

No. 712,502.

Patented Nov. 4, 1902.

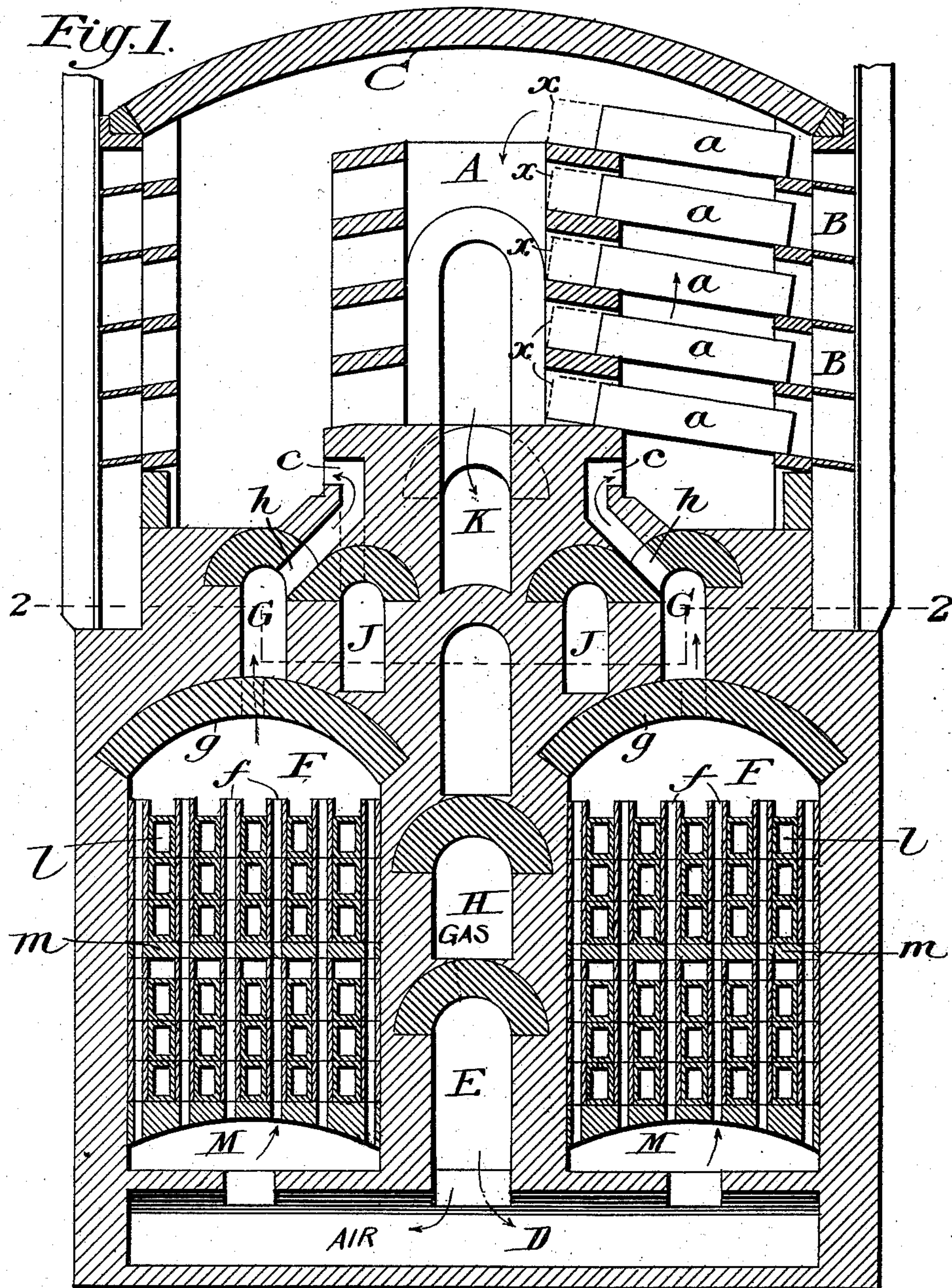
G. G. CONVERS & A. B. DE SAULLES.

