

No. 804,053.

PATENTED NOV. 7, 1905.

M. E. ROTHBERG.

COKE OVEN.

APPLICATION FILED APR. 8, 1905.

3 SHEETS—SHEET 1.

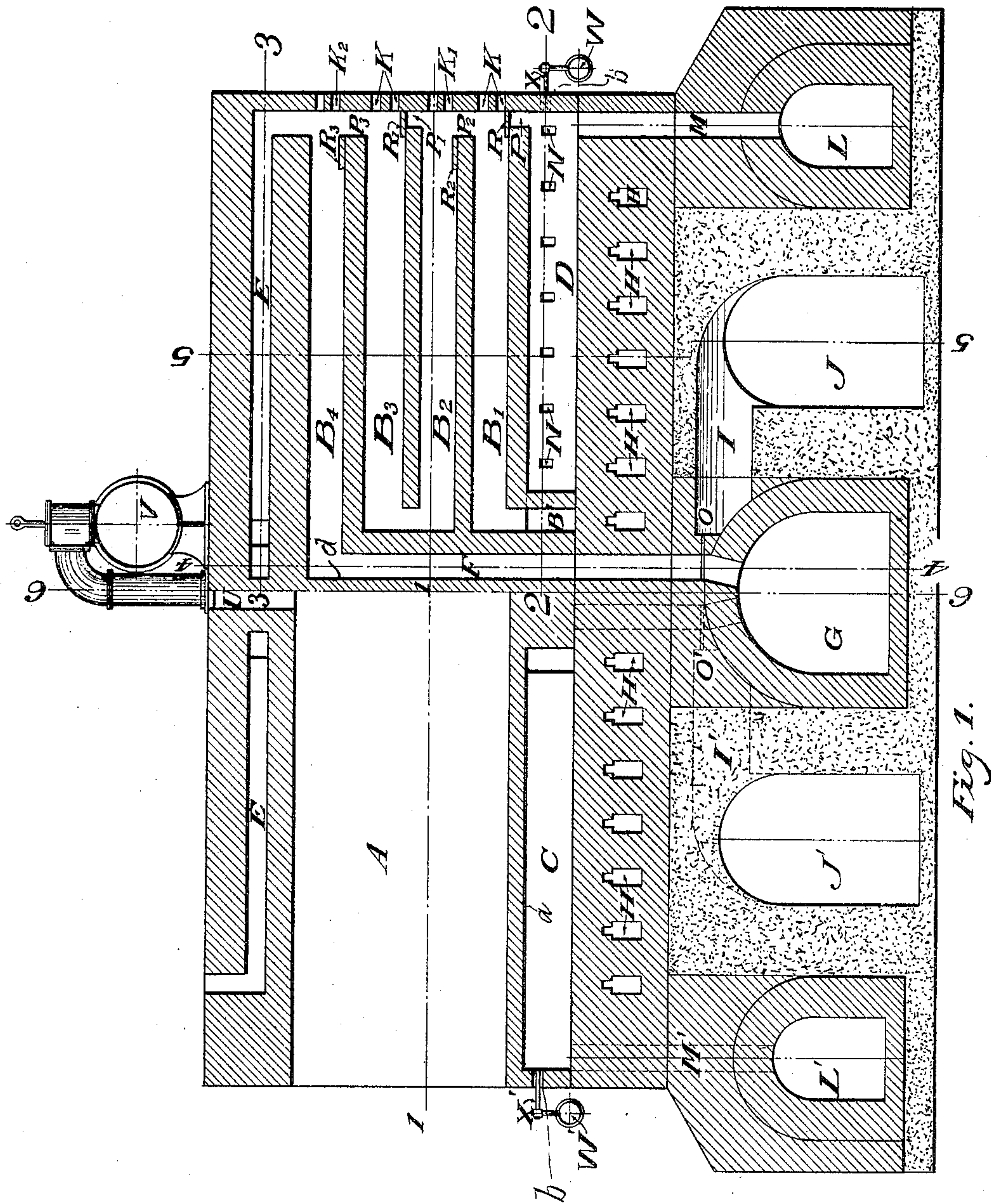


Fig. 1.

WITNESSES.

