G. E. BEHR, Jr.

COKE OVEN.

APPLICATION FILED APR. 20, 1909.

996,829.

Patented July 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

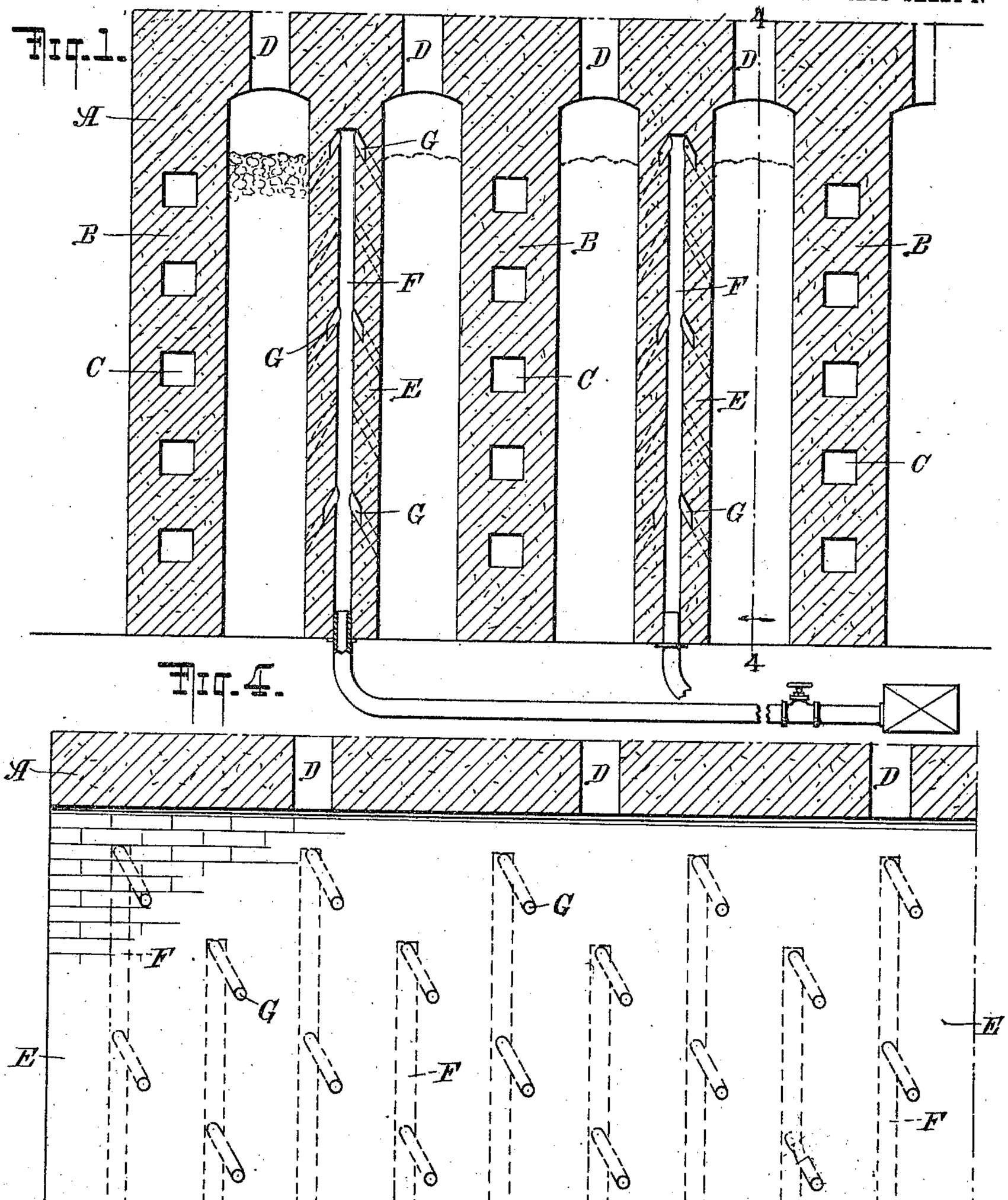

Fig. 4.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

