

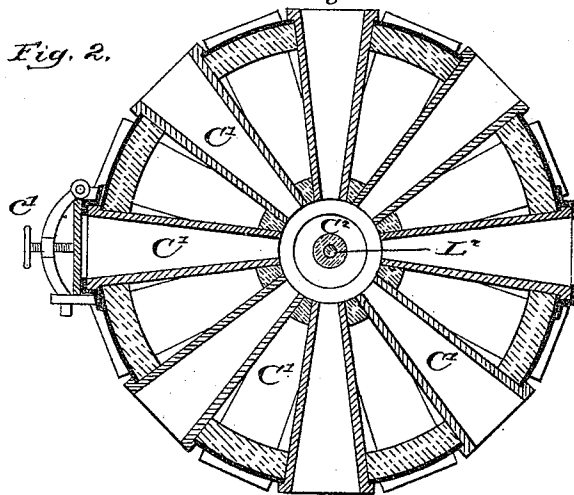
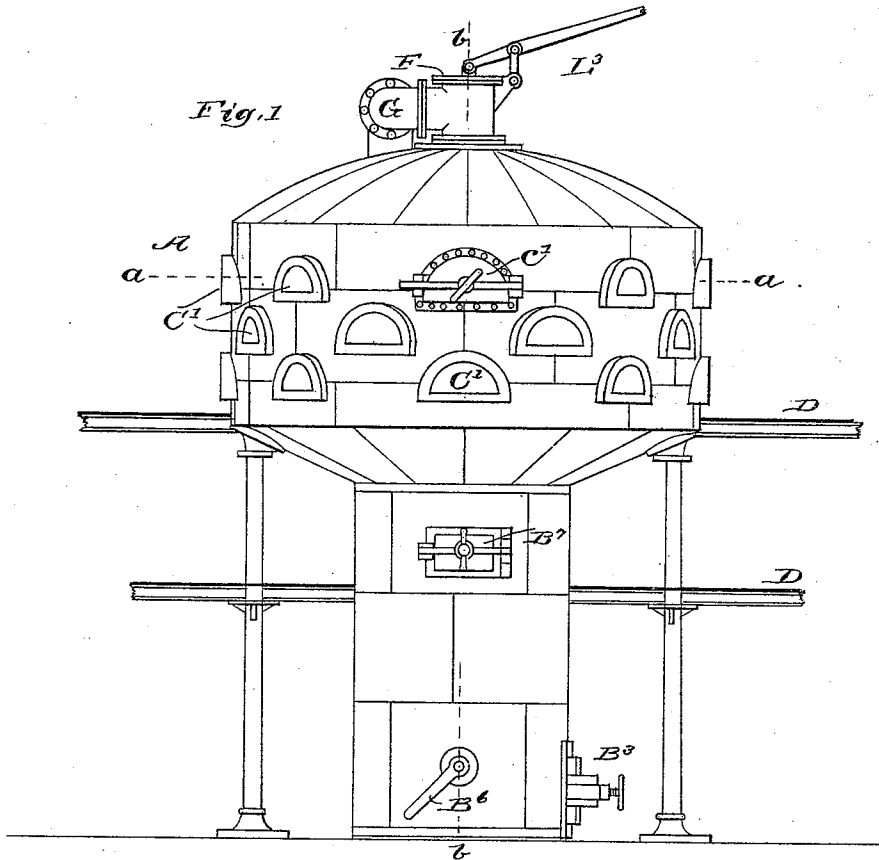
(No Model.)

4 Sheets—Sheet 1.

W. S. WRIGHT.
GAS GENERATING APPARATUS.

No. 438,213.

Patented Oct. 14, 1890.



Witnesses

Charles H. Roberts.

