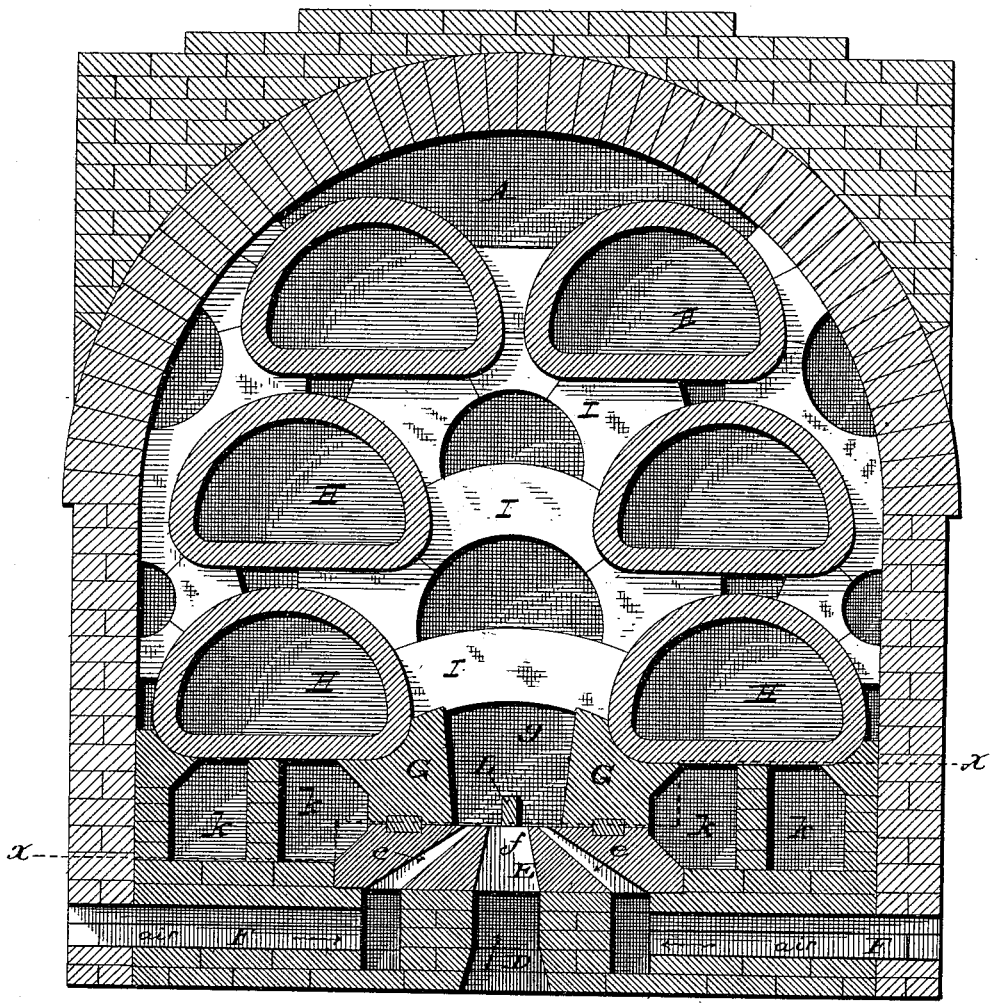
(No Model.) 3 Sheets—Sheet 1.

G. A. McILHENNY.

GAS RETORT FURNACE.

