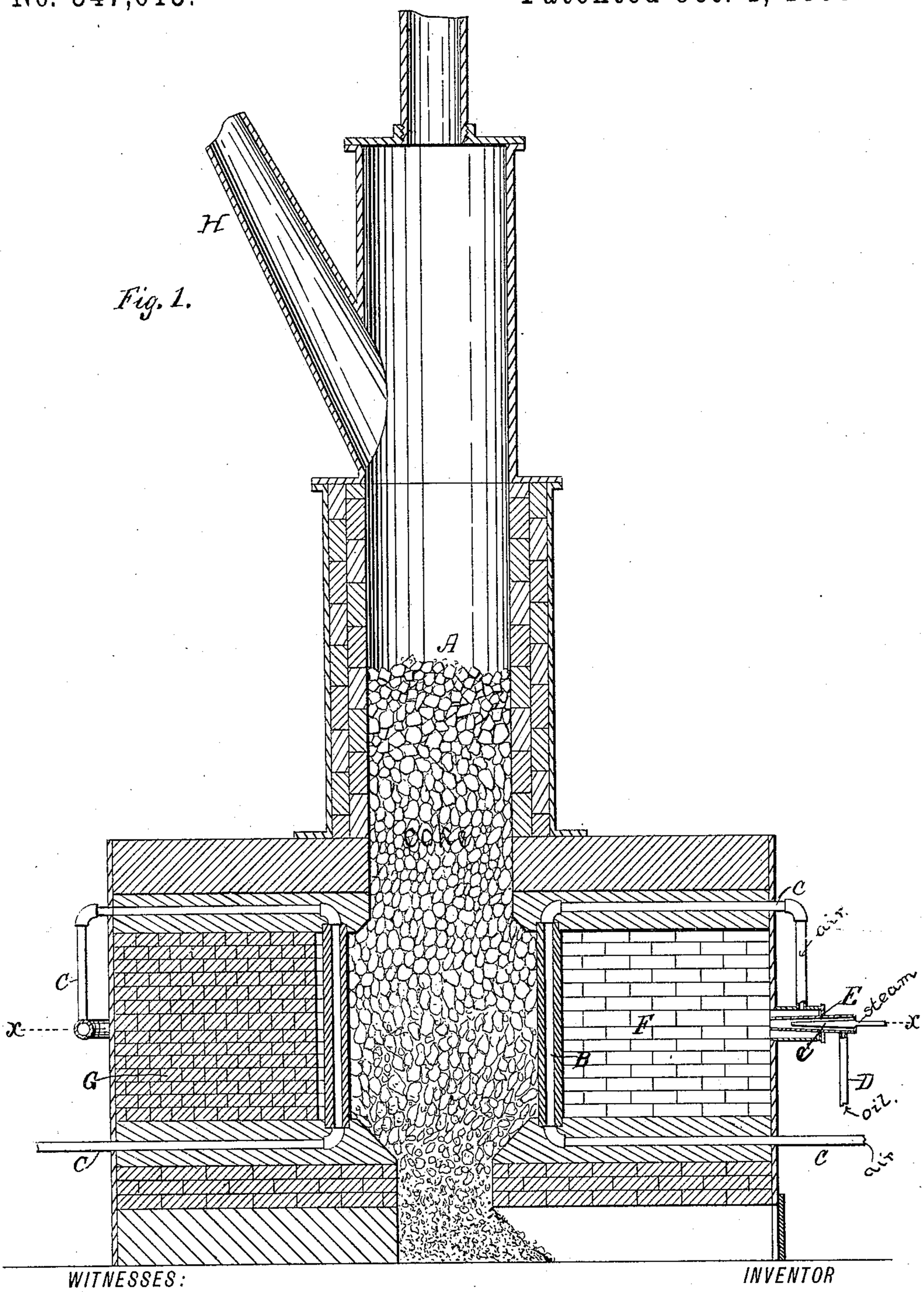
(No Model.) 2 Sheets—Sheet 1.

E. D. KENDALL.

APPARATUS FOR MANUFACTURING GAS.

No. 547,015. Patented Oct. 1, 1895.