F. L. Stevens.

Inventor

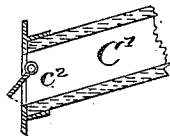
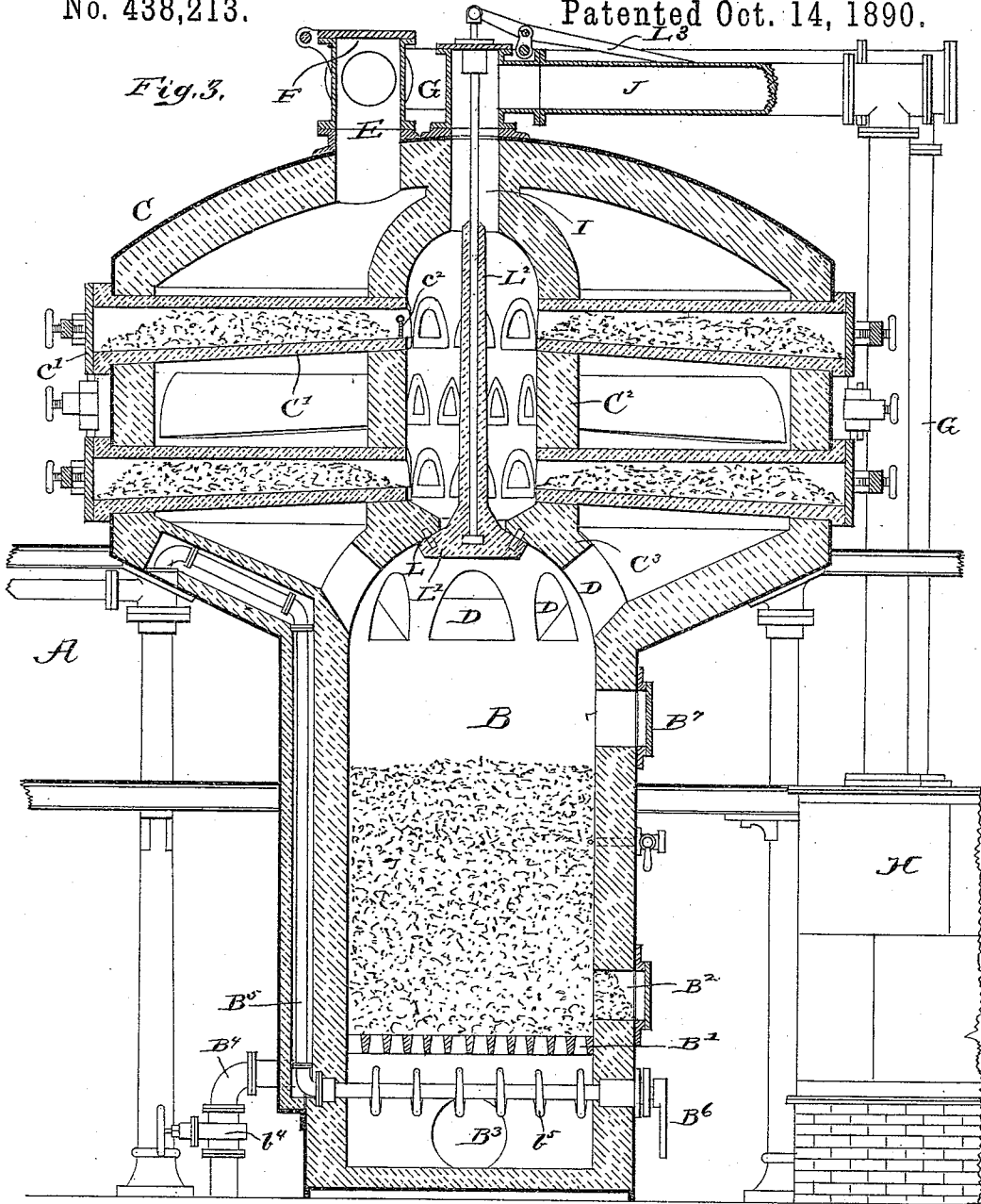
Walter S. Wright

