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PATENTED NOV. 7, 1905.

M. E. ROTHBERG.
COKE OVEN.

APPLICATION FILED MAY 20, 1905.

3 SHEETS—SHEET 1.

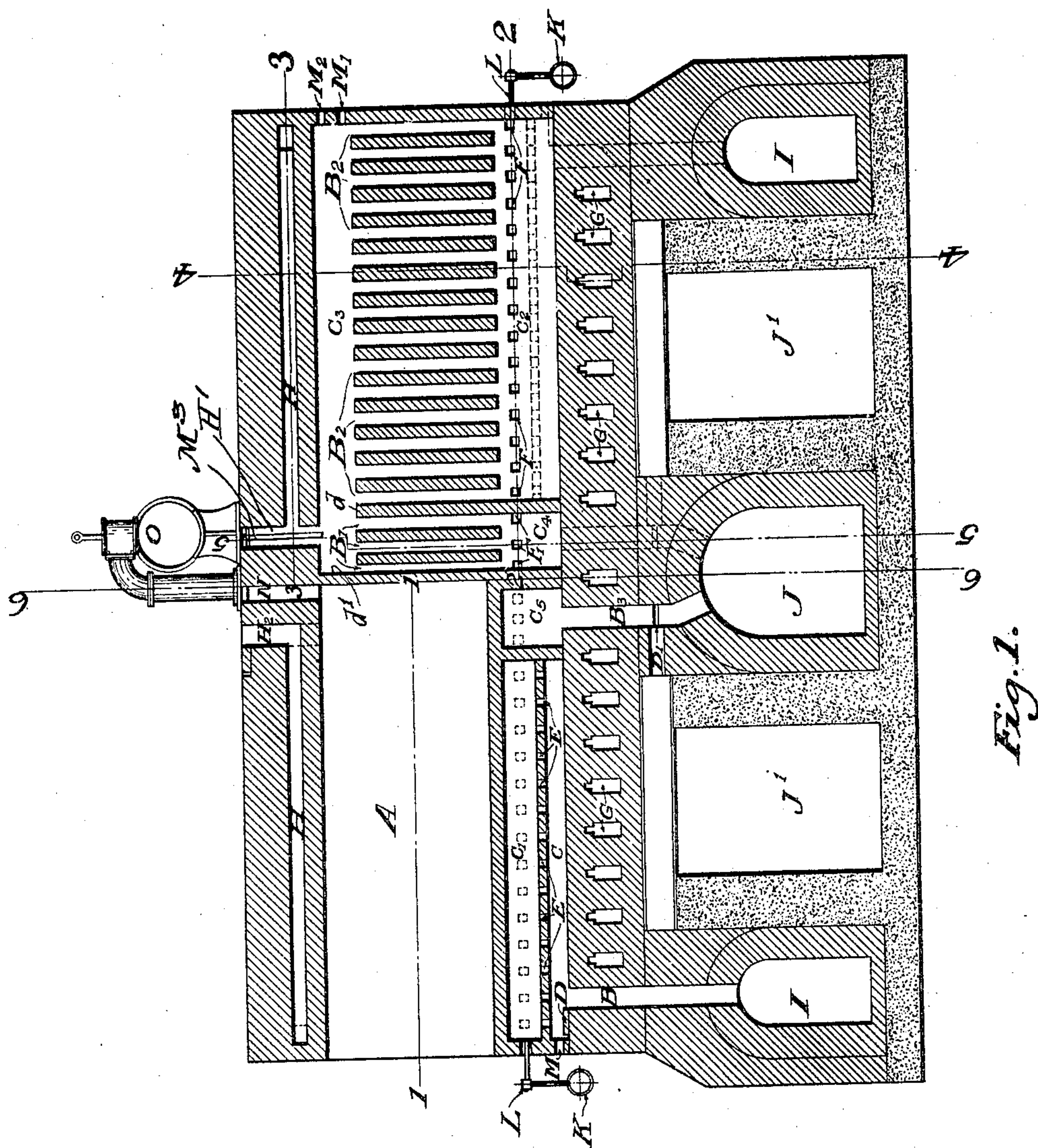


Fig. 1.