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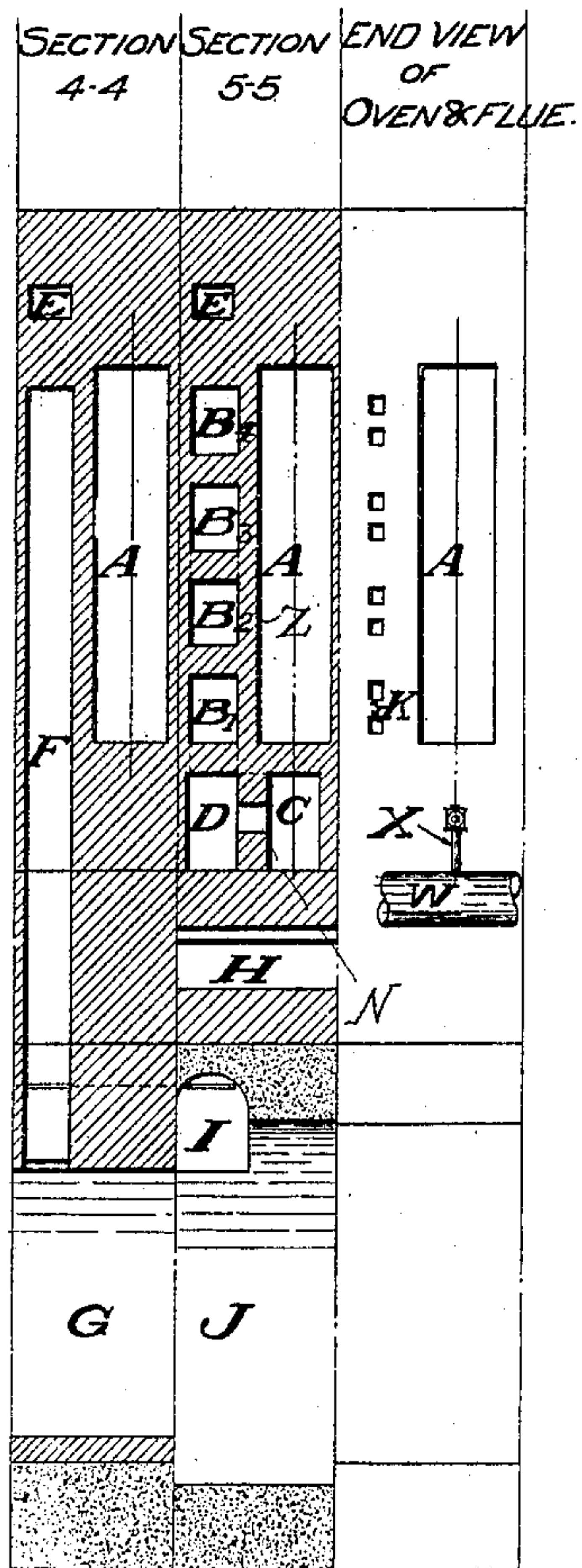


Fig. 3.

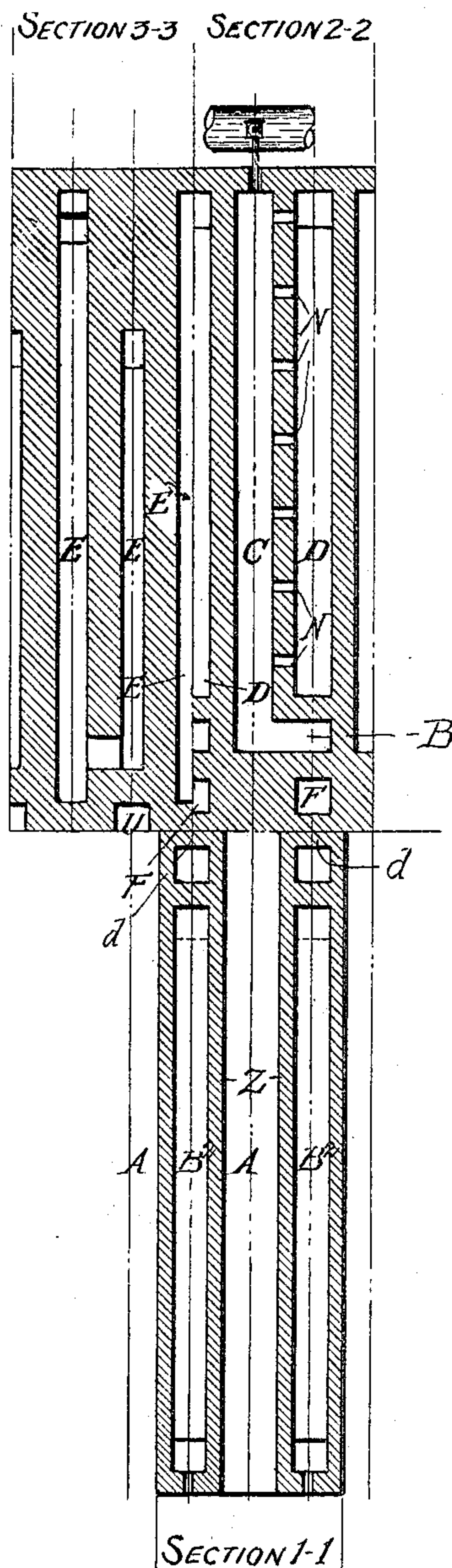


Fig. 2.