No. 346,301. Patented July 27, 1886.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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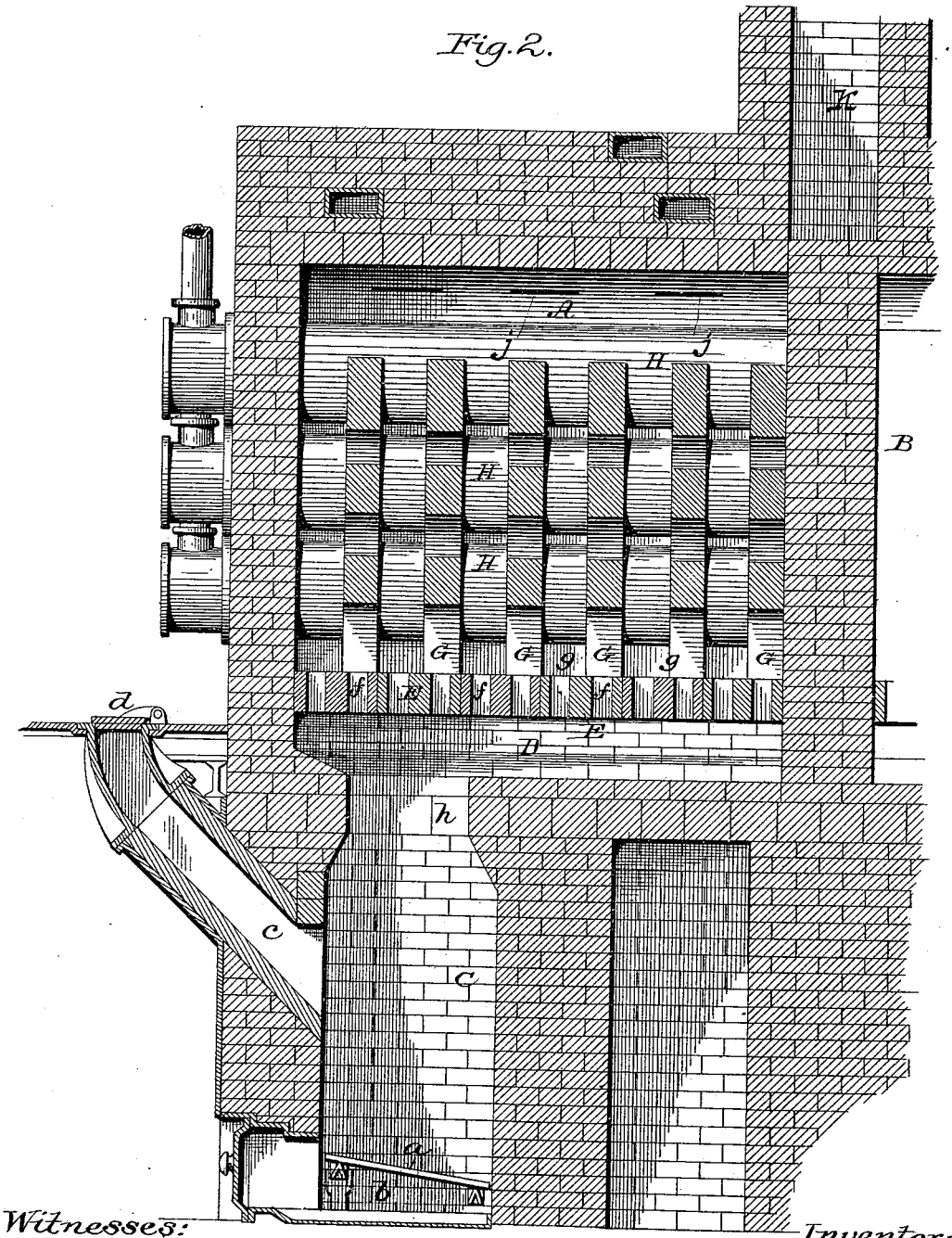
GAS RETORT FURNACE.

No. 346,301. Patented July 27, 1886.

Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

G. A. McILHENNY.

GAS RETORT FURNACE.

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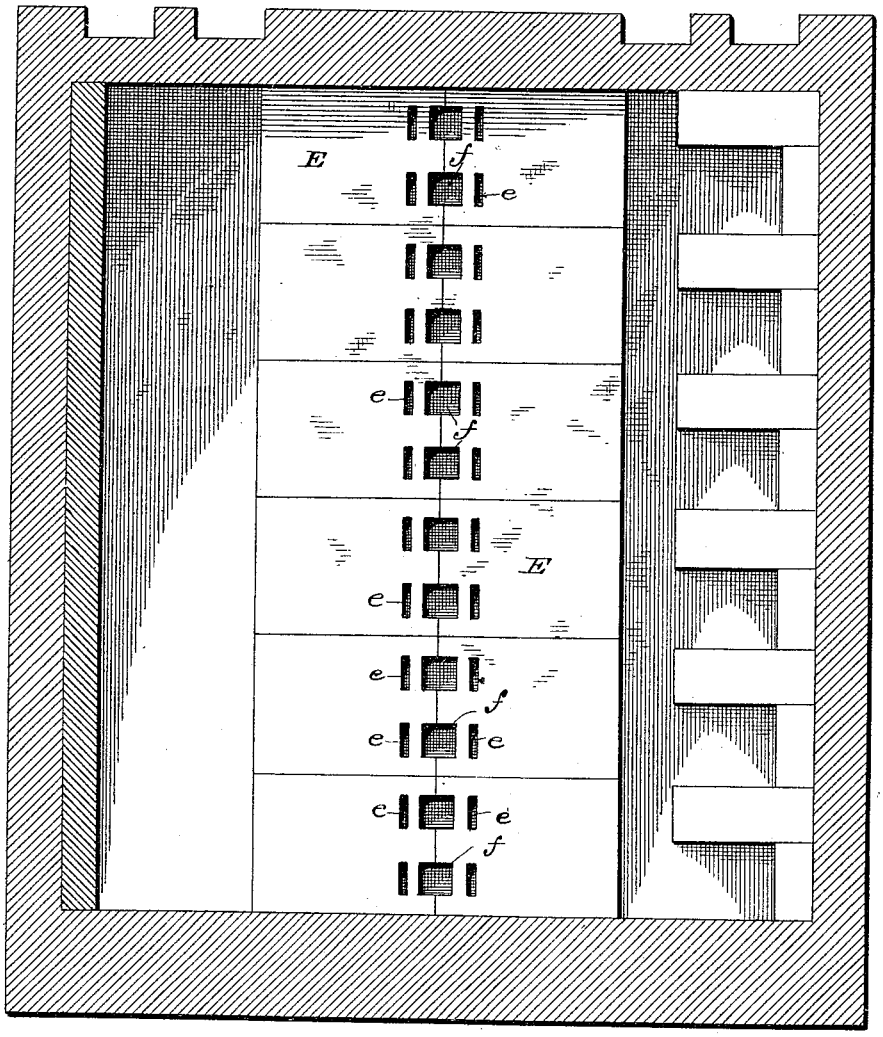
Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

