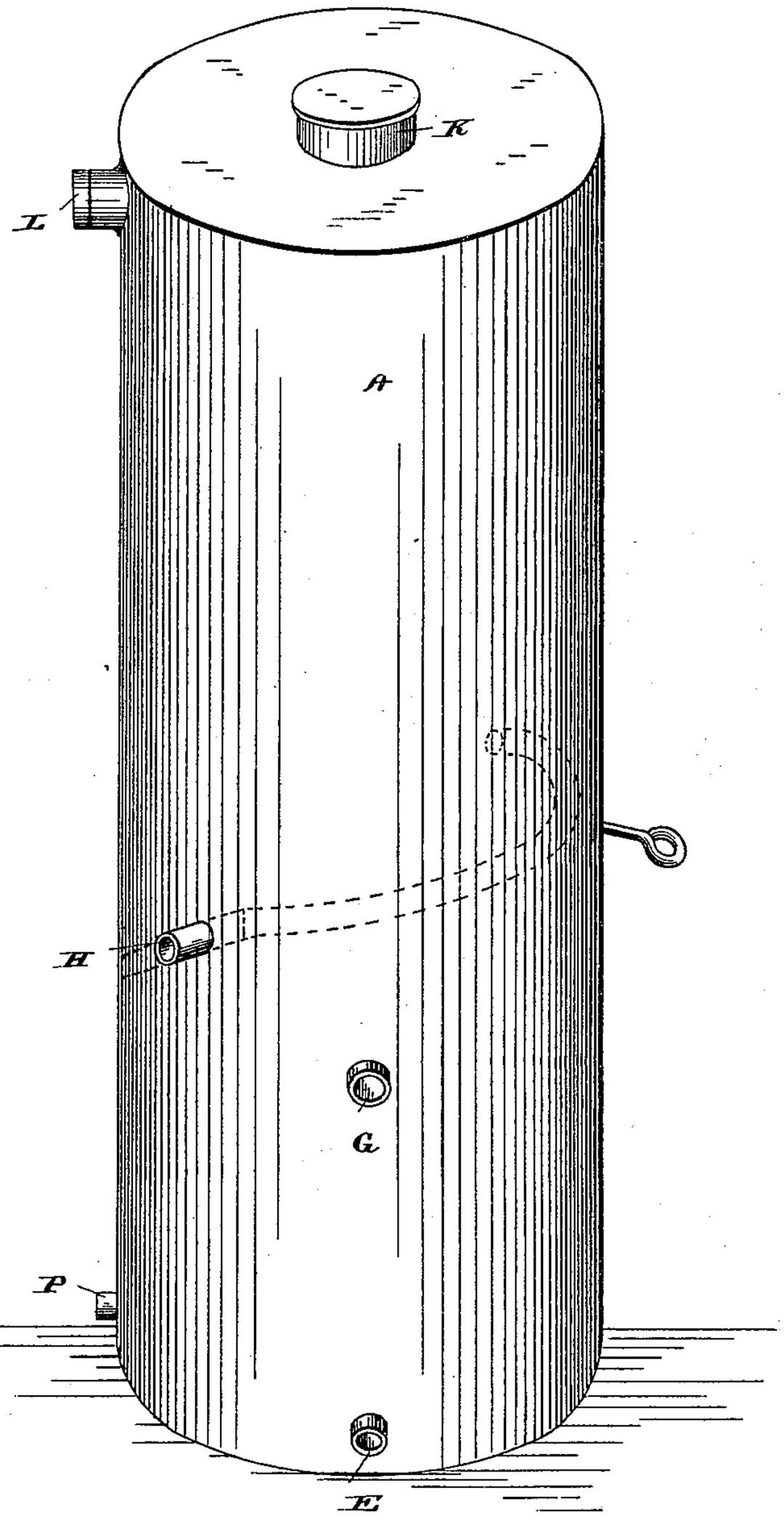
(No Model.) 2 Sheets—Sheet 1.

T. G. SPRINGER.

APPARATUS FOR MANUFACTURING GAS.

No. 253,120. Patented Jan. 31, 1882.

Fig. 1.



