



# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 395,449, dated January 1, 1889.

Application filed August 1, 1888. Serial No. 281,617. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ALVIN MCCOLLUM, of Riverside, in the county of San Bernardino and State of California, have invented a new and Improved Apparatus for the Manufacture of Gas, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved apparatus for the rapid and economical manufacture of water-gas from oil, steam, and coal.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional side elevation of the improvement, and Fig. 2 is a sectional plan view of the same on the line *xx* of Fig. 1.

The improved gas-making apparatus is provided with a furnace, A, charged with coal or coke, and provided in its top with the usual charging-door, B, and at its bottom with the outlet-door C, leading to the grate-bars D, of any approved construction. Under the grate-bars D discharges a blast-pipe, E, connected with a blasting-engine, F, of suitable construction.

Into the top of the furnace A leads a series of oil-supply pipes, G, connected with a channel-pipe, G', provided with a valve, G<sup>2</sup>, and connected with a pipe, G<sup>3</sup>, leading into an oil-tank, G<sup>4</sup>, preferably located above the top of the furnace A, as is plainly shown in Fig. 1. The tank G<sup>4</sup> is provided with the usual gage, G<sup>5</sup>. The pipe G<sup>3</sup> is also connected with the pipe G<sup>6</sup>, leading to the store-house, in which the oil is stored in tanks or barrels, said pipe G<sup>6</sup> being provided with a valve, G<sup>7</sup>. From the bottom of the tank G<sup>4</sup> leads a pipe, G<sup>8</sup>, to a sewer or other place of discharge, being provided with a valve, G<sup>9</sup>. Into the pipe G<sup>8</sup> above the valve G<sup>9</sup> leads a water-pipe, G<sup>10</sup>, connected with a suitable source of water-supply, preferably the city mains. The pipe G<sup>10</sup> is provided with a valve, G<sup>11</sup>.

From the upper end of the furnace A extends horizontally a pipe, H, having two branch pipes, H' and H<sup>2</sup>, leading into a fix-

ing-chamber, J, made double by being provided in its bottom with a fire-place, I, into which discharges the pipe H', and above which are held the checker-bricks K, and above the latter with the fire-place L, similar to the fire-place I, and into which leads the branch pipe H<sup>2</sup>. Above the fire-place L are set the checker-bricks N, arranged similarly to the checker-bricks K.

In the upper end of the fixing-chamber J is held an outlet-pipe, O, provided on its outer end with a valve, O', and leading into a smoke-stack, P. From the pipe O extends horizontally and then downward a discharge-pipe, Q, leading into a washer, R, of any approved construction, and provided with the usual outlet, S. A steam-pipe, T, is connected with the source of steam-supply and passes through the branch pipe H' into the lower end of the furnace A, to discharge steam on the under side of the grate-bars D in the said furnace. Into the fire-places I and L lead the blast-pipes E' and E<sup>2</sup>, connected with the blast-pipe E, deriving an air-supply from the engine F. The pipes E' and E<sup>2</sup> are provided with suitable valves for connecting and disconnecting said pipes with and from the main blast-pipe E.

The operation is as follows: The coal or coke in the furnace A is ignited and a blast is discharged into the said furnace against the burning coal or coke by the blast-pipe E from the engine F. Part of the blast of the engine F is discharged into the fire-place I on the bricks K, and then into the fire-place L and on the bricks N by means of the branch pipes E' and E<sup>2</sup>, the valve O' on top of the pipe O then being opened, so that the discharge takes place through the pipe O into the smoke-stack P. This blast is kept open until the checker-bricks K and N in the fixing-chamber J become a straw color, after which the valves in the pipes E' and E<sup>2</sup> are closed, so as to disconnect the said pipes from the main pipe E. The valve O' is then closed also. The steam from the boiler is then permitted to pass through the pipe T, and the steam, on passing through the pipe H', becomes superheated by the heat passing through the said pipe H' from the furnace A on its way to the fixing-chamber J, the steam thus entering the bottom of the furnace A in a superheated state.

The steam, on passing through the coal or coke fire, generates a hydrogen gas, carbon monoxide and carbon dioxide, and at the same time oil from the oil-supply tank G<sup>4</sup> is permitted to spray into the top of the furnace A by means of the pipes G, and is decomposed, forming light and heavy hydrocarbon gases, which mix with the gases before mentioned. The mixture passes through the pipe H and branch pipes H' and H<sup>2</sup> into the fire-places I and L, and through the bricks K and N to be fixed, thus making an enriched or carburated water-gas, which passes off through the pipes O and Q into the washer R, to be further treated in the usual manner.