By his Attorney *Cyrus Kels.*

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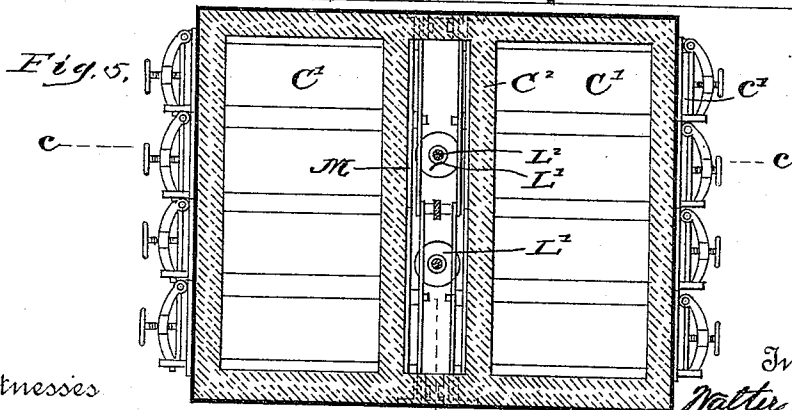
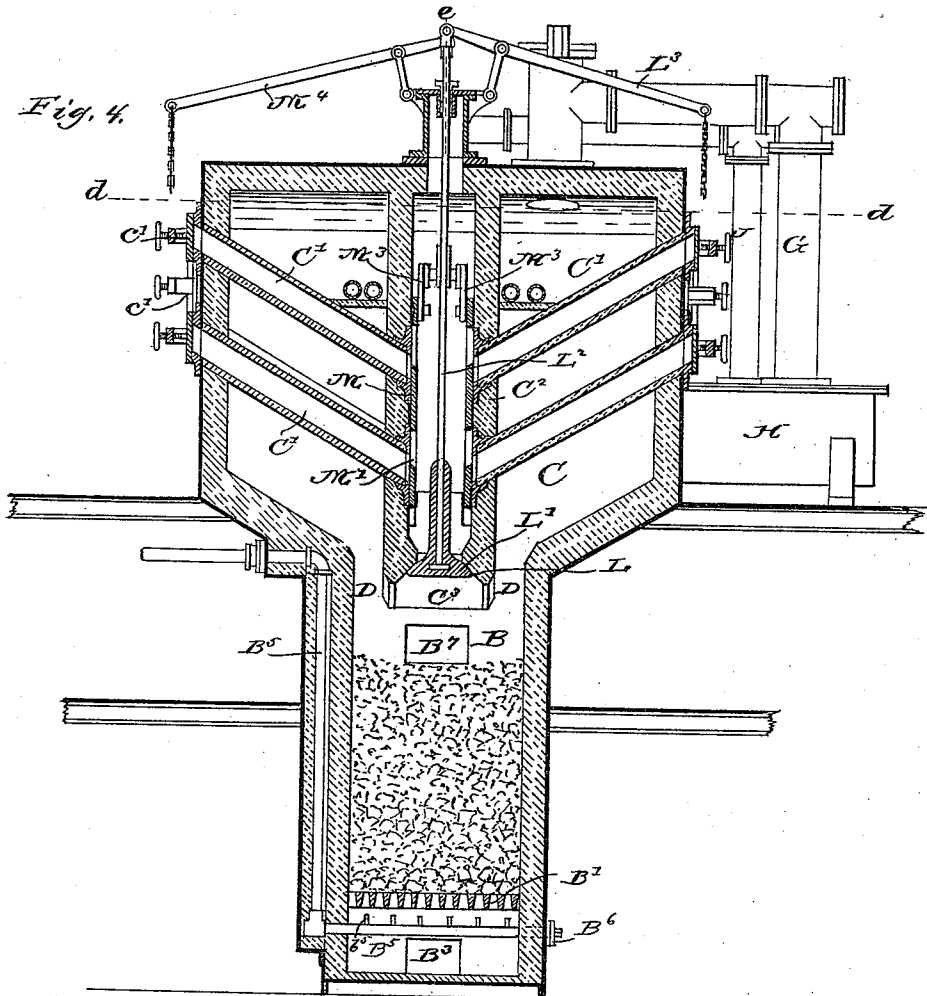
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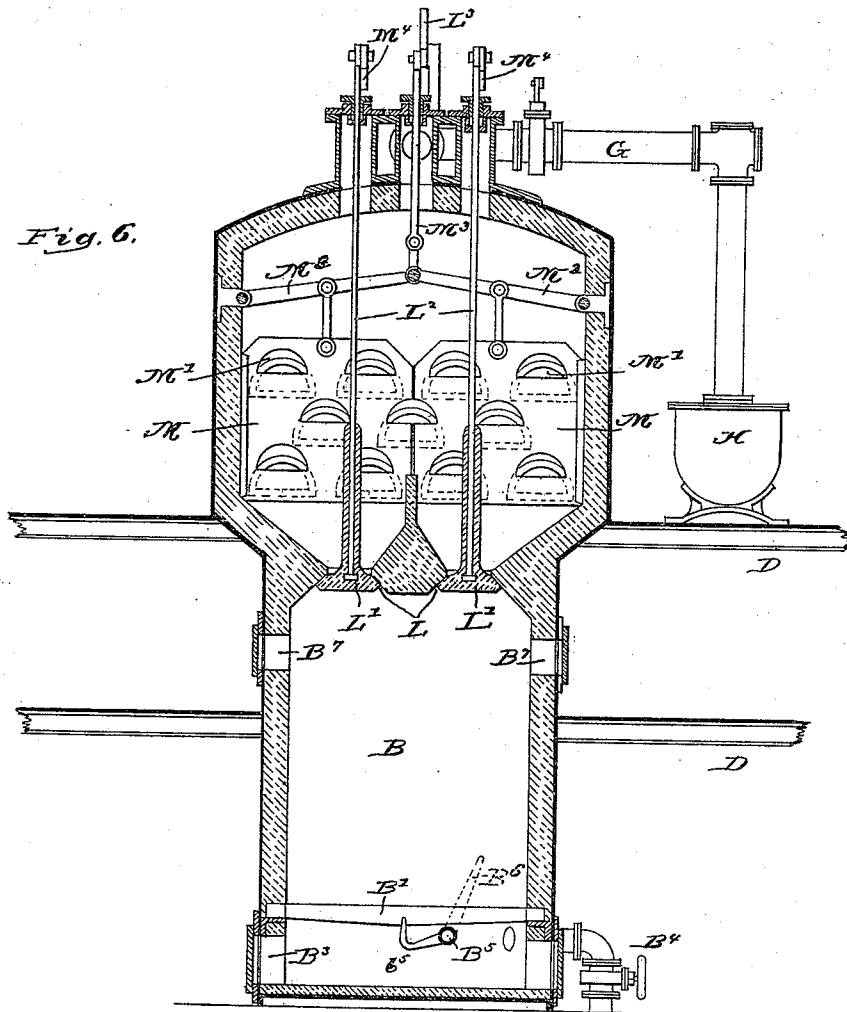
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4 Sheets—Sheet 4.

