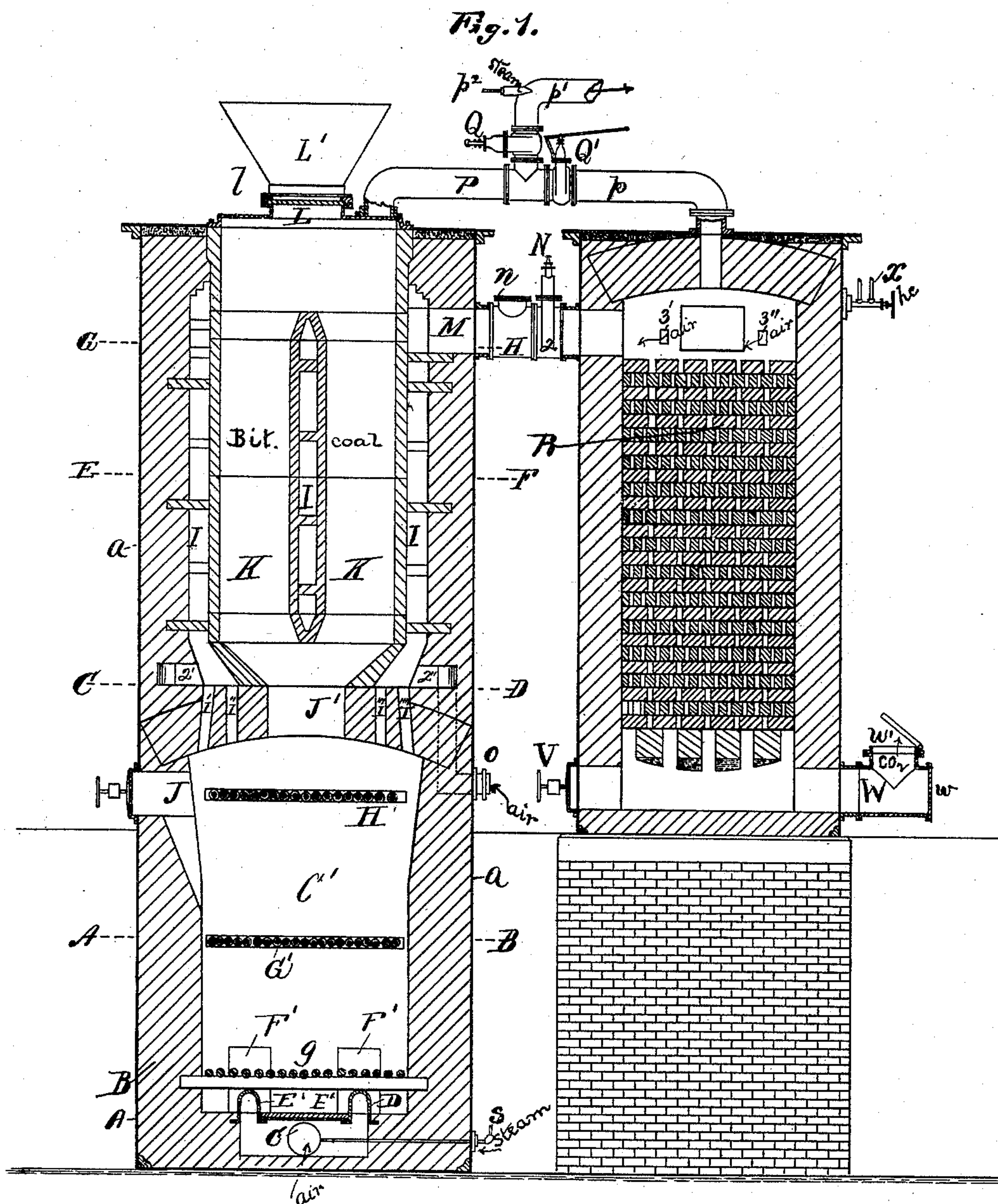


W. H. MORGANS.
GAS GENERATING APPARATUS.

No. 474,178.

Patented May 3, 1892.