Witnesses:
Edwin L. Yewell.
Chas. L. Coombs

Inventor.
Theodore G. Springer
by C. M. Alexander,
Attorney.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

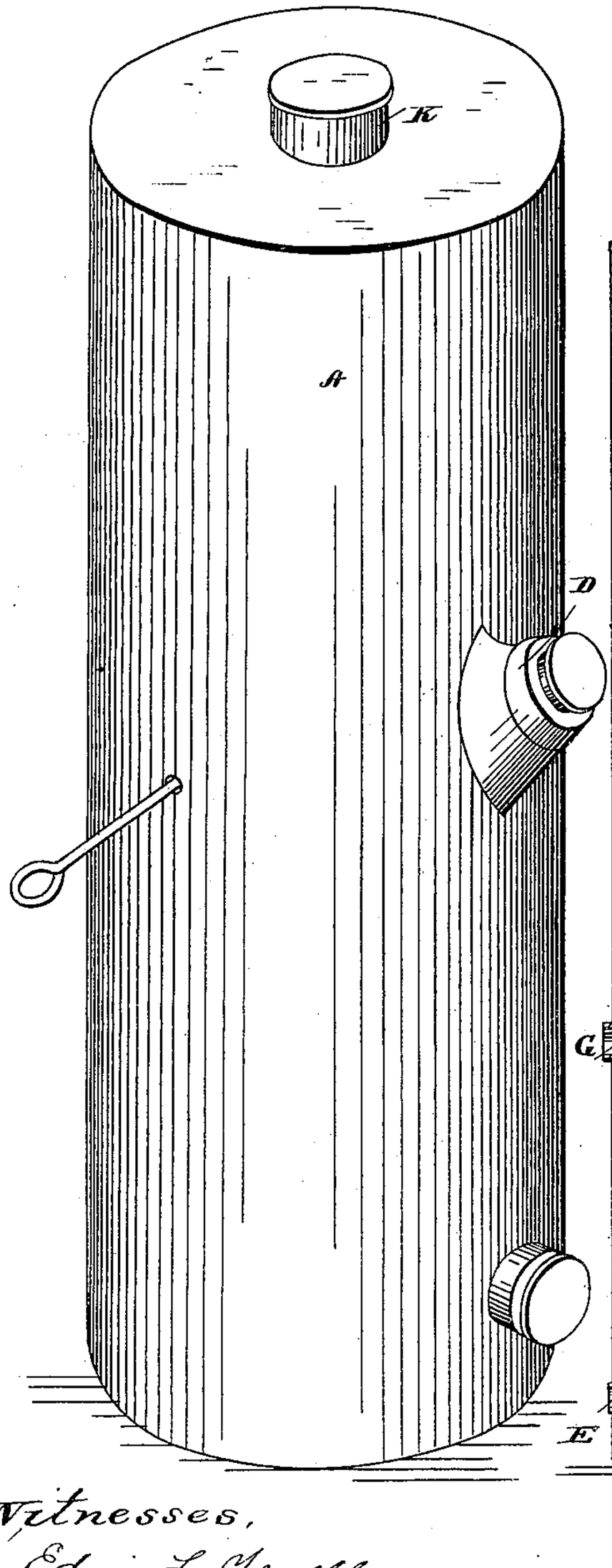
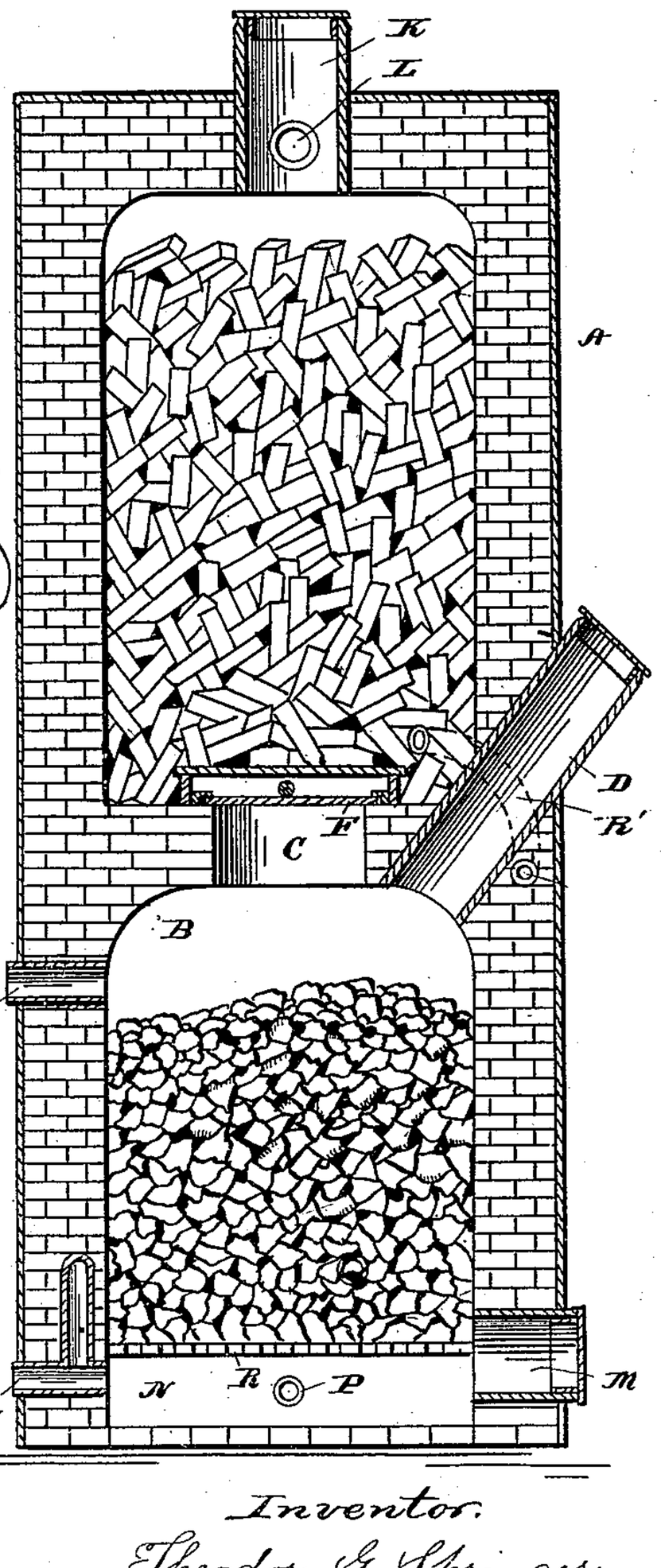


