(No Model.) 2 Sheets—Sheet 1.

E. R. HOWARD.

FURNACE.

No. 355,318. Patented Jan. 4, 1887.

Fig. 1.

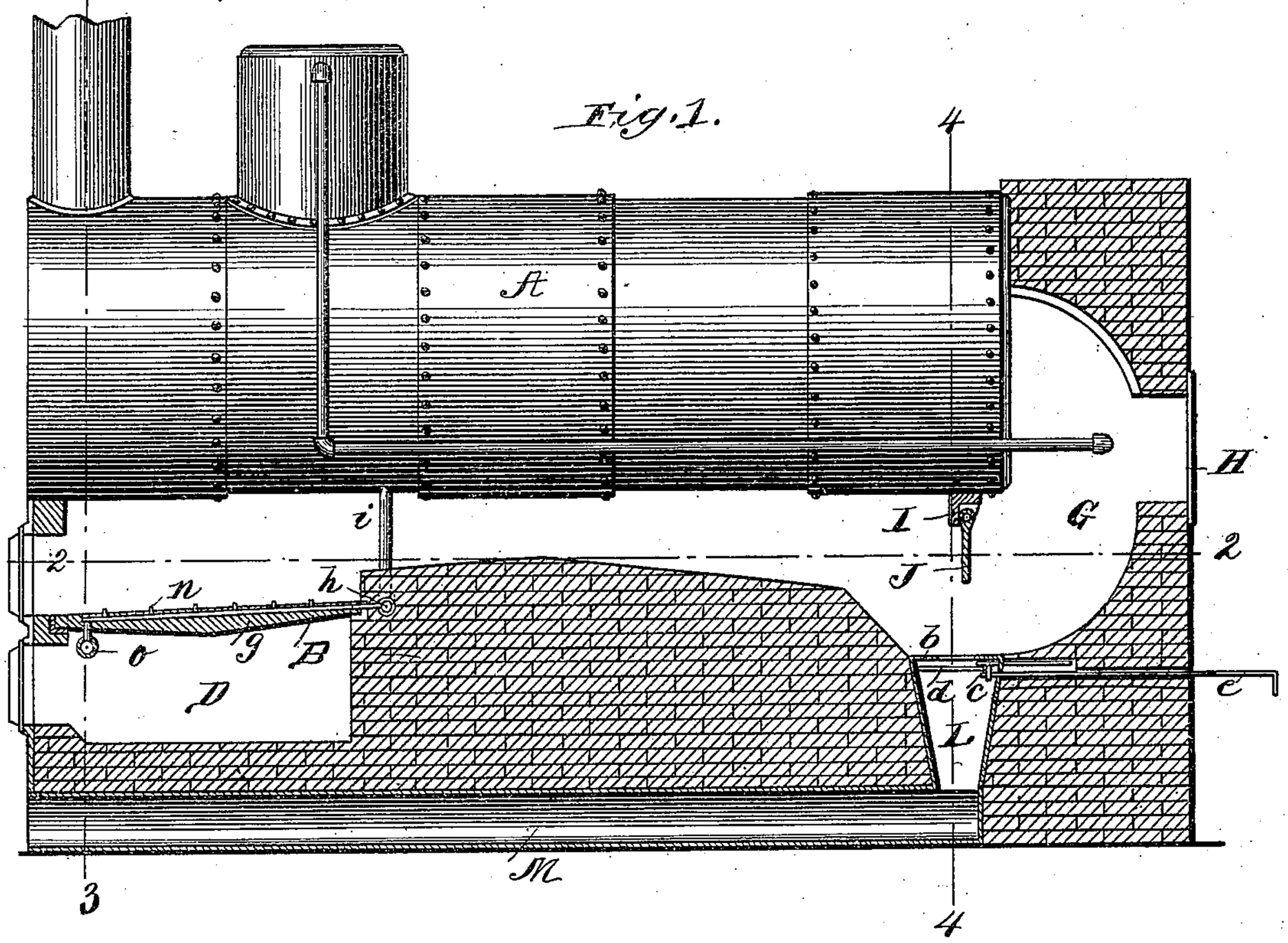
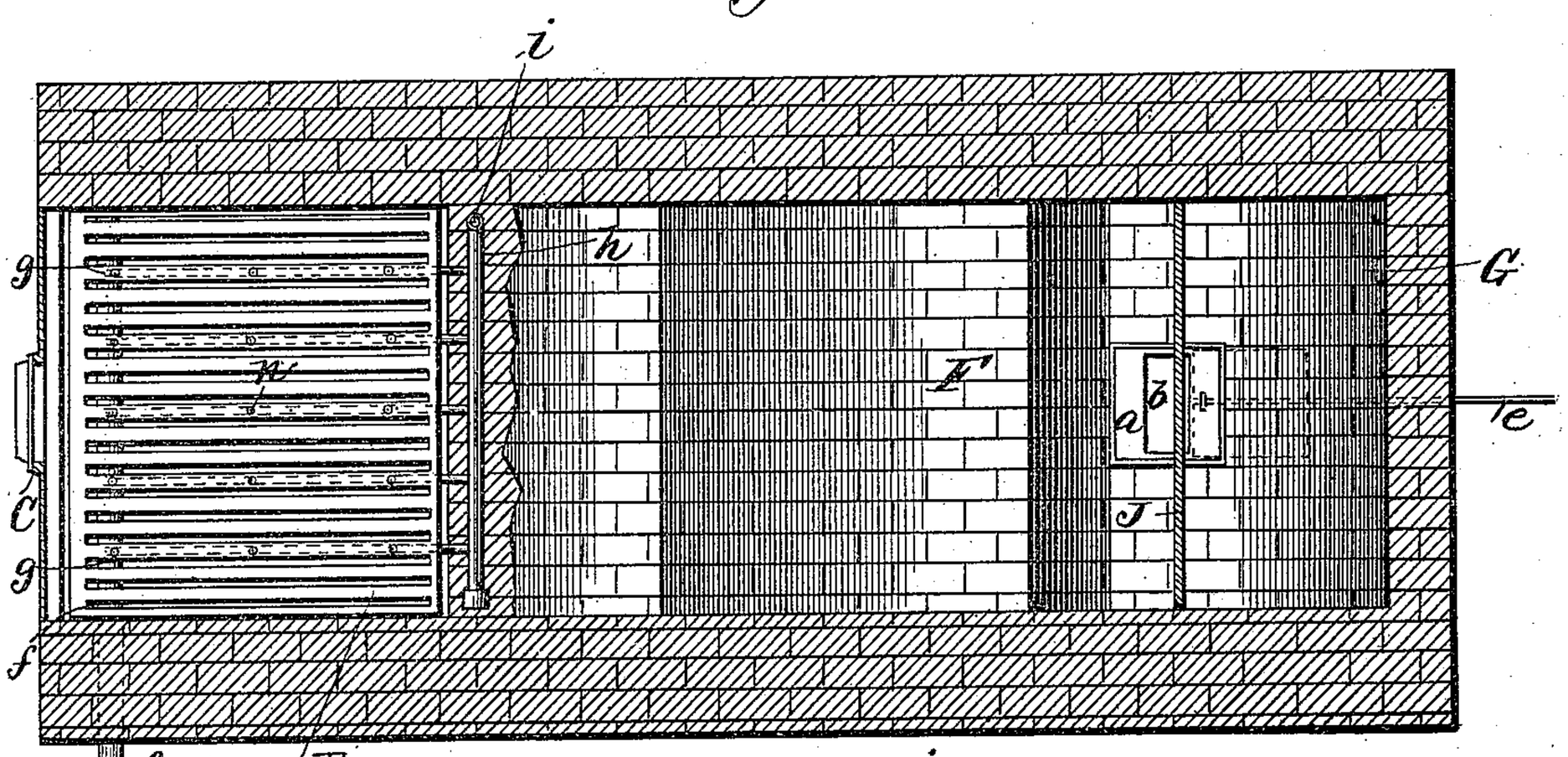