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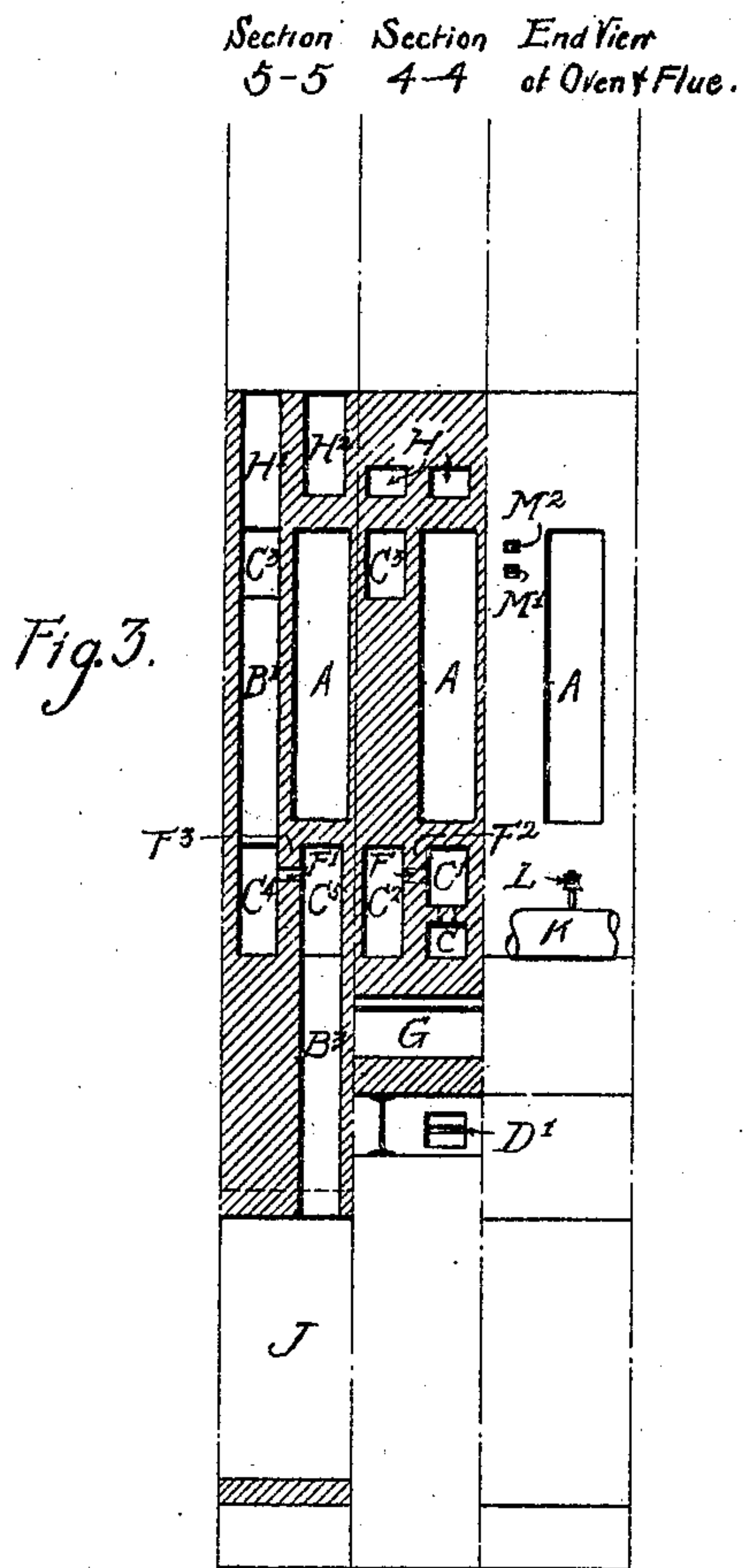
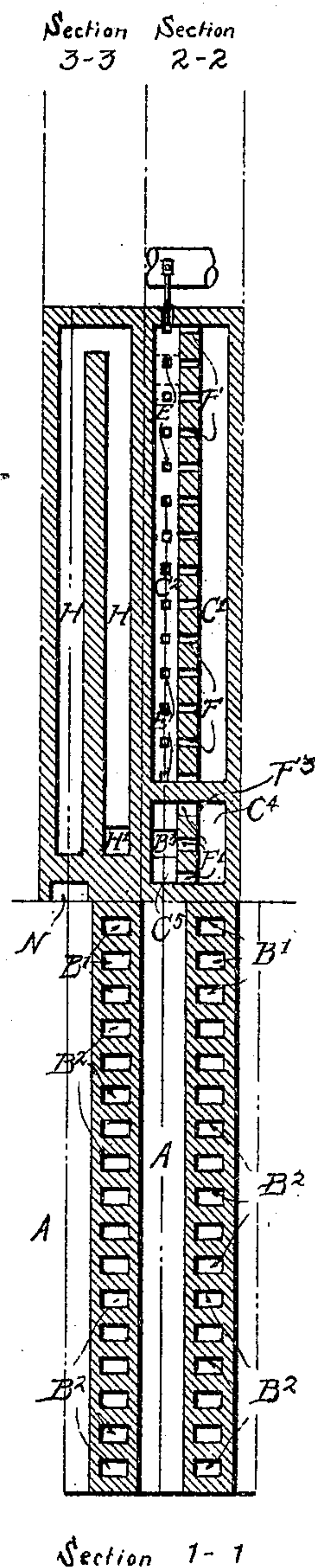