Fig. 1.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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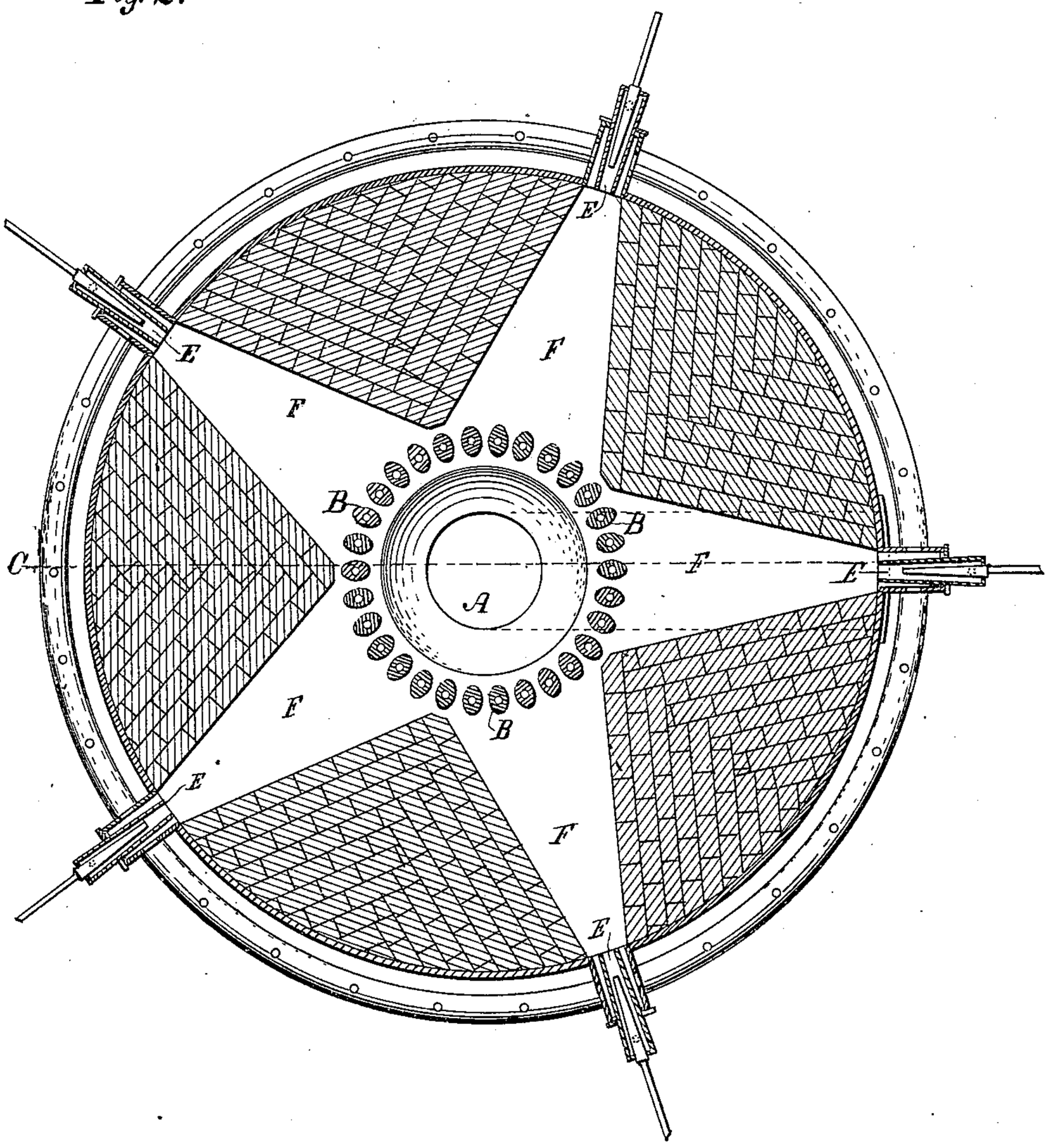
Fig. 2.



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UNITED STATES PATENT OFFICE.

EDWARD D. KENDALL, OF JAMAICA, NEW YORK.

APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 547,015, dated October 1, 1895.

Application filed May 4, 1891. Serial No. 391,498. (No model.)

To all whom it may concern:

Be it known that I, EDWARD D. KENDALL, of Jamaica, Queens county, State of New York, have invented a new and useful Improvement in Apparatus for Manufacturing Gas, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

My invention is especially designed for subjecting a mass of carbon, preferably in the form of coke, contained in a suitable apparatus to the direct action of the flame or flames from burning hydrocarbon with or without the presence of aqueous vapor in addition to that which results from the burning of the hydrogen of the hydrocarbon, the carbon so heated being in contact and reacting with the gas or gases and aqueous vapor derived from the burned hydrocarbon or accompanying steam; and the apparatus which I have devised, in order to conduct my process continuously and with the best advantage, consists in the features set forth in the following specification, and illustrated in the accompanying drawings.

The process which I propose to carry out consists in the combustion of a liquid hydrocarbon with air in a chamber and in carrying the products of that combustion and the heat generated thereby into contact and through an incandescent body of carbon without consuming said carbon by the supply of free oxygen thereto. The combustion of liquid hydrocarbon produces carbonic acid and aqueous vapor. By the passage of the carbonic acid through the incandescent coal the carbonic acid becomes changed to carbonic oxide, an inflammable gas. The aqueous vapor being heated to a point of almost dissociation when it comes in contact with the incandescent carbon produces water-gas. That is generally hydrogen and carbonic oxide, so that as a result of my process I obtain a gas which consists of hydrogen and carbonic oxide and nitrogen, the proportions of which I may state, without absolute accuracy, as follows: hydrogen, seventeen per cent.; carbonic oxide, thirty-four per cent., and nitrogen forty-nine per cent. Ordinary producer-gas contains generally about sixty-four per cent. of nitrogen and the balance principally carbonic oxide. It is obvious that the gas which I produce is a much superior heating-gas to ordinary producer-gas. I have calculated its heating power as equal to one hundred and forty-six thousand six hundred and forty heat-units in comparison with one hundred and three thousand four hundred and eighty-two heat-units from coke producer-gas.