Fig. 2.



Witnesses.
W. Rossiter.
Otto Luebbert.

Inventor:
Everett R. Howard.
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Atty.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

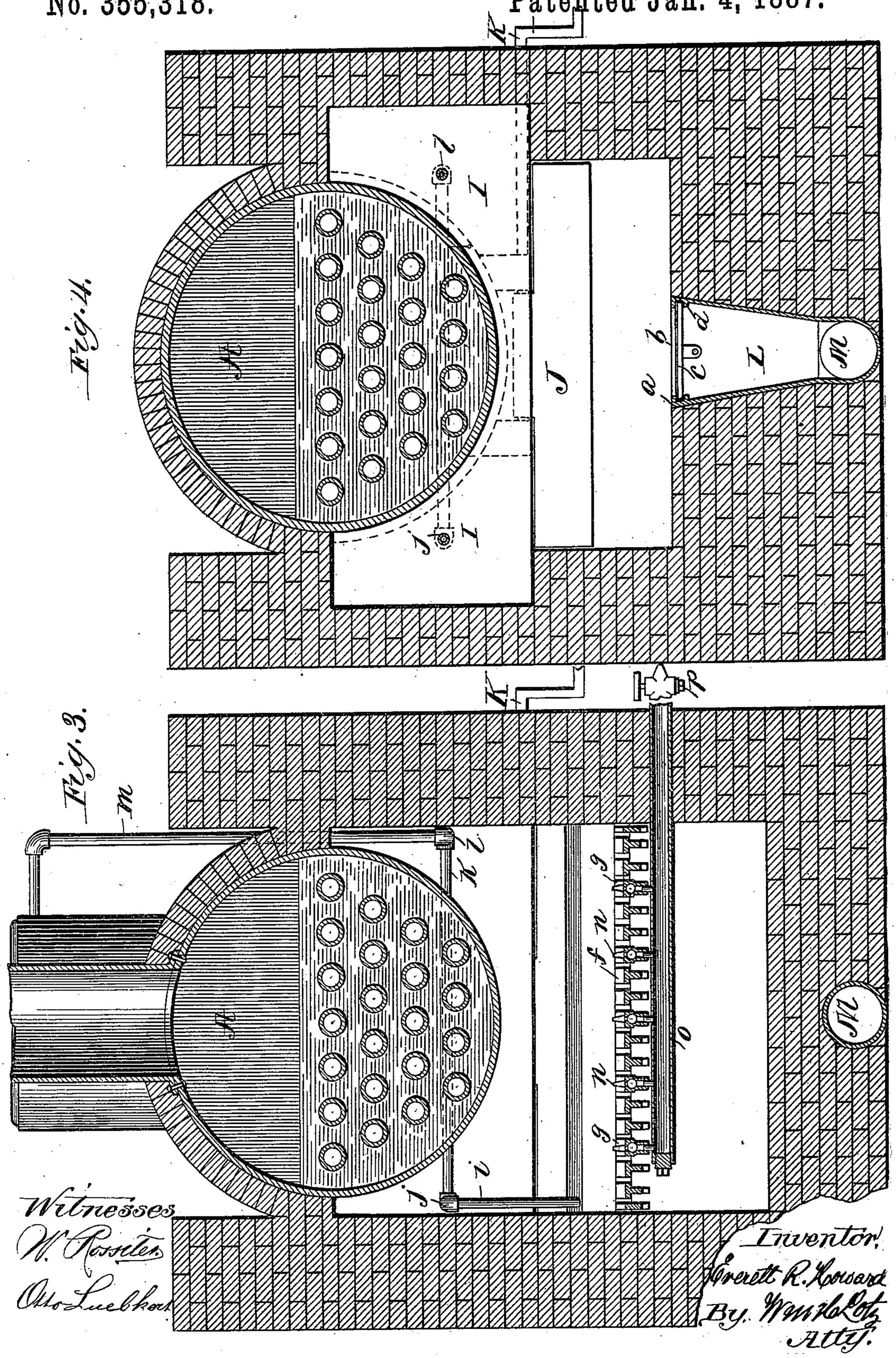

Fig. 2.

UNITED STATES PATENT OFFICE.

EVERETT R. HOWARD, OF AURORA, ILLINOIS, ASSIGNOR OF ONE-HALF TO ROSWELL W. GATES, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 355,318, dated January 4, 1887.

Application filed September 14, 1886. Serial No. 213,534. (No model.)

To all whom it may concern:

Be it known that I, EVERETT R. HOWARD, a citizen of the United States of America, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

The nature of my invention relates to the construction of boiler-furnaces, with the object in view of consuming the smoke and gases generated from the fuel upon the grate, and more particularly to an improvement on the devices described in Letters Patent of the United States, No. 341,008, which were granted to me on May 4, 1886.

My invention principally consists, first, in pivotally suspending the pending bridge wall or plate under the rear of the boiler, for the purpose of enabling its turning from a vertical to an angular or horizontal position that may be desirable to do at different states of the firing; second, in providing the air-inlet opening below the pending bridge-wall with a valve or register for regulating the amount of air to be admitted, and, third, in the arrangement of a blast of superheated steam issuing in jets through openings in hollow grate-bars for augmenting the heat produced from the fuel, all as will be more fully described, and specifically claimed.

In the accompanying drawings, Figure 1 represents a longitudinal vertical section through the boiler-furnace; Fig. 2, a sectional plan on line 2 2 in Fig. 1; Fig. 3, a transverse vertical section on line 3 3 in Fig. 1, and Fig. 4 a transverse vertical section on line 4 4 in Fig. 1.

