the gas-regenerators and c the air-regenerators.

Instead of making the vertical flues which lead from the regenerators to the bed open, as heretofore, I fill them with checker-work, so that they constitute practically a portion of the regenerators. This is shown at b^2 and at c^2 . Thus I construct the furnace with regenerators which are partly horizontal and partly vertical, and by utilizing the flue-space as a regenerator-space I am enabled to reduce the depth of the regenerators under the furnace, and in this way I bring the regenerators nearly to the surface, and save not only in the cost of construction but also in the cost of maintenance and repairs, the regenerators of my improved furnace being much more accessible and easily repaired than those commonly in use.

I prefer to construct the regenerators b and c of checker-brick d , which are conical, conoidal, or pointed at both ends, the points being arranged in the direction of the run of the gases; but they may be constructed of other-shaped brick suitable for the purpose.

The vertical flues b^2 and c^2 are filled with checker-brick d' , having a wedge-shaped or deflecting upper surface, which are supported upon tiles d^2 , of similar construction, so that throughout the entire run of the flues no bear-

ing is afforded for the lodgment of dust, cinders, and dirt, which are carried over from the bed by the stack-draft.

The checker-bricks d' are built up in cross rows or courses—that is, each course is placed on top of and at right angles to the course below it. It has been customary to cut off a portion of the sharp top to make a plain surface for the superimposed bricks to rest upon, or else to groove the flat bottoms for the reception of the sharp tops of the under bricks. This practice I have found to be objectionable, for the reason that it affords an opportunity for the bricks to become fused together by the intense heat to which they are exposed, so that in case it becomes necessary to take down the regenerators the bricks cannot be taken apart without breaking them. I now make the bricks without plain spaces on the upper edge and without grooves in the bottom; and in constructing the regenerators I place the flat bottom of one course on the sharp tops of the course next below. Thus I reduce the surface of the points of contact to a minimum. The result of this construction is that the bricks can be taken apart without breaking them, the area of the points of contact being so small that they can easily be detached from each other.

At the lower end of each vertical regenerator is an open space, e , which is provided with an opening, e' , extending through the walls and closed by suitable doors, e^2 . The purpose of the space e is to catch the dirt and cinders which come down through the vertical regenerators, so that the same may be drawn out through the hole e' without stopping the operation of the furnace.

I construct the ports f , which lead the gas into the bed of the furnace from the vertical regenerators b^2 , of an inverted V form, and the air-ports g , leading from the vertical regenerators c^2 , of V form, and arrange them as shown in Fig. 5 alternately, so that the wide portion of the air-ports shall be over the wide portion of the gas-ports. The division-walls between the flues f and g are formed, preferably, of single slabs or tile, h , and the upper sides of the air-ports g are formed of straight slabs h' with beveled edges, which are dropped into the mouth of the V. This construction and arrangement of the flues causes a much more in-

5 timate and better admixture of the air and gas
 at the entrance of the furnace than the plan
 heretofore commonly practiced, in which the
 entire body of air was thrown in over the top
 10 of the entire body of gas. The construction
 described is much more economical and much
 more easily renewed than the old form, where
 the flue-walls were built up of separate fire-
 brick. In the present case, if any of the ports
 15 are worn or burned out, all that is necessary is
 to take off the roof of that portion of the struc-
 ture, remove the injured slabs, and drop new
 ones into place. No special fitting is neces-
 sary, as the slabs are duplicates in form.
 20 When the ports as formerly constructed burned
 out, it required the bearing out and rebuild-
 ing of the whole side of the furnace, and also
 the removal of a portion of the crown, which
 operation is tedious and expensive. Much
 labor and expense are saved by this portion of
 my improved construction.

