

(No Model.)

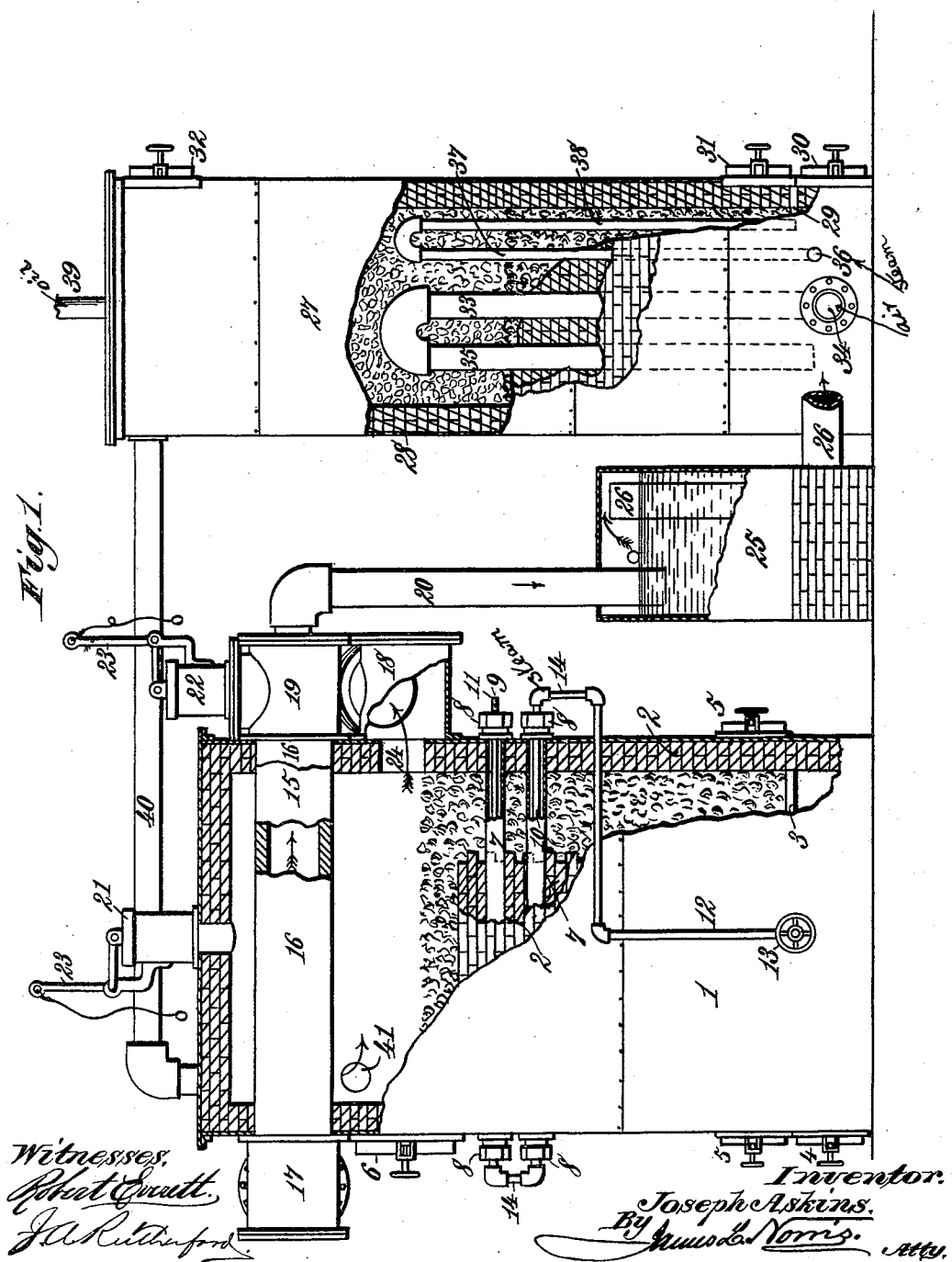
2 Sheets—Sheet 1.

J. ASKINS.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 480,161.

Patented Aug. 2, 1892.



(No Model.)

2 Sheets—Sheet 2.

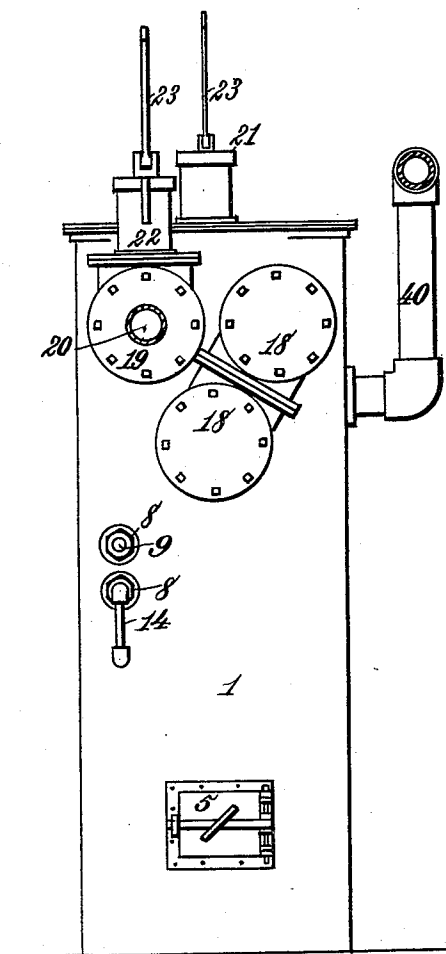
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APPARATUS FOR THE MANUFACTURE OF GAS.

No. 480,161.

Patented Aug. 2, 1892.

Fig. 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 480,161, dated August 2, 1892.

