

**No. 613,961.**

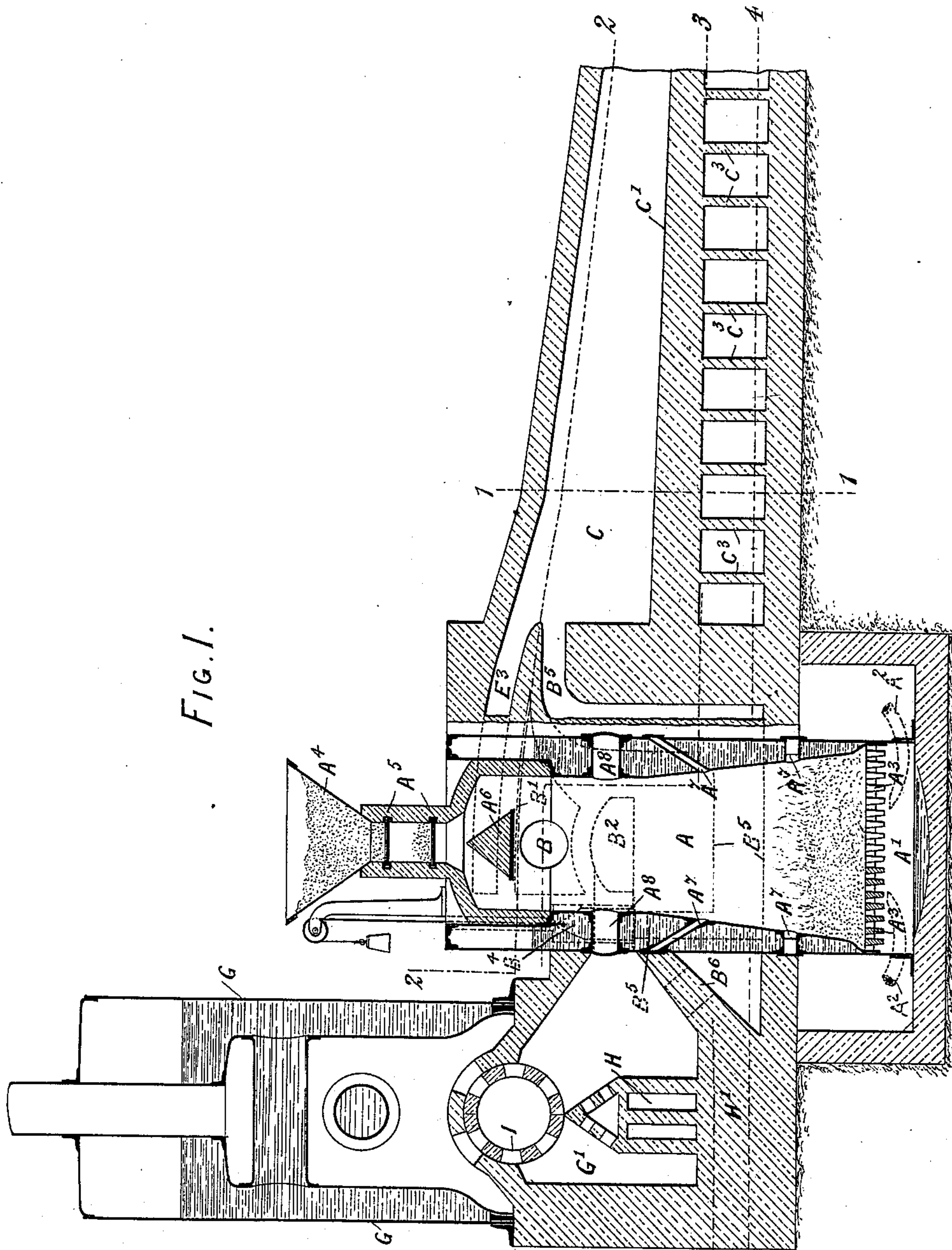
**Patented Nov. 8, 1898.**

**C. BOND.**  
**GAS HEATED FURNACE.**

(Application filed May 21, 1898.)

