

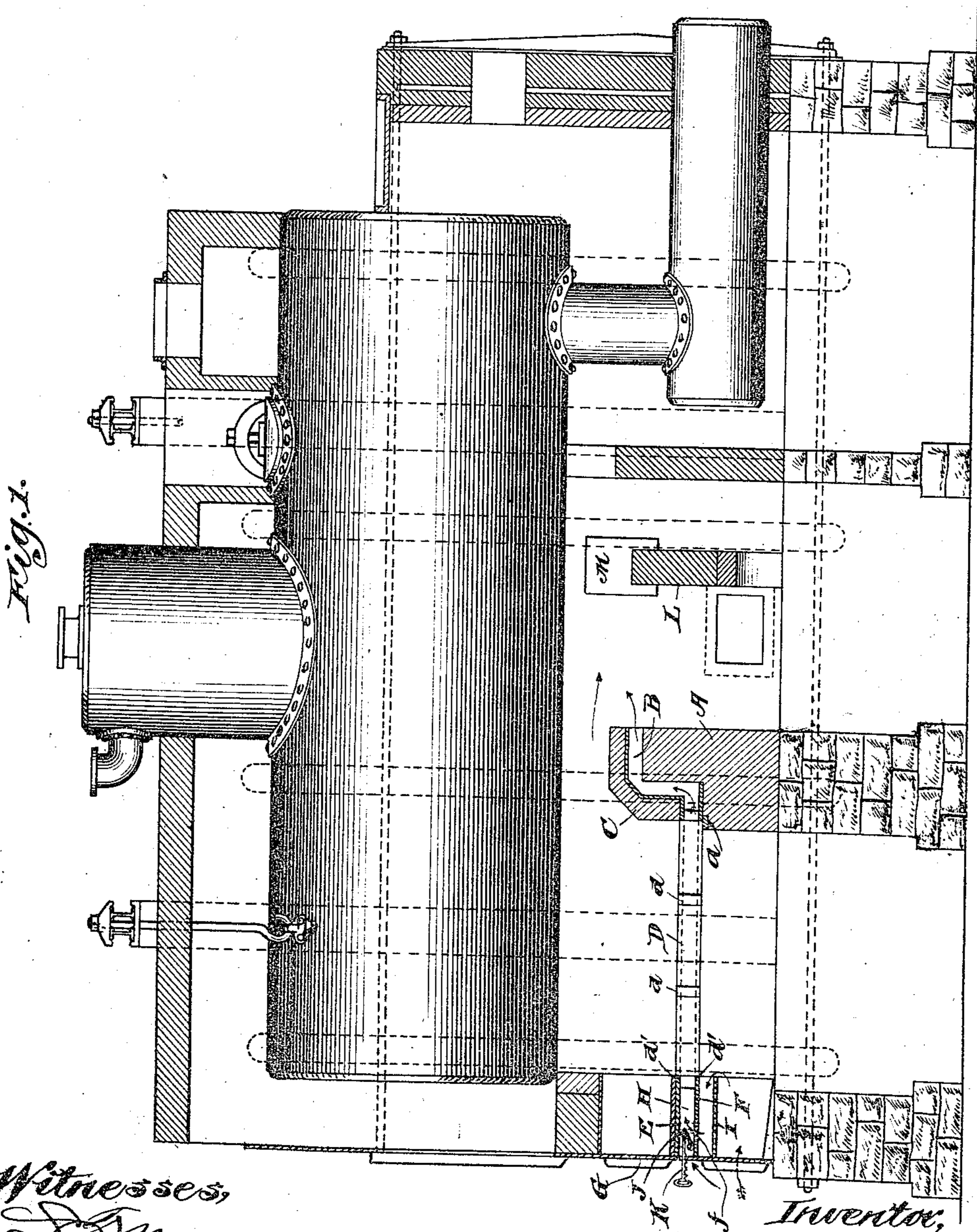
(No Model.)

3 Sheets—Sheet 1.

B. A. THOMAS.
SMOKELESS FURNACE.

No. 542,294.