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

GAS-RETORT FURNACE.

SPECIFICATION forming part of Letters Patent No. 346,301, dated July 27, 1886.

Application filed April 30, 1885. Serial No. 164,007. (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 Gas-Retort Furnaces, of which the following is a specification.

My invention relates to gas-retort ovens and furnaces, and particularly to that class in which highly-heated air is mingled with the gases given off in the fire-pot, and the combustion thus rendered more perfect.

The present invention is in the line of improvements upon the apparatus for which Letters Patent were granted me October 18, 1881, No. 248,335, and September 4, 1883, No. 284,458.

Figure 1 of the annexed drawings is a vertical transverse sectional view of the retort-oven and the combustion-chamber in which the mingled air and gases are burned; Fig. 2, a vertical longitudinal section of the furnace and oven; Fig. 3, a longitudinal horizontal section on the line *x x* of Fig. 1.

Under the construction set forth in my former patents above mentioned and other analogous constructions, it has been found possible to produce very intense heat, and to some extent economy of fuel has resulted; but the high heat has been mainly confined to the fire-pot of the furnace, and owing to its intensity therein it has been found difficult or impossible to so construct the fire pot or chamber as to withstand such heat. As a consequence the economy in fuel and in time required for operating upon a given charge in the retort has been more or less fully offset by the cost of repairing or renewing the fire-pot and other parts, and difficulties of manipulation have presented themselves, such as the high heat about the fire-pot and inability to accurately control the combustion and consequent temperature. This last-mentioned difficulty is a very serious one, as will be readily understood by gas-engineers, and the heat thrown off by the fire-pot represents a large loss or waste, besides rendering attention to the fire unpleasant and arduous.

After long and careful study and costly experimenting, I have succeeded in overcoming the obstacles hitherto encountered, and in producing and utilizing a more intense heat than has ever been done to my knowledge, and with great economy of fuel, durability of apparatus, and the ease of manipulation and control.

Briefly stated, the secret of success in the present apparatus rests in preventing the mingling within the fire-pot of the heated air and the gases given off by the fuel in said fire-pot, and this I accomplish by retarding or checking the outflow of the gases and products of combustion from the fire pot or chamber into the retort-oven, thereby causing said gases and products to completely fill the outlets and prevent the ingress of air through them. As a further consequence of this construction the combustion or decomposition of the fuel in the fire-pot takes place gradually and evenly, since the quantity of air which may enter at the draft-inlet to support combustion must always be proportional to the outlet afforded for the smoke and gases.

By carefully proportioning the outlets from the fire-pot to the size of the fire-pot, and the charge of fuel to be used therein, and regulating the hot-air supply with reference to the capacity of said outlets, I accomplish the results stated.

The precise form of apparatus is not essential, though I have devised and shall describe a construction which practical working shows to be very perfect in its operation, and which I believe best suited to the purposes of my invention.

A B indicate a double bench of retorts, the two ovens or benches placed back to back, as is customary; and C indicates the fire-pot of bench A, which is duplicated for bench B, as usual. The fire-pot contains a grate, *a*, below which is an ash-pit, *b*, and at the top of the fire pot or chamber is an inclined supply-chute, *c*, provided with a door or lid, *d*. The top of the fire pot or chamber is arched, and communicates by an outlet, *h*, with a flue or passage, D, extending along the bottom of the retort oven or chamber from front to rear, as shown in Figs. 2 and 3.

The flue or passage D is formed of bricks or blocks of fire-clay or other refractory substance capable of withstanding intense heat, the blocks E, which constitute the top of the flue being formed with vertical passages *f*, opening directly from the flue D, and with inclined passages *e*, which communicate with air-ducts

F, formed in the walls of the oven, as shown in Figs. 1, 2, and 3, and as described in my former patent, No. 284,458, above referred to.

