(No Model.)

3 Sheets—Sheet 1.

G. A. McILHENNY.

BOILER FURNACE.

No. 328,133. Patented Oct. 13, 1885.

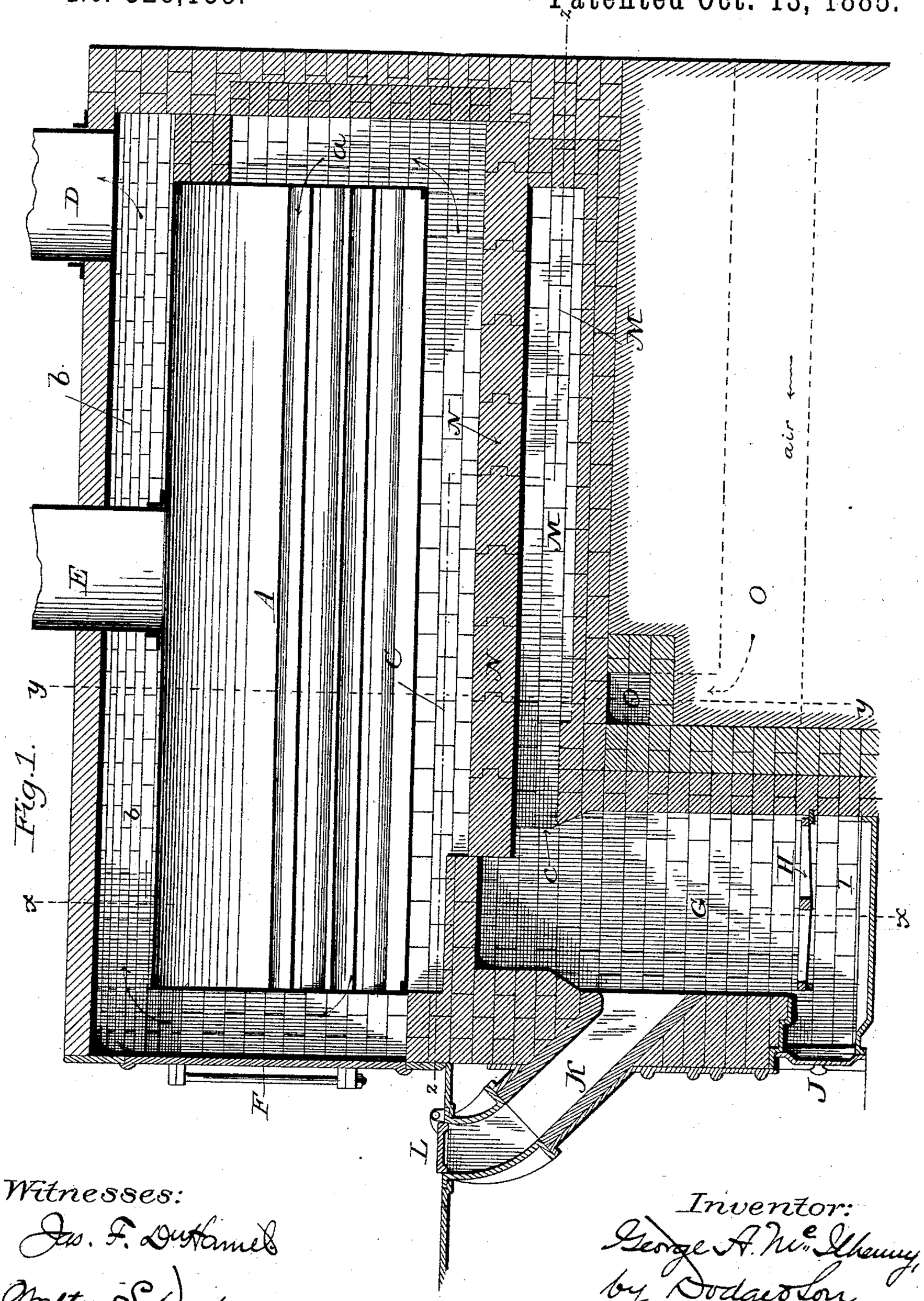

Fig. 1.