(No Model.)

**3 Sheets—Sheet 1.**



WITNESSES:

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FIG. 3.

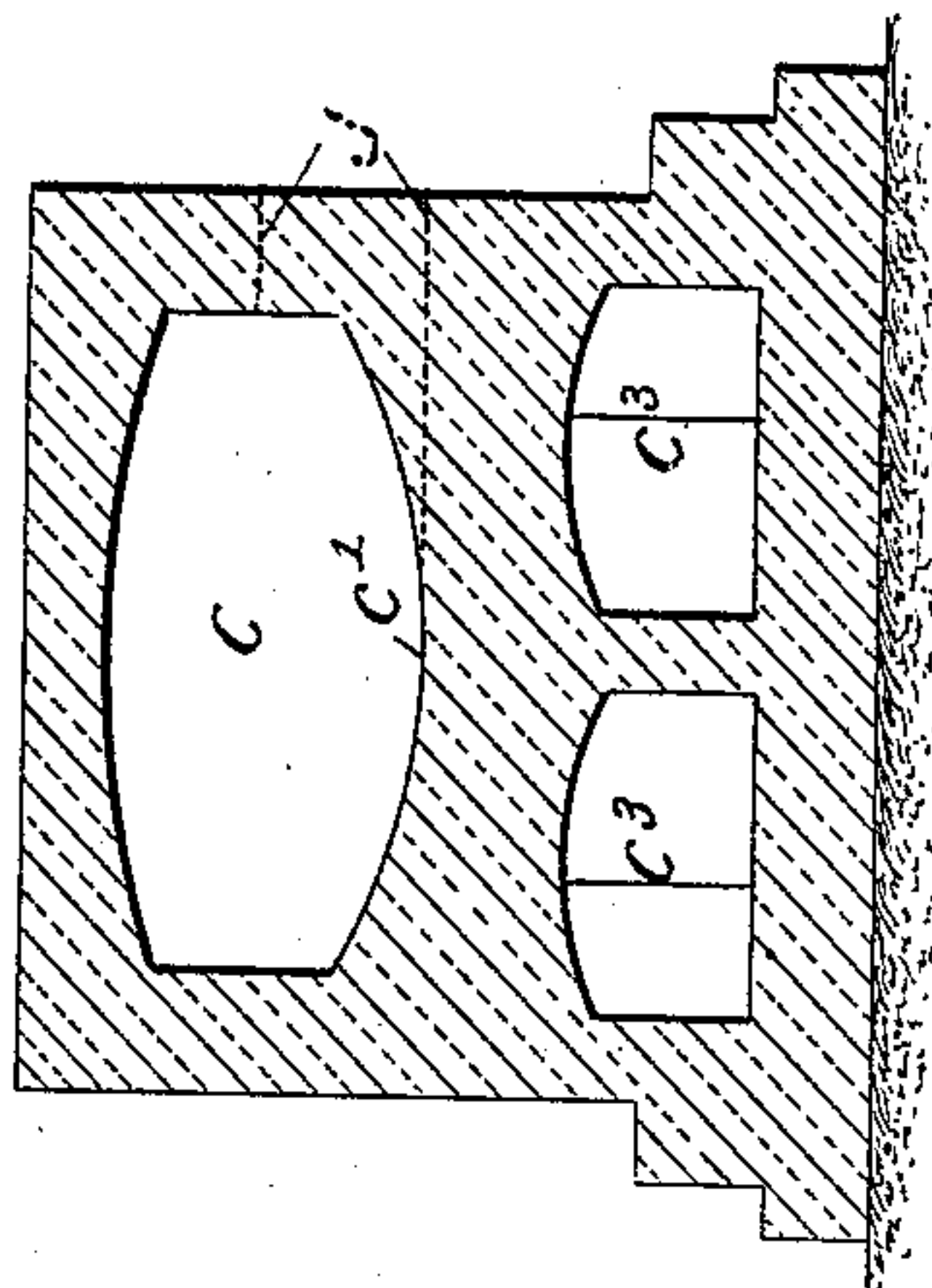
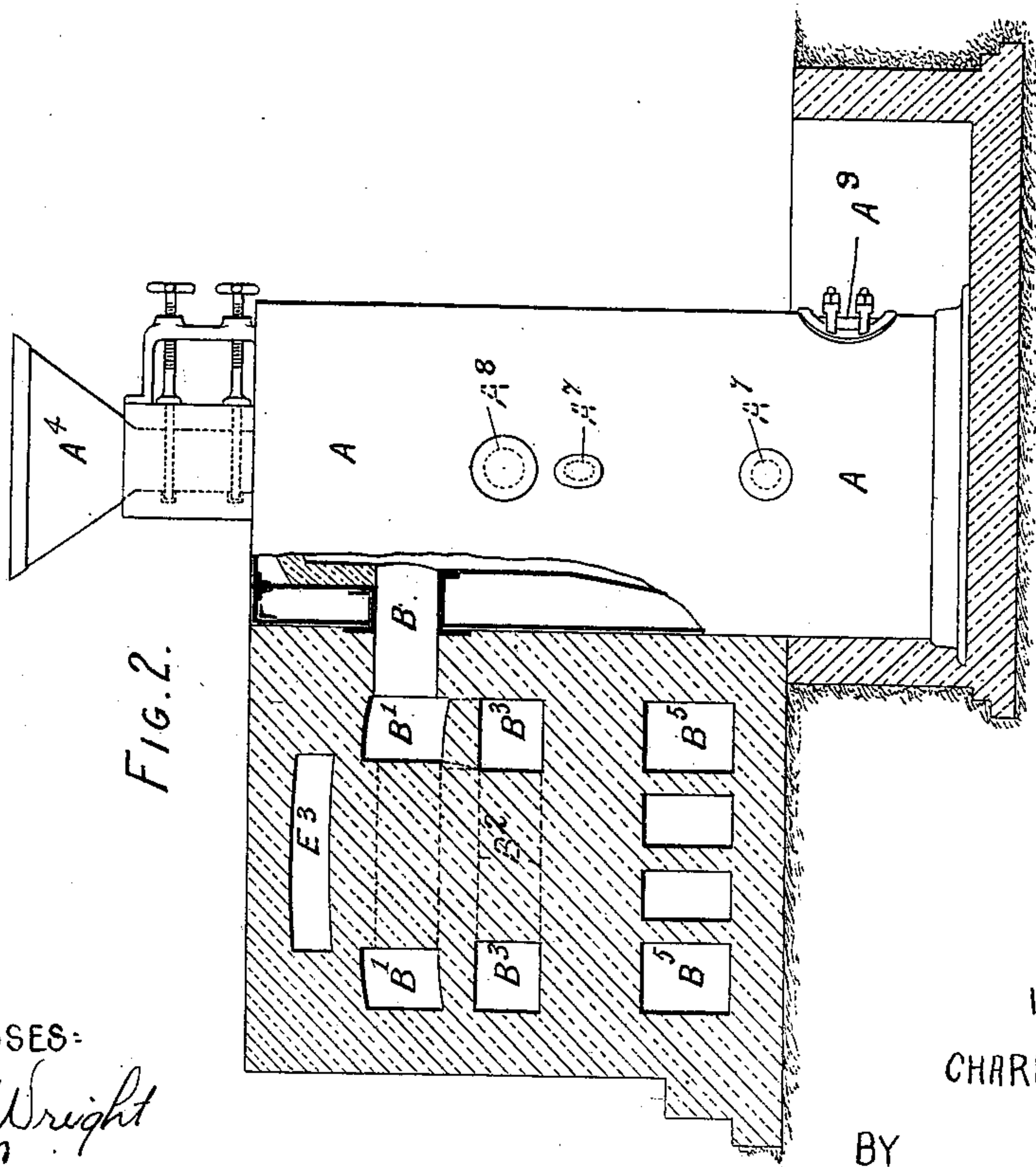


FIG. 2.