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3 SHEETS—SHEET 3

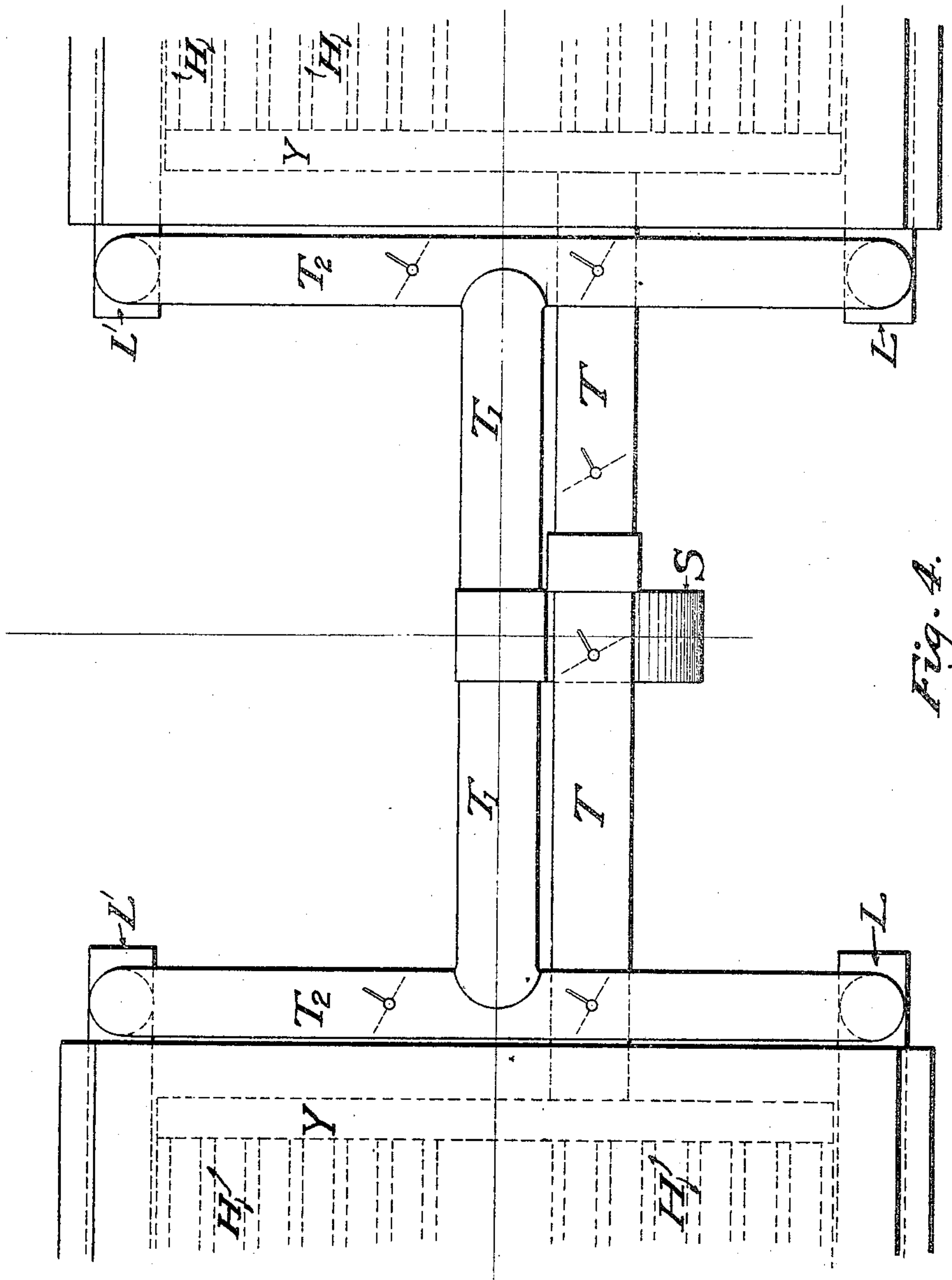


Fig. 4.

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UNITED STATES PATENT OFFICE.

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COKE-OVEN.

No. 804,053.

Specification of Letters Patent.

Patented Nov. 7, 1905.

Application filed April 8, 1905. Serial No. 254,559.

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 characters of reference marked thereon, which form a part of this specification.