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(No Model.)

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Fig. 3. on y-y.

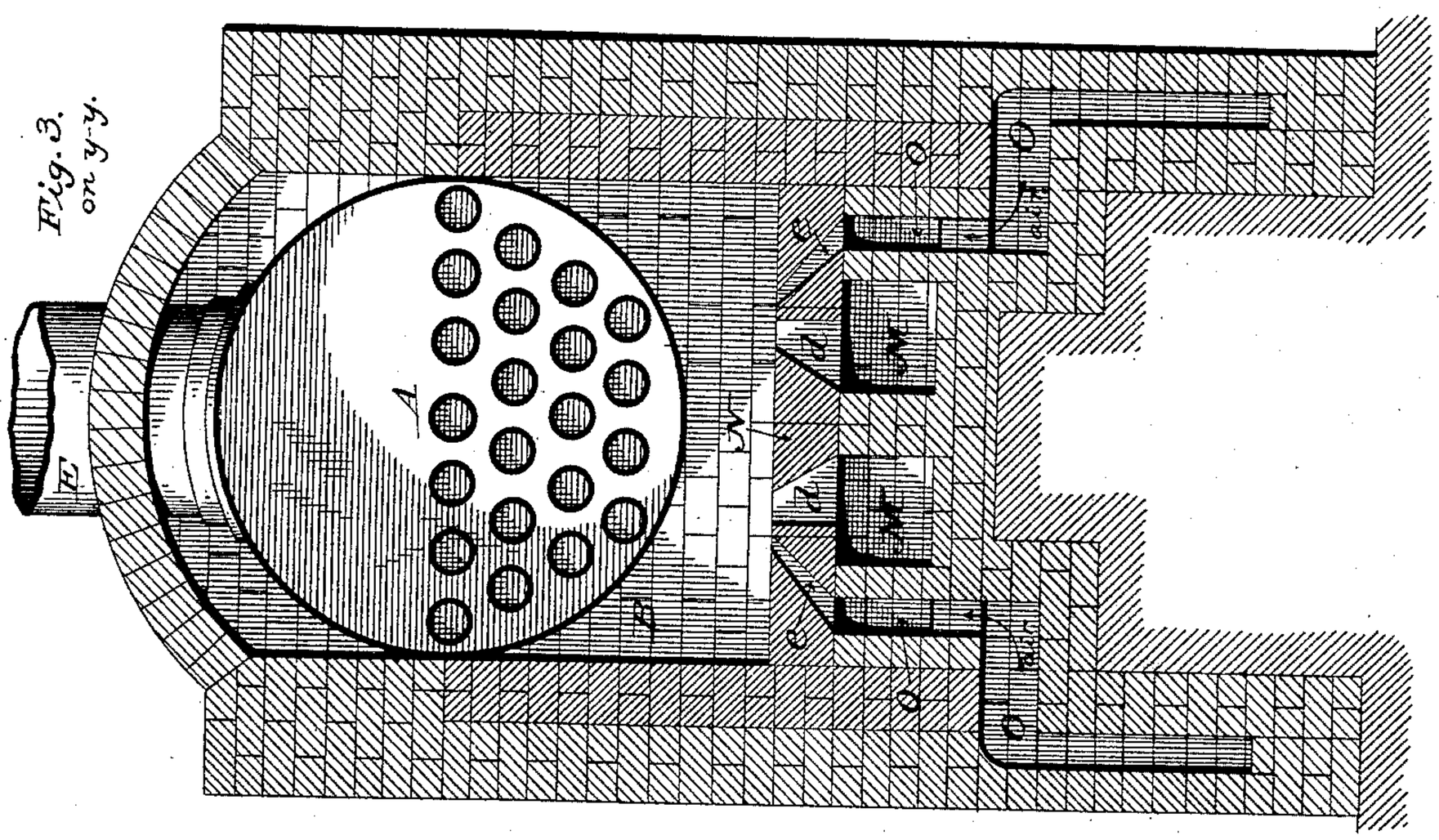
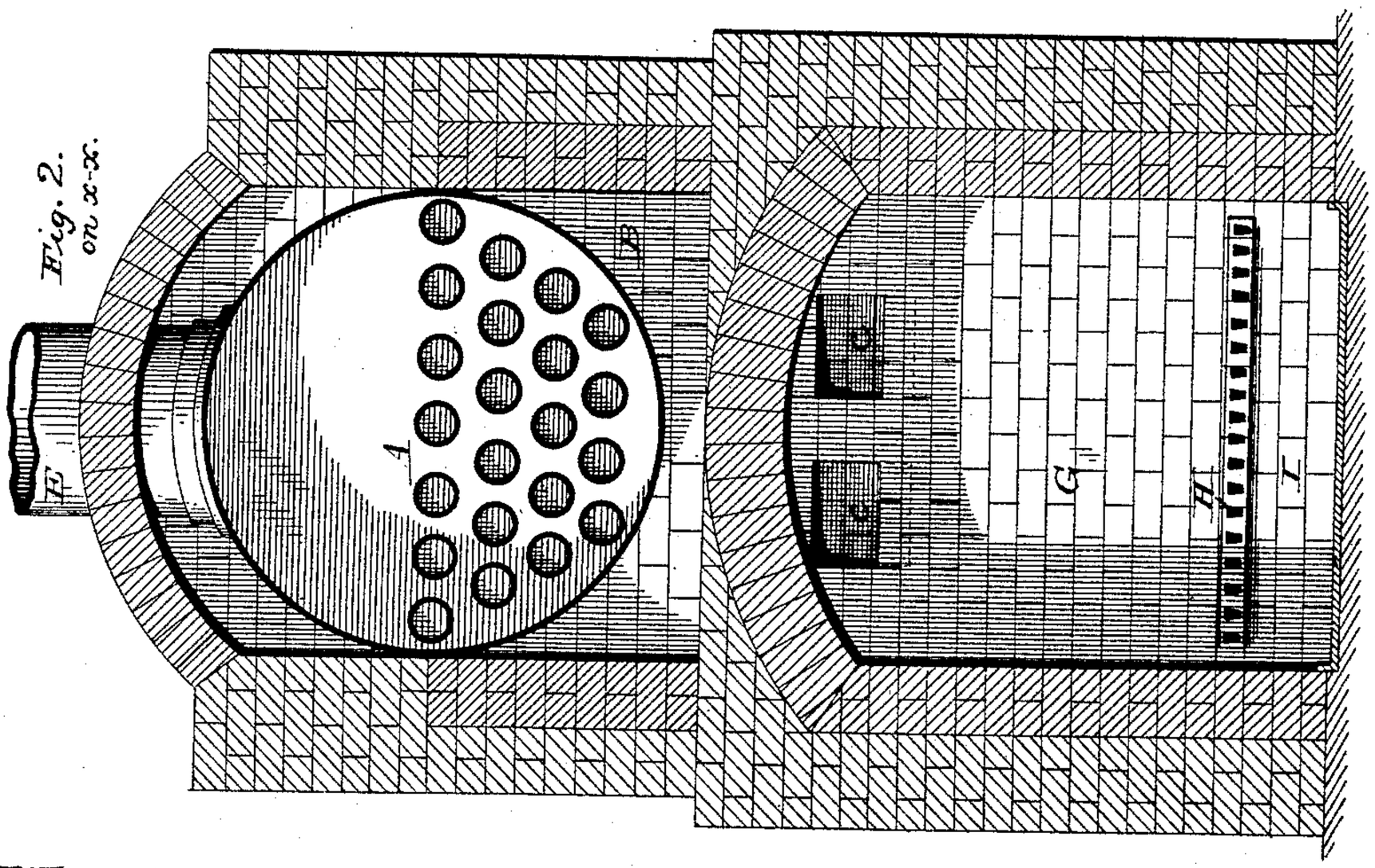


Fig. 2. on x-x.