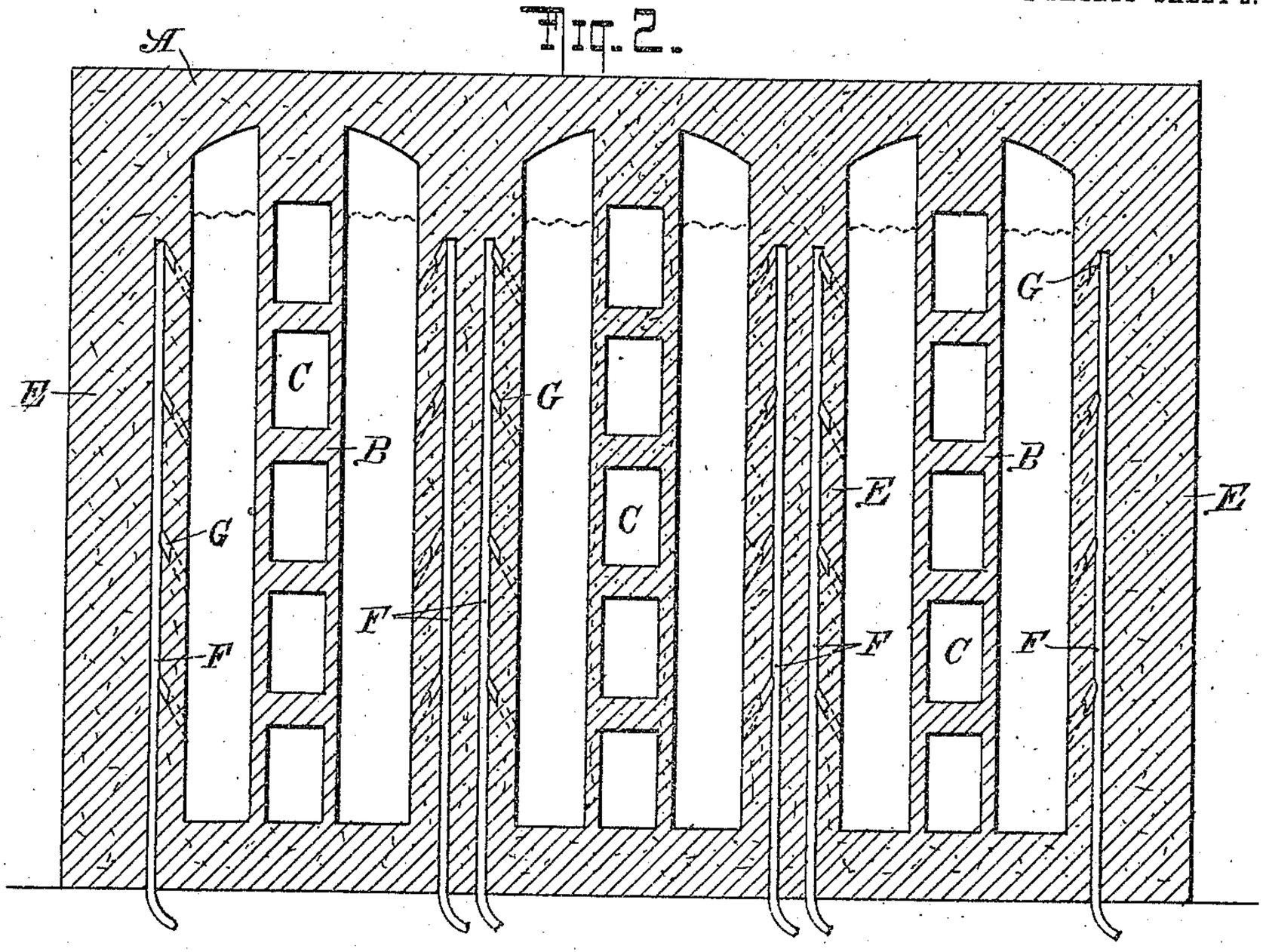
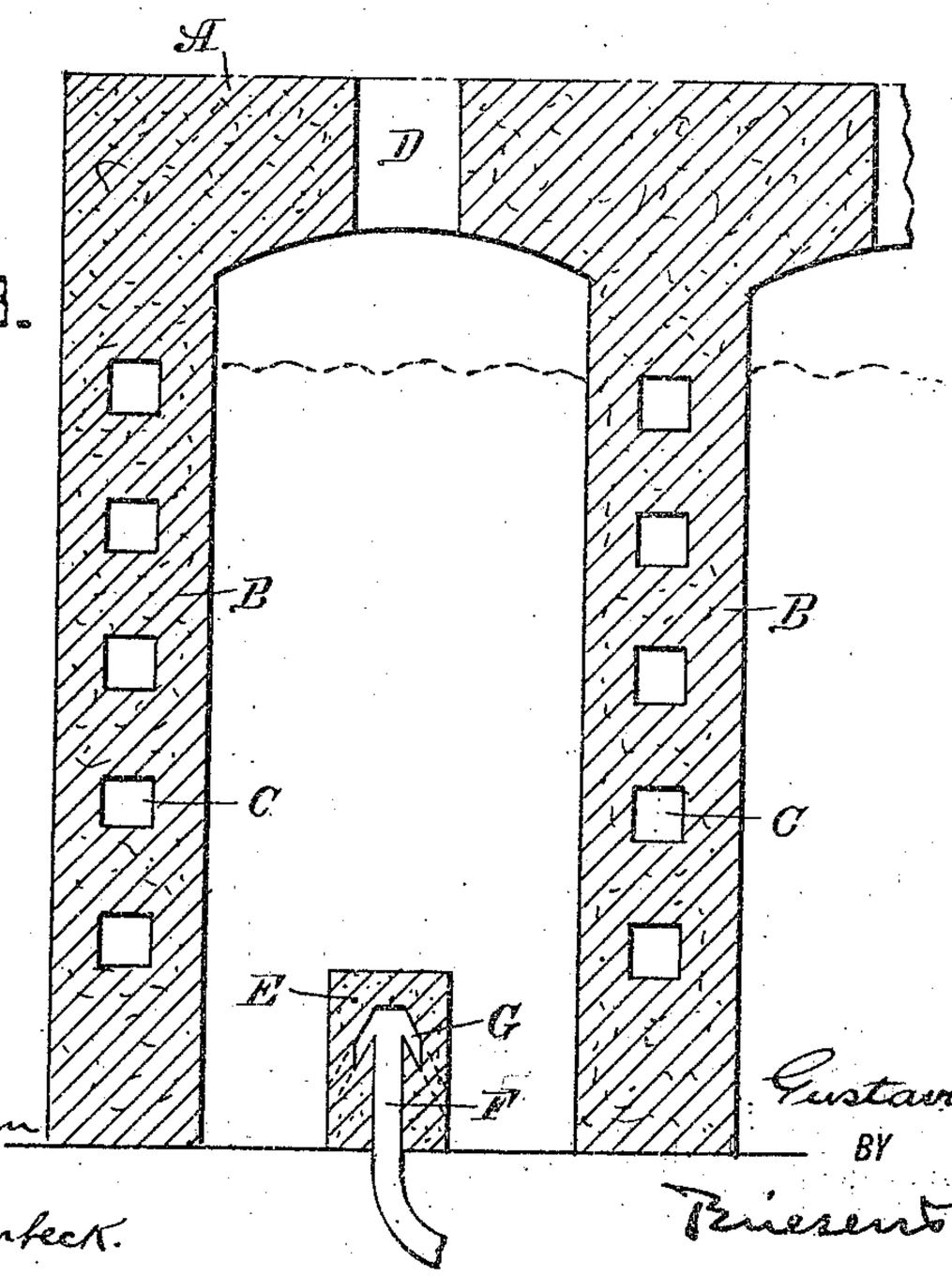