Fig. 3.



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Inventor.
Theodore G. Springer.
by C. M. Alexander.
Attorney.

UNITED STATES PATENT OFFICE.

THEODORE G. SPRINGER, OF NEW YORK, N. Y.

APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 253,120, dated January 31, 1882.

Application filed December 6, 1881. (No model.)

To all whom it may concern:

Be it known that I, THEODORE G. SPRINGER, of New York, in the county of New York, and in the State of New York, have invented certain new and useful Improvements in Apparatus for Manufacturing Gas; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to certain improvements in the manufacture of gas and to apparatus therefor; and the invention has for its objects to provide certain means whereby the heat necessary for decomposing the gas-producing material may be stored and utilized for the generation of gas in quantities as required for use, as more fully hereinafter specified.

Heretofore in the manufacture of gas the gas-producing material, consisting of the solid or liquid hydrocarbons, has generally been subjected to decomposition in small retorts or chambers; or it has been decomposed in conjunction with steam in cupolas or other furnaces of limited capacity. It is well known that the gas-producing hydrocarbons can only be decomposed to produce a fixed gas at a certain temperature. In the hitherto-known processes of manufacturing gas it has been deemed necessary to employ retorts or generators of small capacity in order that they may be conveniently heated to a gas-producing temperature. These said retorts or chambers, as has been demonstrated by practice, lose much heat by radiation, and, moreover, in the case of retorts the only effective heating portions of the same lie in immediate conjunction with the walls, and not in the mass of material contained therein. By my present invention I design to prevent the loss of heat by radiation, and to store it up or hold it for the purpose of decomposing the gas-producing material, as more fully hereinafter specified. These objects I attain by the apparatus and mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a perspective view of my improved apparatus; Fig. 2, a perspective view showing the feed-chute and air-blast induction; and Fig. 3 represents a vertical sectional view of my apparatus.