Patented July 9, 1895.



Witnesses,
J. D. Mann,
Frederick Goodrum

Inventor,
Benjamin Arthur Thomas
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Attys.

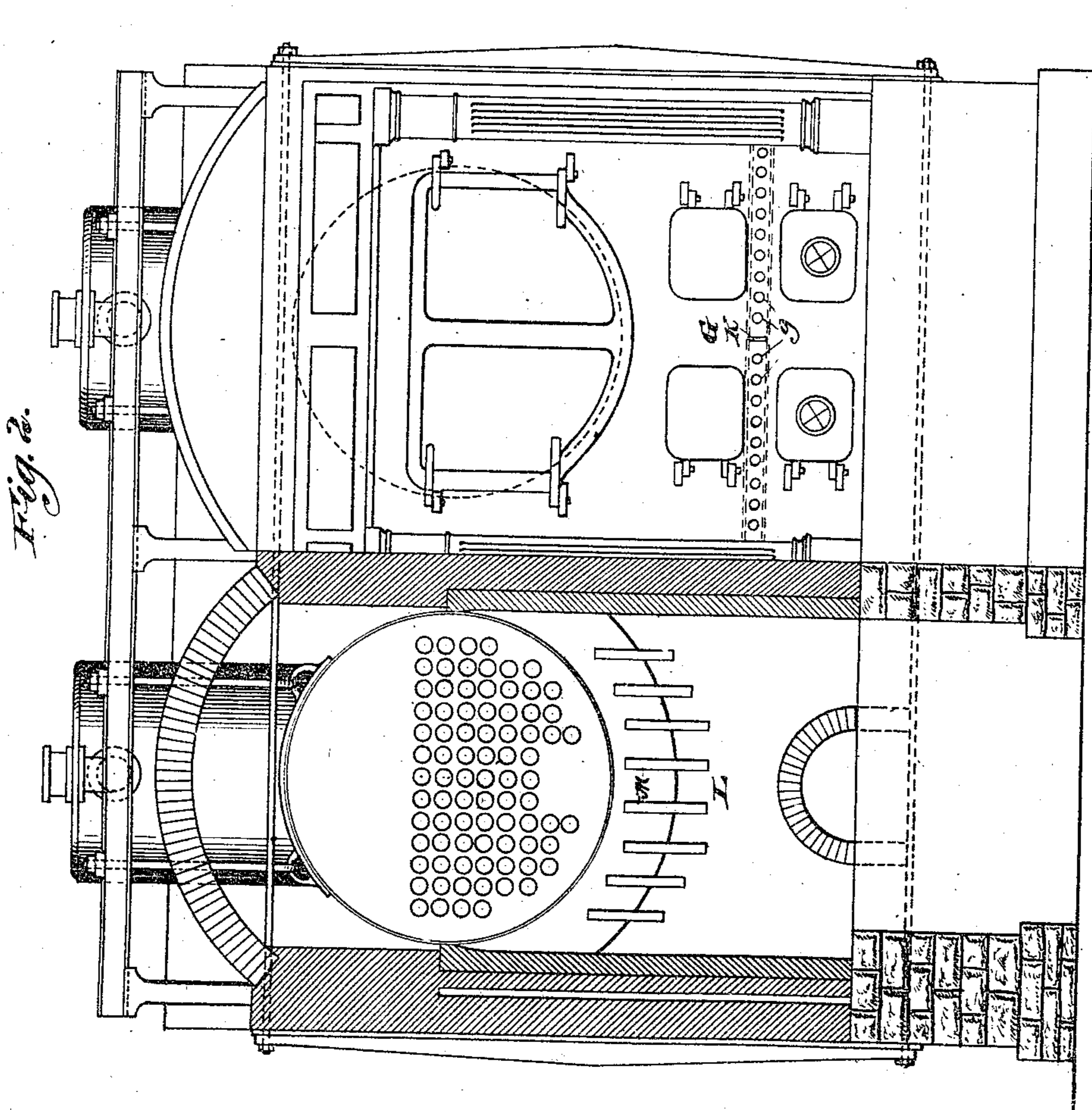
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No. 542,294.