Fig. 2.



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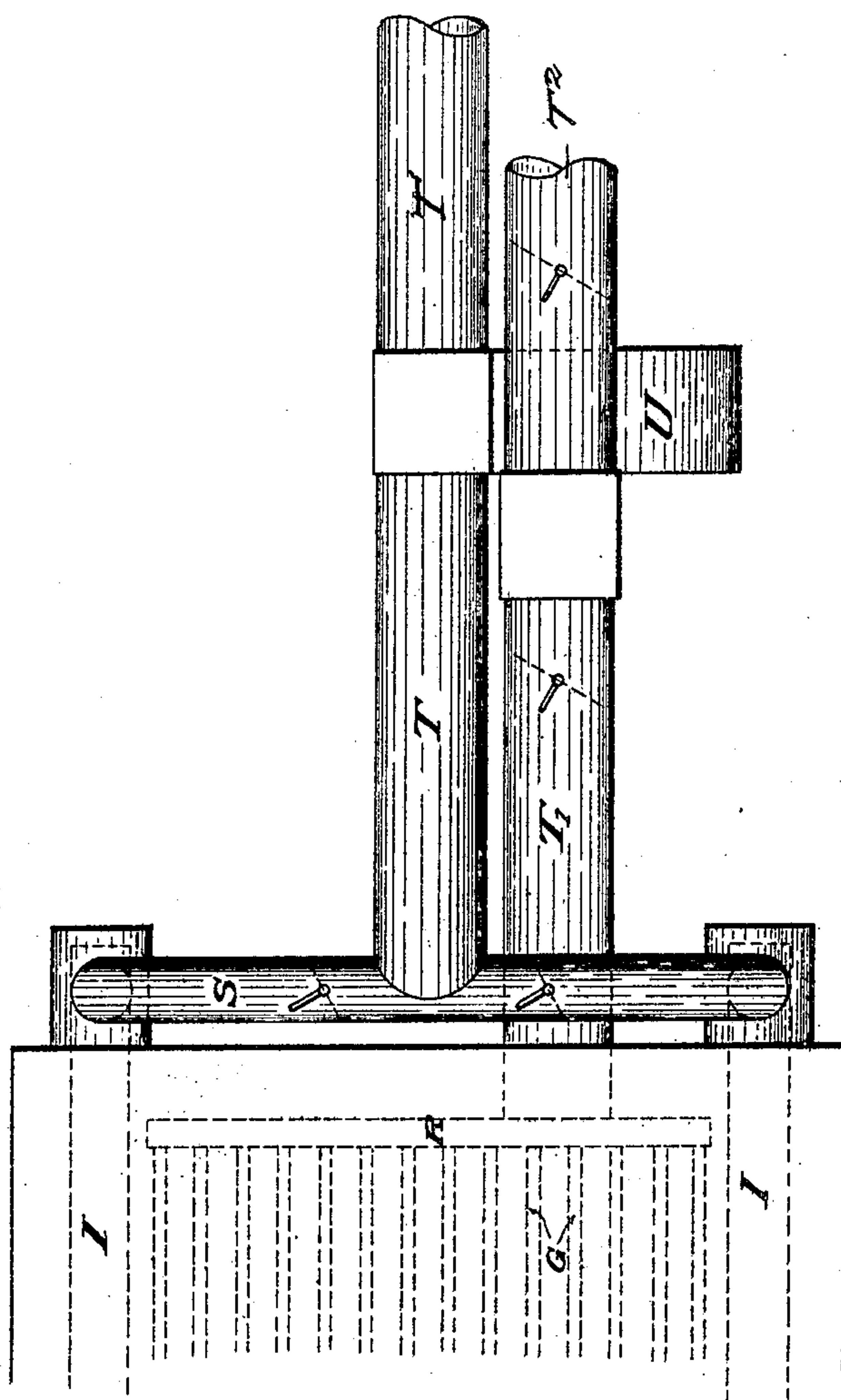