MUFFLE FURNACE.

(Application filed Aug. 27, 1901.)

(No Model.)

5 Sheets—Sheet 1.



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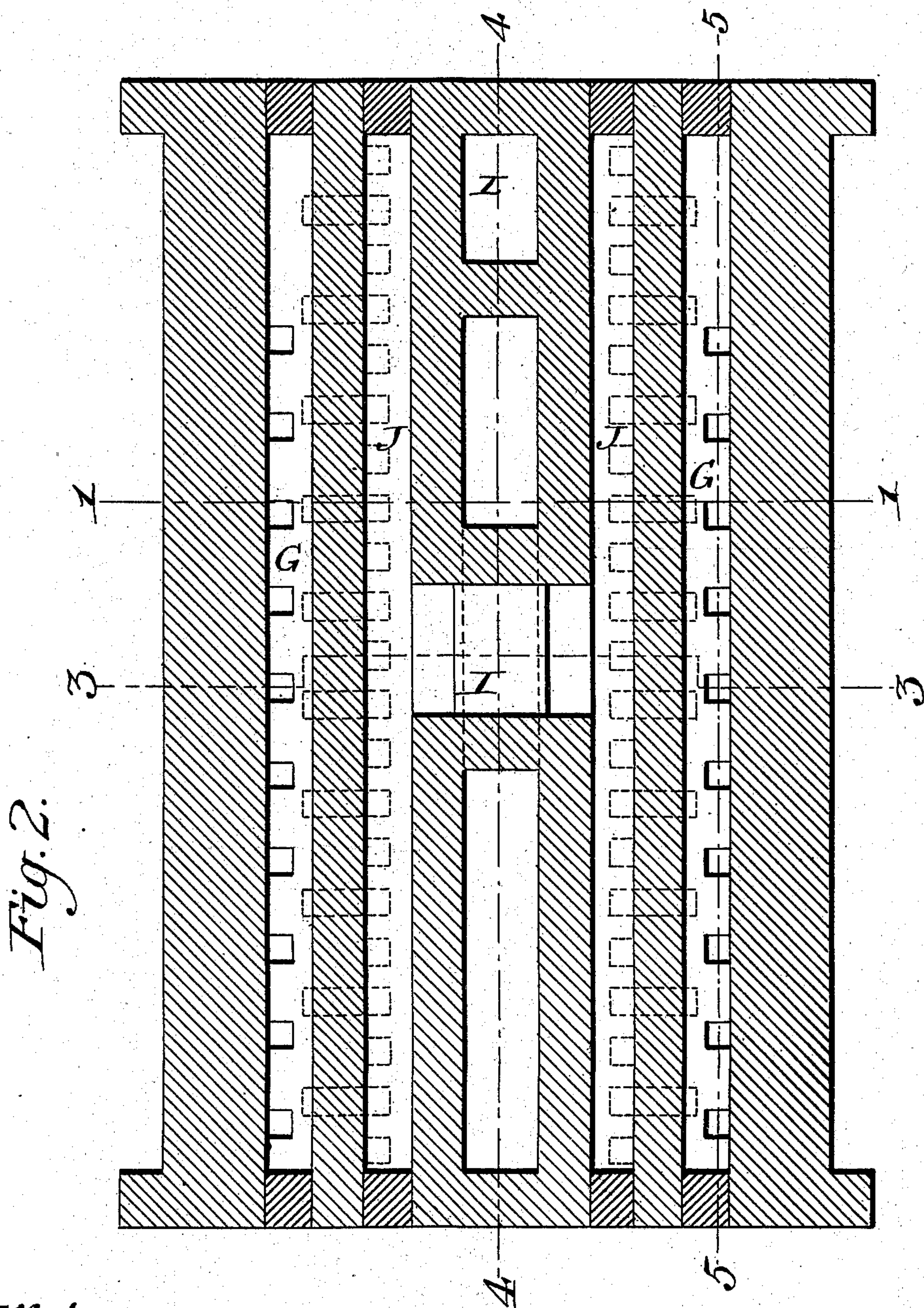