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(No Model.)

3 Sheets—Sheet 3.

G. A. McILHENNY.

BOILER FURNACE.

No. 328,133. Patented Oct. 13, 1885.

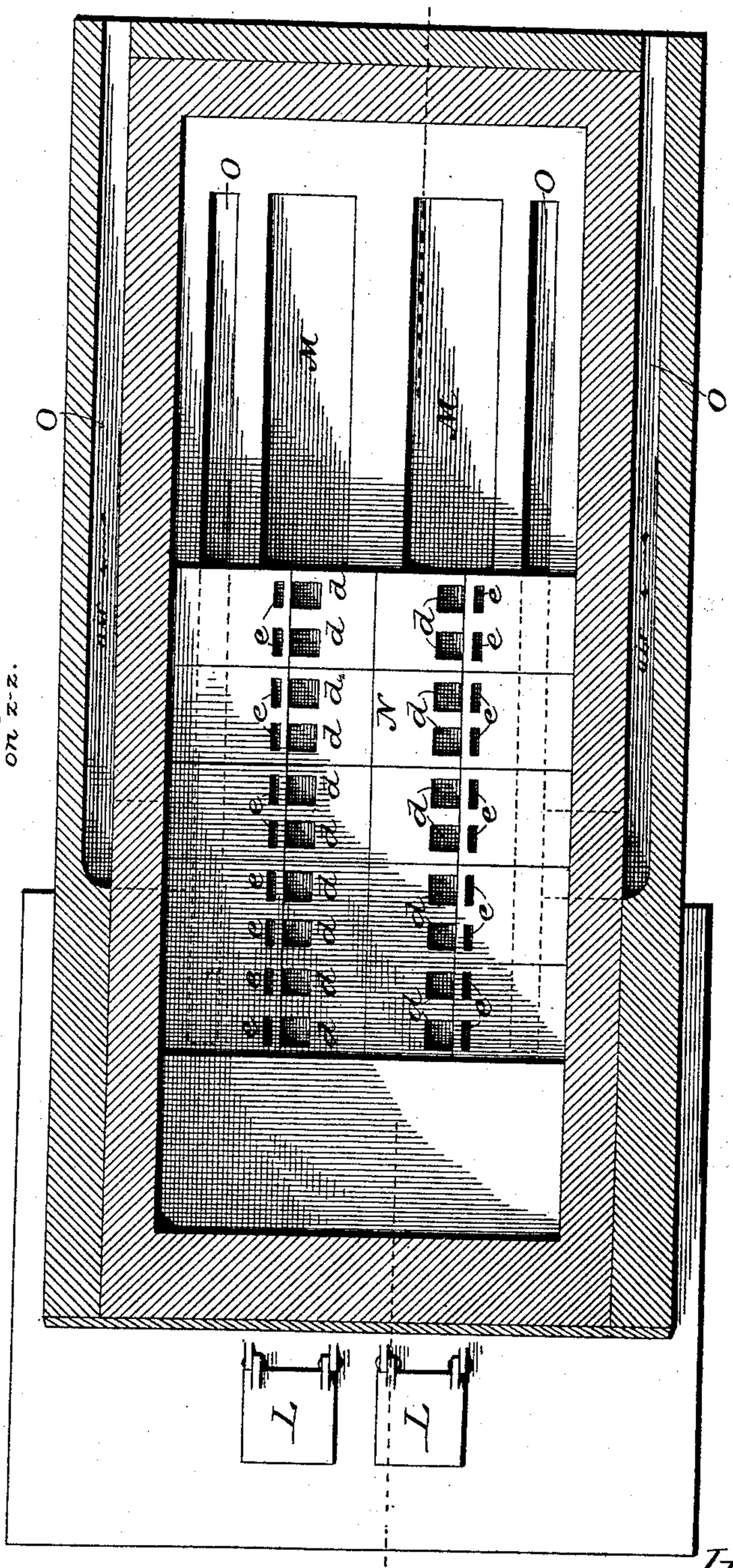

Fig. 4.
on z-z.