W. S. WRIGHT.
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UNITED STATES PATENT OFFICE.

WALTER S. WRIGHT, OF CHICAGO, ILLINOIS.

GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 438,213, dated October 14, 1890.

Application filed March 5, 1889. Serial No. 301,869. (No model.)

To all whom it may concern:

Be it known that I, WALTER S. WRIGHT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas-Generating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention is designed particularly to apply to an apparatus for generating what is known as "water-gas." The object of the invention is to provide an apparatus whereby ordinary coal and water gas may be made from the same coal, and particularly from ordinary bituminous coal. Briefly stated, the result accomplished is the distillation of bituminous coal within the apparatus and the withdrawal of the resultant gases and the subsequent heating of the resultant coke to incandescence and passing steam through such coke to decompose the steam and form water-gas, the entire operation being performed within the same apparatus, the heat for the distillation of the coal being supplied by the burning coke. This method is adopted because of its economy. In the ordinary distillation of coal a certain amount of fire is needed to heat the retorts containing the coal. By the ordinary method of distilling coal such a fire is an extra expense. In the manufacture of water-gas by the ordinary processes considerable heat is wasted during the process of igniting the bed of coal and coke in which the steam is decomposed. By my process the water-gas fire is made to heat the retorts, and the coke resulting from the distillation of the coal is added to the bed of water-gas fuel without loss of heat, so that the temperature of said fuel is always high. The two kinds of gas may be led off separately for separate purifying and storage, or they may be combined and used as one gas. Either or both may also be carbureted to acquire illuminating power.

The apparatus herein described embodies additions to the improvements described and

claimed in an application for gas-generating apparatus filed by Reinhold Boeklen, of even date herewith. Said Reinhold Boeklen and I have also jointly invented a modification of the apparatus shown in this application and in his sole application aforesaid.