WITNESSES
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D. Larrard Henry

INVENTOR
William H Morgans.
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his Attorneys.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

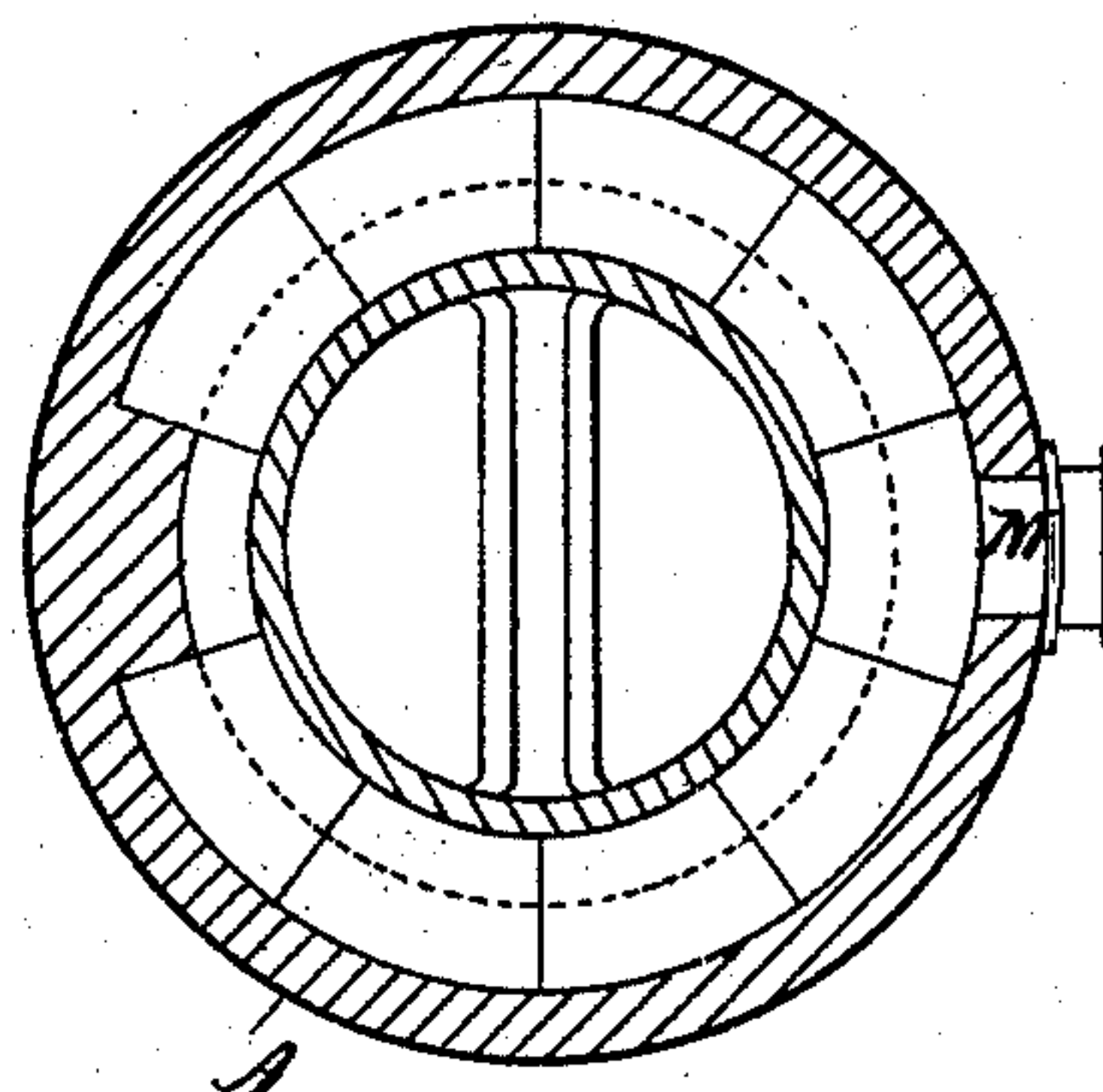


Fig. 3.

