

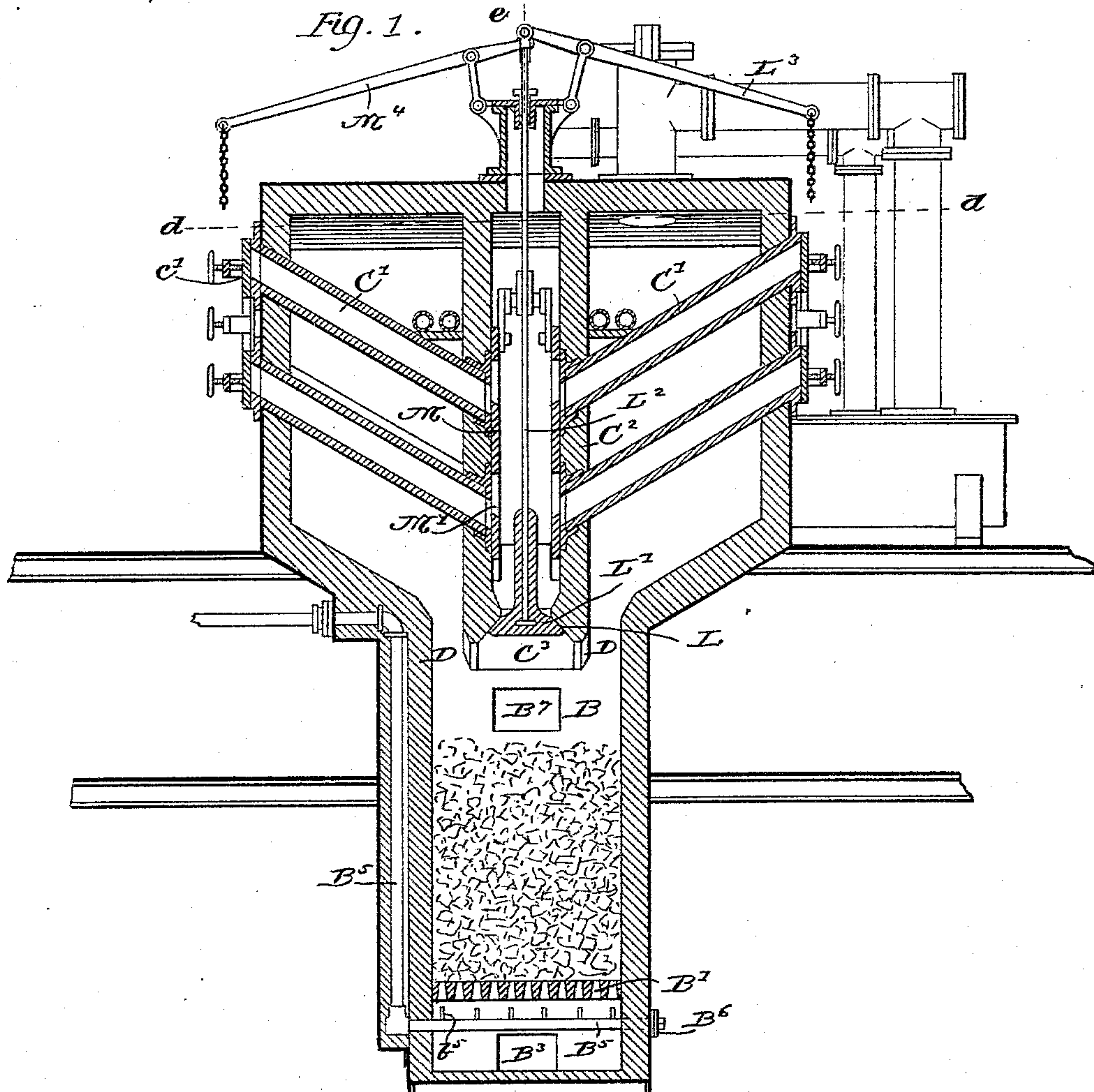
(No Model.)