In the accompanying drawings, Figure 1 is a side elevation of one form of my apparatus. Fig. 2 is a horizontal cross-section in the line *a a* of Fig. 1. Fig. 3 is a vertical central section in line *b b* of Fig. 1. Fig. 4 is a vertical section in line *c c* of Fig. 5. Fig. 5 is a horizontal section in line *d d* of Fig. 4. Fig. 6 is a vertical section in line *e e*, extending through Figs. 4 and 5.

Referring to Figs. 1, 2, and 3, the apparatus consists of a general inclosure or cupola A, the lower portion of which B is used as a combustion-chamber, while the upper portion C is used for the distillation of the coal and for superheating the water-gas. The inclosure A is built up in the usual way of fire-resisting material—such as clay, tile, or brick—and is covered over its outer faces with metallic plate. It is also provided with heat-resisting and gas-tight doors and ports in the places hereinafter mentioned.

The portion B of the cupola may be constructed in any of the well-known forms and operated according to any of the ordinary methods of generating water-gas. The parts relating thereto, as shown in the drawings, excepting the steam-inlets hereinafter described, are merely for illustration.

In Fig. 3, B' is a common grate upon which the bed of fuel is supported. Instead of the common grate shown rocking or revolving grates may be used. Immediately above the grate a door B² opens through the outer wall to afford access to the bed of coal for clearing clinkers and ashes.

B³ designates an ash-door below the grate.

B⁷ designates a door above the fuel-bed.

B⁴ is an air-blast pipe leading through the wall of the cupola below the grate, and b⁴ is a valve in said pipe.

B⁵ designates a steam-pipe entering the cupola below the grate, by which steam is introduced to pass through the bed of incandescent fuel resting upon the grate. Said pipe may have the ordinary nozzles usually adopted for this purpose; but the drawings, Figs. 3

and 6, show an improvement upon the ordinary stationary nozzle. The pipe B⁵, which is lead through the wall of the cupola for additionally heating the steam, is turned horizontally in the wall of the cupola below the grate, at which point said pipe has a joint, permitting the rotation of that portion of the pipe extending horizontally through the space beneath the grate and through the opposite wall of the cupola. Outside of said opposite wall of the cupola a crank B⁶ is applied to and over said end of the pipe, so as to seal the pipe and allow it to be turned by the moving of said crank. Nozzles b⁵ extend laterally from the side of the pipe beneath the grate and then upwardly toward the grate. (See Fig. 6.) When not in use, said pipe is so turned as to bring said nozzles below the grate and away from the intense heat of the fire above the grate; but when the steam is to be directed into the bed of incandescent fuel the steam is turned on and then the crank B⁶ turned, so as to rotate the pipe in the proper direction to raise the nozzles upwardly between the grate-bars to or into the bed of fuel above the grate, so that the steam is delivered directly into the mass of fuel and properly distributed. These nozzles b⁵ are introduced to penetrate the layer of ashes or partially-ignited fuel lying immediately above the grate and to penetrate through any dense layer of ignited fuel which may be formed immediately above the grate. While the steam is issuing through said nozzles they will not be materially affected by the heat of the fuel, and before the steam is shut off said nozzles should be again retracted to a suitable distance beneath the grate.

The portion C of the cupola A is preferably expanded laterally and provided with retorts C', extending from the outer wall toward the middle of the cupola and nearly meeting at such middle.

Figs. 1, 2, and 3 show the cupola as being round in cross-section.

Other shapes may be used, if desired.

In Figs. 4, 5, and 6 the cupola is shown of nearly square cross-section.

In Fig. 3 the retorts C' are represented as extending through the exterior wall of the cupola radially toward the center and there opening through the central vertical chamber C², supported upon an arch C³ built upon the walls of the cupola near the upper limit of the portion B. Said retorts, as shown in said Fig. 3, have outer seal-doors c', but are open at their inner ends, excepting that they may have gravity-doors c², as shown in the upper left-hand retort in said figure. Such swinging doors, when used, are merely for the purpose of preventing the coal from falling through the mouth of the retort before it is urged forward by mechanical means.

