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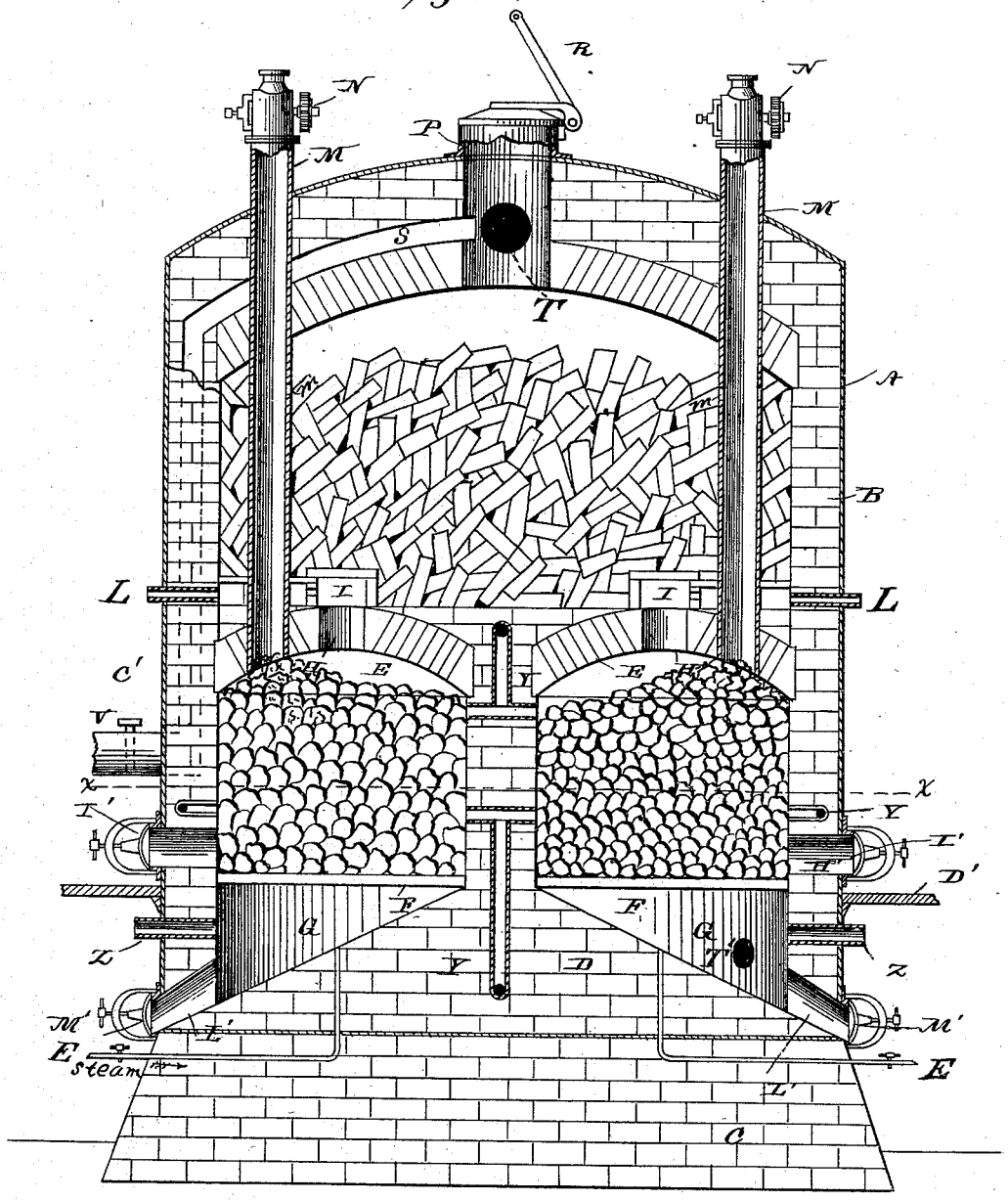
T. G. SPRINGER.

PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF GAS.

