(No Model.) 2 Sheets—Sheet 1.

T. G. SPRINGER.

PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF GAS.

No. 263,611. Patented Aug. 29, 1882.

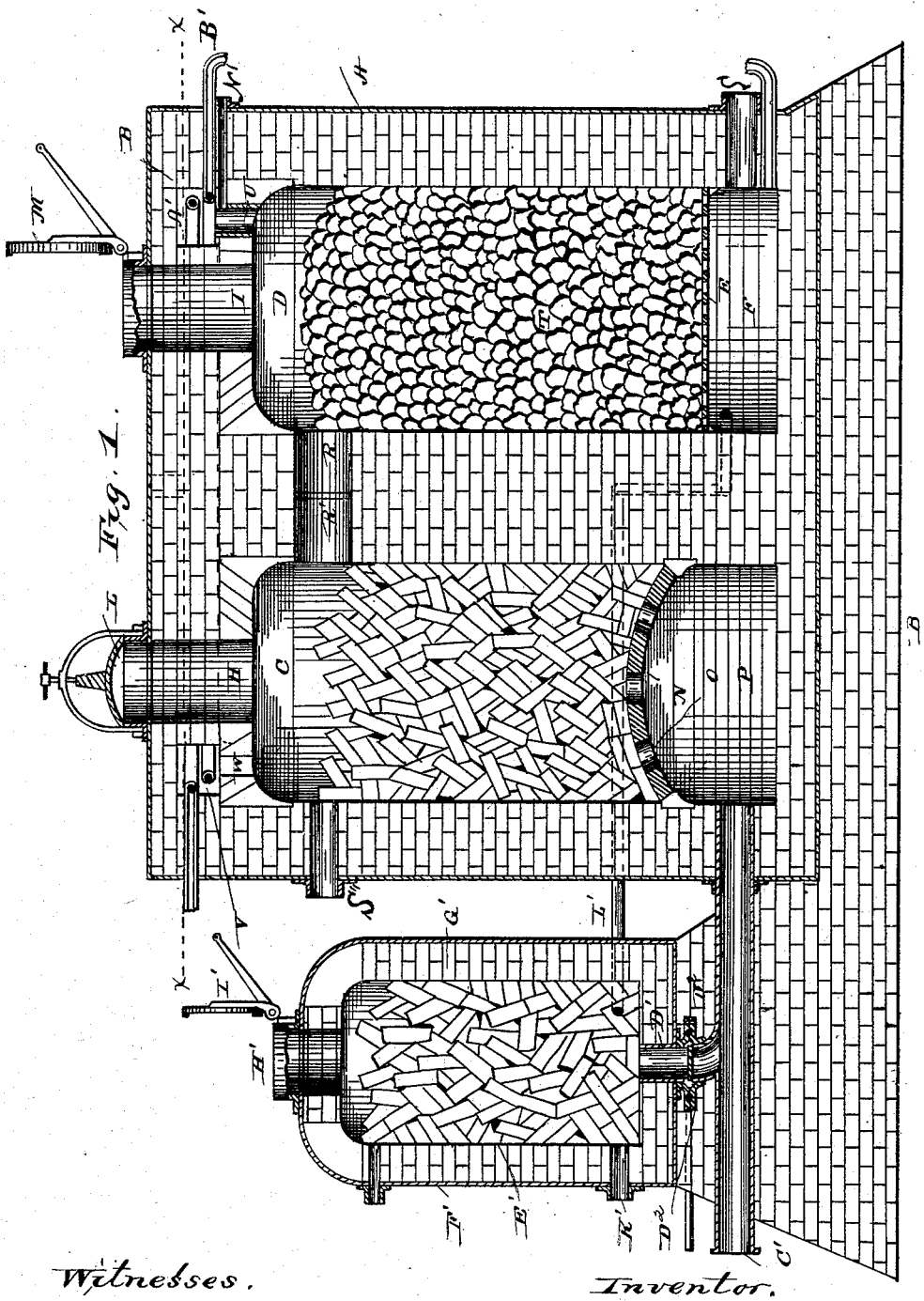

Fig. 1.

Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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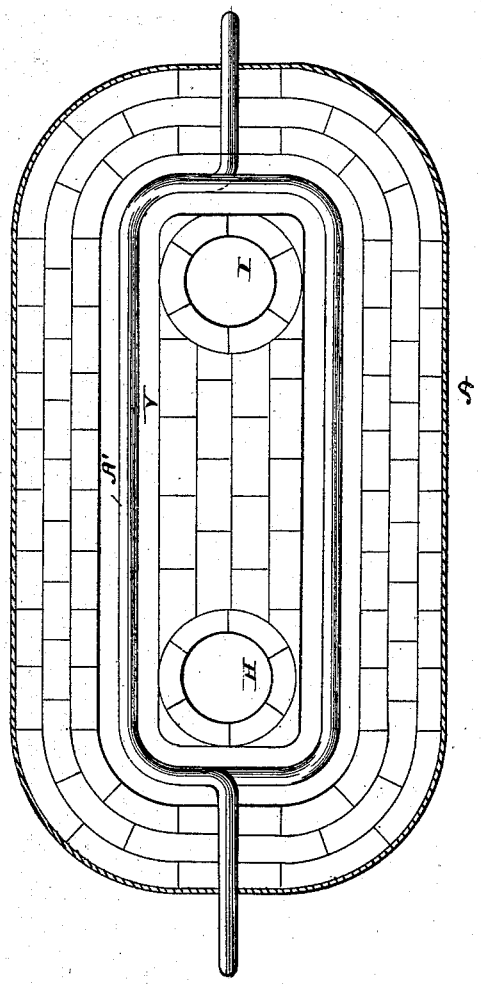

Fig. 2.

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UNITED STATES PATENT OFFICE.

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

PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 263,611, dated August 29, 1882.

Application filed April 25, 1882. (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 Process of and Apparatus for the Manufacture of 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 it has for its objects to provide certain means whereby a body of carbonaceous material may be heated to incandescence and the heat utilized and stored up in a mass of refractory material, and the waste heat employed to superheat the steam to be decomposed subsequently, in connection with liquid hydrocarbons, to produce a fixed gas, as more fully hereinafter specified. These objects I attain by the means illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical sectional view of my apparatus, and Fig. 2 a horizontal sectional view taken on the line *x x* of Fig. 1.

The letter A indicates the shell of the main body of my apparatus, which is constructed preferably of wrought-iron and mounted on a suitable base, B, of brick-work or masonry. The interior of the shell is built up of brick-work or masonry, and is formed with two chambers, C and D, as indicated. The chamber D is designed to contain bituminous coal, wood, or other carbonaceous gas-producing material, and is provided with a grate, E, near the bottom, forming an ash pit or chamber, F, below. The upper part of each chamber is provided with a flue or passage, (indicated respectively by the letters H and I,) which are provided with suitable covers, L M, which can be clamped by suitable means, so as to form gas-tight joints. These tubes or passages are for the purpose of filling the chambers with carbonaceous and refractory material. The chamber C is provided with an arched partition, N, which is perforated, as indicated by the letter O, forming a chamber, P, below.

The letter R indicates a pipe connecting the upper parts of the chambers C and D, for the purpose more fully hereinafter specified.

The letter S indicates an air-pipe leading into the ash pit or chamber F in the lower part of the chamber D, through which air may be introduced to sustain the combustion of the incandescent material. From the upper part of the chamber D extends a pipe, U, communicating with an annular flue, V, formed in the body of the apparatus. The said flue communicates by a pipe, W, with a chamber, C, and is provided with a coil of pipe, A′, extending from a suitable steam-generator, and connecting, by means of a pipe, B′, with the ash pit or chamber F, for the purpose more fully hereinafter specified.

The letter C′ indicates a pipe leading from the chamber P to the main. The said pipe is provided with a branch pipe, D′, leading to a chamber, E′, which consists of a metallic casing, F′, having a lining of fire-brick, G′, as indicated. The said chamber is provided with a pipe or passage, H′, for filling, which has a cover, I′, by means of which it may be securely closed, and a pipe, L″, at the top for the admission of steam.

The letter K′ indicates an air-pipe leading from a suitable air-compressor into the chamber E′, and L′ a pipe leading from said chamber to the ash-pit F of the chamber D.

The pipe R is provided with a damper, R′, by means of which direct communication between the two chambers C and D may be cut off, so as to cause the gases and vapors to pass through the annular flue from the compartment D to the compartment C.

