

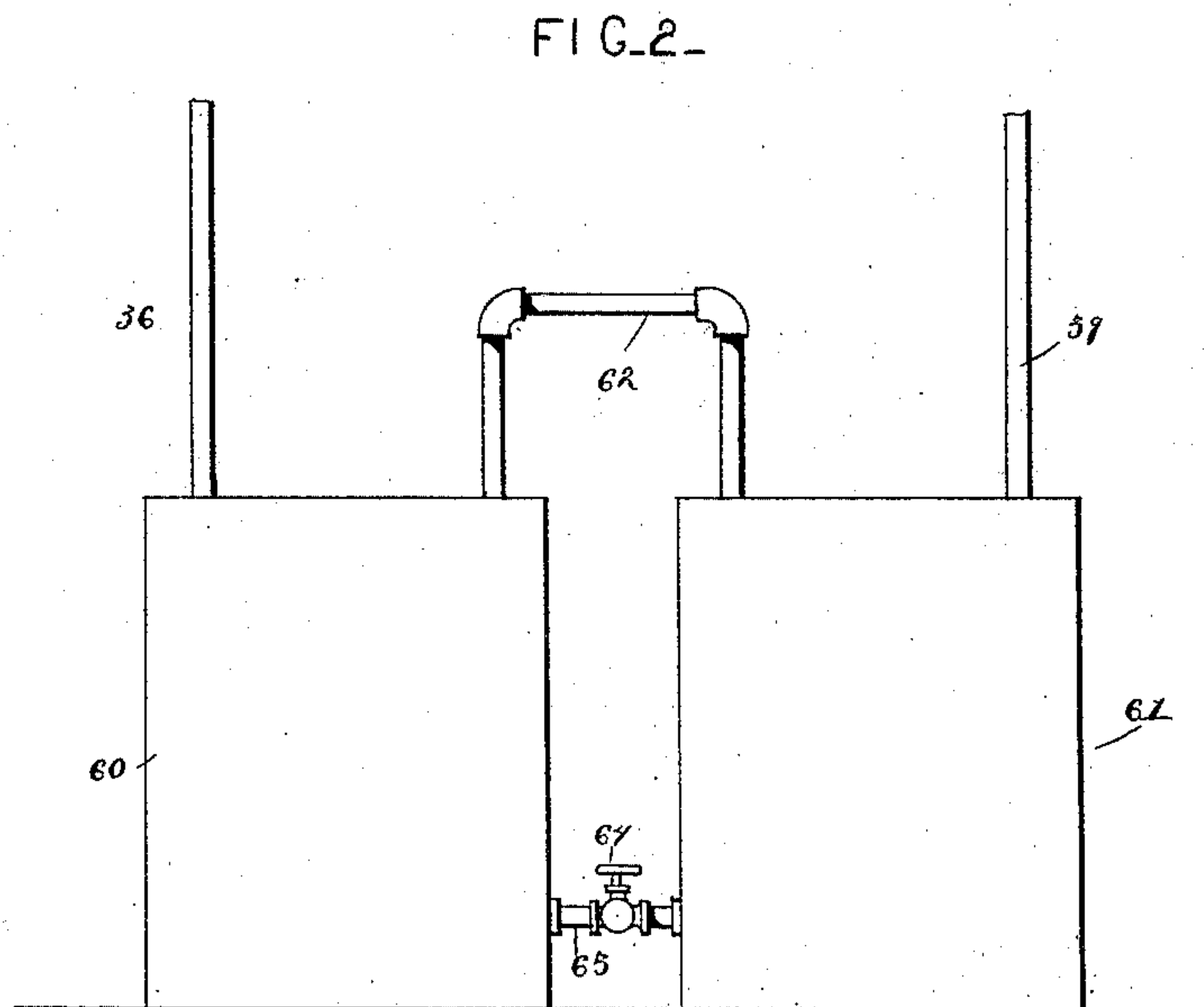