Fig. 3.



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GUSTAVUS E. BEHR, JR., OF BROOKLYN, NEW YORK.

COKE-OVEN.

996,829. Specification of Letters Patent. Patented July 4, 1911.

Application filed April 20, 1909. Serial No. 491,146.

To all whom it may concern:

Be it known that I, GUSTAVUS E. BEHR, Jr., a citizen of the United States, and resident of the borough of Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Coke-Ovens, of which the following is a specification.

My invention relates to the construction of coke ovens in such a manner as to increase the yield of by-products due to the withdrawal of the gases from the hot coal, and furthermore in so constructing a coke oven that the by-products in the form of gas shall not become deteriorated or decomposed between the time they are generated and the time of their withdrawal from the oven.

In the drawings Figure 1 illustrates a section through the oven of my construction; Fig. 2 illustrates a section through a modified form; Fig. 3 illustrates another modification; and Fig. 4 is a side view of the wall showing the gas withdrawing orifices, Fig. 4 being a side view of one of the central walls of Fig. 1.

The coke oven A is built of brick, and some of the walls, to wit: alternate walls B, contain a number of flues C, which serve for the passage of combustion gases heated approximately to 1200° C. Coal is fed into the oven through the openings D until it reaches the level indicated in the drawings. The enormous heat acting through the flues C upon the coal expels from the coal certain gases and organic matters which are profitably carried off, being condensed, scrubbed and refined after leaving the oven and containing among other valuable ingredients ammonia, hydrocarbons, and oils. A portion of the hydrocarbons and other gases constituting illuminating gas thus withdrawn from the coal is usually employed for heating the oven as it passes through the flues C. In the wall E opposite the heat radiating wall B is built a system of flues comprising a vertical flue F connected with downwardly and backwardly projecting gas withdrawal flues G, as illustrated in Fig. 4. According to the usual dimensions of a coke oven this wall should be about thirty or more feet in length, and about eight or nine feet in height, the coal chambers being about ten inches in width

The operation of my oven is as follows: After coal has been charged into the oven up to the level indicated, the oven is closed so as to prevent the entrance of air or oxygen. This is to prevent combustion during the heating process which may last from twenty to twenty-four hours more or less. It has been found that the heat is transmitted through the coal very slowly, and that it will take as much as eighteen hours for the coal ten inches away from the heat radiating wall to reach the same temperature as the coal which touches said wall. As soon, however, as the heat begins to act upon the coal, the coal gives up its organic matter, its coal tar, oils, and gaseous hydrocarbons which in the oven of my invention are drawn off in a direction away from the source of heat, and in lines substantially perpendicular to the heat radiating wall. The advantage of this method of withdrawing the gases is that it prevents them from coming in contact with any portion of the apparatus hotter than that portion where they were generated, thereby preserving the gases in the condition in which they were formed and preventing all possibility of decomposition or deterioration due to the action of heat on said gases after their formation.

In the ordinary coke ovens now in use the gases rise through the heated coal and are withdrawn from the top of the coal chamber, a process according to which the gases are continuously subject to heat either of the same degree or of a greater degree than the heat under which they were generated. According to this older process it was found that the ammonia constituent of the gases was broken up into nitrogen and hydrogen, two gases of comparatively no commercial value as compared with the ammonia, and that the by-products such as the gaseous hydrocarbons and oils were partially converted into hydrocarbons of a lower order and carbon, neither of which products compare in commercial value with the undecomposed oils and hydrocarbons. By my invention, therefore, I accomplish the important economic result of obtaining a far greater yield of valuable by-product than has been heretofore known to be possible, this being due to a large extent, as already described, to the avoidance of all effects of heat on the gases after they have once been generated. After perhaps 24 hours of heat treatment, the coal is completely converted into coke, the oven doors are opened, and the entire mass of coke is forced out by pushing ma-

chinery of the ordinary construction. The rear end of the oven is in some cases slightly wider than the front end according to the common practice of the art, so that as the mass of coke is pushed out it leaves the oven in the form of a wedge, thereby preventing friction and decreasing the power necessary to push the mass of coke out of the oven. The gas withdrawal flues G are inclined toward the rear end of the furnace, so that when the coke is pushed out of it, the wall will not be damaged by reason of any friction between the coke and the apertures of the gas withdrawal flues G. These apertures are as numerous and as small as possible, being built practically in the fire brick composing the wall. The upward inclination of the gas withdrawal flues G toward the flue F prevents the coal from lodging in the gas withdrawal flues G as it is charged into the oven. The free end of the flue F is connected with an exhauster in the usual way, which creates suction in said flue, and causes the gases generated by the hot coal to be withdrawn from the oven.