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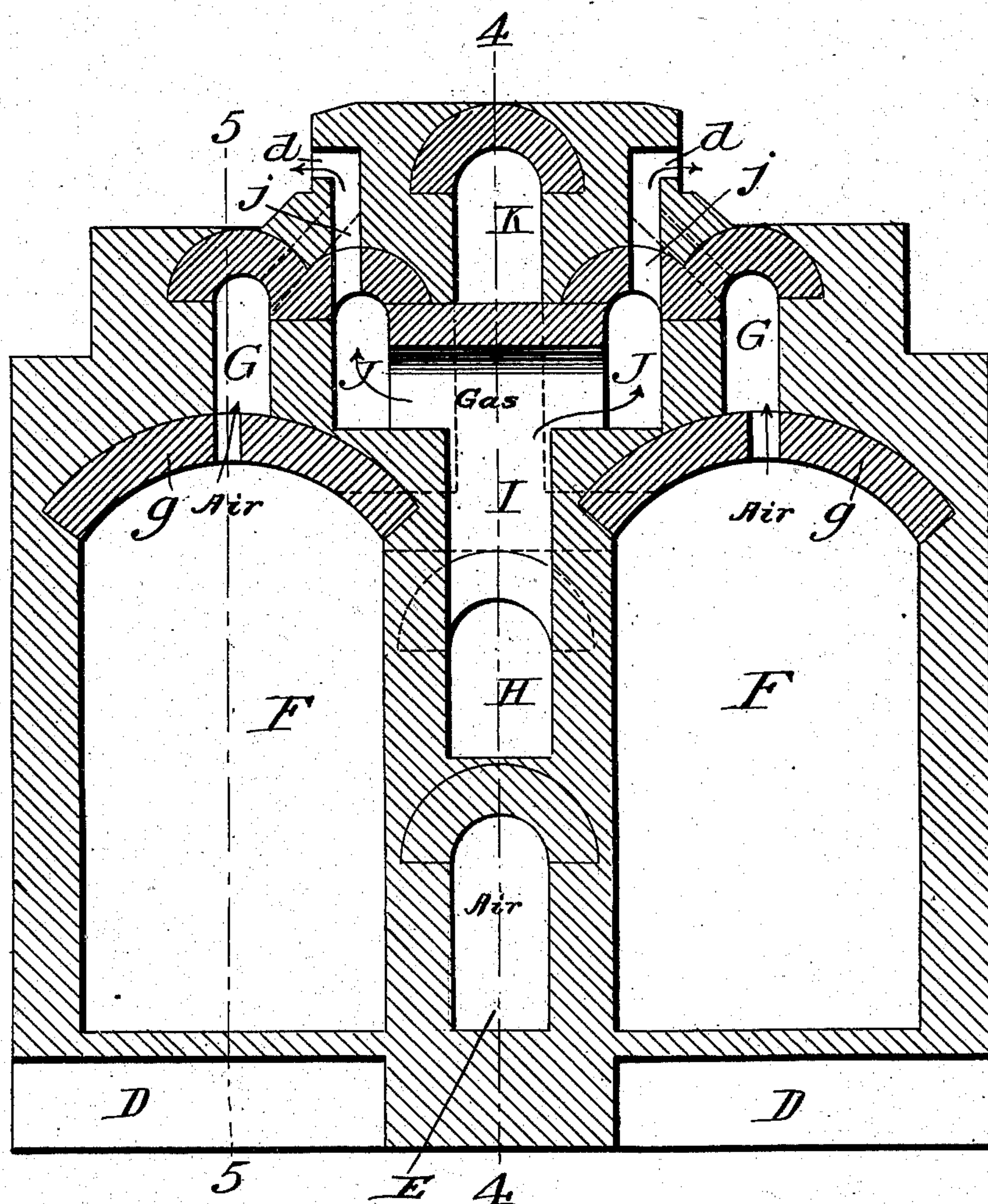
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Fig. 3.