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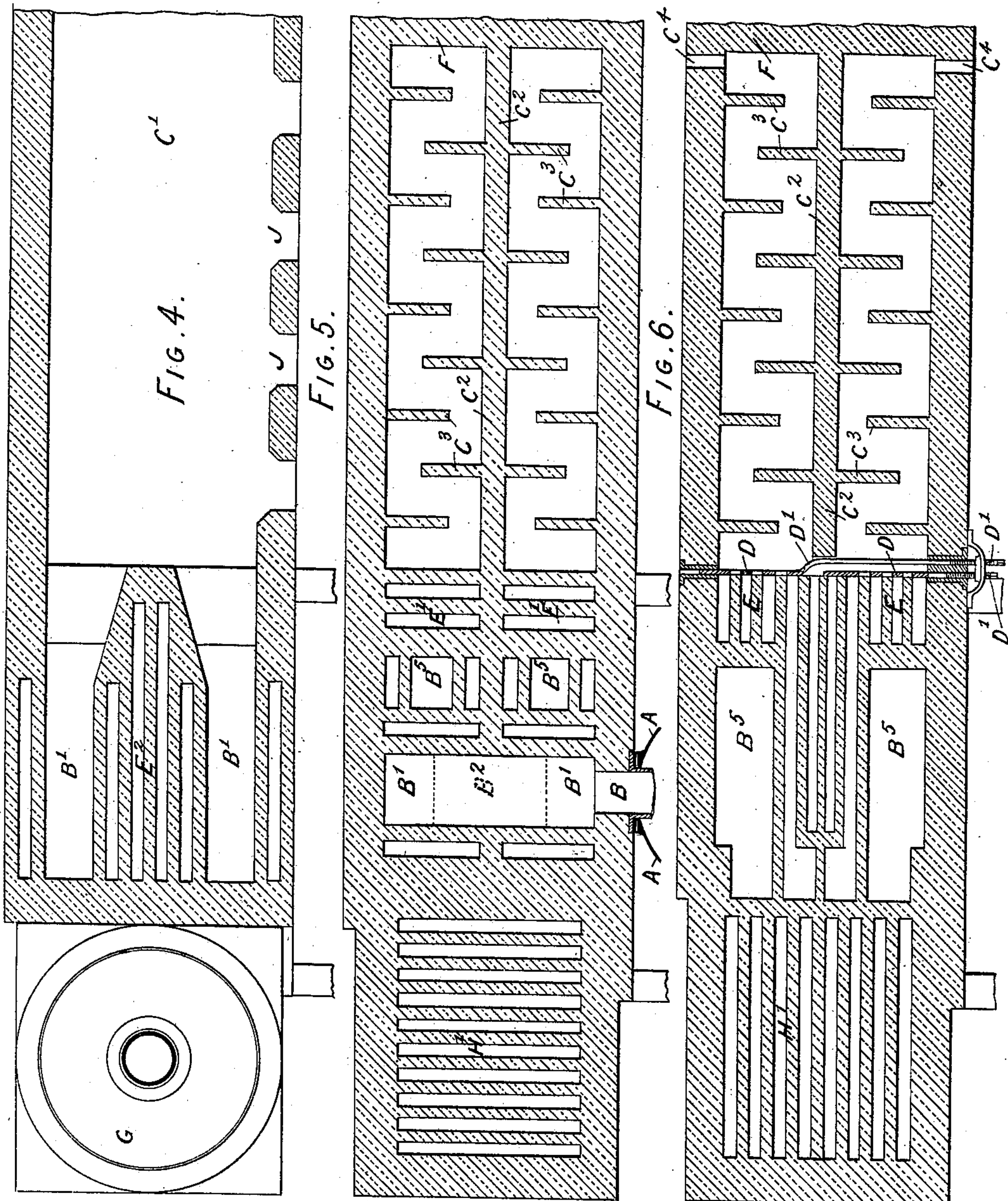
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# UNITED STATES PATENT OFFICE.