The pipe D′ is provided with a damper, D^2, by means of which the gases may be cut off from the chamber E′ and passed directly into the main.

A portion of the superheated steam from the chamber E′ may be passed through the coil A′ and a portion to the ash-pit F, or the steam may be supplied from either alone.

The operation of my invention is as follows: The chamber D being charged with bituminous coal or other carbonaceous material, which is properly ignited, and the chamber C being charged with refractory material, as indicated, the charge in the compartment D is raised to incandescence by a blast of air introduced by the air-pipe leading into the ash-pit. The heated gases and products of combustion pass over into the chamber C and through the refractory material contained therein, where they

are burned, air being admitted to support combustion through the pipe S, heating the same, so as to retain the heat and store it up for future use. The gaseous products, after passing through the chamber C, are conducted through the chamber E′, which is likewise charged with refractory material, which absorbs and stores up any heat that the products of combustion may still contain, to be afterward utilized for superheating the steam to be decomposed and employed in the manufacture of a permanent gas. When the refractory material is raised to a proper temperature the air-blast is stopped and steam, superheated or otherwise, is turned on into the ash pit or chamber F, and as it passes up into the body of incandescent material it is converted into water-gas, which passes over into the chamber C. Liquid hydrocarbon, during the operation, is supplied through the pipe N′ to the upper part of the chamber D, where it is volatilized, and passes over with the water-gas through the annular flue V to the chamber C, the direct passage through the pipe R being cut off by means of the damper R′. In order to prevent the hydrocarbon from being burned by the intense heat as it passes into the annular flue, and to utilize such heat, a current of steam is passed through the coiled pipe, where it is superheated, and it is afterward passed into the ash-pit of the chamber D through the pipe B′, to be decomposed and converted into gas. The heat stored up in the chamber E′ is utilized also for superheating steam, to be supplied to the chamber D through the pipes L′. The combined gases passing from the chamber D through the annular flue V are decomposed and fixed or converted into a permanent gas in the chamber C, which passes off to the main through the pipe C′.

In order to keep the valves cool, the pipes in their immediate neighborhood are provided with water-spaces D^3, connecting with suitable water-pipes, whereby a current of water may be caused to circulate around the pipes to keep down the heat.

In the present application I have shown and described a generating-furnace and fixing and superheating chambers supplied with refractory material and connected with each other by flues, the furnace and chambers being provided with pipes for the admission of air and steam; but these I do not claim, as they form the subject-matter in part of another application filed by me of even date herewith.

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

1. In the manufacture of water-gas, the process of utilizing the heat and waste gases resulting from raising the carbonaceous material to incandescence by an air-blast, which consists in burning the gases by the admission of air in contact with a body of refractory material and storing the heat, then causing complete combustion of any remaining unburned carbon or gas by the admission of a second blast of air and storing the heat in a second body of refractory material, then superheating steam in one body of hot refractory material, then decomposing said steam by bringing it in contact with incandescent carbon and fixing the resultant gases in the other body of hot refractory material.

2. In combination with the generating and fixing chambers, the annular flue connecting the same, through which the hot gases and vapors pass, substantially as specified.

3. In combination with the combustion and fixing chambers, provided with a connecting-flue, the coiled steam-pipe extending through the flue, whereby the temperature of the flue may be controlled and the heat of the hot gases utilized to superheat the steam to be subsequently decomposed, substantially as specified.

4. In combination with the combustion and fixing chambers, the heating-chamber containing refractory material, connected as described, and the steam-pipe leading to and from the same and to the combustion-chamber, whereby the waste heat of the gaseous products of combustion passing through the fixing-chamber may be stored up and utilized to superheat the steam to be decomposed, substantially as specified.

5. In combination with the decomposing and fixing chambers and the annular flue, the connecting-pipe R and the damper R′, whereby direct communication is cut off between the chambers C D and the vapors and gases caused to pass through the annular flue, substantially as specified.

6. In combination with the chambers C and E′ and connecting-pipes, the damper D^2, whereby the gases may be shut from the chamber E′ and passed directly to the main, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses, this 24th day of April, 1882.

THEO. G. SPRINGER.

Witnesses:
J. J. McCarthy,
Chas. D. Davis.