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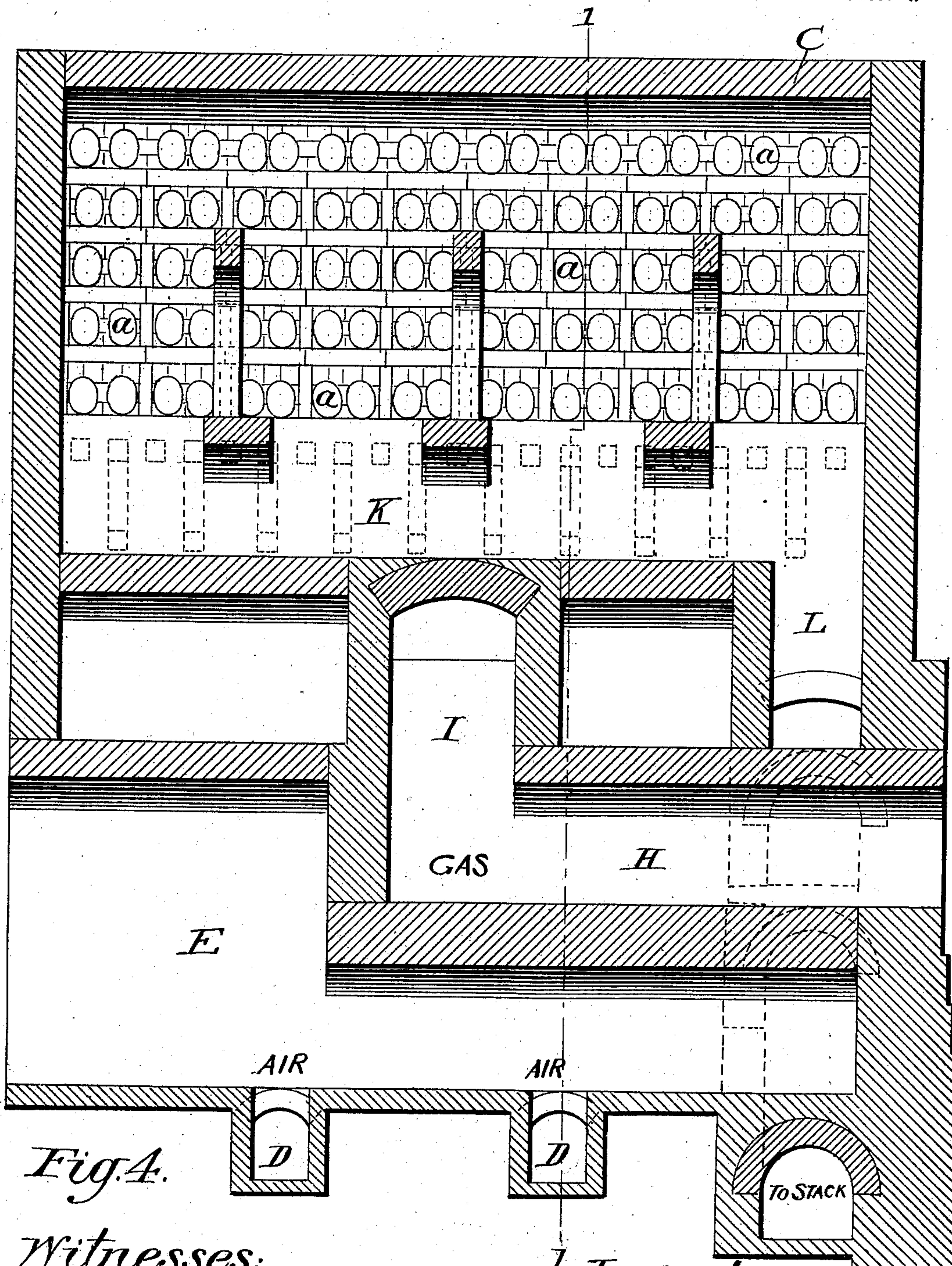
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(Application filed Aug. 27, 1901.)

(No Model.)