The letter A indicates a cupola consisting of a casing of metal, which is lined on the interior with fire-brick or other poor conductor of heat. The said cupola is divided about midway between its upper and lower ends by a diaphragm or partition, B, having one or more openings, C, by which communication is established between the lower and upper compartments.

The letter D indicates a tubular feed-chute leading from the outside into the lower chamber or compartment of the cupola; and the letter E indicates an air-blast pipe, by means of which air may be supplied to the lower compartment to start the combustion therein and generate the necessary heat to raise the temperature of the material located in the decomposing-chamber to the proper temperature above. The decomposing-chamber is packed with brick or other indestructible material capable of being highly heated and adapted to retain its heat until it is required to give it off to the gas-producing material to be decomposed.

The diaphragm or partition may be provided with a damper or dampers, F, by means of which the communication between the two chambers or compartments may be regulated and controlled.

The letter G indicates an air-induction tube, which enters the upper part of the lower chamber or compartment just above the level of the fuel therein, when the same is charged.

The letter H indicates the hydrocarbon-supply pipe, by means of which liquid hydrocarbon may be introduced.

The letter K indicates a stack or chimney, from which extends a service-pipe, L, to carry off the gas. The stack is provided with a suitable valve or damper, by means of which the products of combustion may be permitted to escape when heating the contents of the upper chamber; or the gas may be directed into the service-pipe during its generation.

The letter M indicates an opening leading to the ash-pit N. The said opening and feed-chute are provided with suitable doors, valves, or caps, by which they may be closed.

The letter P indicates a steam-induction pipe leading from a suitable generator into the ash-pit below the grate R, by means of which steam

may be admitted below the highly-heated fuel in the lower chamber or compartment.

R′ indicates a flue formed in the brick-work of the furnace, and extending from the upper part of the lower chamber to the lower part of the upper chamber, the said flue passing partially around the furnace. The hydrocarbon-induction pipe H enters the lower end of said flue in such manner that the inflowing hydrocarbon fluid will be met by the hot gases generated in the lower chamber, and vaporized before passing into the upper chamber, the damper being closed to prevent the escape of such gases directly upward into the upper chamber.

Where no damper is employed, as may be sometimes the case, a forced current may be created through the flue by means of a suitable injector, which will draw the mixed gases from the lower chamber and deliver them with the liquid or vaporized hydrocarbon into the upper chamber.

The operation of my invention is as follows: The upper chamber being suitably charged with loosely-packed bricks, the lower chamber is properly filled with fuel through the chute D, after which the chute is closed. The coal or fuel is then ignited from the ash-pit and the opening to the ash-pit is closed, after which a blast of air is forced into the ash-pit and up through the ignited fuel. This causes the formation of carbonic oxide—an inflammable gas—which meets with a blast of air introduced through the blast-pipe in the upper part of the chamber and is consumed, creating an intense heat in the upper chamber. The heating process is continued until the temperature of the bricks in the upper chamber reaches a proper degree, when the air-blast is shut off, the damper of the partition closed, and the valve in the smoke-stack is arranged to close the smoke-stack and direct the gases generated into the service-pipe L. Steam is then admitted to the ash-pit through the pipe P, and is passed up through the incandescent fuel, causing by mutual decomposition the generation of hydrogen and carbonic-oxide gases. These hot gases pass through the flue R′, where they meet the incoming hydrocarbon fluid supplied through the pipe H, vaporizing said hydrocarbon and carrying the vapor into the chamber above, where it passes through the highly-heated brick filling, the vapor being converted into a fixed gas, which is carried off through the service-pipe for consumption.

One important advantage of my method of generating the gas over the old methods heretofore in use lies in the fact that in such old methods retorts or generating-chambers of limited capacity were employed, in which the proportion of radiating-surfaces largely exceeds the heating-surfaces, causing the loss of much effective heat, thus enhancing the cost of the manufacture of the gas, while by my method, wherein the cupolas are constructed of great cubic capacity, it is evident that the radiating-surface is small in comparison with the heating capacity, and that the heating capacity becomes very much greater in proportion to the radiating-surface as the generator is enlarged, thus reducing the cost of manufacture to a minimum.