D D are passages through the arch C³, and E is an exit through the upper portion of the cupola. Upon the upper portion of said exit is a door F, and from said exit a pipe G leads

laterally and then downwardly into the wash-box H. From the upper portion of the chamber C² there is an exit I, with a lateral pipe J, leading also to the wash-box H. At the bottom of the chamber C² there is an opening L, and below said opening is a head L', composed of fire-resisting material and arranged to be drawn upwardly over the opening L, so as to form a valve to seal the space within said chamber from the general space in the cupola. The head L' is supported by the upwardly-extended valve-stem L², which passes through the upper wall of the exit I, and is there joined to the lifting-lever L³ or other mechanism for raising and lowering said stem and head.

The operation of this apparatus is as follows: A bed of coke or coal is first placed upon the grate B' to a sufficient depth for decomposing steam to form water-gas, said bed being prepared with kindling or otherwise for readily igniting the same. The kindling may first be arranged upon the grate through the door B². Then the coal and coke may be fed in from above through the door F or the door B⁷. When this has been done, the door B⁷ is closed. The retorts C' are then filled with bituminous coal through the doors c'. The valve at L is closed. The door F being still open, the charge upon the grate B' is ignited and the fire urged by a blast from the blast-pipe B⁴. The gaseous products of this combustion rise upwardly through the openings D in the arch C³ and pass between and around the retorts C' and out through the exit E and the door F into the outer air; or they may be led thence and utilized as "producer" gas. By this means each of the retorts C' is well heated simultaneously with the ignition of the bed of material upon the grate. Thus the distillation of the coal in the retorts is established and continued so long as the apparatus remains hot. The gases resulting from such distillation in the retorts pass out of the inner ends of the retorts into the chamber C², and thence rise through the exit I and pipe J into the wash-box, and from the latter are led in the usual way for consumption.

When the bed of material upon the grate B' has been sufficiently ignited for the decomposition of steam, the blast-pipe B⁴ and the door F are closed and the steam-pipe B⁵ opened. Thus steam is delivered through the bed of incandescent material and decomposed in the well-known manner, the gases resulting being hydrogen and carbonic oxide or hydrogen and carbonic acid. If when the bed of incandescent material has been cooled the coal in the retorts has not been fully distilled, then the steam is shut off, the door F and the blast-pipe B⁴ again opened, and the mass of material upon the grate again raised to the required temperature, and said blast-pipe B⁴ and door F again closed and the steam again turned on, and so on until the coal in the retorts has been fully distilled and only coke remains in the retorts. Now the grate B'

may be cleared of ashes and cinders and the mass of fuel thereon allowed to settle. Then the head L' is lowered, the sealed doors c' opened, and the coke in the retorts pushed inwardly into the chamber C² and allowed to fall through the opening L upon the bed of burning carbonaceous material supported by the grate B'. Thus the coke from the retorts C' is added to the bed of fuel upon the grate, so that said bed is again of the proper depth to decompose steam. The emptied retorts are again filled with coal and the head L' raised to seal the chamber C². The door F is opened and the blast of air is again turned on to "blow up" the mass of material upon the grate, and the new charges of coal in the retorts are heated and distilled.

It will be seen that when the distillation is progressing and the water-gas is being formed by the decomposition of the steam the two kinds of gas are being formed simultaneously and pass separately into the wash-box. This is done when it is desired to mix the two kinds of gases and consume them as a mixture. It will be seen, however, that the two pipes G and J may lead to distinct wash-boxes and the latter communicate with distinct mains or holders, so that each kind of gas may be consumed separately for the purpose desired. Either or both of the gases may be carburated by mixing the same with vaporized petroleum or other liquid hydrocarbon. As the process of carburating such gases is well understood, I deem it unnecessary to illustrate the same.

It is to be observed that the entire inclosure or cupola A is a unitary heated chamber and that the coke produced by distilling the coal in the retorts does not leave said chamber, but remains and is consumed therein, it being transferred only from one portion of said chamber to another. Thus the heat of the coke is preserved to aid in burning it when it reaches the fuel-bed. It is also to be observed that by this means the mass of heated coke is not exposed to the outer air, so as to discharge into the latter any gases.