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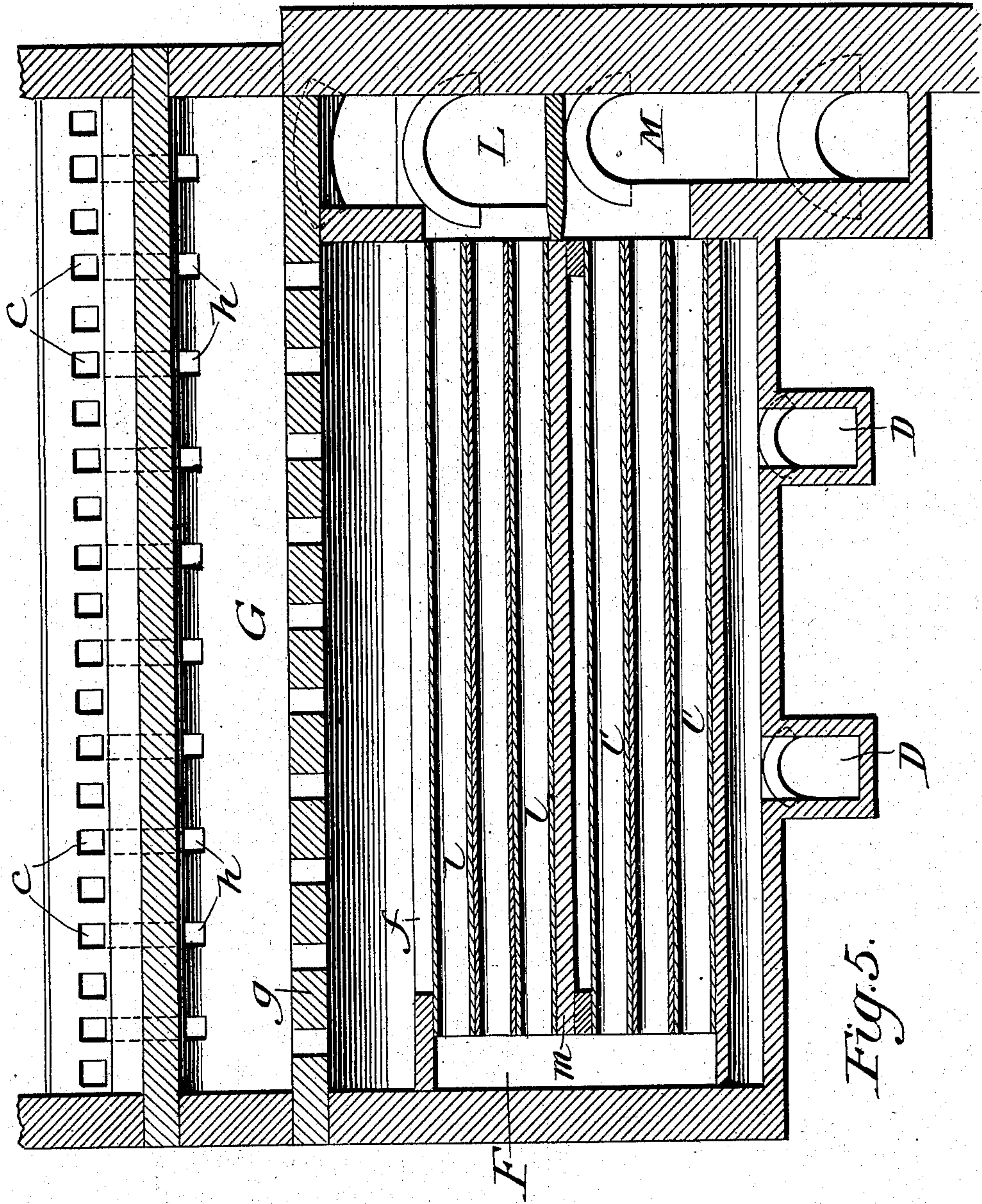
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(Application filed Aug. 27, 1901.)

(No Model.)

5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

GEORGE G. CONVERS AND ARTHUR B. DE SAULLES, OF SOUTH
BETHLEHEM, PENNSYLVANIA.

MUFFLE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 712,502, dated November 4, 1902.