No. 263,612. Patented Aug. 29, 1882.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

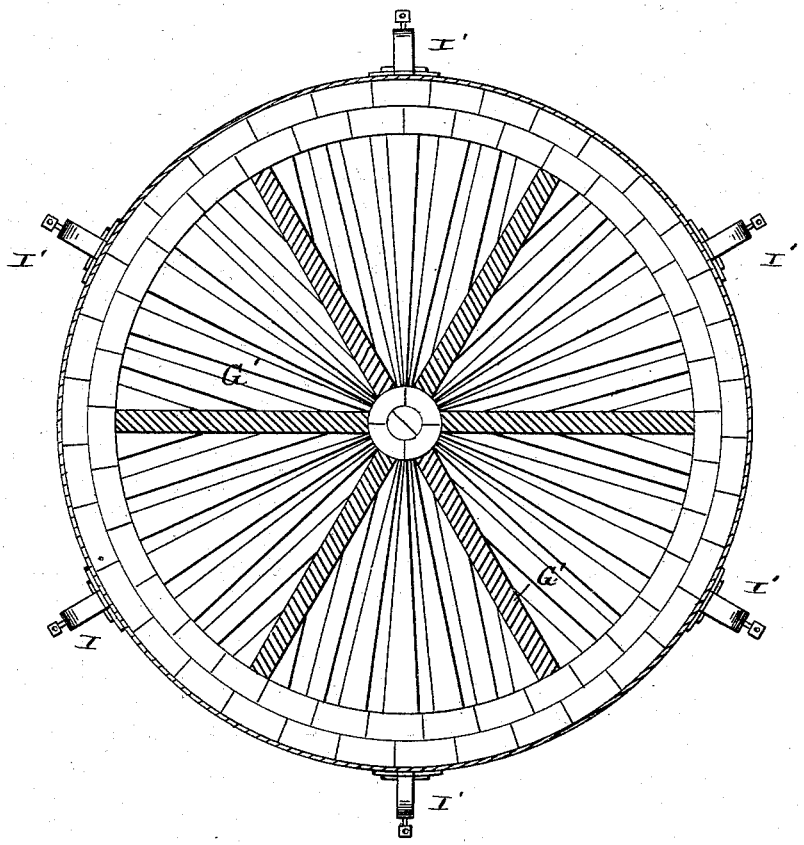

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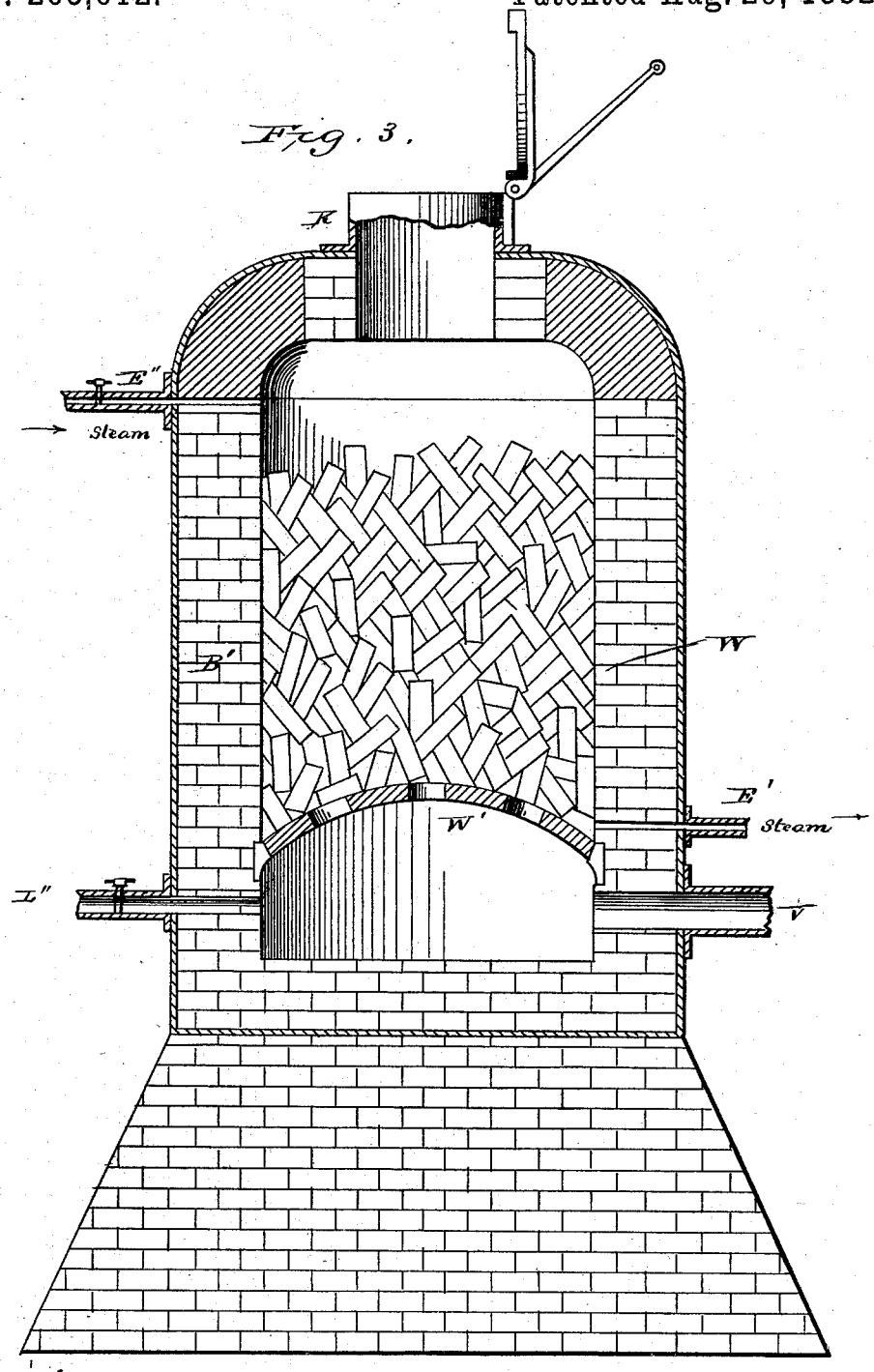
Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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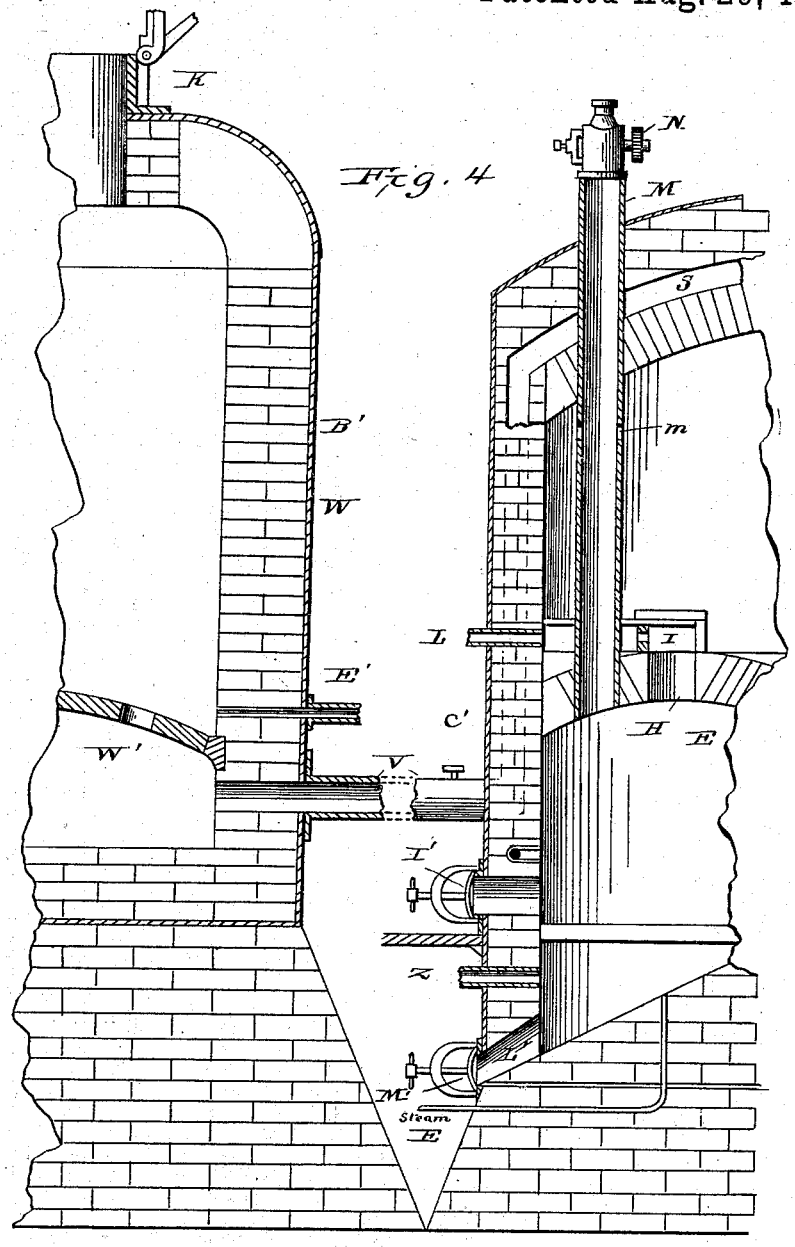
Fig. 4



WITNESSES

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PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 263,612, 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 for heating and illuminating purposes, and it has for its objects to provide for the continuous production of gas in quantities to supply the demand, as desired, with the least possible waste of heat, as more fully hereinafter specified. These objects I attain by the means illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical section of my improved apparatus; Fig. 2, a horizontal section on the line *x x* of Fig. 1; Fig. 3, a detached view of the apparatus employed for superheating the steam prior to its decomposition, and Fig. 4 a sectional view of the cupola or generator and the superheater.