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UNITED STATES PATENT OFFICE.

GEORGE A. McILHENNY, OF WASHINGTON, DISTRICT OF COLUMBIA.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 328,133, dated October 13, 1885.

Application filed April 30, 1885. Serial No. 164,006. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. McILHENNY, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification.

This invention has for its object the more economical use of fuel in the heating of steam-generators; and it consists in a boiler-furnace in which the fuel is burned or decomposed in a fire pot or chamber from which the gases and products of combustion are delivered into a flue running lengthwise of and beneath the boiler, and thence into a combustion-chamber between said flue and boiler, where they are mingled with heated air and burned.

In the annexed drawings I have represented one embodiment of my invention; but the details may be considerably varied without affecting the principle of operation or the final result.

Figure 1 is a longitudinal vertical section through my improved furnace; Fig. 2, a transverse vertical section on the line *x x* of Fig. 1; Fig. 3, a similar section on the line *y y* of Fig. 1; Fig. 4, a horizontal section on the line *z z* of Fig. 1.

As hitherto constructed boiler-furnaces have been formed with a fire box or chamber at one end, a bridge-wall to direct the flames, a long flue beneath the boiler for the gases and flames to pass through, and in some cases with hot-air inlets in the bridge-wall to aid combustion. In all such plans the heat is unequally applied to the boiler, much of the heat being wasted upon the crown-sheet, and a large percentage of the gases and heat passing off unused.

My invention is designed to obviate such loss, to distribute the heat uniformly over the entire length of the boiler, to divide the gases into a number of small streams or bodies in order to facilitate the mingling of heated air therewith, and thus to insure perfect combustion. The arrangement which I prefer for this purpose is shown in the drawings, in which—

A indicates a horizontal boiler, advisably formed with one or more longitudinal flues, and set in a chamber, B, of brick-work suitably lined with fire-brick to resist the intense heat of the fire.

Beneath the furnace is a chamber, C, in which the gases and heated air are mingled and burned, the flames passing thence upward through flue *a*, through the longitudinal flue or flues of the boiler, along flue *b* toward the stack or chimney D.

E indicates a steam-dome, and F a door at the front of the chamber B, which may be opened to give access to the boiler.

Below the boiler-chamber B is a fire pot or chamber, G, having a grate, H, and ash-pit I, ash-door J, and charging-chute K, provided with lid L.

The top of the fire pot or chamber is covered by a slab of fire-brick or like material; but immediately beneath this top or cover I form one or more outlets, *c*, opening into a flue or flues, M, beneath the mixing-chamber C, and separated therefrom by a floor or partition, N, also of fire-brick or other refractory substance. This floor N is formed with a number of openings, *d*, through which the gases and other products of combustion may pass from the flue or flues M into the mixing-chamber C.

O indicates an air flue or passage running lengthwise the brick-work, opening into the atmosphere at a point below the level of flue M, then rising to said level and extending lengthwise of and close beside the flue M from end to end parallel with the lower section. The flue M and air-passage O being separated by a single thickness of brick, the air traversing said passage will become very highly heated, and in doing so will utilize only heat that would otherwise pass off through or into the wall and be wasted.

From the air-passage O, of which there are two—one at either side of the furnace—the heated air escapes into the mixing-chamber C through outlets *e*, which are inclined toward and open close to the mouths of the outlets *d*, through which the gases and products of combustion enter chamber C. The outlets *d* also have their outer walls inclined toward the outlets *e*, so that the hot air and the gases are thrown together and intimately mingled, the air furnishing to the gases the necessary supply of oxygen to insure perfect combustion.