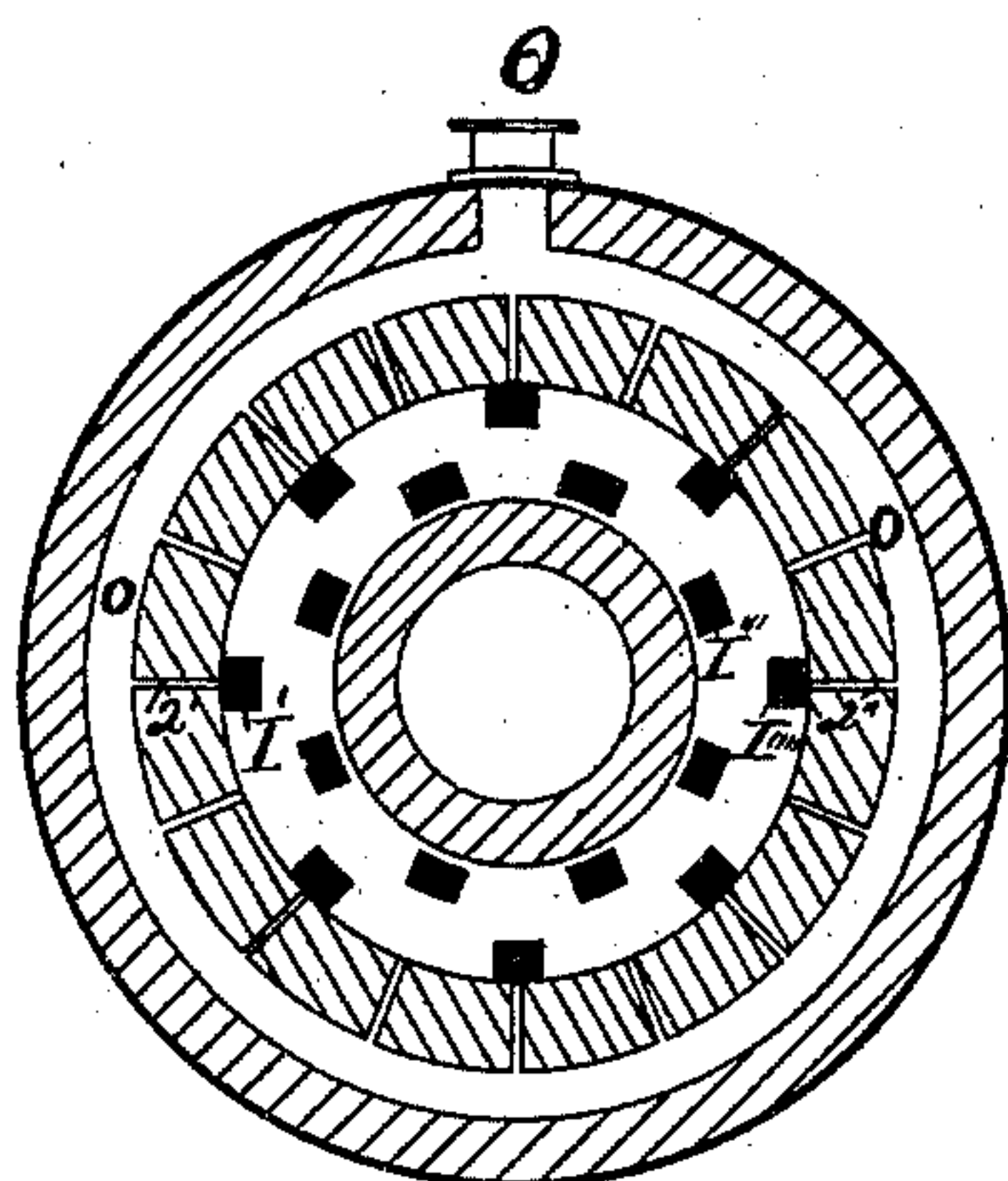


Fig. 4.