It is essential in order to produce the best results by my invention that the carbon should not be consumed by free oxygen admitted with the air, but that its combustion shall occur practically only from its reaction with the aqueous vapor. I may admit with the products of combustion of my liquid hydrocarbon an additional supply of aqueous vapor in the shape of steam, if I so desire.

The apparatus is shown in the accompanying drawings, in which—

Figure 1 represents a vertical section, and Fig. 2 a cross-section through Fig. 1 on the line *x x*.

My apparatus consists generally of a central cylindrical chamber A to contain the body of carbon, preferably coke, which I propose to employ. This body of carbon may be supported in any suitable way, and any suitable arrangements may be made for removing the ash. The lower part of the carbon is surrounded by a series of vertical bars B, preferably made of fire-clay, which, if found desirable to reduce the heat, may be made hollow and be provided with interior cooling-apertures for the passage of air or water, as may be desired. As shown, I have arranged them for the passage of air through pipes C, extending through them. The air which may be forced through these pipes under pressure becomes heated and may be employed to aid in the combustion of the hydrocarbon entering through the pipe D. Tuyeres E are employed in any suitable construction, by means of which I may introduce a jet of hydrocarbon and air, to which steam may be added, if desired, in the chambers F, surrounding the cylindrically-arranged bars B. The pipe *e'* may serve for the injection of a steam-jet, the petroleum introduced being burned in combination with the air, which may be introduced in any suitable way.

I have shown the chambers F as divided from each other by supports or partitions of brick G; but the details of this arrangement

may be varied, as desired. By the arrangement shown, however, I am enabled to concentrate five or more radial flames upon the central body of carbon. I propose that the only air introduced shall be that injected in connection with the hydrocarbon through the tuyeres.

I do not fully describe all the details of a gas apparatus of this kind, the structure of the same being ordinarily known. The lateral chute H is used for supplying the carbon as it is absorbed, so as to maintain an approximately-continuous level of the body of carbon.

In putting my apparatus into operation, in the first place I fill the central chamber A with carbon, preferably coke, though, if purity of gas is not desired, anthracite might be employed. Then starting my jets, the carbon is rapidly brought to incandescence, up to which point the gases may be allowed to escape. Then, continuing the process, the products of combustion are passed through the incandescent material and the gases produced are conducted off in the usual way for combustion. The amount of air to be admitted can be readily determined by an analysis of the gas from time to time, and that analysis should show not to exceed fifty per cent. of nitrogen in the gas in order to demonstrate that the apparatus is doing its best work.

I do not claim the process of making non-combustible gas under pressure described in British patents of March 16, 1886, No. 3,697, and January 25, 1887, No. 1,132.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for the manufacture of gas the combination of a hydrocarbon combustion chamber, a vertical carbon containing stack communicating with said chamber, a plurality of hollow vertical grate bars separating the stack from the chamber, and a series of hydrocarbon burners arranged about and directed against said hollow grate bars and the material supported thereby and an air connection leading to said hollow grate bars and thence to the burners to supply heated air to support combustion of the hydrocarbon, as set forth.

2. In a gas-plant, a furnace having a combustion-chamber in which hydrocarbon is burned, with or without the addition of steam, and which connects with a compartment for containing carbon in fragments, which compartment is separated from the said combustion-chamber by a series of hollow bars made of refractory material, the said bars being so constructed as to hold in place the broken carbon while permitting the flame and gases from the burning hydrocarbon to impinge on the carbon and on said bars, and an air conduit connecting said bars with the combustion-chamber, substantially as shown and described.

3. In a gas-plant, a furnace containing a combustion-chamber in which hydrocarbon is burned, with or without the addition of steam, and which communicates with a compartment for containing carbon in fragments, which compartment is separated from the said combustion-chamber by a series of tubular bars made of refractory material, the bars holding the broken carbon in place, the hollows of the bars communicating at either end of each bar with appropriate air-passages in the body of the furnace so that air may be passed through the interiors of the tubular bars, as and for the purposes shown and described.

4. In a gas-plant, a furnace containing a combustion-chamber in which hydrocarbon is burned, with or without the addition of steam, and which communicates with a compartment for containing carbon in fragments, which compartment is separated from the said combustion-chamber by a series of tubular bars, made of refractory material and serving to hold the broken carbon in place, each of the said tubular bars containing a pipe which is connected at either end of the bars with a system of pipes conveying air or water, as and for the purposes shown and described.

5. In a gas producing apparatus, the inner chamber A for containing carbon in fragments, the hollow vertical bars B separating the same from the external combustion-chambers, the radially arranged combustion-chambers F F, tuyeres E provided with the hydrocarbon and air supply pipes, and air connections between said bars and the tuyeres, substantially as described.

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

EDWARD D. KENDALL.

Witnesses:
H. COUTANT,
ANTHONY GREF.