The letter A indicates a cupola constructed preferably of an outer casing of metal, with a lining of fire-brick, B. The said cupola is provided with a base or substructure, C, of brick-work, upon which the cupola sets, the cupola being formed with a bottom, D, of brick-work or masonry, which inclines from the center toward the circumference or sides, as indicated. The cupola is divided into two compartments by means of an arched partition, E, the lower compartment constituting the heating and decomposing chamber of the apparatus and the upper compartment the fixing or superheating chamber thereof. The lower chamber is provided with a grate F, leaving an ash-pit, G, below, as shown in Fig. 1 of the drawings. The arched partition is provided with a series of apertures, H, leading to the chamber I, communicating with the upper compartment, the said chamber connecting with a suitable reservoir containing liquid hydrocarbon by means of pipes L, as illustrated in Fig. 1.

The letter M indicates two of a series of pipes leading down through the upper chamber into the lower chamber, the said pipes being provided with valves N, by which they may be opened and closed. The said tubes are intended for charging the lower chamber with fuel, as more fully hereinafter explained.

The letter P indicates a passage or man-hole at the top of the upper compartment, through which said compartment may be charged with refractory material, the said aperture being provided with a tightly-fitting cover, R, by means of which it may be closed.

The letter T indicates an opening leading into the eduction-pipe for illuminating-gas or such gas as is to be stored in a holder.

The letter S indicates a flue leading from the passage P down through the wall of the cupola, and connecting with a pipe, V, leading to a superheater, W.

The letter Y designates a series of air-pipes communicating with a suitable blast-producer and with the interior of the lower chamber to supply air to keep up combustion in said lower chamber, and Z air-pipes leading to the ash-pit to supply air to the said chamber from below.

The superheater W (shown in Fig. 3) consists of a metallic casing having a refractory lining, B′, the pipe V connecting the said superheater with the flue S, being provided with a valve, C′, for the purpose hereinafter set forth. The superheater is provided near the bottom with a perforated arch or grating, W′, for supporting the brick-work or other refractory material used for storing up the heat of the waste gases. A large opening, K, and a tight-fitting cover are provided at the top of the superheater, by means of which the refractory material may be placed in position, and through which the waste products of combustion may escape. An induction-pipe, E″, for steam connects near the top of the superheater. A pipe, L″, having a valve and connecting with the chamber below the arch W′, serves for the admission of air when it is desired to burn the gases admitted by the pipe V. The cupola occupies two stories of a building, the letter D′ indicating the floor between said stories, the superheater being located upon said floor conveniently to the cupola.

The letter E′ indicates a steam-pipe leading from the superheater to the ash-pit of the

cupola, whereby superheated steam may be supplied to the same.

The lower chamber of the furnace is provided with a series of radial walls, G′, dividing it into a number of segmental sections, from which extend passages H′, provided with removable covers I′, by means of which the sections may be cleaned of clinkers and other accumulations, as more fully hereinafter specified. The ash-pit is provided with passages L′, having suitable doors, M′, by means of which the ashes may be removed.

The operation of my invention will be readily understood in connection with the above description, and is as follows: The lower chamber is charged with bituminous coal or other solid gas-producing material, which is ignited, the combustion being urged by a blast supplied through the air-pipes above mentioned. The heated products of combustion, consisting partly of carbonic oxide, meeting the current of air above the bed of incandescent material in the lower chamber, the carbonic oxide is ignited, and the products generated pass up through the upper chamber of the cupola, which is charged with refractory material, and out through the flue S and pipe V into and through the superheater, where they meet with an additional quantity of air entering through the pipe L″, whereby the free carbonic oxide passing over is thoroughly consumed to supply heat to the superheater, which is also filled with refractory material. The heat imparted from the burning gases is stored up in the refractory material in the fixing-chamber and in the superheater, and is subsequently used to superheat the steam to be decomposed, and to fix the hydrocarbon vapors carried over from the decomposing-chamber. After the refractory material in the fixing-chamber and superheater have been raised to the proper temperature the supply of air in each is cut off by closing the cocks or valves. The valve C′ in the pipe V is also closed, the lid at the top of the superheater is closed, and then a current of steam from a suitable generator is supplied through pipe E″ at the top of the superheater, and is thence passed down through the highly-heated refractory material, and is thus highly superheated. The superheated steam is then conducted by the pipe E′ to the lower chamber of the cupola, where it is decomposed by passage through the incandescent material into carbonic oxide and hydrogen gases, the gases passing upward into the annular chamber I, where they meet with the liquid hydrocarbon in the state of a nascent vapor, the gases and vapor passing through the refractory material in the fixing-chamber, where they are converted by the absorbed heat into a fixed gas, which may be conveyed away for use.