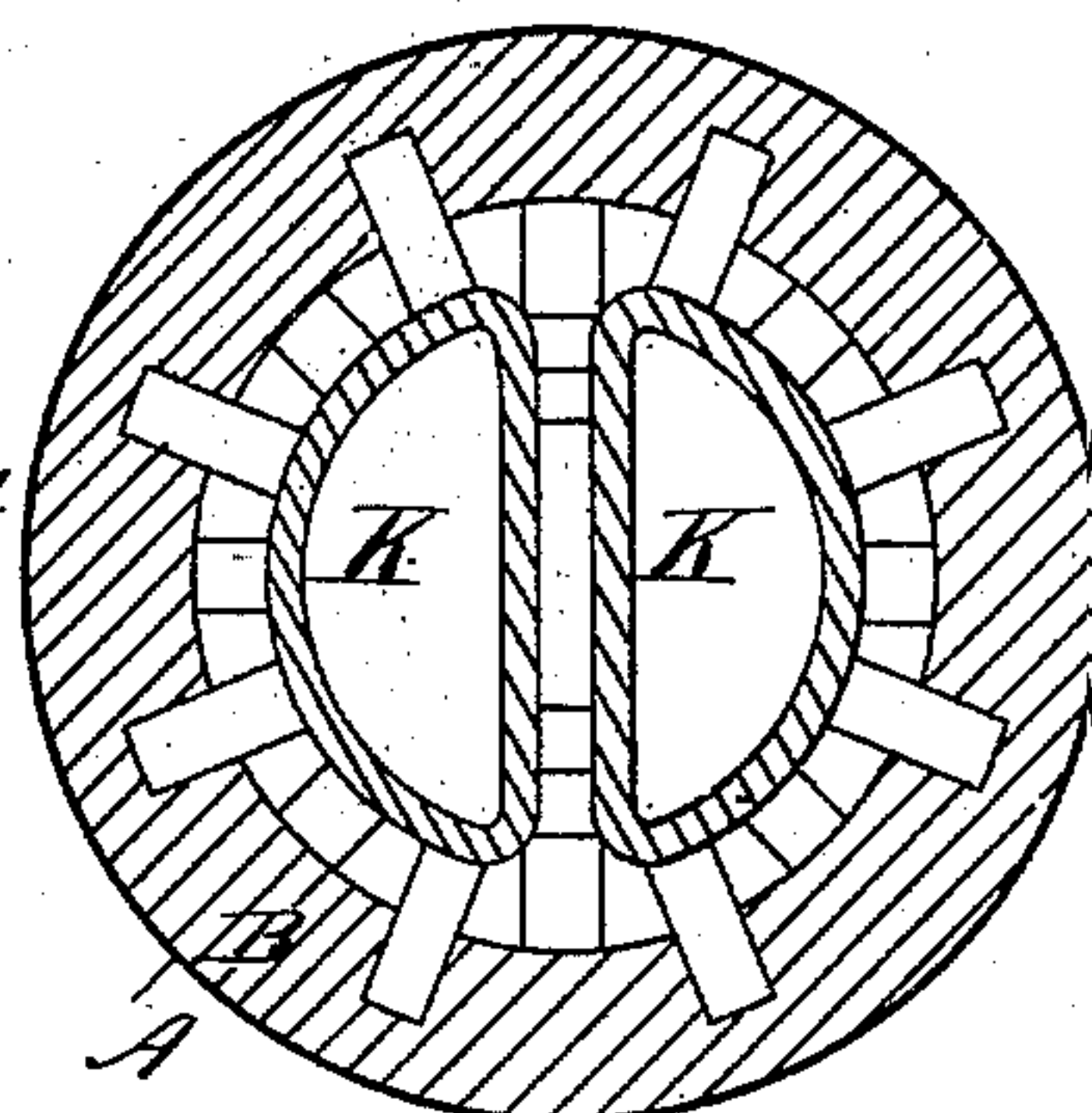