In the form of the cupola shown in Figs. 4, 5, and 6 the chamber C² extends across the cupola, and the retorts C' extend from opposite sides in parallel through the side walls of said chamber C². At the lower portion of said chamber there is an arch C³, having spaces D at its sides. To afford communication with the lower portion of the cupola by means of small valves, there are two holes L and two heads L', whereby said holes are sealed. The retorts C' are shown inclined downwardly toward the chamber C², so as to facilitate the removal of the coke. In such construction it is desirable to provide means for holding the coal positively against sliding downwardly into the chamber C² before the coking is completed. This I accomplish by means of gates M M, hung adjustably in front of said retorts and having holes M' of the size of the mouth of the retorts arranged to come oppo-

site said mouths when said gates are lowered. Then when said gates are raised the lower portion of said mouths is obstructed while the upper portion is open for the escape of gas. Said gates may be hung from levers M², M³, and M⁴, or otherwise. In this modification G and J are the pipes for leading off the two kinds of gases, as shown in the form in Figs. 1 and 2.

I claim as my invention—

1. The combination, with a combustion-chamber, of the grate B', a rotating steam-pipe located beneath and detached from said grate, nozzles b⁵, extending laterally from said pipe and of such length as to extend through the spaces between the grate-bars when said pipe B⁵ has been turned so as to bring said nozzles into their uppermost position, substantially as shown and described.

2. In a gas-generating cupola, the central chamber C², having a gas-outlet above and a sealed coke-outlet below, and coal-distilling retorts leading through the outer wall of said cupola, through the interior space of said cupola, and then through the wall of the central chamber C² and opening into said chamber, the outer ends of said coal-retorts being provided with seal-doors, substantially as shown and described.

3. In a gas-generating cupola, an arch C³, supporting a chamber C², having a gas-outlet above and a sealed coke-outlet below, and coal-distilling retorts leading through the outer wall of said cupola, through the interior space of said cupola, and then through the wall of the central chamber C² and opening into said chamber, the outer ends of said coal-retorts being provided with seal-doors, substantially as shown and described.

4. In a gas-generating cupola, the central chamber C², having a gas-outlet above and one or more coke-outlets below, provided with a head or heads for sealing the same, said heads having stems rising through said chamber to the outside of the cupola, and coal-distilling retorts leading through the outer wall of said cupola, through the interior space of said cupola, and then through the wall of the central chamber C² and opening into said chamber, the outer ends of said coal-retorts being provided with seal-doors, substantially as shown and described.

5. In a gas-generating apparatus, a cupola having in its lower portion a grate, a space above said grate for a bed of carbonaceous material, and having in its upper portion a sealed central chamber C³, having a gas-outlet above, coal-distilling retorts extending through the outer wall of the cupola, through the inner space of the cupola, and through the wall of said central chamber and opening into the latter, said cupola having an outlet for the products of combustion of said bed of carbonaceous material, substantially as shown and described.

6. In a gas-generating apparatus, a cupola having in its lower portion a grate, a space

above said grate for a bed of carbonaceous material, and having in its upper portion a sealed central chamber C², supported on an arch rising from the wall of said cupola, having a gas-outlet above and coal-distilling retorts extending through the upper wall of the cupola, through the inner space of the cupola, and through the wall of said central chamber and opening into the latter, said cupola having an outlet for the products of combustion of said bed of carbonaceous material, substantially as shown and described.

7. In a gas-generating cupola, the central chamber C², having a gas-outlet above and a sealed coke-outlet below, and coal-distilling retorts leading from the outer wall of said cupola, through the interior space of said cupola, and then through the wall of the central chamber C² and opening into said chamber, said chamber having an opening L below, a head L' of heat-resisting material fitted

over the lower side of said opening, a stem L² rising from said head through said chamber C², and a lifting-lever located upon the top of the cupola and connected with said stem L², substantially as shown and described.

8. In a gas-generating apparatus, a cupola having a lower portion B and a relatively expanded upper portion C, a dome-shaped arch rising from the wall of said portion B and dividing the latter from the portion C, and having passages D, a sealed chamber C², supported by said arch, and coal-distilling retorts opening into said chamber, substantially as shown and described.

In testimony whereof I affix my signature, in presence of two witnesses, this 13th day of February, A. D. 1889.

WALTER S. WRIGHT.

Witnesses:

CYRUS KEHR,

CHARLES H. ROBERTS.