

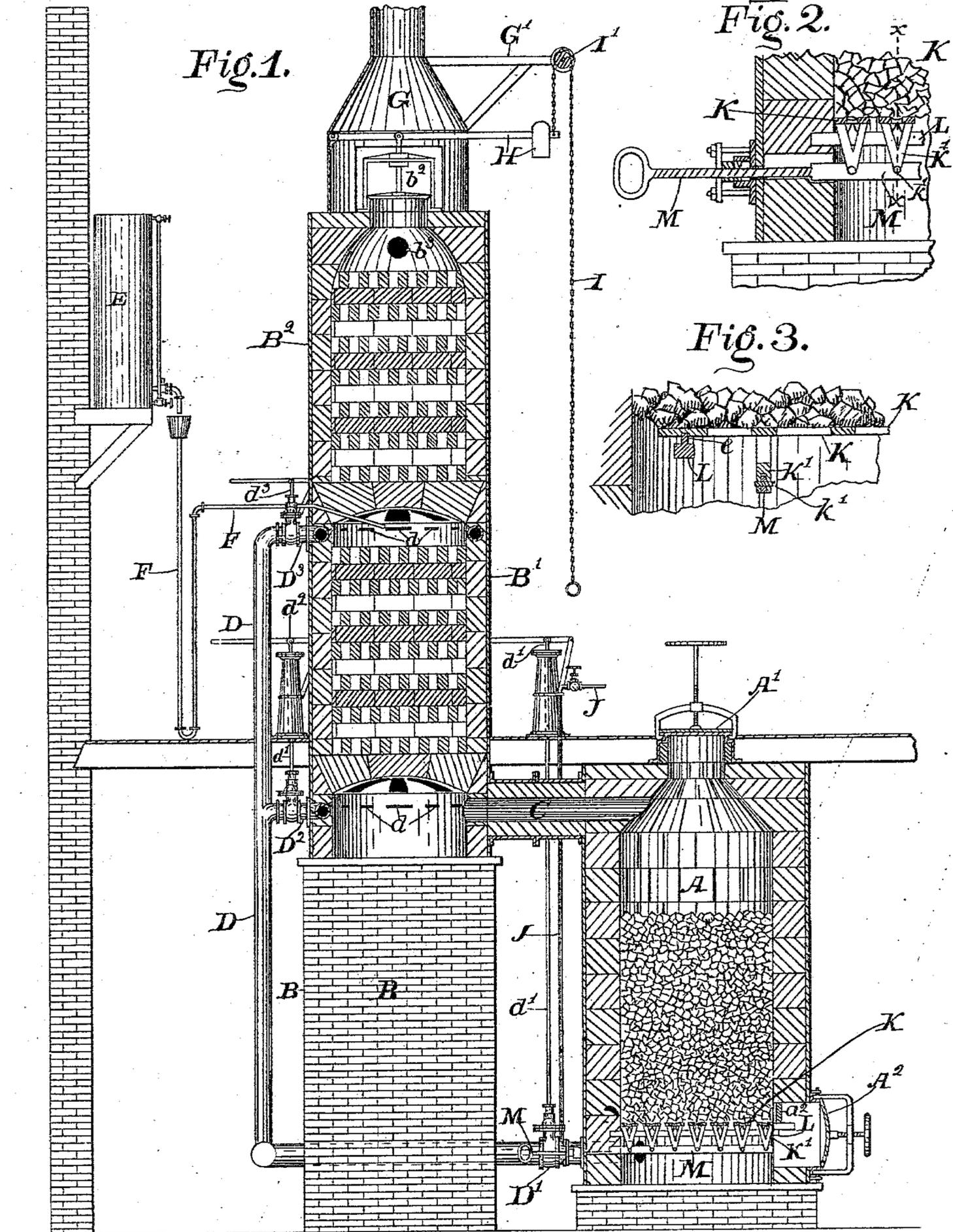
(No Model.)

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APPARATUS FOR THE MANUFACTURE OF ILLUMINATING OR HEATING GAS.

No. 274,637.

Patented Mar. 27, 1883.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE MANUFACTURE OF ILLUMINATING OR HEATING GAS.

SPECIFICATION forming part of Letters Patent No. 274,637, dated March 27, 1883.

Application filed April 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANK D. MOSES, of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Apparatus for the Manufacture of Illuminating or Heating Gas, of which the following is a specification.

My said invention consists of certain improvements in the process of manufacturing illuminating and heating gas and the apparatus therefor. My improvements relate to that process and apparatus used in the production of "water-gas," and are fully defined in the following description.