The invention relates to coke-ovens of the horizontal open-end type, having heating-flues in the walls between the coking-chambers; and it consists in the novel construction and combinations of parts, as hereinafter set forth.

In the accompanying drawings the invention is illustrated to show the battery of coking-ovens symmetrically with reference to a median vertical plane indicated by the line 6 6.

Figure 1 represents vertical longitudinal half-sections taken, respectively, through the coking-chamber A and through the heating-flues in the partition-walls. Fig. 2 represents various horizontal half-sections taken on the lines 1 1, 2 2, and 3 3, Fig. 1. Fig. 3 represents various vertical sections taken on the lines 4 4, 5 5, Fig. 1, and also a face view of part of the oven-front; and 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.

Section 1 1 is a horizontal half-section through a coking-chamber and partition-wall heating-flue. Section 2 2 is a horizontal half-section through the combustion-chamber under an oven and through the air-inlet chamber under a partition-wall flue. Section 3 3 is a horizontal half-section through the air-inlet flue above an oven and partition-wall flue. Section 4 4 is a vertical transverse section through an oven, a vertical off-gas flue, a top air-inlet flue, and a main draft-flue, and section 5 5 is a vertical transverse section through an oven, a partition-wall flue, combustion and air-inlet chambers, cooling-flues, and passage in the foundation.

In the drawings, the letter A designates the coking-chambers or ovens extending longitudinally and opening on each front; B B' B² B³ B⁴, heating-flues in the walls Z between the coking-chambers, there being two sets of such heating-flues separated by the vertical median transverse partition *d* in each wall;

C, combustion-chambers under each oven or coking-chamber; D, a hot-air-inlet chamber under the heating-flues; E, upper air-inlet flues over the heating-flues B⁴ and ovens A; F, vertical "off-gas" flues; G, the main off-gas flue leading to the stack; H, cooling-flues extending transversely under the combustion-chambers and hot-air-inlet chambers; J J', passages extending transversely in the foundation and having offsets I I' for access to the stack-draft dampers; K K' K², openings for burners; L L', air-flues; M M', small vertical flues; N, small openings into the combustion-chamber C; P P' P² P³, valved openings in the wall heating-flue; R R' R² R³, dampers; S, a suction-fan; T, suction-pipes in connection therewith; T' T², air-discharge pipes also in connection with the suction-fan; U, a gas-flue; V, a gas-main; W W', gas-feed pipes; X X', burners; Y, a common or yoke flue of the cooling-flues, and O O' dampers for the stack-draft.

The operation is as follows: The gases liberated from the charge of coal in the ovens A pass off through the gas-flues U, extending from the upper middle part of each oven to the gas-main V, by which they are conducted in the usual manner to a condensing-house for the removal of tar and ammonia. The gases are then returned to the ovens by piping, which is in connection with the feed-pipes W W', from which they flow to the burners X X'. These burners communicate through opening *b* in the front wall with combustion-chambers C, which extend under the oven from its front ends to its middle portion, being separated therefrom by a horizontal hearth-partition *a*. In the operation of coke-ovens the high temperature necessary for coking is communicated to the brickwork to such a degree that the oven-foundations would be injured were not some means provided for abstracting the heat from the brickwork below the ovens. For this purpose the cooling-flues H are arranged in horizontal series below the combustion-chambers. These cooling-flues are each open at one end to the atmosphere and at the other end connect with a common or yoke flue Y, whereby all the cooling-flues of one bank of ovens are brought in connection with a suction-fan S. These cooling-flues extend transversely under the entire bank or battery of ovens and by means of the suction-fan acting in connection therewith through the suction-pipe T and the discharge-pipes T' T² air is kept constantly circulating through the brick-