Application filed August 27, 1901. Serial No. 73,453. (No model.)

To all whom it may concern:

Be it known that we, GEORGE G. CONVERS and ARTHUR B. DE SAULLES, citizens of the United States, residing at South Bethlehem, Northampton county, State of Pennsylvania, have invented certain new and useful Improvements in Retort or Muffle Furnaces; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to certain new and useful improvements in furnaces designed principally for heating retorts used in the metallurgy of zinc, and is designed to provide a construction and arrangement of parts whereby the retorts are heated in a continuous manner by products of combustion, which rise through the retort-chambers from the bottom to the top thereof and have their exit through a central downtake, being utilized on their way to the chimney-stack for preheating the incoming air and fuel-gas. The arrangement is such that the retorts are heated not only continuously, but with great uniformity throughout their lengths, a main characteristic feature being that the rear ends of the retorts are freely exposed to the furnace heat.

In practice we have ascertained that the operation of a furnace constructed in accordance with our invention is accompanied with a notable increase in the output of metallic zinc or spelter, a considerable saving in fuel, and a marked decrease in the loss of retorts or muffles incident to the usual forms of Belgian furnaces.

In the accompanying drawings, Figure 1 represents a vertical section of a furnace embodying our invention, taken on a plane indicated by the line 1 1 of Fig. 2. Fig. 2 represents a horizontal section taken on a plane indicated by the line 2 2 of Fig. 1. Fig. 3 represents a vertical section of that part of the furnace below the retort-chambers, taken on the line 3 3 of Fig. 2. Fig. 4 represents a vertical section on the line 4 4 of Figs. 2 and 3, and Fig. 5 represents a section on the line 5 5 of Figs. 2 and 3.

Similar letters of reference indicate similar parts throughout the several views.

Upon reference to the drawings it will be noted that the main or principal elements of the furnace consist of retort-chambers located on either side of a central downtake and a subjacent regenerator in which the incoming air and gas are preheated and through which the products of combustion from the downtake pass on their way to the chimney-stack. For convenience of illustration we have omitted from one of the retort-chambers the removable spelter-muffles adapted to be placed therein and have shown them in but one of said retort chambers or compartments. For like reasons we have omitted to include in certain of the views the illustration of the brickwork filling of the regenerating-chambers, inasmuch as its construction and arrangement are familiar to those skilled in the art.

The spelter retorts or muffles *a*, as indicated, for instance, in the right-hand compartment or retort-chamber, (see Fig. 1,) are supported in the usual inclined position upon shelves on either side of the central downtake *A* and upon corresponding shelves of the outer walls *B B*, the retort chambers or compartments being spanned by the vaulted roof or arch *C*. The spelter retorts or muffles are indicated in the drawings in outline merely; but it will be understood that they are to be provided at their outer ends with the usual condensers and prolongs and are to be luted at said outer ends in the usual manner to prevent the ingress of air in the manner customary to the working of Belgian furnaces for the metallurgy of zinc. They may be of any preferred length and cross-section and may be supported at their inner ends, as shown in full lines, or have these ends extended to the edge of the downtake for the waste products, as denoted by the dotted lines *x*. At the base of each of the retort compartments or chambers is located a longitudinal series of air-inlet openings *c* and a corresponding series of fuel-gas-inlet openings *d*, the two sets of openings alternating with each other throughout the length of the retort compartments or chambers, so as to ob-

tain a regular and uniform combustion of the gas at its entrance into the said compartments.

The incoming air entering the gallery E, Fig. 4, passes from the feeder-flues D into the air-regenerator chambers F and passes upwardly through the perforated bricks *f* thereof, (see Fig. 1,) through the perforated arches *g* into the air-distributing chambers G, from which a series of inclined passages *h* conduct it to the air-inlet ports *c*. The gas from the producers entering the gallery H (see Fig. 4) passes through the uptake I into the gas-distributing chambers J, and thence by the passages *j* to the fuel-gas outlets *d*.