2 Sheets—Sheet 1.

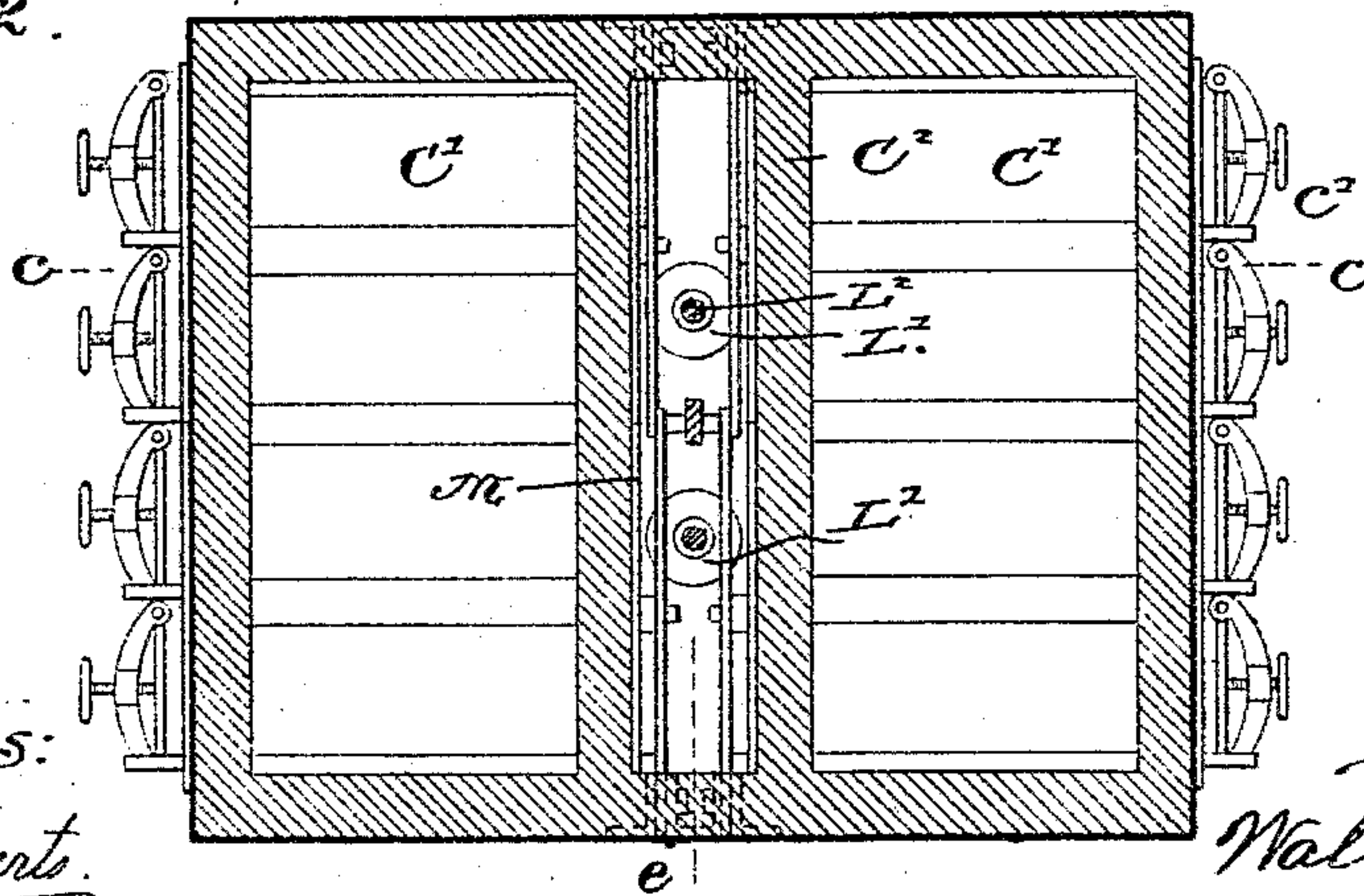
W. S. WRIGHT.  
GAS GENERATING APPARATUS.