I am fully aware that the process of producing gas from steam, incandescent carbon, and fluid hydrocarbon, broadly, is old, and numerous forms of apparatus for so producing gas are also old. I therefore desire to be understood as confining myself in this present invention to the processes and devices hereinafter specifically described and claimed as new.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a vertical section through the center of my improved apparatus, except some portions, which are shown in side elevation; Fig. 2, a similar section, on an enlarged scale, of a portion of the grate-bars and surrounding parts; and Fig. 3, a sectional view, looking to the left from the dotted line  $xx$  in Fig. 2.

In said drawings, the portions marked A represent the furnace of the apparatus; B B' B<sup>2</sup>, the foundation and the two stories of the superheater; C, the pipe connecting said furnace and said superheater; D, an air-pipe for furnishing the furnace and superheater with air-blasts; E, the tank for holding the petroleum or other fluid hydrocarbon; F, a pipe leading from said tank to the top of the story B' of the superheater; G, a smoke-stack; H, a weighted rod attached to said stack for holding down the cover  $b^2$ ; I, a chain for lifting said weighted rod and cover; J, the pipe through which the steam enters the furnace; K, the grate-bars to said furnace; L, the bars by which they are supported, and M a rod by which they are operated.

The furnace A is constructed in substantially

the usual form of such furnaces. It is provided with an opening at the top, through which the coal may be introduced, and a cover, A', therefor. It is also provided with grate-bars, and with the usual ash-pit and the opening leading thereto, and a door or cover, A<sup>2</sup>, therefor. The upper portion of the opening leading to the ash-pit is stopped by a plug,  $a^2$ , which prevents the air from entering the coal above the grate-bars, but forces it all to pass up through the grate-bars and the coal, thus producing even combustion all over the bottom, instead of more at one side than the other, as has been the case before I applied this plug.

The superheater is divided into a base and two stories of the heater proper. The base B is a base simply and serves to bring the bottom of the working part of the superheater up to the level desired—usually to the top of the furnace. The first story, B', operates to volatilize the oil, and to partially burn the gases and cause them to mingle in the proper manner. The second story, B<sup>2</sup>, finishes the burning and produces the fixed gas. In the heating of the apparatus, before the gas-making proper has commenced, the use of two stories and the accompanying branches of the blast-pipes has the effect of moderating the intensity of the heat at any one place, while securing the same aggregate, thus lessening the danger of melting down the fire-brick composing the lining of the superheaters, and also those laid up in tiers in the center thereof, which is one of the difficulties of gas-making with this class of apparatus as heretofore constructed.

The pipe C is simply a pipe to convey the products of combustion from the furnace to the superheater, and may either run directly across, as shown, if the base B is of sufficient height, or down somewhat in the form of an S if the base of the superheater and the base of the furnace are on the same level.

The pipe D is an ordinary pipe leading from a fan (not shown) to the several places where an air-blast is needed to promote combustion. Each branch leading from said pipe is provided with a valve, and these valves are operated by the rods  $d'$   $d^2$   $d^3$ , respectively, said rods being provided with appropriate handles. The branches D<sup>2</sup> and D<sup>3</sup> terminate in circular pipes surrounding the lower portions of the

two stories B' B<sup>2</sup> of the superheater, and each of these circular pipes is provided with slits or orifices *d*, through which the air enters said portions. This distributes the air evenly and causes a more equal combustion.

The tank E is the ordinary petroleum-tank forming part of apparatus of this description. The pipe F, leading therefrom, is bent to form a trap, as shown, so that no flame can pass from the superheater to said tank. Said pipe runs into the superheater at a point just below the upper story thereof, so as to discharge the oil directly upon the brick-work of the lower story.

The stack G is similar to an ordinary smoke-stack. It is provided with an arm, G', upon the end of which is the pulley I'.

The weighted arm H prevents the cover *b*<sup>2</sup> from being raised by the force of the gas in the superheater, and said gas is thus prevented from escaping from said superheater by any except the regularly-provided orifice *b*<sup>3</sup>.

The chain I runs over the pulley I', and is attached to the end of the weighted lever H. It is used to raise said lever, and through it the cover *b*<sup>2</sup>, when it is desired that there should be an outlet for the products of combustion through the stack G, as when heating up the apparatus preparatory to making gas.

The steam-pipe J leads from a steam-boiler (not shown) to a point beneath the grate-bars. A very satisfactory and economical arrangement is that shown, wherein said steam-pipe enters the branch D' of the air-blast pipe at a point inside the valve, and thereby utilizes the remainder of said branch for a steam-pipe as well as an air-pipe.