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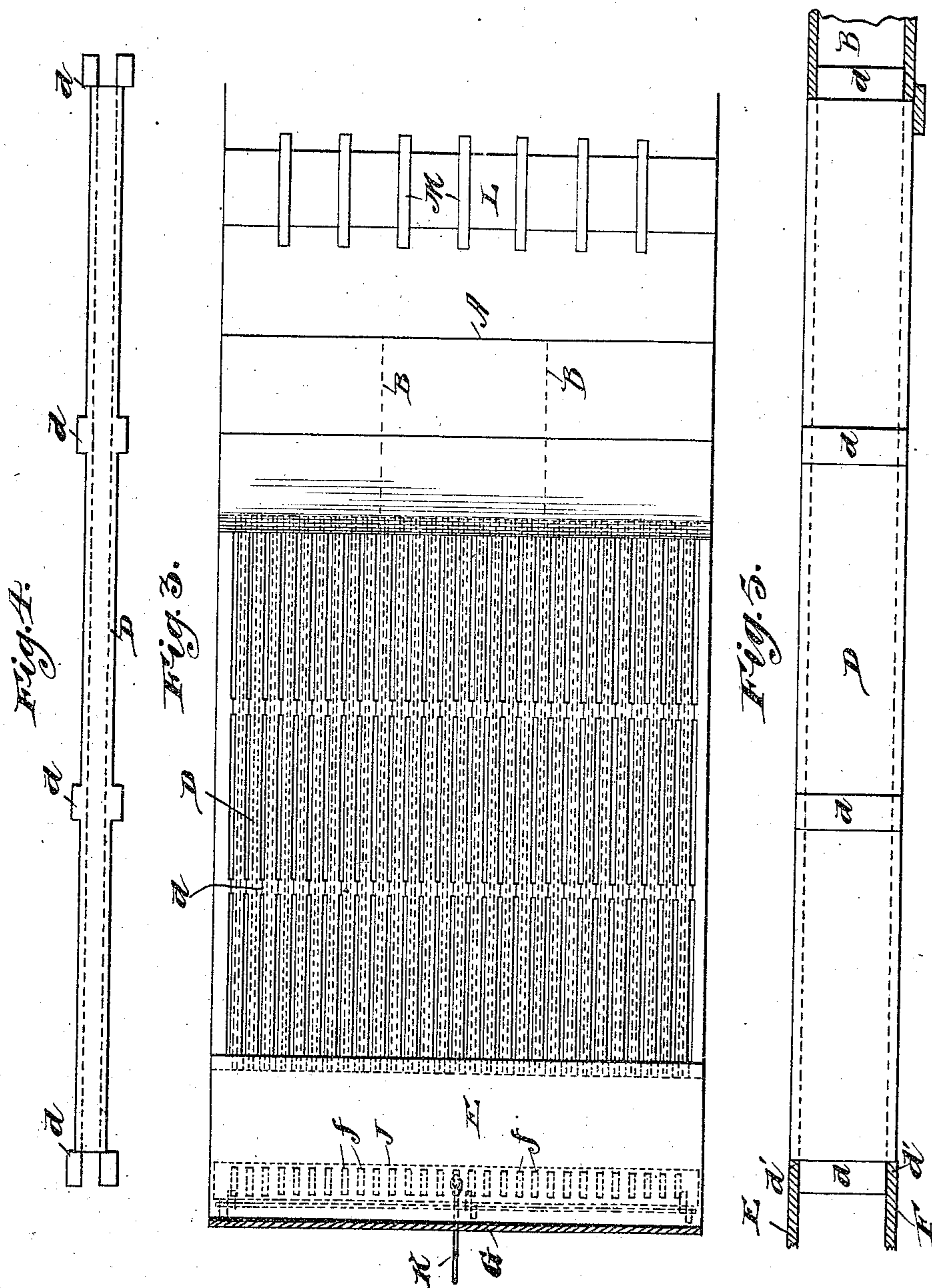
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Witnesses:

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UNITED STATES PATENT OFFICE.