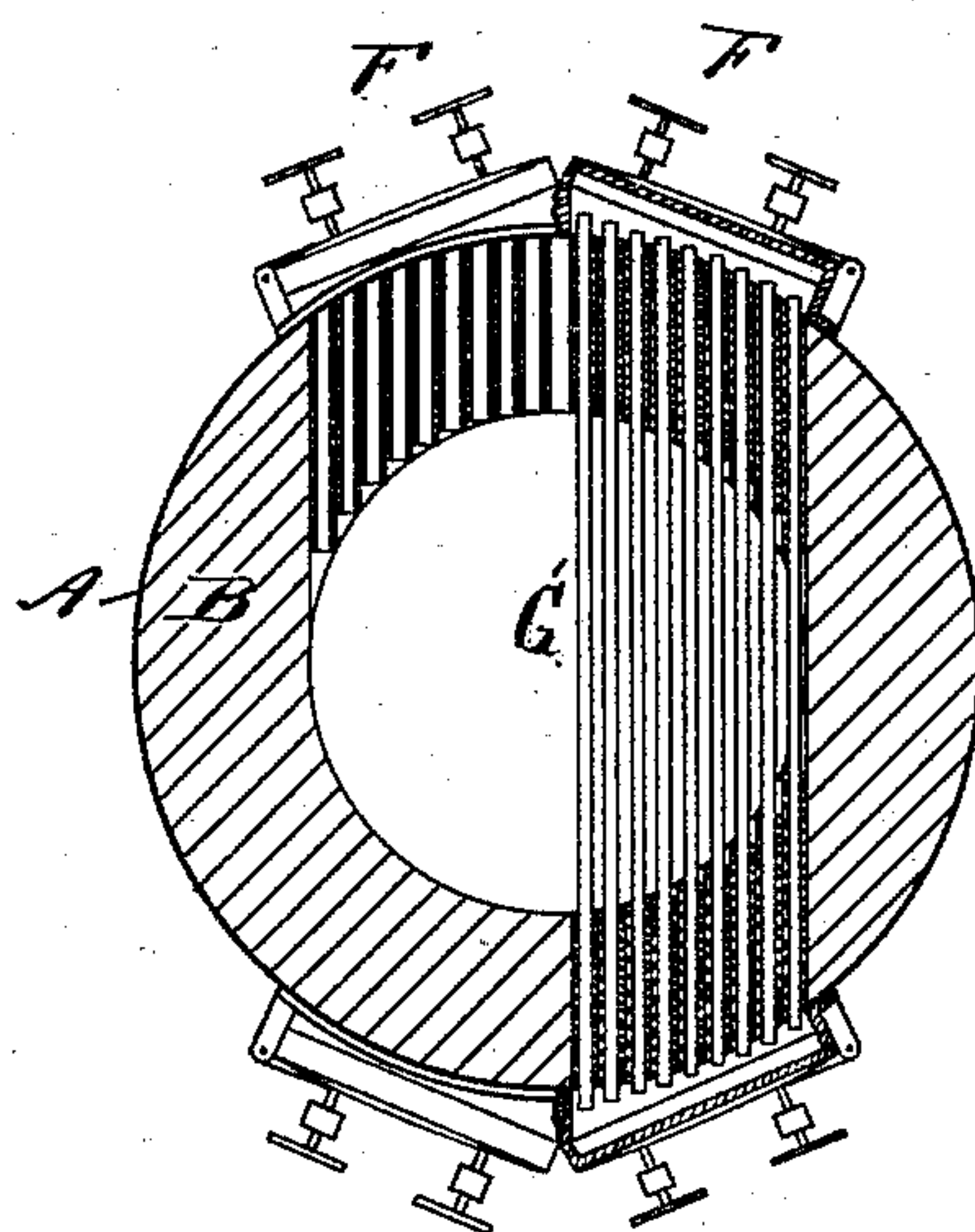