If desired, a fan or other air-forcing apparatus may be combined with the air-flues to insure an adequate supply of air; but this I

do not find necessary under ordinary circumstances, the strong draft produced by the ascending flames and the natural flow of the air as it becomes heated and rarefied insuring a proper inflow.

Practical application of the principles involved in this apparatus has demonstrated that economy of fuel and proper utilization of the heat thereof can be secured only when the flow of gases and other products of combustion from the fire-pot into the mixing-chamber is checked or retarded more or less, so that said gases exert a constant effort or pressure to get out. The necessity for this slight pressure I attribute to the fact that the gases resulting from combustion or distillation of the fuel possess a strong affinity for oxygen, and the air supplied to the mixing-chamber passes into the fire-pot and is there burned with the gases, thus producing a most intense heat within the fire-pot to the injury thereof, and with a great sacrifice of heat in the boiler-chamber. I therefore so proportion the outlets *d* in relation to the size of the fire-pot and to the draft-opening necessary to support combustion of a given charge of fuel that the gases and products given off by the fuel shall always be under slight pressure in the fire-pot. When this is done, the fuel in the fire-pot is found to burn but slowly and to coke and freely give off its constituent gases, producing an exceedingly small percentage of slag, cinders, or ashes.

It is also found that the fire burns with such remarkable steadiness and uniformity that throwing the draft-door wide open does not appreciably affect the fire, and that only a limited quantity of fuel can be burned at a time in the fire-pot.

So perfect is the combustion that no smoke is seen to pass off at the stack or chimney after the apparatus is fairly in operation, and a thermometer placed therein shows a very low temperature as compared with ordinary plans, while the heat beneath the boiler is of great intensity.

A small jet of steam may be advantageously used under the grate-bars of the fire-pot.

I do not broadly claim a construction in which the fire-pot is separated from the boiler-chamber, and a mixing-chamber is interposed between the fire-pot and boiler-chamber; nor do I claim the same, broadly, when air-flues are formed in the walls of the apparatus to heat an inflowing supply of air. I, however, believe myself to be the first to so reduce the passages of communication between the mixing-chamber and the boiler-chamber as to retard or check the mingled gases and cause them to issue under pressure more or less appreciable; and this I mean to to claim, broadly.

Having thus described my invention, what I claim is—

1. In a boiler-furnace, the combination of a boiler-chamber containing a mixing space or chamber at its bottom, a flue running beneath the mixing-chamber and provided with a series of passages opening into the mixing-chamber, a fire-pot communicating with said flue, and a hot-air flue formed with openings into the mixing-chamber, substantially as set forth.

2. The herein-described boiler-furnace, consisting of boiler-chamber B, fire-pot G, flue M, communicating with fire-pot G, and having outlets *d*, and air-flue O, having outlets *e*, all substantially as described and shown.

3. In combination with a boiler-chamber and with a boiler therein, a fire-pot or chamber, an intermediate flue communicating with the fire-pot and having openings into the boiler-chamber, the outlets or passages between the fire-pot and boiler-chamber being of such size as to slightly check or retard the entrance of gases into the boiler-chamber.

4. In combination with boiler-chamber B, and with boiler A therein, fire-pot G, flues M, communicating with said fire-pot and passing beneath floor N of the boiler-chamber, flue O, also passing beneath the floor N, and openings *d e* passing through the floor N from the respective flues, and inclined toward each other, substantially as and for the purpose explained.

5. A boiler casing or chamber, in combination with a fire pot or generator having its passages of communication with the boiler-chamber checked or reduced at the point of entrance to the combustion-chamber in the boiler-chamber so as to cause the flow of gases to conform to the flow of air and to the heat required in said chamber.

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