BENJAMIN ARTHUR THOMAS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE
ENGINEERING IMPROVEMENT COMPANY, OF SAME PLACE.

SMOKELESS FURNACE.

SPECIFICATION forming part of Letters Patent No. 542,294, dated July 9, 1895.

Application filed November 19, 1894. Serial No. 529,271. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN ARTHUR THOMAS, of Chicago, Illinois, have invented certain new and useful Improvements in Smokeless Furnaces, of which the following is a specification.

This invention relates to furnaces which are intended to consume the smoke produced by the combustion of solid fuel, and to this end the invention consists in a novel construction and arrangement of the parts whereby not only is the smoke mainly consumed, but the heat efficiency of the fuel is sensibly increased.

In carrying out my invention I employ hollow grate-bars of a novel construction, through which air is admitted to a point over or near the bridge-wall and there mingled with the smoke and unconsumed carbon, thus furnishing to these gases and solids the necessary oxygen to support further combustion. The smoke, gases, and heated air being thus mixed pass over a secondary bridge-wall, located in the rear of the main bridge-wall, and which supports a series of slabs or plates of fire-clay, or other refractory material, which being highly heated serve as torches to ignite the now inflammable mixture of smoke, gases, and air. By this secondary combustion the smoke is almost entirely consumed, intensifying the heat within the furnace and avoiding the emission of the smoke into the atmosphere.

The quantity of air admitted through the hollow grate-bars is regulated by valves or dampers which can be operated at the front of the furnace, and the passage of the air through these hollow grate-bars not only serves to heat the air to the proper temperature, but also subtracts heat from the walls of the grate-bars, thus prolonging their usefulness.

In the accompanying drawings, Figure 1 is a longitudinal section through a steam-boiler furnace, showing the boiler and connected parts in elevation. Fig. 2 is an end elevation, partly in section, through a pair of boilers, particularly intended to show the slabs or plates which serve as torches. Fig. 3 is a plan view of the grate-bars, bridge-walls, and the plates mounted on one of said bridge-walls. Fig. 4 is an enlarged plan; and Fig. 5, an enlarged elevation of one of the grate-bars,

showing its connection with the dead-plates at the front of the furnace.

In the drawings, A represents the bridge-wall, which is offset at its upper front corner to receive a hollow casting B, which may be made in sections of suitable length, as indicated by the dotted lines in Fig. 3. Over the top of this casting a lining of fire-brick C is placed. This casting provides an opening extending the width of the bridge-wall less the partitions of the casting and opening from front to back.

D indicates the grate-bars, which are preferably made rectangular in cross-section and hollow from end to end, and which have fillets cast on their sides in order to provide for spacing them suitably apart. The grate-bars have a support on a ledge α of the bridge-wall and their open ends register at the rear with the openings in the casting B. The front ends of these grate-bars are offset, as seen at d' , Fig. 5, and the offset portion enters between two dead-plates E F, arranged transversely of the furnace near its front plate G and spaced sufficient distance apart to provide a passage H between them for the admission of air to the front ends of the hollow grate-bars. The lower dead-plate may be provided with openings f , through which air may pass to the hollow grate-bars around the shelf I, as indicated by the arrow in Fig. 1. A suitable damper, as J, is provided in the opening between these dead-plates E F, and in the instance shown is notched at its lower edge and provided with an operating ratchet-handle K, projected through the front wall G of the furnace. The ratchet-teeth on this handle may be engaged with the plate G, through which the ratchet passes to lock the damper to any desired position. An opening or openings g may be made through the front plate G, as shown in Fig. 2, the damper arranged outside the front plate to admit air to the space H between the dead-plates. The air to support combustion on the grate-bars may be admitted in the usual way, and this air will circulate freely in the spaces between the grate-bars, which are provided by the spacing-fillets.