I construct my reversing-valve *i* of two cast
 or wrought iron plates, *i'*, bolted together, and
 having dovetailed recesses formed by project-
 25 ing flanges *i''* upon each side of the same.
 These recesses are filled so as to line the ex-
 ternal surfaces of the valve with a correspond-
 ingly-shaped brick or tile, *i'''*. The valve, be-
 ing mounted on the shaft *k* in the valve-cham-
 30 ber, with its edges projecting under a re-
 versely-beveled shoulder, *l'*, formed on the
 sides of the chamber *l*, is caused to seat down-
 wardly against the upper surfaces of the walls
m' of the smoke-flue *m* and upwardly against the
 35 lower face of the top *l''* of the valve-chamber *l*.
 Thus it is caused to seat in the same direction
 as the pressure of the passing current of gas
 or air, and hence is not nearly so liable to leak.
 In addition to this, the construction of the
 40 valve is such as to guard against warping. In
 case of the wearing out of the tile covering,
 the same may be renewed by simply inserting
 new pieces. Thus I effect economy in con-
 struction and use, and obtain greater precision
 45 in the operation of the furnace.

The flues *n o*, leading from the gas and air
 regenerators and valve-chambers *l l* to the
 stack-flue *p*, are controlled by separate valves,
n' o', so as to regulate the temperature of the
 50 air and gas regenerators by governing the
 passage of the waste products of combustion
 through them.

The reversing-valve may be formed by plac-
 ing the tile *i'''* in a mold and casting the metal
 55 part of the valve around and between them.
 One great advantage of this valve over the
 old form is that the metal parts are protected
 from injurious action of the heat. The metal
 flanges *i''* extend along the edges, which are
 60 not greatly exposed, while the end which is
 exposed at all times to the intense heat is
 covered with the refractory material, and is
 not liable to be burned off, as is the case with

the prior valve mentioned. While the edges
 of the valve are not greatly exposed to the 65
 heat when the valve is used, yet when the
 valve becomes warped the inflowing gas from
 the producer is liable to leak in around the
 joints, and, meeting the outgoing heated pro-
 ducts of combustion, burn at the edges and 70
 produce an intense heat, which tends to melt
 off the edges of the valve. To prevent this
 from occurring I have formed the side of the
 valve-chamber with the reversely-inclined
 shoulders *l'*, which form a seat for the edge 75
 of the valve and make a tight joint, which
 prevents the leakage of the gas at that point,
 and consequently all danger of the burning
 away of the edges of the valve. The same
 danger exists, but to a lesser degree, with the 80
 air-valves, and I have therefore constructed
 the air-valve chambers also with the reverse-
 ly-inclined shoulders. In order to fully pro-
 tect the lower edges of the valve I form simi-
 lar reversely-inclined shoulders, *l''*, below the 85
 valve, so that the lower edges of the valve
 may seat thereon, said shoulders being bev-
 eled, so as to afford no lodgment for dirt.

What I claim as my invention, and desire to
 secure by Letters Patent, is— 90

1. In a regenerator-furnace, the combina-
 tion, with a horizontal regenerator-chamber
 provided with checker-work, of a vertical re-
 generator-flue leading from the regenerator
 to the hearth, said flue provided with check- 95
 er-work, whereby the flue-space is utilized and
 the depth of the regenerator reduced, substan-
 tially as and for the purpose specified.

2. In a regenerator-furnace, the flues con-
 necting the regenerator with the working- 100
 chamber constructed of a series of inclined or
 converging walls which divide the passages
 into a series of contiguous alternating air and
 gas flues of V-section, substantially as and for
 the purpose specified. 105

3. In a regenerator-furnace, a series of in-
 clined tiles reversely arranged to divide the
 air and gas inlets into V-shaped ports, sub-
 stantially as and for the purpose specified.

4. In a regenerator-furnace, the combina- 110
 tion of the converging tiles *h h* and top tile, *h'*,
 arranged to form V-shaped air-ports, substan-
 tially as and for the purpose specified.

5. A regenerator or stove having its check- 115
 er-work constructed of bricks having deflect-
 ing tops and flat bottoms, the flat bottoms of
 each course resting on the sharp top edges of
 the bricks of the subjacent course, substan-
 tially as and for the purposes described.

In testimony whereof I have hereunto set 120
 my hand this 2d day of August, A. D. 1883.

WILLIAM SWINDELL.

Witnesses:

THOMAS W. BAKEWELL,
 FRANK W. SMITH.