Above and resting upon the blocks E are other blocks, G, between which is left a space, *g*, of a width sufficient to embrace the mouths of the openings or passages *e f* in the blocks E, said space *g* forming a mixing and combustion chamber for the gases and heated air entering through the passages *e f*. The passages *f* are made of such size that they tend to retard or check the flow of gases from the fire-pot through them into the mixing chamber or space *g*, and hence there is no liability of the heated air which enters through passages *e* passing downward into the fire-pot, as occurs where the outlet for the gases is large enough to permit them to escape without effort or pressure. At the same time care must be exercised not to make the outlets so small as to prevent proper combustion of the fuel in the fire-pot, or to produce any considerable pressure in the fire-pot. In other words, the outlets must be of such size that the gas will constantly exert a slight pressure to get out, just sufficient to completely fill the outlets and prevent any inflow of air through them. Under this arrangement, and with the air-inlets proportioned with due regard to the gas-passages *f*, combustion takes place in the mixing and combustion chamber, and produces a heat which I believe to be in excess of anything ever before attained within a retort oven or chamber. So perfect is the combustion with this plan that no smoke or gases can be seen issuing from the stack, as heretofore, and the temperature at the top of the stack is found to be from 600° to 800° as against 1200° to 1400° hitherto. Practical use of the apparatus also demonstrates the fact that the quantity of fuel which it is possible to use in the fire-pot with the outlets for the gases checked, as above, is limited, and that it is impossible, therefore, to waste the fuel. If more than the requisite amount be placed in the fire-pot it will not burn, and it is therefore essential to the working of the apparatus that a limited charge be used.

By increasing the size of the gas-outlets and of the hot-air inlets, a larger charge can be handled, provided adequate draft or air supply be given to the fuel in the fire-pot.

The flames of the ignited gases pass upward through the oven around and between the retorts H therein, which are supported and separated by blocks I, as heretofore, thence pass downward through flues *j* to the passages *k* beneath the lower retorts of the bench, which run lengthwise beneath said retorts from back to front, thence again to the back, where they communicate with the stack or chimney K.

It is important that provision be made for operating the benches upon the plan herein set forth, or in the ordinary way, so that in the event of any accident or derangement of the air-forcing apparatus the products of combustion from the fire-pot may be discharged directly into the oven or retort-chamber with or without a supply of heated air. For this purpose I make the openings *f* of larger size than is actually requisite for the outlet of the gases from the fire-pot, and I place across the middle of such opening a block or brick, L, of fire-clay or like substance, as shown in Fig. 1.

In practice I employ simply a brick placed on edge, which I find admirably suited to the purpose; but it is obvious that any convenient form of damper may be employed, if made of material capable of withstanding the high heat to which it will be subjected.

The several blocks or bricks L may be connected by a rod or bar, so as to be moved simultaneously and equally.

Air is forced into flues F by a fan or blower, or in any other usual or convenient manner.

It is difficult to state proportions or dimensions with accuracy, owing to the many influencing circumstances which affect or necessitate a change therein; nor are arbitrary proportions or dimensions necessary.

The essential points to be observed are, first, the slight checking or retarding of the outflow of gases to prevent the inflow of air through the gas-outlets; and, second, the supply of heated air in sufficient quantity to insure the complete consumption of said gases. A larger supply of air is, however, unnecessary. For the purpose, however, of giving the fullest information practicable to the public, I may here state the dimensions and proportions of apparatus which I have now in use, as follows: cubical contents of retort-oven independent of retorts and setting or supports, approximately, seven feet eight inches, within which are placed six ordinary D-retorts; cubical contents of fire-pot, approximately, thirty-six cubic feet, and charged under this plan with from twenty to twenty-five bushels of coke or eighteen to twenty bushels of coal; area of outlet from fire-pot to flue or passage D, approximately, three square feet; aggregate area of openings *f*, approximately, two and one-fourth square feet; aggregate area of hot-air inlets *e*, approximately, three-fifths of one square foot.

It will be observed that under the present plan the gases, flames, &c., pass upward equally throughout the entire length of the oven or chamber and heat all parts of the retorts evenly and alike, thus insuring more rapid distillation of their contents and greater durability of the retorts.

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

I am aware that it is not new to convert the gases from the generator into carbonic oxide, and to burn said carbonic oxide within the retort-chamber, having myself done that heretofore, as explained in my former patents, above referred to; and I am also aware that it has been proposed to make the outlets from the generator sufficiently small to retard or check the escape of the gases. I therefore do

not claim either of these ideas, broadly; but I believe my apparatus to be novel in construction and peculiarly adapted to carry out the objects stated.

Having thus described my invention, what I claim is—

The combination of a retort oven or chamber, A, fire-pot C, flue D, and mixing-chamber *g*, provided with hot-air inlets *e* and gas-outlets *f*, and upright dividing-blocks L, of less width than the outlets *f* and placed centrally thereover, whereby the gases are thrown equally toward the air-inlets at each side.

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