In the rear of the bridge-wall A a secondary bridge-wall L is arranged transversely of

the furnace, and this bridge-wall supports a series of slabs or plates M of some refractory material, such as fire-clay. These slabs or plates are preferably set edgewise, as shown in Figs. 2 and 4, and spaced apart at suitable distances, so that the products of combustion and flame coming over the bridge-wall C and the hot air coming through the hollow castings B from the hollow grate-bars will meet and mingle in the vicinity of the plates or slabs M, the course of the currents being indicated by the arrows in Fig. 1. This highly-heated air issuing beneath the flame, passing over the bridge-wall and mingling therewith, will supply the necessary oxygen to support combustion of the smoke and gases, which will be effected by the highly-heated plates M, which thus serve as torches. This secondary combustion not only serves to sensibly increase the heat of the furnace, but it further serves to consume, to a large extent, the smoke produced by the burning of the fuel in the primary combustion-chamber, thus making the furnace comparatively smokeless. The details of construction and the exact proportions of the several passages may be varied to some extent; but I preferably form air-inlet openings either in the lower dead-plate or in the front wall of the furnace, as may be preferred, and the area of these openings will be equal to the sum of the areas in cross-section of the series of grate-bars. By the manipulation of the damper the quantity of air supplied may be regulated or controlled to suit the atmospheric and other conditions, and it is highly desirable to get the proper proportions of oxygen from the air to combine with the carbon in the smoke to insure complete chemical combustion or combination. When openings are provided in the lower dead-plate and the air is admitted through the ash-pit door, the dampers may of course be in said doors; and in lieu of the plates some other means—*e. g.*, a jet of flame—may be used to effect the ignition of the smoke and gases.

I am aware that it has been proposed to employ hollow grate-bars delivering into a chamber in the bridge-wall with openings from said chamber at the back of the bridge-wall. To this common provision I add means for positively igniting the superheated air when mingled with the gases escaping over the bridge-wall, and this means I have herein designated as a "torch."

I claim—

1. In a smokeless furnace, the combination with a bridge wall, of a series of hollow grate-bars communicating with the atmosphere and

opening at their rear ends near the bridge wall whereby a volume of heated air may be supplied to the products of combustion escaping over the bridge wall, and a series of separate torches supported in the rear of the bridge wall and between which the escaping gases pass and whereby they are ignited, substantially as described.

2. In a smokeless furnace, the combination with a bridge wall provided with a chamber at its top opening along its front and rear sides, a series of hollow grate bars communicating with the front of said chamber at their rear ends and with the outer air at their front ends, a damper to regulate the admission of air to said grate bars, and slabs or plates arranged transversely of the furnace behind the bridge wall, substantially as and for the purpose described.

3. In a smokeless furnace, the combination with a bridge wall, a hollow casting mounted thereon and having an opening at the front and rear of the bridge wall, linings applied to said casting, hollow grate bars communicating at their rear ends with said hollow casting and at their front ends with the outer air, a valve controlling the air inlet and a second bridge wall arranged in the rear of the first and slabs or plates mounted transversely thereon, substantially as described.

4. In a smokeless furnace, the combination with a bridge wall having an air chamber therein opening at the front and rear of the bridge wall, of a series of hollow grate bars communicating with the atmosphere and opening at their rear ends into the chamber in the bridge wall, a torch arranged in the rear of the bridge wall for igniting the mingled gases escaping over the bridge wall, and a valve or damper arranged in the air inlet and controllable from the furnace front, substantially as described.

5. A furnace grate, comprising in combination a bridge wall having an air chamber in its upper portion opening at the front and rear of the bridge wall, a series of hollow grate bars separated from each other longitudinally and communicating at their rear ends with said air chamber, dead plates arranged transversely to said grate bars and separated vertically to provide an air space between them, a damper hinged in said space and a ratchet handle connected with said damper and projected through the front wall of the furnace, substantially as described.

BENJAMIN ARTHUR THOMAS.

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