In Fig. 1 the wall E is apertured to tap two coke ovens standing side by side, thereby greatly strengthening the oven as compared to some old styles of construction where the arches were supported solely on the radiating walls which by virtue of the flues therein, and of the action of the great heat on the brick, were not well suited to bear great strain.

In Fig. 2 the walls E are shown as practically the sole supporting walls of the oven, thereby taking all the load except that of its own weight from the wall B, increasing its life and comparative strength. In Fig. 2 each of the walls E contains a separate series of flues F and gas withdrawal flues G, this construction being desirable for the following reason: When the coking operation is completed, and before the pushing apparatus comes into play, it is necessary to shut off the connection between the flue F and the gas mains until the coke has been pushed from the oven and it has been recharged. This shut-off connection would affect two chambers of the oven in the form illustrated in Fig. 1, and consequently produce a slightly undesirable result as the pushing machine operates only on one of said chambers at a time; in Fig. 2, however, each cut-off being independent will only affect a particular chamber in which the coking operation has been completed. In each construction it will be noted that the gases are subjected to continually lessening temperatures as they pass from the point of generation to the system of flues.

In Fig. 3 is shown the modification in which the flues F and gas withdrawal flues G are located in a comparatively low wall at the bottom and center of the oven. The heat of the two walls B causes the gases to approach the center of the chamber and to run down the central line of the coal until they are withdrawn by the gas withdrawal flues G. In this case the gases while not continuously cooled in increasing degree from the times of generation to the time of withdrawal, are nevertheless withdrawn from the apparatus without at any time being heated to a much greater degree than the temperature of their generation.

Having thus described my invention what I claim is:

1. A coke oven having a bottom wall, a roof and straight side walls, there being a coal feeding opening in the roof and a coke discharge opening at the rear end of the oven; one of the side walls being provided with heating channels and the other with a suction conduit connected with the interior of the oven by a plurality of gas withdrawal flues, the latter extending to said interior in a direction angularly toward the bottom wall and the end discharge opening.

2. A coke oven comprising a series of flat vertical walls sustaining the roof of the oven, the said walls containing flues and connections leading into the interior of the oven, and into the flues for withdrawing the gases generated by the radiation of heat, heat radiating walls interposed between two of said series of walls, and a suction apparatus adapted to withdraw the gas generated by the intermediate heat-radiating walls through the small connections and the flue in a direction substantially at right angles to the radiating wall, and so arranged as to cause the gases generated to be withdrawn from the point of generation through a zone of heat less intense than that existing at the point of generation, the gases being maintained in their passage through the coal at a temperature less than the temperature of generation.

3. A coke oven comprising a series of flat vertical walls sustaining the roof of the oven, the said walls containing flues and connections leading into the interior of the oven and into the flues for withdrawing the gases generated by the radiation of heat, heat radiating walls interposed between two of said series of walls, the said flues and connections in each of said sustaining walls comprising two independent series, one for each coal chamber, and a suction apparatus adapted to withdraw the gas generated by the intermediate heat-radiating walls through the small connections and the flue, in a direction substantially at right angles to the radiating wall, and so arranged as to cause the gases generated to be withdrawn from the point of generation through a zone of heat less intense than that existing at the point of generation, the gases being maintained in their passage through the coal at

a temperature less than the temperature of generation.

4. A coke oven comprising a bottom wall, a roof, heat radiating walls provided with substantially horizontal heating flues, gas withdrawal walls extending between and alternating with the radiating walls and provided with outlet passages for the gas generated in the coking process and a suction conduit connected with the outlet passages.

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

GUSTAVUS E. BEHR, JR.

Witnesses:

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JOHN A. KEHLENBECK.