No. 414,470.

Patented Nov. 5, 1889.



*Fig. 2.*



Witnesses:  
*Charles H. Roberts.*

*F. L. Starnes*

Inventor:  
*Walter S. Wright*  
By *Cyrus W. De la*  
Attorney.

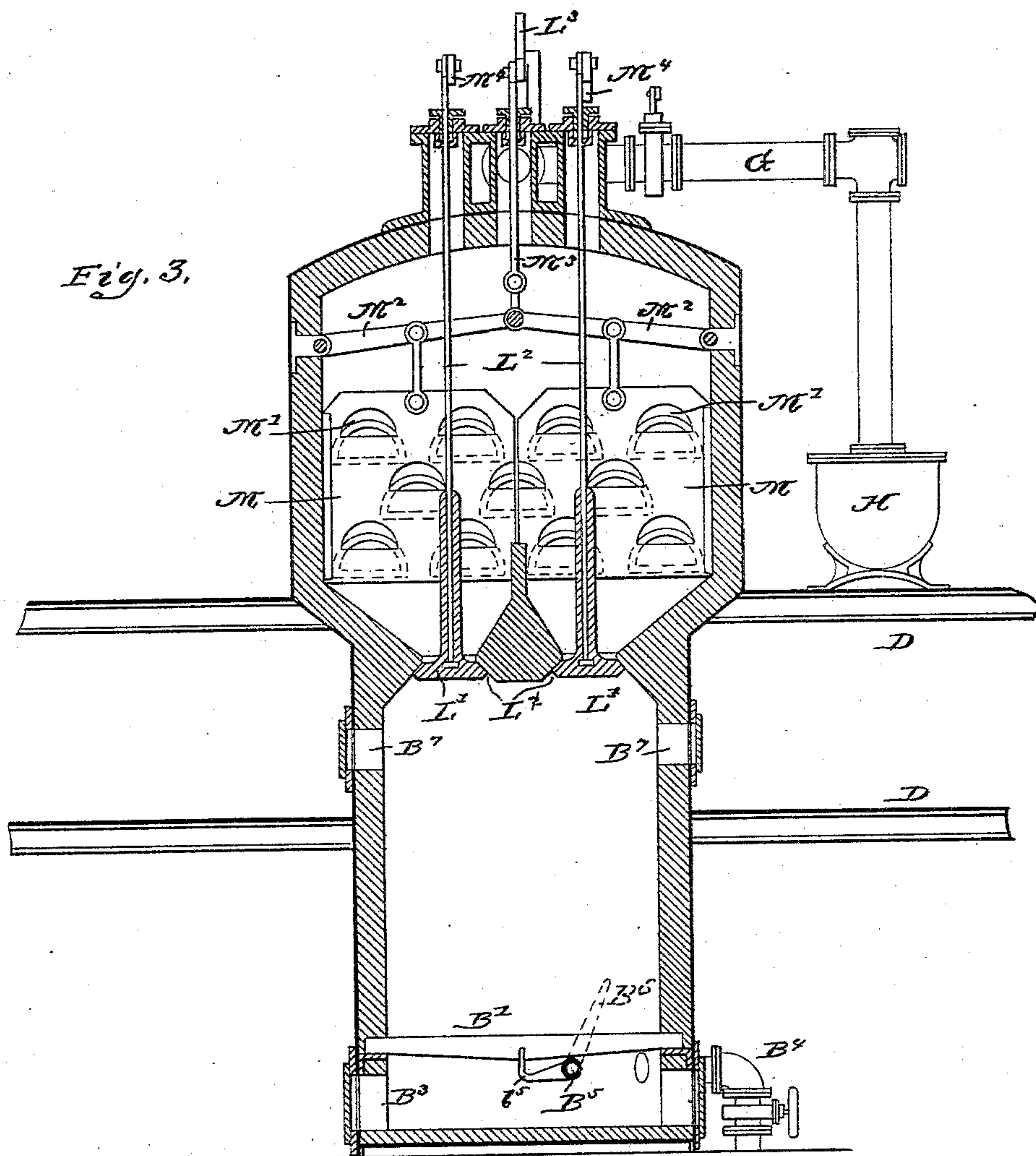
(No Model.)