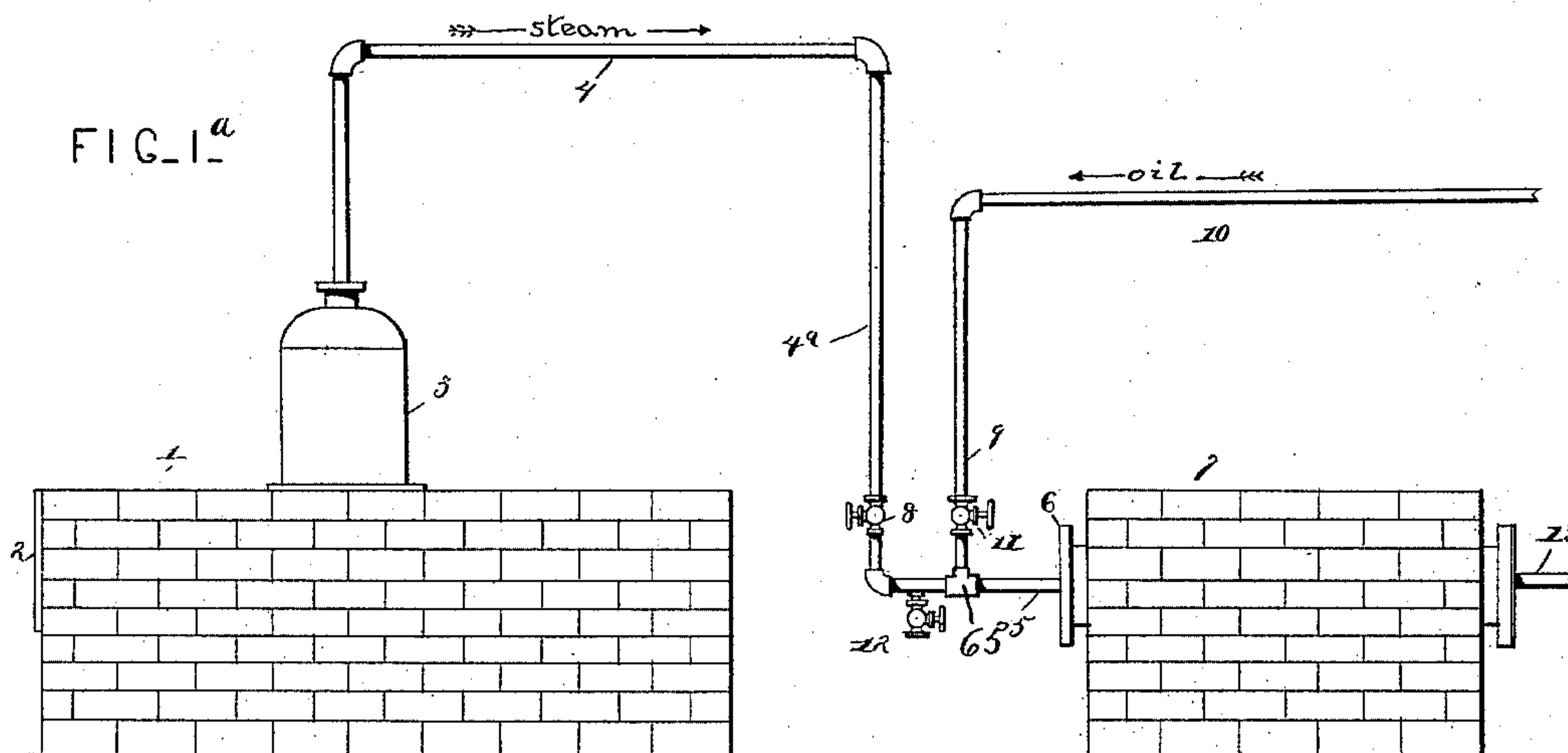
(No Model.)