The waste products of combustion from the downtake A enter the horizontal flue K and pass along intermediate of the gas-distributing chambers J, finally entering the air-regenerator chambers by way of the downtake L, from which they are distributed to the right and left into the air-regenerators F, as indicated in Figs. 1 and 5. In passing through the air-regenerator chambers the products of combustion pass through the three upper series of hollow horizontal tiles *l* to the end of the regenerator-chamber, and thence downwardly and in the opposite direction through the three corresponding series of hollow horizontal tiles *l'* below the partition *m* of said chambers, finally entering the flue M, from which they are led off to the chimney-stack.

The operation of the furnace is as follows: The incoming air on its passage through the regenerator-chambers F is highly heated by the products of combustion on their passage through the horizontal flues of said chambers and arrives at the outlet-ports *c* at the temperature appropriate to the operation. In like manner the gas entering from the producers finds itself distributed in the chambers J between the air-regenerators and the flues for the outgoing products of combustion before the latter have entered the regenerator-chambers, in consequence whereof the gas itself is preheated to a very high degree, it being found that the temperature prevailing in the distributing-chambers J is so high that the brickwork of said chambers is raised to a cherry-red, almost if not quite equal to the temperature of the walls of the air-distributing chambers G. The preheated air and preheated gas at the high temperatures developed enter into combustion at the base of the retort compartments or chambers, and because of the draft of the central downtake the products of combustion, instead of being projected solely toward the outer ends of the retorts, are so acted upon that they distribute themselves with substantial uniformity over the entire length of the retorts in their upward passage through the retort-chambers. On their passage through the central downtake A, moreover, they heat the inner walls of said central downtake and also the inner

ends or butts of the retorts or muffles, thereby further distributing and utilizing their heating effect to the advantage of the operation. On passing through the central downtake they follow the course hereinbefore described, finally issuing at the chimney-stack.

So far as we are aware it is broadly new in furnaces of this character to admit the products of combustion at the base of the retort-chambers and to cause them to pass upwardly through said chambers and downwardly through a central downtake in such manner as to distribute and utilize their heating effect in the way described. It is also broadly new, in so far as we are aware, to convey the waste products of combustion from the downtake on their way to the air-regenerator chambers in such manner that the gas-distributing chambers or flues shall be interposed between the air-regenerator chambers and the flues for said waste products of combustion on their way to the air-regenerators. We desire, therefore, that such of our claims as set forth these features generically shall have a correspondingly broad interpretation.

Having thus described our invention, what we claim is—

1. A retort-furnace provided with two retort chambers or compartments having air and gas inlets at their base and having a central downtake, said downtake extending throughout the length of the furnace between the retort-chambers; substantially as described.

2. A retort-furnace provided with two retort chambers or compartments having air and gas inlets at their base and having a central downtake, the walls of said downtake consisting of a series of shelves upon which the inner ends of the retorts are adapted to rest, said shelves being separated by open spaces, whereby the down-going products of combustion have access to the said inner ends of the retorts; substantially as described.

3. A retort-furnace provided with two retort chambers or compartments having air and gas inlets at their base and having a central downtake, said downtake extending throughout the length of the furnace between the retort-chambers, the said air and gas inlets being arranged in horizontal alternating series along the inner side of said retort chambers or compartments; substantially as described.

4. A retort-furnace provided with two retort chambers or compartments having air and gas inlet flues at their bases and having a central downtake for the products of combustion, air-regenerator chambers into which said downtake discharges, and gas-distributing chambers intermediate of the waste-product flues and said regenerators; substantially as described.

5. A retort-furnace provided with two retort chambers or compartments having gas

and air inlet flues at their bases and having
a central downtake, air-distributing cham-
bers for said air-inlets, gas-distributing cham-
bers for said gas-inlets, air-regenerator
5 chambers supplying said air-distributing
chambers, and a horizontal flue for waste
products of combustion communicating with
the central downtake and located between
the gas-distributing chambers, said horizon-
10 tal flue communicating with the heating-flues

of the air-regenerator chambers; substan-
tially as described.

In testimony whereof we affix our signa-
tures in presence of two witnesses.

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ARTHUR B. DE SAULLES.

Witnesses:

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