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. MORGANS, OF PONTIAC, MICHIGAN.

GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 474,178, dated May 3, 1892.

Application filed May 14, 1890. Serial No. 351,717. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. MORGANS, a citizen of the United States, residing at Pontiac, in the county of Oakland and State of Michigan, have invented a new and useful Improvement in Gas-Generating Apparatus, of which the following is a specification.

This invention relates to an apparatus for the manufacture of gas, and has for its object the production of an apparatus by means of which gas can be produced from water with the use of raw or uncoked bituminous coals, and in which the gaseous products emanating from the coal may be employed either alone or in unison with the hydrogen and carbonic oxide produced from the water in the presence of incandescent carbon.

As is well known, one of the common ways of producing illuminating-gas is to decompose water into the elements of oxygen and hydrogen by throwing a jet of steam through a mass of incandescent coal or coke, where the oxygen of the water combines with a portion of the carbon of the coal, forming carbonic oxide and setting the hydrogen free. The two gases thus formed are then conveyed into another chamber, where, by the addition of a hydrocarbon, they are enriched to the required illuminating power. It is usually necessary to employ in the process of manufacturing such a gas expensive anthracite coals, or if bituminous coal is used, it must have been previously prepared in form of coke.

In operating my invention I make use of a soft or bituminous coal, reducing it to a coke in the apparatus itself, which is arranged in such a way that the coking-chamber is directly over and feeds constantly into the generator, while the gas which is drawn from the soft coal in the process of reducing it to coke is conveyed into the gas-holder and utilized.

My apparatus is shown in the accompanying drawings, of which—

Figure 1 shows in section the generator, the coking-chamber above it, and the superheater. Fig. 2 shows a cross-section of the coking-chamber and surrounding flues at the line G H. Fig. 3 shows a cross-section of the same at the line E F. Fig. 4 shows a cross-section at the line C D. Fig. 5 shows a cross-section of the generator at the line A B.

A represents a shell of boiler-iron, lined

with fire-brick and having doors or passages through the walls at various parts for the purpose of communicating between the outside and inside; and of these openings E' E' are doors underneath the grate, through which ashes and incombustible material can be withdrawn.

J represents a door near the top of the generator, through which the coke can be leveled or the fires in the generator attended to.

F' F' represent doors near the lower part of the generator, but above the lowermost grate, for the purpose of drawing fires or removing clinkers and cleaning fires.

L represents an opening in the top of the coking-chamber, closed by a valve l, which shuts off communication between the coking-chamber and a hopper L', arranged to receive a supply of coal.

Between the coking-chamber and the generator is a passage-way J', constantly open, and allowing free access of coke from the coking-chamber K to the generator C'.

D represents a hollow supporting-bar open on its under side and having its walls perforated to permit the passage of air from an air-blast inlet c into a space underneath the grates g. Through this hollow supporting-bar also passes steam from the steam-pipes S when the apparatus is being utilized to decompose water admitted to it in the form of steam.

Through the walls of the generator are inserted about midway between the top and bottom of the generator a number of tubes or pipes set in the fire-brick, through which the round grate-bars of the second grate-bars of the second grate G' may be inserted whenever the apparatus is being used to drive the gas from the bituminous coal and is not being used for the purpose of decomposing water, as will be explained hereinafter, there being suitable doors riveted to the shell to allow of the grates being put in or taken out when desired. Fig. 5 shows these tubes and part of the inserted bars G', together with the doorways. At a still higher point in the generator, at a short distance below the outlet J' from the coking-chamber is a similar set of tubular perforations through the walls of the generator, through which a supplementary set of grate-bars may be inserted to support the coal

or coke and prevent it from dropping down into the generator whenever it is desired to remove the contents of the generator entirely.

Above the generator is an arch supporting the coking-chambers K and perforated by the opening J' between the generator and the coking-chamber and by numerous small passage-ways I' I'' I''' I'''' between the generator and the flues I around the coking-chambers. On the arch rests the bottom end of the vertical coking-chambers K K, (shown in these drawings as two;) but their number may be either more or less than two, the requisite being that the interior passage-way from top to bottom shall be large enough to prevent the coal from clogging, while the confining-walls shall present the largest possible surface to the heated gases arising from the generator. A secondary supply of air is admitted into flue I above the arch through the valve-closed opening O, the annular passage-way O, and leading in through passage-ways 2' 2''. (Shown most plainly in Fig. 3.) These air passage-ways are equal in number to the passage-ways I' I'', and are so located that an air passage-way comes opposite and feeds into each one of the passage-ways I' I''.

The top of the flue I communicates with the interior of the superheater R by means of the pipe M, and the passage of the gaseous products from the generator though this pipe is controlled by the valve N.

From the upper part of the coking-chamber a pipe P leads outward and branches into two pipes P P', of which P leads into the superheater and P' leads to the washer or storage-tank, the direction to be taken by the escaping gasses being controlled by means of the two valves Q Q'. Into the pipe P' leads a steam-jet P², used to produce an exhaust or relieve excessive pressure on coking-chambers at certain times during the production of the gas.