2 Sheets—Sheet 1.

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PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF  
ILLUMINATING GAS.

No. 468,747.

Patented Feb. 9, 1892.



Witnesses

*Geo. C. French,*  
*Geo. L. Wheelock,*

Inventor  
*Charles B. de Lamarre*

By *his* Attorneys,

*C. A. Snow & Co.*

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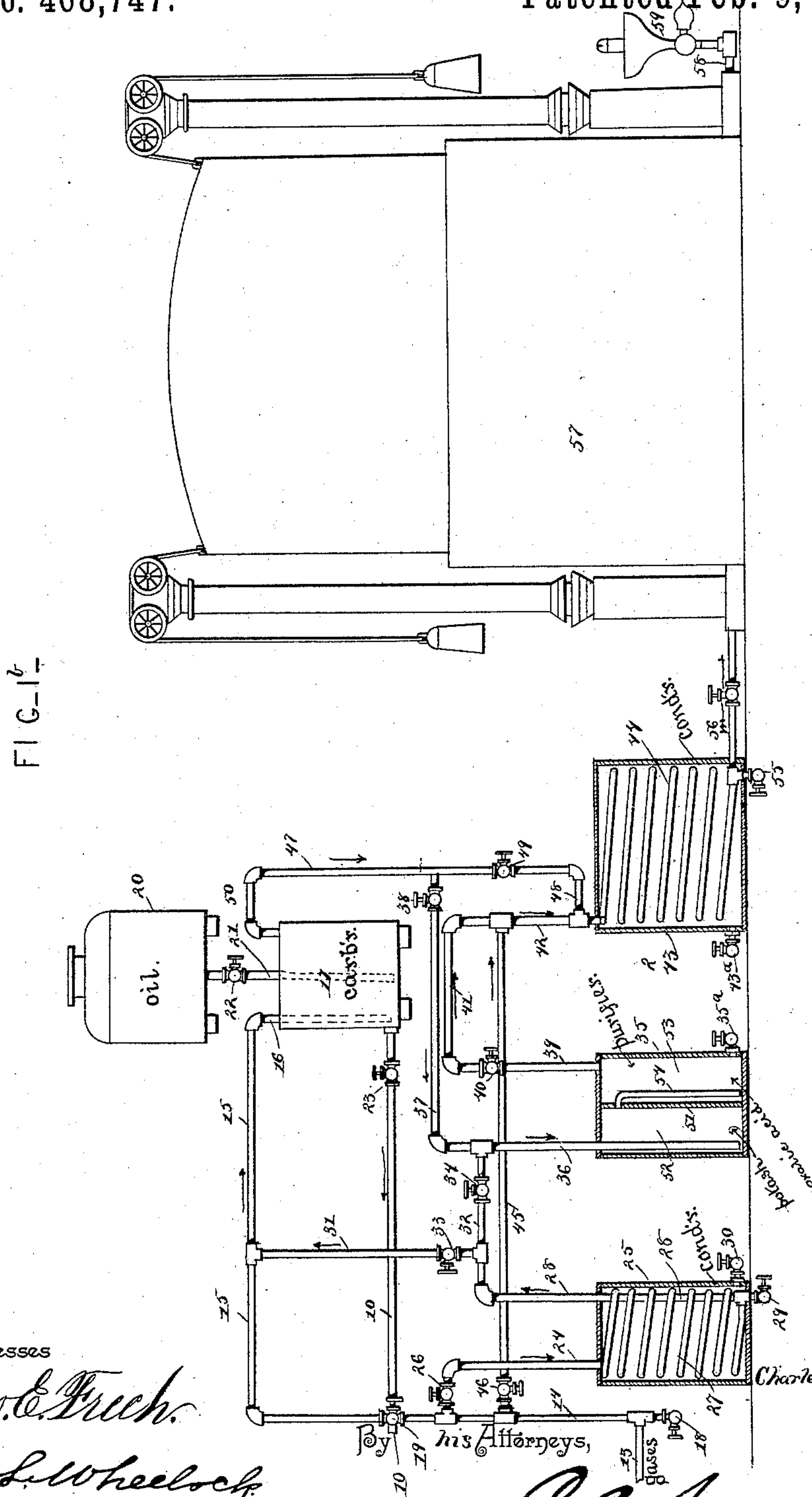
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# UNITED STATES PATENT OFFICE.

CHARLES BOUGOURD DE LAMARRE, OF BILOXI, MISSISSIPPI, ASSIGNOR OF  
ONE-HALF TO ALEXANDER B. FRENCH, OF NEW ORLEANS, LOUISIANA.

PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 468,747, dated February 9, 1892.

Application filed October 8, 1890. Serial No. 367,383. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES BOUGOURD DE LAMARRE, a citizen of the United States, residing at Biloxi, in the county of Harrison and State of Mississippi, have invented a new and useful Process of and Apparatus for the Manufacture of Illuminating-Gas, of which the following is a specification.

My invention relates to an improved method of and apparatus for the manufacture of gas, which is capable of making illuminating-gas by four different methods separately or combined in one; and its objects are the making of gas which will combine all the various qualities of a gas producing a bright and steady flame.

With these objects in view my invention consists in certain features of novelty to be hereinafter described, and then pointed out in the claims.

In the accompanying drawings, Figure 1<sup>a</sup> is a view of a portion of my improved apparatus, showing the steam-generator and gas-retort. Fig. 1<sup>b</sup> is a view of the remaining portions of my improved apparatus, showing the carburetor, coolers, purifier, the gas-holder, and burner, the parts shown in both of these figures being combined as a whole into a single plant for the manufacture of gas. Fig. 2 is a modification of the purifier.