Corresponding letters in the several figures of the drawings designate like parts.

A denotes the boiler, B the grate, C the fuel-door, D the ash-pit, and E the ash-pit door.

F is the bridge-wall extending from the rear end of the grate to near the rear end of the boiler, and being upwardly inclined from the grate toward the rear to a point about one-third its length, and thence downwardly sloping to its rear end, where on a downward angle of about forty-five degrees it forms a connection with the upwardly-curved smoke-chamber G, that can be inspected or entered through a door, H.

The rear end of boiler A is supported on or surrounded on its bottom by a plate, I, to which is hinged or pivotally suspended the plate J, coupled to a crank-rod, K, that being extended through the furnace-wall will enable the swinging of such plate in a rearward direction, to be turned from a vertical to an angular or horizontal position whenever desirable, and by a suitable locking device to be held on any such adjusted positions.

Vertically below pendent plate J, at the communicating point of the bridge-wall F and smoke-chamber G, is the mouth of the vertical upwardly-flaring air-duct L, which communicates with the end of horizontal pipe or flue M, built into the bottom of the furnace and extending through the front thereof. The mouth of this air-duct L is covered by a plate, *a*, having an oblong opening, *b*, that can be closed, or its size can be regulated by a slide-valve, *c*, resting upon guide-bars *d*, and having rigidly secured a rod, *e*, that extends through the rear of the furnace for operating and adjusting such valve.

The grate is composed of a series of solid cast bars, *f*, and of hollow bars *g* interposed between bars *f* at regular intervals. The hollow bars *g* are coupled at their rear ends to a transverse pipe, *h*, built into the bridge-wall F, which pipe, being closed on one end, is coupled with its other end to a vertical pipe, *i*, that again connects with a horizontal pipe, *j*, placed against the wall at one side of the boiler, and coupled at its rear end with a transverse pipe, *k*, which again is coupled with a horizontal pipe, *l*, placed against the inner wall of the furnace at the opposite side of the boiler, and being connected by a vertical pipe, *m*, with the dome of the boiler. By this arrangement dry steam from the boiler will circulate through all these pipes to become superheated, and then to issue in jets through small vents *n* of hollow grate-bars *g*.

The forward ends of grate-bars *g* are tapped from the bottom, and are connected with a pipe,

o, that extends through the furnace-wall, and is provided with a faucet, *p*, for discharging any water of condensation.

The pipe *m* may be provided with a valve for shutting off or for regulating the amount of steam that is to issue through the vents in the hollow grate-bars.

The adjustability of pendent plate J and of the size of opening of air-duct L will enable the regulating of the draft for different kinds or qualities of fuel, as well as to varying conditions of the fire, and will thus render the furnace more perfect and complete, and the ejecting through the fuel on the grate-bars jets of superheated steam will not only increase the draft and prevent baking together of the coal, but will add so much fuel as the gases from the decomposition of the steam will yield by uniting with the carbon and carbonic-oxide gases, whereby all combustible elements contained in and generated from the fuel will be consumed and utilized, and the formation of smoke will be obviated.

What I claim is—

1. In a boiler-furnace, and in combination with the grate, bridge-wall, and smoke-chamber, of a pivotally-suspended rear plate, providing the only communication to such smoke-chamber from under such plate, and the coupling with such plate of a crank-rod for swinging it rearward, and of an air-channel through the base of such furnace, communicating with the gas-duct through an opening directly below and opposite to such pendent plate, substantially as and for the purpose set forth.

2. In a boiler-furnace, and in combination with the grate, bridge-wall, and smoke-chamber, of a pendent rear plate providing the only communication to such smoke-chamber from under such plate, and of an air-channel through the base of such furnace, communicating with the gas-duct through an opening directly below and opposite to such pendent plate, such opening being provided with a valve operated by a rod projected through the furnace-wall for regulating the air admittance, substantially as and for the purpose set forth.

3. In a boiler-furnace, hollow grate-bars having vents through their upper faces, and being connected at their rear ends by pipes with the dome of the boiler and at their front ends with a pipe for discharging the water of condensation, substantially as and for the purpose set forth.

4. In a boiler-furnace, the grate composed in whole or part of hollow bars having vents through their upper faces, and being connected at their rear ends with the dome of the boiler by pipes passed around the boiler inside of the furnace and at their front ends with a pipe for discharging the water of condensation, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EVERETT R. HOWARD.

Witnesses:
WM. H. LOTZ,
OTTO LUEBKERT.