CHARLES BOND, OF WHIFFLET, SCOTLAND.

## GAS-HEATED FURNACE.

SPECIFICATION forming part of Letters Patent No. 613,961, dated November 8, 1898.

Application filed May 21, 1898. Serial No. 681,373. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES BOND, brick-layer, a subject of the Queen of Great Britain and Ireland, and a resident of Whifflet, county of Lanark, Scotland, have invented certain new and useful Improvements in Gas-Heated Furnaces, of which the following is a specification.

My invention relates to improvements in gas-heated furnaces of the class in which the gas to be burned within the furnace is provided by a gas-producer, and has for its objects the utilization of the gas-producer as a steam-generator and by the arrangement of the gas and air passages the obtainment of the maximum of heat and the total consumption of smoke, while using the waste products of combustion to raise steam in an ordinary boiler, and also to effect economy in construction and increased durability.

The drawings illustrate the application of my invention to a duplex heating-furnace, one half of which only is shown, the other half being merely a duplication of the same in all its details, although my invention is equally applicable to a single arrangement of furnace.

Figure 1 is a longitudinal and vertical section of one half of a duplex heating-furnace. Fig. 2 is an end view, partly in section. Fig. 3 is a transverse section on the line 1 1. Fig. 4 is a horizontal view, partly in section, on the line 2 2. Fig. 5 is a horizontal section on the line 3 3, and Fig. 6 is a horizontal section on the line 4 4.

The gas-producer A is erected near the end of the furnace, at one side thereof, and is duplicated at the other end in the case of a duplex furnace. This producer is preferably in the form of a steam-boiler having inner and outer shells forming an internal combustion-chamber and an annular water-space provided with a closed ash-pit A' over a water-tank, into which ash-pit compressed air from any fan, blower, or other source of supply is introduced by the nozzles A<sup>2</sup>. The grate A<sup>3</sup> supports the incandescent fuel, and fresh fuel is fed into the interior from the hopper A<sup>4</sup> through the duplex sliding doors A<sup>5</sup>, beneath which the cone A<sup>6</sup> is fitted to spread the fuel as it falls, or the cone may be suspended from the end of a lever actuated from outside to

act as the lower closing door or valve. Tubular openings A<sup>7</sup> are formed through the shells and water-space of the boiler for the introduction of bars for stirring up the fuel within, and these openings can be closed by covers or plugs. Tubes A<sup>8</sup> are also provided, closed with blind flanges, to give access to the interior, when desired, or they may be used for coupling one gas-producer to another where more than one are used. The boiler would be further provided with a manhole-door A<sup>9</sup>, as shown in Fig. 2, water-injecting apparatus, a safety-valve, and other fittings, which it is unnecessary to show in the drawings. The upper part of the boiler is formed with an annular steam-drum which is lined with refractory material, as shown in Fig. 1.

The gas generated in the producer passes through the short pipe B into gas-holding chambers B', one on each side, which are connected by the arched passage B<sup>2</sup>, and through ports B<sup>3</sup> (shown in Fig. 2) and opened and closed by the suspended valves B<sup>4</sup> in Fig. 1, whence it passes by the duct B<sup>5</sup> to be consumed within the furnace C.

A chamber is formed below the hearth C', which is divided into two parts by the partition-wall C<sup>2</sup> and provided with the baffles C<sup>3</sup>, and the air for admixture with the gas to be consumed enters or is forced in by the openings C<sup>4</sup> and on its way to the furnace circulates around the baffles to be heated. From this heating-chamber the air passes through inclined gridiron valves D, actuated from the outside by the bars D', secured to them, up the passages E, Fig. 6, E', Fig. 5, filled with checker brickwork, whence it passes by an interior duct to the heating-chamber E<sup>2</sup>, from which it passes through top openings by the passage E<sup>3</sup>, Fig. 1, to the furnace C, where it mixes with the gas to consume it. A partition-wall F divides the heating-chamber of one half of the furnace from that of the other half, the said furnace being provided with suitable side doors J.