1 represents a furnace, and 2 a steam-boiler fixed therein, said furnace and boiler being constructed and operated in the usual well-known manner. With the steam-dome 3 a pipe connection 4 communicates, said pipe extending upwardly, horizontally, and downwardly at 4<sup>a</sup>, and is provided at its lower end with a horizontal pipe connection 5, that leads into a retort 6, which is heated by a furnace 7. The retort 6 is made of fire-proof clay or iron, and is filled with charcoal or coke, which is susceptible, when in its heated condition, of uniting with the oxygen of the steam which is decomposed by coming in contact with the heated material within the retort.

8 is a valve arranged in the portion 4<sup>a</sup> of pipe 4, so as to regulate the amount of steam passing from the steam-boiler 2 into the gas-retort 6. Extending from the pipe 5 is a branch pipe 9, from the upper end of which

extends a pipe 10 above the gas-retort 6, said branch pipe being provided with a valve 11. In the pipe 5 between the pipes 4<sup>a</sup> and 9 is a valve 12. From the rear end of the retort 6 a pipe 13 leads.

In order to produce the apparatus on a proper scale, portions thereof have been represented on separate sheets of drawings, the points of severance extending through pipes 10 and 13. Extending upwardly from the outer end of pipe 13 is a vertical pipe 14, the upper end of which is connected with a horizontal pipe 15, which has a downwardly-projecting branch 16, extending into the carburetor 17, said carburetor being supported in any suitable manner. At the juncture of the pipe 13 with the pipe 14 is a valve 18, and in the pipe 14 is a valve 19. Above the carburetor 17 is the oil-supply tank 20, which contains the requisite oil, such as spirits of petroleum or a similar oil, such as is customarily used in the carbureting of gases, said tank having communication with the carburetor through the medium of the pipe 21, which is provided with a valve 22. The pipe 10 leads into the lower end of the carburetor 17 and is provided with a valve 23.

24 is a branch pipe leading from the pipe 14 outwardly and downwardly into the upper end of the auxiliary cooler or condenser 25, and provided with a valve 26. The pipe 24 is formed in the usual spiral or coil 27 within the auxiliary cooler 25, the lower end of said coil communicating with a vertical pipe 28, extending through the top and bottom of the cooler. The lower end of the pipe 28 is provided with a valve 29, and the cooler is provided with a discharge-valve 30. The purpose of the cooler, as will be understood, is to get rid of the tar or the water resulting from the gases which have not been decomposed in the retort, which will then be condensed within said cooler. 31 is a vertical pipe extending downwardly from the pipe 15 and communicating with a branch pipe 32, extending from the upper end of pipe 28 of the cooler, said pipe 31 being provided with a valve 33.

35 is the purifier, downwardly into which extends a vertical pipe 36, extending upwardly



therefrom and communicating with pipe 32 and provided with a branch horizontal pipe 37. This purifier is provided with a discharge-valve 35<sup>a</sup>. Branch pipe 37 is provided with a valve 38. From the top of the purifier 35 extends a vertical pipe 39, provided with a valve 40 and having at its upper end a branch pipe 41, the outer end of which communicates with a vertical pipe 42, extending downwardly into the main cooler 43, said vertical pipe 42 communicating with the coil 44 within the cooler 43. The pipes 14 and 42 are connected by a horizontal pipe 45, which is provided with a valve 46. 47 is a vertical pipe, intermediate of the ends of which pipe 37 communicates. The lower end of the pipe 47 is provided with a branch pipe 48, which communicates with the pipe 42 of the main cooler, and between the branch pipe 48 and the pipe 37 the pipe 47 is provided with a valve 49. The upper end of pipe 47 is provided with a branch pipe 50, which has communication with the carburetor 17 at the top thereof. The purifier 35 is constructed with a partition 51 between the pipes 36 and 39, so as to form chambers 52 and 53, and extending from the upper end of the partition 51 downwardly into the chamber 53 is a pipe 54. The chamber 52 contains an alkaline solution of potash or chromate of potash, and the chamber 53 contains a solution of oxalic acid, the purifier being provided with these chemicals for the purpose of purifying the gas and supplying it with additional illuminating means when required. The gas coming into the purifier is impregnated with sulphur in the shape of sulphureted hydrogen, which is one of the gases carried along from the retort, where the decomposition of the steam and a union of gases primarily takes place, and coming in contact with the first solution the sulphur is eliminated from its union with the hydrogen and combines with the chromium of the chromate to form a sulphide thereof, while the free hydrogen and other gases passing into the oxalic acid, which under the action of the heated gases is in a state of decomposition, and its eliminated combustible gas is carried along with the passing gas and additionally supplies it with illuminating means. The lower end of the coil 44 in the main cooler 43 is provided with a valve 55, and communicates, through the medium of pipe 56, with the gas-holder 57 or "gasometer," as it is sometimes called, the gas-holder being of the usual well-known construction.