When it is desired to produce a heating-gas alone the superheated steam from the superheater W is directed through the flues V and S, passing down through the refractory material in the fixing-chamber of the cupola, where it is highly superheated, and is thence passed down through the incandescent mass of fuel in the lower chamber, where it is decomposed, forming water-gas, which may be carried off by means of suitable pipes, T′, to the main.

It having been found advantageous, in respect to economy in the production of gas, to construct the cupolas of large diameter, as explained in a previous patent granted to me, it is found desirable to charge the heating and decomposing chamber with fuel to clean the grate of clinker and ash, and, if need be, to discharge the coke in sections. By charging and cleaning the generator in sections the cupola of large diameter is much more readily managed, and reduction of temperature to a detrimental degree is avoided. By means of the segmental sections formed by the radial walls I provide for cleansing and charging a conveniently-operated portion of the generator at a time. The sections are cleaned, and, if desired, the contents discharged successively, and are recharged in the same order, thus providing at all times a quantity of fresh coal in some portion of the heating and decomposing chamber of the cupola. This is desirable where bituminous coal is used, in order that the hot gas, poorer in hydrocarbon, from a highly-heated and partially-spent charge will combine with the rich hydrocarbon gas and vapor given off from a fresh charge, and make a good homogeneous illuminating-gas. In case the spent fuel or coke is entirely discharged from the sections by opening the grates the charging-tubes M should be provided with slide-valves at their lower ends, which would be closed in any one tube when the section which it feeds is discharged. It is desirable, however, to feed the fuel continuously through the tubes, allowing it to enter the generating-chamber as the ash and cinder are removed at the bottom and the charge settles down. In this case, also, the grates should be cleaned of ash and clinker in successive order. The fuel in passing down through the charging-tubes is subjected to the high heat of the fixing-chamber, and is thus partially coked and converted into gas. The gas evolved by the heat escapes at the lower open ends of the tubes, or through openings *m m* in the walls thereof, and mingle with the other gases resulting from the decomposition of steam and oil.

In order to provide for the continuous production of gas, two cupolas, constructed as described, may be employed, being used alternately—that is, one being used for the production of gas while the other is being heated.

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

1. In combination with a cupola divided into two compartments, one located above the other, the charging-tubes provided with valves, by means of which solid carbonaceous material may be supplied to the lower heating and decomposing chamber, substantially as specified.

2. In combination with the cupola, the su-

perheater arranged as described and connected thereto by means of a flue extending through the wall of the same, and suitable pipes provided with valves, whereby the superheater may be employed to utilize the waste heat used in preparing the fixing-chamber to superheat the steam to be decomposed, substantially as specified.

3. The process herein described of drawing and charging the generating-chamber of a cupola by removing the clinkers and other deposits in sections, substantially as specified.

4. The combination, with the cupola having charging and discharging passages, of the radial walls, whereby the charge is divided in such manner that the residuum may be removed and the cupola recharged in sections from time to time, substantially as specified.

5. The heating and generating furnace, a fixing-chamber, and a superheating-chamber, all suitably and successively connected by flues, in combination with air-pipes entering the base of the generator and the base of both the fixing and superheating chambers.

6. The generating-furnace and the fixing and surperheating chambers, supplied with refractory material, and successively connected with each other by flues, in combination with air-supply pipes connected with each, and steam-supply pipes entering the superheater and connecting the latter with the generator.

7. A cupola gas-generator divided into a lower heating and generating compartment and an upper fixing-compartment containing refractory material, and having a steam-supply pipe or flue and a gas-eduction pipe at the top, and also a steam and air supply pipe and a gas-eduction pipe at the bottom, for the purpose described.

8. In combination with a cupola divided into upper and lower compartments, constituting the generating and fixing chamber, the charging-tubes passing through the upper compartment and provided with openings for the escape of gas into the fixing-chamber, for the purpose described.

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

THO. G. SPRINGER.

Witnesses:
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