Fig. 4.

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UNITED STATES PATENT OFFICE.

MATHEW E. ROTHBERG, OF CLEVELAND, OHIO.

COKE-OVEN.

No. 804,054.

Specification of Letters Patent.

Patented Nov. 7, 1905.

Application filed May 20, 1905. Serial No. 261,393.

To all whom it may concern:

Be it known that I, MATHEW E. ROTHBERG, a citizen of the United States, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have made a certain new and useful invention in Coke-Ovens; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

The invention relates to coke-ovens of the horizontal open-end type having vertical heating-flues in the walls between the coking-chambers, and has for its object the elimination of the cumbersome mechanism required for the frequent reversals of the air and gas, as is usually required with ovens of this class; but like them it is designed to utilize the heat in the waste gases for heating the air-supply to the fuel-gas.

With this object in view the invention consists in the novel construction and combinations of parts, all as hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating the invention, Figure 1 represents vertical longitudinal half-sections taken, respectively, through the coking-chamber A and through the heating-flues B' B² in the partition-walls. Fig. 2 represents various horizontal sections taken on lines 1 1, 2 2, and 3 3, Fig. 1. Fig. 3 represents vertical sections taken on the lines 4 4 and 5 5, Fig. 1, and an end view of an oven. Fig. 4 represents an arrangement of a fan in connection with flues and pipes for effecting a circulation of air, the parts being in plan view.

The section 1 1 is a horizontal half-section through a coking-chamber and partition-wall flues B' B². Section 2 2 is a horizontal half-section through the combustion-chamber under an oven and through the chamber under the heating-flues. Section 3 3 is a horizontal half-section through the air-inlet flue at the top of the oven. Section 4 4 is a vertical transverse section through an oven, the top air-inlet flue, a partition-wall of the heating-flues, the chambers above and below the same, and through a cooling-flue G, and section 5 5 is a vertical section through an oven, heating-flue, and the chambers above and below the same.

In the drawings the letter A designates the

coking chambers or ovens, extending longitudinally and opening on each front of the battery, suitable gas-tight doors being provided for such openings.

B' B² are vertical heating-flues in the longitudinal walls between the coking-chambers, there being two sets of heating-flues in each such wall upon opposite sides of a median transverse partition d', each set being divided into updraft and downdraft flues by a partition d, the downdraft-flues being located at the central part of the wall adjacent to the partition d'.