Another important advantage of my invention lies in the fact that by storing the heat in the generator the necessity of storing large quantities of gas in expensive gas-holders occupying valuable room is obviated, and the holders may be either wholly dispensed with or others of more limited capacity employed, since the gas can be generated in large volumes, or in volumes adequate to the demand, and supplied as required. Moreover, the necessity of frequently drawing and recharging the generators is obviated, and a large proportion of the force necessary in working the old processes is thus dispensed with.

Another advantage consists in effecting the generation and fixing of the gas in the same generator, thus dispensing with the additional fixing-chamber, which takes up room and adds to the expense of the plant. By my invention a great saving is effected in the fuel employed, for the reason that the carbonic-oxide gas generated in burning the fuel to the proper temperature to decompose the steam is utilized for heating the material in the fixing-chamber, whereas in the other cupola processes of manufacturing gas the heat developed from this source has been allowed to escape into the open air and go to waste. I not only utilize the heat, owing to the combustion of such carbonic-oxide gas, but I save the heat absorbed by the gas from the fuel and transfer or store it up in the fixing-chamber.

When the process of generation is required to be continuous two cupolas may be employed and used alternately—that is to say, one is employed to generate the gas while the other is being heated, and vice versa—the generation being allowed to proceed in one retort until the temperature has become too much reduced to convert the vapor into fixed gas, after which the generation is effected in the other retort, and the other is reheated to serve in its turn as generator.

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

1. A cupola or gas-generating apparatus having a decomposing-chamber wherein steam and solid hydrocarbon may be mutually decomposed, a fixing-chamber wherein mixed gas and hydrocarbon vapor may be fixed, and a connecting-flue wherein the liquid hydrocarbon and the hydrogen and carbonic-oxide gases may be mixed before entering the fixing-chamber and the heat of the cupola thoroughly utilized, the respective chambers being located respectively one above the other, substantially as specified.

2. An apparatus for generating gas, consisting of a cupola divided into communicating compartments by means of a perforated diaphragm or diaphragms, the lower of said compartments being adapted to contain fuel and

the upper refractory material, the fuel-compartment being provided with suitable air-inlet and steam-inlet pipes, whereby air may be admitted to create the proper heat, or steam may be admitted for decomposition, and the intermediate flue provided with suitable means for the introduction of liquid or vaporized hydrocarbon, substantially as specified.

3. The combination, in a cupola divided into communicating compartments by a perforated diaphragm, of the damper adapted to open and close communication between compartments, substantially as and for the purposes specified.

4. In combination with the communicating compartments of a vertical cupola, the flue extending from the lower to the upper compartment, and the hydrocarbon-induction tube leading into said flue, whereby the hydrogen and carbonic oxide and hydrocarbon may be mingled and the hydrocarbon vaporized before entering the upper compartment, substantially as specified.

5. In combination with the communicating chambers of the cupola, the perforated diaphragm, the connecting-flue, and the damper arranged to cut off direct communication between the two chambers and direct the gases from the lower chamber through the flue into the upper chamber, substantially as specified.

6. The combination, with the communicating chambers, the perforated diaphragm, the damper, and connecting-flue, of an oil-supply pipe leading into said connecting-flue, substantially as specified.

7. In combination with the communicating chambers, the perforated diaphragm and damper and the connecting-flue, the air-blast pipes leading into the ash-pit and combustion-chamber, and the smoke-stack and damper, whereby the fuel may be prepared for the subsequent decomposition of the steam and the carbonic oxide utilized for heating the fixing-chamber, substantially as specified.

8. In combination with the communicating chambers, the perforated diaphragm and dampers, the connecting-flue and oil-inlet, and the air and steam blast pipes, whereby a current of air or steam, as may be required, may be passed through the ignited fuel for heating the fixing-chamber or generating a fixed gas, substantially as specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 6th day of December, 1881.

THEO. G. SPRINGER.

Witnesses:

J. J. McCARTHY,

CHAS. L. COOMBS.