2 Sheets—Sheet 2.

W. S. WRIGHT.  
GAS GENERATING APPARATUS.

No. 414,470.

Patented Nov. 5, 1889.



Witnesses:

Charles H. Roberts.

F. L. Stevens.

Inventor:

Walter S. Wright

by Cyrus K. E. Jr.  
Atty.



# UNITED STATES PATENT OFFICE.

WALTER S. WRIGHT, OF CHICAGO, ILLINOIS.

## GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 414,470, dated November 5, 1889.

Application filed March 5, 1889. Serial No. 301,870. (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 or figures of reference marked thereon, which form a part of this specification.

This invention is designed particularly to apply to 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 or 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. It is also an addition to the improvements claimed in another application filed by me of even date herewith. Said Reinhold Boeklen and I have also jointly invented a modification of the apparatus shown in this and my other application and his sole application aforesaid.

In the accompanying drawings, Figure 1 is a vertical central section in line *c c* of Fig. 2. Fig. 2 is a horizontal section in line *d d* of Fig. 1. Fig. 3 is a vertical section in line *ee* of Figs. 1 and 2.

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 distilling of the coal and for superheating the water-gas. The inclosure A is built 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 A 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, are merely for illustration.

The form of steam-inlet shown herein is made a part of the subject-matter of said sole application filed by me of even date herewith.

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.

B<sup>2</sup> designates ash-doors below the grate.

B<sup>7</sup> designates a door above the fuel-bed.

B<sup>4</sup> is an air-blast pipe leading through the wall of the cupola below the grate, and *b<sup>4</sup>* is a valve in said blast-pipe.

B<sup>5</sup> 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 show an improvement upon the ordinary stationary nozzle. The pipe B<sup>5</sup>, which is led 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 B<sup>6</sup> is applied to and over said end of the pipe, so as to seal the latter and allow it to be turned by the moving of said crank. Nozzles b<sup>5</sup> extend laterally from the side of the pipe beneath the grate, and then upwardly toward the grate. 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 B<sup>6</sup> turned so 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 b<sup>5</sup> 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, where they enter the central vertical transverse chamber C<sup>2</sup>. Said retorts extend through the outer wall of the cupola, through the inner space of the cupola, and through the wall of the central chamber C<sup>2</sup>, into which they open, and said retorts incline downwardly from the outer wall toward the center of the cupola. Said chamber C<sup>2</sup> is supported from the side walls of the cupola and is in the form of an arch below, having at its sides the passages D. Said retorts have at their outer ends seal-doors c'.

E is an exit through the upper portion of the cupola. Upon the upper portion of said exit is a door F, and from the side of said exit a pipe G leads laterally and then downwardly into the wash-box H. From the upper portion of the chamber C<sup>2</sup> there is an exit I, with a lateral pipe J, leading also to the wash-box H. At the bottom of the chamber C<sup>2</sup> there are one or more openings L, below each of which 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 said opening and isolate the space within said chamber from the general space in the cupola. The head L' is supported by the upwardly-extended stem L<sup>2</sup>, which passes through the upper wall of the exit I, and is there joined to the lifting-lever L<sup>3</sup> or other mechanism for raising and lowering said stem and head.