The oil-tank G<sup>4</sup> is emptied and filled in the following manner: When said tank G<sup>4</sup> is full of oil, the valve G<sup>7</sup> in the pipe G<sup>6</sup> is closed and the valve G<sup>2</sup> in the pipe G<sup>7</sup> is open, while the valve G<sup>9</sup> in the pipe G<sup>8</sup> is closed and the valve G<sup>11</sup> in the water-supply pipe G<sup>10</sup> is open, so that the water under pressure passes through the said pipe G<sup>10</sup> and the pipe G<sup>8</sup> into the bottom of the tank G<sup>4</sup>, so that the oil in the tank is forced through the pipe G<sup>3</sup> into the pipe G', and from the latter through the pipes G into the furnace A. The oil passing through the pipes G is forced into the furnace A under such a pressure that the oil is sprayed and easily converted into carbonic oxide. When the tank G<sup>4</sup> is emptied, the operator closes the valve G<sup>2</sup> in the pipe G', and also closes the valve G<sup>11</sup> in the pipe G<sup>10</sup>, and opens the valve G<sup>7</sup> in the pipe G<sup>6</sup>, leading to the tank in the store-house. The operator then opens the valve G<sup>9</sup> in the pipe G<sup>8</sup>, so that the water in the tank G<sup>4</sup> flows out through the pipe G<sup>8</sup> into the sewer, thereby acting as a siphon in the tank G<sup>4</sup>, so that the oil is drawn from the tank in the store-house through the pipe G<sup>6</sup> into the tank G<sup>4</sup>, which thus becomes filled. Then the above-described operation for discharging the oil from the tank G<sup>4</sup> through the pipes G into the furnace A is repeated. The gas-fuel generated in the furnace A passes through the branch pipe H' into the fire-place I, in which it is burned, thence through the checker-bricks K with fuel from the pipe H<sup>2</sup> and air from the blasting-pipe E and the branch pipes E' and E<sup>2</sup>, so as to cause a combustion in the fire-place L, from which the gas passes through the checker-bricks N, whereby an even heat is maintained in the checker-bricks K and N and a great saving of fuel is effected.

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

1. In a gas-making apparatus, the combination, with a furnace, of oil-supply pipes discharging into the top of the said furnace, a double fixing-chamber filled with checker-bricks and having two fire-places, being connected by pipes with the said furnace, and a

blast-pipe discharging into the said fire-places, and also into the bottom of the said furnace, substantially as shown and described.

2. In a gas-making apparatus, the combination, with a furnace, of oil-supply pipes discharging into the top of the said furnace, branch pipes leading from the said furnace, a superheater filled with checker-bricks and having two fire-places into which discharge the said branch pipes, and a blast-pipe discharging into the said furnace at its bottom, and also provided with branch pipes leading into the said fire-places of the fixing-chamber, substantially as shown and described.

3. In a gas-making apparatus, the combination, with a furnace, of oil-supply pipes discharging into the top of the said furnace, branch pipes leading from the said furnace, a fixing-chamber filled with checker-bricks and having two fire-places into which discharge said branch pipes, a blast-pipe discharging into the said furnace at its bottom, and also provided with branch pipes leading into the said fire-places of the superheater, and a steam-pipe passing through one of the said branch pipes into the bottom of the said furnace, substantially as shown and described.

4. In a gas-making apparatus, the combination, with a furnace, of oil-supply pipes discharging into the top of the said furnace, branch pipes leading from the said furnace, a fixing-chamber filled with checker-bricks and having two fire-places into which discharge said branch pipes, a blast-pipe discharging into the said furnace at its bottom, and also provided with branch pipes leading into the said fire-places of the fixing-chamber, a steam-pipe passing through one of the said branch pipes into the bottom of the said furnace, and a pipe leading from the upper end of the said superheater and connected with a washer, substantially as shown and described.

5. In a gas-making apparatus, the combination, with a furnace, of oil-supply pipes discharging into the top of the said furnace, branch pipes leading from the said furnace, a fixing-chamber filled with checker-bricks and having two fire-places into which discharge said branch pipes, a blast-pipe discharging into the said furnace at its bottom, and also provided with branch pipes leading into the said fire-places of the fixing-chamber, a steam-pipe passing through one of the said branch pipes into the bottom of the said furnace, and a valve held on the upper end of the said fixing-chamber to discharge into a smoke-stack, substantially as shown and described.

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Witnesses:

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