The grate-bars K are constructed preferably double, and with an arm, K', extending downwardly from the under side of each. They rest upon points *l* upon the cross-bars L, which points enter sockets in the under side of said grate-bars, whereby said grate-bars are enabled to rock on said points without slipping off. I do not, however, claim this construction of grate-bars in this application, but reserve the same for another application for Letters Patent which I intend to make.

The rod M is connected to each of the arms K' by a pivot, *k*', and is thereby enabled to rock the grate-bars as it is pulled back and forth. By this means the usual "holding up" can be entirely avoided. One side of each grate-bar, when rocked, is forced up a slight distance into the coal, or the ashes or clinkers therefrom which are lying on the grate, and thus disturbs the contents of the furnace at all points alike, and prevents any blocking up of said furnace by the arching over or holding up of said contents. The tops of the grate-bars are intended to rock so as to stand at an angle of about thirty degrees from their usual horizontal position, which is sufficient to accomplish my purpose. As it may not be thoroughly understood how important this arrangement of grate-bars is in connection with apparatus of this character, I will explain that these furnaces are often stopped up and rendered

temporarily useless by reason of the caking together of the ashes and clinkers because of the steam passing through them. This grate-bar and its operating rod and handle enable the operator to break up and dislodge these substances without opening the furnace, which should never be done during the process of making gas, as too much air is thereby admitted.

The operation of my said invention is as follows: The furnace A is first filled with anthracite coal to about the point indicated in the drawings, which is then ignited. The cover *b*<sup>2</sup> is raised by means of the chain I, and the blast of air is turned on through the branch D' of the pipe D. When the coal has burned sufficiently to produce the requisite amount of heat to cause the first story, B', of the superheater to become hot enough to ignite the gases escaping unconsumed to the superheater, the blast of air is turned on through the branch D<sup>2</sup> of the pipe D, thus causing a fierce blaze in said story of the superheater and heating it to an intense heat. When the second story, B<sup>2</sup>, of the superheater becomes hot enough to ignite the portion of the gases which pass unconsumed through the first story, the air-blast is turned on through the branch D<sup>3</sup> of the pipe D, and said second story is heated in like manner as the first story. When both stories are thoroughly heated, the air-blasts are all turned off, the cover *b*<sup>2</sup> is replaced, a blast of steam is turned on through the pipe J, and the petroleum or other fluid hydrocarbon is turned into the top of the first story of the superheater through the pipe F. The steam, in passing through the mass of incandescent coal, is decomposed into hydrogen and carbonic-oxide gases. The oil, in passing through the heated fire-bricks in the story B' of the superheater, is volatilized and changed into carbureted hydrogen. These gases are brought together in said story B' of the superheater, and mingle, forming an illuminating or heating gas. This, in passing through the second story, B<sup>2</sup>, of the superheater, becomes a fixed gas, and passes thence through the conduit to the scrubbers, and thence to the burners or reservoir. (Not shown.)

In passing the steam through the coal the ashes and clinkers after a time become dampened and soggy, and in the ordinary construction of grates clog up the furnace by arching over, or "holding up," as it is termed, and thus destroy the efficiency of the apparatus until the furnace is opened and the arch of fuel and ashes broken down. By the use of my improved grate-bars and the means for operating the same this trouble is avoided, as all the grate-bars are moved at once in such a way as to dislodge whatever may be resting upon them.

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

1. In an apparatus for producing gas, the combination, with the generating-chamber, of

a superheater consisting of two independent superheating-chambers, one located directly above the other and communicating with each other, an intermediate chamber having suitable air-blast passages, and a similar chamber at the bottom of the lower superheater, provided with air-blast passages, and a flue connecting the generating-chamber with the lower chamber of the superheater, the whole arranged substantially as and for the purposes specified.

2. In an apparatus for the manufacture of illuminating-gas, the combination, with the generator, of the double-chambered superheater, having the intervening combustion-chamber, and the combustion-chamber below the lower

chamber, and provided with annular chambers communicating with said combustion-chambers by suitable openings, the air-blast pipes connecting with said annular chambers, the steam-jet pipes, and the liquid-hydrocarbon induction-pipes and their respective valves, the whole arranged to operate substantially in the manner specified.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 1st day of April, A. D. 1882.

FRANK D. MOSES. [L. S.]

In presence of—

C. BRADFORD,

CHAS. L. THURBER.