58 is a gas-supply pipe leading from the gas-holder and provided with a burner 59. 43<sup>a</sup> is a discharge-valve of the cooler 43.

In Fig. 2 I have shown two separate tanks or receptacles 60 and 61, which constitute the purifier, in lieu of the single tank 35, said tanks 60 and 61 being connected at top by a pipe 62. The lower ends of the tanks are connected by a short pipe 63, provided with a valve 64, whereby the solution of chromate of potash and oxalic acid in tank 60 and 61, re-

spectively, are allowed to combine, for the purpose set forth, in which the action previously referred to may be combined in a single receiver, into which, when the gas passes, the separation and precipitation of the sulphur from the  $H_2S$  to the chromium of the chromate to form a sulphide thereof occurs simultaneously with the decomposition of the oxalic acid from the heated gas, the reactions being identical with that of the form described, except that the gas undergoes the same step twice, and hence is more thoroughly purified and supplied with additional illuminating means.

The valves or water-traps 12, 18, 29, and 55 are for the purpose of rejecting from the pipes the water produced by condensation of the steam when the retort 6 is not heated enough to decompose the steam coming from the boiler 2.

My improved apparatus being constructed and arranged as above set forth, it is susceptible of operation in the four following different methods:

First operation: The water in the boiler 2 being converted into steam, it passes by the way of pipe 4, valve 8 being open, into the retort 6, which is heated to a sufficient temperature to cause the material within the same to effect the complete decomposition of the steam. The hydrogen from the steam being set free by the decomposition of the same passes along with the gases formed by the heated carbon and decomposed steam through pipe 13. Valve 46 being open, it passes through pipe 45 and pipe 42 into the main cooler 43, from which it passes into the gas-holder through pipe 56 and out of the gas-holder into the supply-pipe 58 of the burner 59.

Second operation: When the gas coming from the retort is sufficiently carbureted, the valve 46 is shut, so that the gas may pass into the auxiliary cooler 25 through the medium of pipes 24, valve 26 being open. Valve 33 being open, the gas coming from the auxiliary cooler passes up through pipe 28 into pipe 31, into pipe 15, and thence into the carburetor 17, from which the gas flows into pipes 50, 47, and 48, and through the lower end of pipe 42 into the main cooler 43. From cooler 43 the carbureted gas passes, as before, through pipe 56 into the gas-holder 57, from which it is drawn, as required, through supply-pipe 58.

Third operation: When the oil contained in the carburetor 17 is too much volatilized by evaporation, (after the second aforesaid operation,) the hydrogen coming from the retort 6 to be carbureted, as required, passes through pipes 13, 14, and 15 into the carburetor, the valves 26 and 46 being closed and the valve 19 opened. Thus the warm gas from the retort runs directly into the carburetor, wherein the same is carbureted. Passing from the carburetor 17 the gas enters pipes 50, 37, and 36 and into the chamber 52 of the purifier, the valves 34 and 49 be-



ing closed and the valve 38 open. From the chamber 52 of the purifier, containing the chromate of potash, the gas passes through pipe 54 into the chamber 53, containing the oxalic acid, from which latter chamber the gas passes through pipes 39, 41, and 42 into the main cooler 43, from which it passes, as before, into the gas-holder, from which the gas is drawn as required.

Fourth operation: After the last operation the oil in the carburetor 17 loses somewhat of its combining qualities to effect a complete carbureting of the gas, inasmuch as the liquids used for carbureting are not, except in a very pure state, homogeneous in substance, so are a combination of liquids of various volatility, the lighter of course passes off first and leaves the heavier and less volatile residuum, which will but slightly carburet the gas. The carbureting, also, after a short time is hindered, because, as is well known, the amount of vapor taken up depends upon circumstances, chief among which is that the volatilization is affected by the cold produced from the evaporation of the liquids, the gas coming from the retort 6 cannot hence be saturated sufficiently to effect its carbureting. In this operation all valves are shut excepting valves 11 and 23, so that the oil in the carburetor may flow in small jets through the pipe 9 into the retort 6 by the joint 65. Now, the valve 8 in pipe 4<sup>a</sup> being opened, the steam from the boiler 2 passing into pipe 5, where the steam and oil are mixed together, and passing onto the heated substances contained in the retort 6 are decomposed into their several constituent gases, and, in their gaseous state intimately combined together, pass out of said retort. These hydrocarbons pass through pipes 13, 14, and 26 into the auxiliary cooler 25, the valve 26 being open, and into pipes 28, 32, and 36 into the purifier, the valve 34 being also open. From the purifier the gas passes into the main cooler 43 through pipes 39, 41, and 42, the valve 40 being open. From cooler 43 the gas passes into the gas-holder, as before, from which it is drawn as required.