When the coal-distilling retorts are inclined, as shown in the drawings, it is desirable to provide means for holding the coal positively against sliding downwardly into the chamber C<sup>2</sup> before the coking is completed. This is accomplished by means of gates M M, hung adjutably in front of said retorts, and having holes M' of the size of the mouth of the retorts arranged to come opposite 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 M<sup>2</sup>, M<sup>3</sup>, and M<sup>4</sup>, or otherwise.

The operation 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. Said bed of coke or coal may be fed in through the door B'. When this has been done, said door B' is closed. The retorts C' are then filled with bituminous coal through the doors c'. The valves at L are 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 B<sup>4</sup>. The gaseous products of this combustion rise upwardly through the openings D at the sides of the arch C<sup>3</sup> 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 C<sup>2</sup>, 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 B<sup>4</sup> and the door F are closed and the blast-pipe B<sup>5</sup> is 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 B<sup>4</sup> again opened, and the mass of material upon the grate again raised to the required temperature, and said blast-pipe B<sup>4</sup> and door F again closed and the steam again  
 5 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  
 10 heads L' and gates M are lowered, seal-doors c' opened, and the coke in the retorts pushed downwardly and inwardly into the chamber C<sup>2</sup> (if it does not run from gravity) and allowed to fall through the openings L upon the  
 15 bed of burning carbonaceous fuel 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 heads L' and  
 20 gates M are again raised to seal the chamber C<sup>2</sup> and to partially close the inner ends of the retorts C'. Then the emptied retorts are again filled with coal. Then the door F is opened, and the blast of air is again turned on to  
 25 "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  
 30 are being formed simultaneously and pass separately into the wash-box. This is done when it is desired to mix the two kinds of gas and consume them as a mixture. It will  
 35 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  
 40 or both of the gases may be carbureted by mixing the same with vaporized petroleum or other liquid hydrocarbon. As the process of carbureting such gases is well understood, I deem it unnecessary to illustrate the same.  
 45 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  
 50 transmitted 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  
 55 is not exposed to the outer air, so as to discharge into the latter any gases.

I claim as my invention—

1. In a gas-generating apparatus, a cupola of rectangular cross-section having in its lower portion a grate and steam-inlet and above  
 60 said grate a space for a bed of carbonaceous material, the central chamber C<sup>2</sup>, extending from side to side of the upper portion of the cupola and having a gas-outlet above and one or more sealed coke-outlets below, and coal-  
 65 distilling retorts arranged parallel to each other and leading through the outer wall of said cupola from each side of the said central chamber, through the interior space of said cupola, and then through the wall of the central chamber C<sup>2</sup> and opening into said chamber,  
 70 the outer ends of said coal-retorts being provided with seal-doors, substantially as shown and described.

2. In a gas-generating apparatus, a cupola  
 75 having in its lower portion a grate and a steam-inlet and a space above said grate for a bed of carbonaceous material, a central chamber C<sup>2</sup> in the upper portion of the cupola and having a gas-outlet above and one or more  
 80 sealed coke-outlets below, and a series of retorts extending through the outer wall of the cupola, through the interior space of the cupola, and through the wall of the said central chamber, and said chamber having gates M  
 85 hung over the inner ends of the retorts and provided with suitable lifting-levers, substantially as shown and described.

3. In a gas-generating apparatus, a cupola of rectangular cross-section having in its lower  
 90 portion a grate and steam-inlets and having above said grate a space for a bed of carbonaceous material, a central chamber located in the upper portion of said cupola and having a gas-outlet above and one or more openings  
 95 L below provided with sealing-heads L', inclined retorts C', extending through the outer wall of the cupola, downwardly and inwardly through the interior space of the cupola, and through the wall of said central chamber, and  
 100 gates M, hung adjustably in front of said retorts and having holes M', substantially as shown and described.

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

WALTER S. WRIGHT.

Witnesses:

CHARLES H. ROBERTS,  
 CYRUS KEHR.