work under the ovens. The cold air entering the series of transverse flues becomes heated in its passage and is forced by the suction-fan through the discharge-pipes T' and T² into the air-flues L and L', which extend transversely through the front portion of the basement-work throughout the length of the battery and communicate with the small vertical flues M M', which extend upward to the air-inlet chambers D under the partition-wall flues B'. From the air-inlet chamber D the heated air passes through a series of small lateral openings N into the combustion-chamber C, where it becomes mixed with the gas from the burner for combustion. The heated products of combustion pass along the chamber C until near the center of the oven, where they pass through the short transverse flue B to the series of heating-flues B' B² B³ B⁴ in the partition-wall between the oven-chambers. By these flues, which are of reverting form communicating at alternate ends, the heated gases and smoke are conducted back and forth and upward through the partition-wall in such a manner as to distribute the heat throughout this side of the oven. From the end of the upper flue B⁴, which is about level with the top of the oven, the gaseous products of combustion pass down through the vertical flue F to the main off-gas flue G, which extends transversely through the central portion of the foundation and serves to conduct such products to the stack. Normally the reverting-flue in the partition extends from the transverse flue B near the middle of the oven-wall horizontally along the portion B', thence reversely along the horizontal flue B², thence forward again along the horizontal flue B³, and then again reversely along the horizontal flue B⁴ toward the middle, where it communicates with the off-gas flue; but the vertical air-flues M extend upward through the front of the partition-wall and communicate with the front ends of the horizontal reverting-flues, except when the dampers R and R' are closed, as in such normal position. Should it be required to operate an additional burner, as at K, the damper R is pushed in to open the air-flue P to maintain proper combustion. If it should be required to operate burners near the upper portions of the partition-walls—as, for instance, in producing combustion in the flues B⁴—such burners are introduced at K² and air is supplied by means of the top air-inlets E, which bring air through the top of the oven downward to the points of combustion. For the most part the damper R' will be closed. Should it become necessary to reduce the temperature in the flues B² and B³, this damper should be opened, allowing some of the off-gases to pass directly from the flue B' to the flue B⁴. The dampers R² and R³ are designed to be normally open; but they will be found useful in regulating the flow of these heated gases should occasion require.

Near the junction of the gas-exit flues F with the main off-gas flue G dampers are provided, as at O O', which are used for establishing uniformity of the stack-draft in the various ovens. As these important dampers are in the lower middle portion of the interior of the structure, the transverse passages J in the foundation, parallel to the main draft-flue, are arranged to facilitate their ready adjustment. The general form of each battery of coke-ovens is rectangular, the coking-chambers extending through from front to front longitudinally and the cooling-flues in the basement portion extending transversely from end to end. The combustion-chambers, heating-flues, air-inlet flues, and off-gas flues are symmetrically arranged with reference to the median plane. Each battery has for combustion purposes a main lower system of air-inlet flues and a system of top air-inlets. Adjacent batteries are designed to be combined with a single suction-fan operating the cooling-flues of both batteries.

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

1. A coking-oven having in combination a series of adjacent coking-chambers, reverting heating-flues in the side walls of the coking-chambers, a transverse stack-draft flue in the foundation at one end of said heating-flues, vertical off-gas flues connecting said stack-draft flue with said heating-flues, a transverse air-supply flue in the foundation parallel to said stack-draft flue and at the other end of said heating-flues, and combustion-chambers under the ovens and having connection with said air-supply flue, substantially as specified.

2. A coking-oven having in combination horizontal reverting heating-flues in the side walls of the coking-chamber, a transverse stack-draft flue in the foundation at one end of said heating-flues and having connection therewith, a transverse air-supply flue in the foundation, parallel to said stack-draft flue and at the other end of said heating-flues, an air-inlet chamber under the heating-flues having connection with said air-supply flue and a combustion-chamber under the oven having a perforated dividing-partition between it and said air-inlet chamber, substantially as specified.

3. A coking-oven having in combination a series of adjacent coking-chambers, horizontal reverting heating-flues in the side walls of the coking-chambers, a transverse stack-draft flue in the foundation, vertical off-gas flues connecting said stack-draft flue with said heating-flues, a transverse air-supply flue below the oven parallel to said stack-draft flue, combustion-chambers under the ovens having connection with said air-supply flue, cooling-flues in the floor of the oven open at one end to the atmosphere, and means for establishing a circulation of air through said cooling-flues

and air-supply flue in communication with the combustion-chamber, substantially as specified.

4. In a double-front coking-oven, the combination with longitudinal open-end coking-chambers extending from front to front, heating-flues in the side walls of said coking-chambers extending from front to middle, and combustion-chambers under said coking-chambers and in communication with said heating-flues, of a middle stack-draft flue in the foundation, downward-extending flues from said heating-flues to said stack-draft flue, dampers for said downward-extending flues, air-flues in communication with the combustion-chambers, horizontal series of cooling-flues under the combustion-chambers, and a fan, substantially as specified.

5. In a coke-oven, the combination with a series of adjacent coking-chambers, reverting

heating-flues in the side walls of said chambers, their openings and dampers for regulating the flow of the gases, combustion-chambers under said coking-chambers, and air-chambers in communication therewith, a stack-draft flue, downward-extending flues from the reverting heating-flues to said stack-draft flue, their dampers, cooling-flues in the foundation, air-flues in the foundation communicating with said air-chambers, and means for drawing air through said cooling-flues and discharging the same through said air-flues in the foundation into said air-chambers, substantially as specified.

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

MATHEW E. ROTHBERG.

Witnesses:

ALFRED ERNST,
R. C. BATEMAN.