From the above it will be seen that my improved apparatus is capable of making illuminating-gas by four different methods either separately or combined, when combined said operations following each other in succession by means of regulating the valves, as described, so that each of the different courses of the gas follows each other successively as a single operation, and obtains the full utilization of all the material used and complete carbureting of the gas at all times during the process.

What I claim is—

1. The improved method herein described for producing illuminating-gas, the same consisting in first passing steam into a retort, then passing the gases from the decomposition produced in said retort into a main cooler or condenser, then diverting the gases from the

retort from their original course to said cooler and passing them first into an auxiliary cooler or condenser, then passing the gas from the latter into a carburetor, and then passing the carbureted gas from the carburetor into said main cooler, and finally drawing from said main cooler the gases admitted thereto by the two steps described into a suitable gas-holder, substantially as described.

2. The improved method herein described for producing illuminating-gas, the same consisting in first passing steam into a retort, passing the gases from the decomposition produced in said retort into a main cooler or condenser, then diverting the gases from their original course to the main cooler and passing them intermediately first into an auxiliary cooler or condenser, then from the latter into a carburetor, and then passing the carbureted gas from the carburetor into said main cooler, and finally again deviating the course of the gas to direct the same from the retort directly into the carburetor, passing the carbureted gas from the carburetor into a purifier and from thence into the main cooler, and finally drawing from said main cooler the gases admitted thereto by the three steps described into a suitable gas-holder, substantially as described.

3. The improved method herein described for producing illuminating-gas, the same consisting in first passing steam into a retort, passing the gases from decomposition produced in said retort into a main cooler or condenser, then diverting the gases from their original course to a main cooler and passing them intermediately first from the retort into an auxiliary cooler or condenser, then from the latter into a carburetor and then passing the carbureted gas from the carburetor into said main cooler, then again changing the direction of the gas and passing the gas from the retort directly into the carburetor, passing the carbureted gas from the carburetor into the purifier and from thence into the main cooler, and finally diverting the course of the gas from the carburetor, admitting the oil from the carburetor into the retort, the oil being first commingled with the steam which enters said retort, passing the hydrocarbon gas obtained in the retort into an auxiliary cooler and then into a purifier, and thence into the main cooler, and finally drawing from said main cooler the gases admitted thereto by the four steps described into a suitable gas-holder, substantially as described.

4. The herein-described apparatus for the manufacture of gas, the same comprising a steam-generator, a decomposing-retort connected with said generator, a main cooler provided with means for cooling, an auxiliary cooler provided with means for cooling, and a carburetor intermediate of said retort and main cooler, the said carburetor connecting with the said auxiliary and main coolers by piping, which are in communication with the retort and each other by piping provided with



suitable valves for directing the course of the gas, substantially as set forth.

5. The herein-described apparatus for the manufacture of gas, the same comprising a steam-generator, a decomposing-retort connected with the said generator by piping, a main cooler provided with means for cooling, and an auxiliary cooler provided with means for cooling, a purifier and a carburetor immediately interposed between said retort and main cooler, the said carburetor being connected with both coolers and the intermediate purifier by piping, the same being also in communication with the retort and each other by piping provided with valves for directing the courses of the gas, substantially as set forth.

6. The herein-described apparatus for producing illuminating-gas, the same comprising a steam-generator, a decomposing-retort con-

nected with said generator by means of valved piping, a main cooler, and an auxiliary cooler, a purifier, and a carburetor immediately interposed between said retort and main cooler, the said carburetor connecting with said retort between the same and the generator by piping, and said auxiliary cooler, purifier, and main cooler being in communication with the retort, carburetor, and each other by piping provided with suitable valves for directing the courses of the gases, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

CHS. BOUGOURD DE LAMARRE.

Witnesses:

WILLIAM W. LANG,  
WM. KENT.