C' designates combustion-chambers under the ovens; C, air-distributing chambers under said combustion-chambers and having a horizontal dividing-partition provided with perforations E; C², chambers under the flues B² and to the bottom of which partition d extends, these chambers being on a level with the combustion-chambers C', which communicate therewith through the openings F in a dividing-wall F².

C³ designates chambers above the flues B² and B' and into which they open; C⁴, chambers beneath the flues B' and into which such flues open; C⁵, chambers similar and on a level with the chambers C⁴, with which they communicate through openings F' in a dividing-partition F³; B³, vertical flues connecting chambers C⁵ with the main off-gas flue J, extending transversely in the foundation under the bank of ovens to the stack and having dampers D'; J', transverse passages on a level with the flues J and having offsets for access to the stack draft-dampers D'; I I, transverse air-flues in the foundation on a level with the flues J and communicating with the air-distributing chambers C by vertical flues B, having dampers D; G G, cooling-flues extending transversely under the combustion-chambers and air-distributing chambers in the floors of the ovens and connecting with a common or yoke flue R at the end of the battery, said flues G G being open to the atmosphere at the opposite ends thereof; H H, air-inlet flues over the heating-flues B² in the roof of the oven; H', openings in the roof of the oven for an additional burner at the rear portion of the chamber above the heating-flues, supplied with air through flue H, which connects with opening H'; K K, gas-feed pipes; L L, burners located in the combustion-chambers C' and connected with said gas-feed pipes; M², additional burners at the front portion of the chamber above the heating-flues, supplied

with air through openings M' ; M^3 , additional burners at the rear portion of the chamber above the heating-flues, located in passages H' and supplied with air through reverting-flues H ; O , a gas-main above and transverse of the battery of ovens, with which it is connected by pipes communicating with openings or passages N at the center of the ovens.

U is a suction-fan; T , suction-pipes connecting therewith and connected also with the common or yoke flues R ; T' T^2 , air-discharge pipes, also in connection with the suction-fan and connecting with the air-flues I I .

In the operation of the oven the gas given off from the coal in the coking process passes up through the passages N to the gas-main O , by which it is conducted to the condensing-house (not shown) and the tar and ammonia removed in the usual way. The purified gas is then returned to the ovens by piping connecting with the burner-pipes K , by which it is distributed to the burners L , enters the combustion-chambers C' under the oven-chambers, and mingles with the heated air from the chambers C . Heated air for combustion is obtained in the following manner: In the brickwork below the ovens are located a number of flues G , which run transversely to the oven-chambers A under the entire battery of ovens. One end of the flues G is open to the atmosphere, the other end connecting with a cross-flue R , Fig. 4, which joins the ends of all the flues G . To prevent the high temperature in the ovens from injuring the foundations, air must be kept circulating through the flues G . This is commonly done by a chimney which connects with the flue R or by a fan discharging the heated air into regenerators; but both of these systems are objectionable—the first because the heated air goes to waste and the second because the use of regenerators requires frequent reversals of the air and gas, which I wish to avoid, deeming it more economical to burn the gas continuously. I propose to utilize the fan for obtaining the circulation of air through the flues G , as shown in Fig. 4. The air for combustion will be drawn from the flues G into flue R , thence by the pipes T' to the fan U , by which it will be discharged into the pipes T and S , which convey the heated air to the conduits I . The heated air from this conduit passes up through the small flue B into the air-distributing chamber C . The top of this chamber is provided with a number of small openings E , through which the air flows and uniformly distributes itself in chamber C' . The air mixes with the gas from burner L , combustion takes place, and the products of combustion pass through the perforations F into the chamber C^2 , under the vertical flues B^2 , up the same and into chamber C^3 , and along the same toward the center of the oven, whence they pass down through the flues B' into the chamber C^4 . From this chamber they pass through the

openings F' into chamber C^5 , from which they pass down through the flue B^3 to the main off-gas flue J to the stack.