The superheater P is filled nearly full of fire-brick or other refractory material placed in a checkered position form loosely, so that the heated air or gas can pass freely through it, while at the same time the mass will furnish a large heated surface to be utilized for the purpose of gasifying and fixing the hydrocarbon used to enrich the coal-and-water gas. Openings 3' 3'' communicate with the interior superheater and furnish an additional supply of air to complete the combustion of the gases passing into the superheater when the contents of the superheater are being heated, as described. The hydrocarbon oil is admitted through the pipe x when enriching the gas. At the bottom of the superheater is a door V, an eduction-pipe W leading out and branching, one branch W leading to the washer or storage tank and the other branch W' leading to the smoke-stack.

The operation of my invention is as follows: In starting my apparatus it is necessary to fill the generator C' and part of the coking-

chambers with coke sufficient to heat the coking-chamber and superheater before charging with bituminous coal. A fire is started and the air-blast admitted through c underneath the grate. The heated gases arising from the generator (the valves Q Q' being both closed and the valve N opened) pass into the flues I, where a secondary supply of air is admitted through the inlet-pipe O, and the gases are burned in contact with the walls of the coking-chamber, heating the same, and passing thence into the superheater, down through the "checker-brick," raising those to a high temperature, and passing away into the smoke-stack. After these chambers are sufficiently heated the air-valves, the stack-valve, and the valve marked N are closed and the valve Q' opened. Steam is then turned on underneath the grate G of the generator. This, passing up through the incandescent coke, is decomposed, forming carbonic oxide and hydrogen gases which, passing up through the chamber K, take up the gasses which are there being driven from the soft coal and with them pass into the superheater, where they are properly enriched by the admission of hydrocarbons, the vapors of the hydrocarbons being mingled with the gases from the coal and water and "fixed" by the hot checker-brick, through which the combined gases are passing, and the united product passes out through the pipe W to the washer or storage tank. The steam-jet p² is employed as an exhaust to draw off the coal-gas from the coking-chamber K during the period of reheating, when the products of combustion are passing up around the coking-chamber through the flue I and across through the pipe M into the superheater; but care must be used when this is employed not to exhaust so excessively as to introduce nitrogen in excess from the decomposition of the air coming from the air-blast C. The bituminous coal is admitted into the coking-chambers from the hopper L' as it is needed to fill them and to furnish coke for the generator; and when in the process of manufacturing water-gas the temperature of the bed of carbon or coke in the generator has been reduced by the passage of steam through it, so that it will no longer decompose the steam, the steam and oil is shut off, the valve N is opened, and the valve Q' is closed. The valve W' to smoke-stack is opened, and the process of reheating the coking-chamber and superheater proceeds anew. During this time the valve Q is opened and the exhaust-jet p² is brought into use.

During the night, or at a time when it is desired to leave the apparatus without care, the secondary grates G' are placed in the generator and the ashes, clinkers, &c., are removed from beneath them, leaving a clean bed of fire above them. One of the doors E' is opened to permit the ingress of sufficient air beneath the fire, and the valves are arranged to cause the products of combustion

to pass into the flue I and have their exit through the pipe *n* on the connection between the generator and the superheater. During such time the combustion of gaseous products from coke in the generator is assisted, if necessary, by admitting a secondary supply of air, which is heated in a passage-way built in the brick lining and passes into the flue I through the air-pipe O, and during such time the coking-chambers are filled with coal in process of transformation from coal to coke.

The regulating of the various valves and dampers to effect the various results desired is easily learned and the regulation easily attended to by one who has experience with the apparatus.

Whenever it is desired to thoroughly clean out the generator, the supplementary grate-bars H are inserted, and these serve to hold up the coke in the coking-chamber, while they permit the withdrawal of all fire, ashes, and clinkers from the generator.

I prefer to make the coking-chamber in one or more upright parts, coming together in a

single part at the top and in a single discharge-orifice at the bottom.

Having thus described my invention, what I claim as novel, and desire secured to me by Letters Patent, is—

In a gas-generator, the combination, with a combustion-chamber, of an arch for the same, having a series of flues therein near the outer edge and a central feed-opening, a coking-chamber above and communicating with the combustion-chamber through the feed-opening, a flue surrounding the coking-chamber, communicating with the combustion-chamber through the flues in the arch, an air-flue at the base of the coking-chamber, a hollow central partition in the coking-chamber, its center communicating with the surrounding flue, and an exit for the coking and combustion chambers, substantially as described.

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