G is an upright boiler, which may be of any ordinary construction, or it may be a boiler of any other type suitable, which is heated by the waste products of combustion and, like the gas-producer, is duplicated at the other end of the furnace in the case of a duplex furnace;



but in the case of a single furnace this boiler and its smoke-consuming appliance are placed at the other end of the furnace. This boiler may, if desired, be connected to the producer-boiler to equalize the steam-pressure and is preferably provided with a supplementary producer H. The space H' below the producer is filled with checker brickwork (not shown in Fig. 1, but indicated in Figs. 5 and 6) to heat the air passing to the producer H and space G'.

In operating the duplex furnace the producer-gas and air are introduced to the furnace C from each end alternately by opening and closing the valves B<sup>4</sup> and D, the products of combustion passing through the whole length of the furnace and passing down the passage B<sup>5</sup>, through the opening B<sup>6</sup> (indicated in dotted lines) to the interior of the chamber G'. Within this chamber G' it is mixed with producer-gas from a small producer, (indicated at H,) and the gas and products of combustion becoming thoroughly mixed by passing through the openings in the brickwork or fire-clay cylinder I pass under the boiler G, where they are burned, the gas and air currents being reversed intermittently. In the case of a melting-furnace this duplex process is very advantageous.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-heated furnace, the combination with the furnace, of a gas-producer having its combustion-chamber surrounded by a water-chamber to form a steam-generator, gas-holding chambers and passages connecting said chambers with the producer and with the furnace, air-heating chambers below the hearth of said furnace, and passages connecting said air-heating chambers with the furnace, and a steam-boiler provided with smoke-consuming devices connected by passages with the furnace, substantially as described.

2. In combination with a gas-heated furnace, a gas-producer having an inner shell forming a combustion-chamber, passages connecting the same to said furnace, an outer shell forming a water-chamber, the upper part of which constitutes an annular steam-drum, and a lining of refractory material on the inner wall of said drum, with suitable passages connecting the gas-producer with the furnace, substantially as described.

3. The combination with a gas-heated furnace provided with gas-holding chambers

near one end communicating with the furnace-chamber, air-heating chambers below the hearth of said furnace-chamber and a passage connecting said air-heating chamber with the furnace above the hearth, a gas-producer having passages connecting the combustion-chamber thereof with the gas-holding chambers of the furnace, and a supplementary steam-boiler having a gas-combustion chamber and communicating with the furnace, substantially as described.

4. The combination with a gas-heated furnace, provided with gas-holding chambers near one end and a passage connecting said chambers with the furnace-chamber, air-heating chamber below the hearth of said furnace-chamber, and a passage connecting said air-heating chamber with the furnace above the hearth, a gas-producer communicating with the gas-holding chambers, a supplementary steam-boiler having a combustion-chamber, a producer in said chamber, and passages for conveying unconsumed smoke from the furnace to said combustion-chamber, substantially as described.

5. The combination with a gas-heated furnace, provided with gas-holding chambers near one end and communicating with the furnace above the hearth thereof, air-heating chambers below said hearth and communicating with the furnace above the hearth, a gas-producer having passages connecting the combustion-chamber thereof with the gas-holding chambers, and valves controlling the passages leading from the air-heating chambers to the furnace, and valves also controlling the passages leading from the gas-producer to said gas-holding chambers.

6. The combination with a gas-heated furnace, provided with gas-holding chambers near one end communicating with the furnace, of a gas-producer formed of inner and outer shells, an annular steam-drum formed at the upper end of the producer, a refractory lining on the inside of said drum, a feed-hopper carried by said refractory lining and passages connecting said producer with the gas-holding chambers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHAS. BOND.

Witnesses:

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WM. RUTHERFORD.