Should additional heat be required in coking the charge of coal, burners may be inserted at H' and M^2 . Heated air for the burner at H' will be supplied by the flue H . Air is admitted to this flue at H^2 and absorbs heat from the surrounding brickwork in passing along its reverting branches. Air for the burner at M^2 will be taken from the atmosphere through M' .

Inasmuch as the oven is symmetrical about the line 6 6, Fig. 1, the flow of gases, as described, will take place simultaneously and continuously in separate sets of flues at both ends of the oven. Dampers are provided at D and D' , the former to regulate the flow of air for combustion in chambers C' and the latter to regulate the stack-draft in the flues of the different ovens. In Figs. 1 and 2 three flues B' and fifteen flues B^2 are shown; but I do not wish to be limited to this arrangement.

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

1. In double-front coke-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, combustion-chambers under the ovens having communication with said updraft heating-flues, a common central off-gas flue in the foundation having connection with the downdraft heating-flues, and air-passages in the foundation having connection with said combustion-chambers, substantially as specified.

2. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, combustion-chambers under the ovens having communication with said updraft heating-flues, a central transverse off-gas flue in the foundation having connection with the downdraft heating-flues, and air-flues in the foundation at the fronts of the ovens parallel to said off-gas flue and having communication with the combustion-chambers, substantially as specified.

3. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of ver-

tical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, a chamber below the updraft-flues of each double set, a separate chamber below the downdraft-flues of each double set, combustion-chambers under the ovens having perforated dividing-walls from the chambers below the updraft heating-flues, a central transverse off-gas flue in the foundation having connection with the downdraft heating-flues, and air-flues in the foundation parallel to said off-gas flue and having communication with the chambers under the updraft heating-flues, substantially as specified.

4. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, a chamber below the updraft-flues of each double set, combustion-chambers under the ovens having perforated dividing-walls from the chambers below the updraft heating-flues, an air-distributing chamber below each combustion-chamber and having a perforated dividing-wall therefrom, a central transverse off-gas flue in the foundation having connection with the downdraft heating-flues, and air-flues in the foundation parallel to said off-gas flue and having communication with said air-distributing chambers, substantially as specified.

5. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, combustion-chambers under the ovens having communication with said updraft heating-flues, a common central off-gas flue in the foundation having connection with the downdraft heating-flues, air-passages in the foundation having connection with said combustion-chambers, reverting air-flues in the tops of the ovens connecting with the chambers above the heating-flues at the

rear thereof, and burner-openings in the tops of the ovens connecting with said reverting air-flues, substantially as specified.

6. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, a chamber below the updraft-flues of each double set, combustion-chambers under the ovens having perforated dividing-walls from the chambers below the updraft heating-flues, an air-distributing chamber below each combustion-chamber and having a perforated dividing-wall therefrom, a central off-gas flue in the foundation having upward-extending branches opening into chambers at the side of the chambers below the downdraft heating-flues and separated therefrom by perforated walls, and air-flues in the foundation having communication with said air-distributing chambers, substantially as specified.

7. In double-front coking-ovens, the combination of hollow longitudinal walls having each a median transverse partition, a set of vertical updraft heating-flues and a set of vertical downdraft heating-flues upon each side of said partition and extending from front to middle of the ovens, a chamber above each double set of said heating-flues and into which they open, said chamber extending from front to middle of the ovens, combustion-chambers under the ovens having communication with said updraft heating-flues, a common central off-gas flue in the foundation having connection with the downdraft heating-flues, air-flues in the foundation having connection with said combustion-chambers, cooling-flues in the floors of the ovens open at one end to the atmosphere and connected at their opposite ends by a yoke-flue, and a fan and piping connections for drawing air through said cooling-flues and discharging it through the air-flues in the foundation, substantially as specified.

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

MATHEW E. ROTHBERG.

Witnesses:

C. W. COMSTOCK,
DAVID P. BALLARD.