Application filed January 9, 1892. Serial No. 417,578. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ASKINS, a citizen of the United States, residing at Lima, in the county of Allen and State of Ohio, have
5 invented new and useful Improvements in Apparatus for the Manufacture of Gas, of which the following is a specification.

The object of my invention is to provide a simple and conveniently-operated apparatus
10 for the economical manufacture of carbureted water-gas.

To this end my invention consists in an apparatus comprising separate generators for water-gas and hydrocarbon vapors, the
15 water-gas generator being provided with superheating steam-passages laid in the refractory generator-lining to thoroughly dry and superheat the steam before it is passed upward through a bed of incandescent coke into the
20 body of the generator, in which are located refractory gas-superheating retorts that communicate at one end with the interior of the gas-generator and at the other end through
25 a suitable pipe with a seal or washer or with a gas-holder, as preferred, the said water-gas generator being arranged to receive hot hydrocarbon vapors from the separate hydrocarbon-vapor generator, which is provided
30 with superheating air and steam pipes discharging beneath a bed of incandescent coke and an oil pipe or inlet discharging into the top of said generator upon a body of soft coal that fills the generator above the incandescent
35 coke, whereby the oil is thoroughly and rapidly vaporized in contact with the heated soft coal, the gases of which are driven off and mingled with the oil-vapors, while the coal is converted into coke and feeds downward to replenish the fire. By this arrangement of
40 apparatus there is no loss of heat or waste of hydrocarbon vapors or coal-gas, the same being conducted hot and in a gaseous state into the water-gas generator to mingle with the water-gas and pass together therewith into
45 the superheating gas-retorts, where the mingled vapors and gases are subjected to intense heat and rapidly converted into a fixed gas, which passes off to the washer, water seal, or other point, as required.

50 The invention also consists in the construction, arrangement, and combination of parts

in a gas-making apparatus, as hereinafter described and claimed.

In the annexed drawings, illustrating my invention, Figure 1 is a partly sectional side
55 elevation of my improved apparatus for use in the manufacture of carbureted water-gas. Fig. 2 is an end elevation of the water-gas generator.

In carrying my invention into practical effect I prefer to employ a water-gas generator composed of an iron or steel shell 1, having a fire-brick lining 2 and provided with a grate 3 and self-sealing doors 4, 5, and 6, as shown. The door 4 opens under the grate-bars 3 and
65 is used when cleaning out the ashes and cinders and as an inlet for air when required. The door or doors 5 are arranged above the grate for giving access to the generator when it is necessary to clean out clinkers from the
70 grate-bars and from the side walls, and also for use in kindling the fire. The door 6 is located in the upper part of the generator for use in charging the apparatus and replenishing the fuel.
75

The generator 1 is preferably rectangular in form and has a length of about eight feet, a width of about five feet, and a height of about fourteen feet; but these dimensions may of course be varied, as desired.
80

In the fire-brick walls or lining of the generator 1 are laid tubular steam-superheaters 7, that are provided at their ends with stuffing-boxes 8, located on the outside of the generator-shell. These tubular steam-superheaters 7 afford passages and protecting coverings
85 or casings for steam-pipes 9 and 10, that are extended through said casings and their stuffing-boxes. This construction not only protects the steam-pipes from injury by direct
90 contact with the heated fire-brick, but in case the inclosed steam-pipes become defective or damaged in any way they can be readily removed and replaced at any time without injury to the generator-walls. In passing
95 through the steam-pipes 9 and 10, inclosed in the superheaters or castings 7, the steam, which is admitted at the point 11 from any suitable source of supply, becomes thoroughly dried and superheated before passing through
100 a pipe 12, which leads into the generator at a point below the grate-bars. This pipe 12 may

be provided with a hand-valve 13 for controlling the admission of steam into the generator. The several sections of the steam-pipes 9, 10, and 12 may be connected by suitable bends or couplings 14 outside the generator-shell.

Above the bed of fuel in the generator are supported parallel retorts or gas-superheaters 15 and 16, that are preferably cylindrical in form and composed of fire-clay or other suitable refractory material. The ends of these retorts are inserted into openings formed in the fire-brick lining 2 and communicate with cast-iron T's or couplings 17, 18, and 19, secured to the outside of the generator-shell.

The coupling 17 connects two adjacent retorts at one end in such a manner as to establish communication between them. The couplings 18 connect the first retort of the series with the interior of the generator above the bed of fuel, and the coupling 19 connects the last retort of the series with a pipe 20, leading to a washer or water seal, as hereinafter described. Although I have only shown two of these gas superheating or fixing retorts in the apparatus illustrated, it is obvious that there may be more, if deemed preferable.

At the top of the water-gas generator 1 is a valve 21 for use in producing a draft when it becomes necessary to reheat the generator. The retort-coupling 19 is provided with a similar valve 22 for use in heating the retorts rapidly when required. These valves 21 and 22 are also safety-valves and are so arranged that a gas-pressure of one pound in the generator will raise either or both of them, thereby relieving the pressure. Each valve is provided with a suitable operating-lever 23, by which the valve can be raised or opened at will, the closing of the valve being effected by gravity when the lever is released.

The water-gas generator is charged with coke to a point immediately below the passage or opening 24, where the retorts 15 and 16 communicate with the interior of said generator. After the gas-generator has been properly heated water-gas is made by admitting steam through the pipes 9, 10, and 12 into the lower part of the generator below the grate, whence it passes upward through the body of incandescent fuel and is thereby decomposed and converted into gas. The gas thus produced passes through the opening 24 and couplings 18 into the retort or gas-superheater 15, thence through the coupling 17 into the retort 16, and is conveyed thence through the coupling 19 and pipe 20 to a washer or to any suitable gas-holder, as may be preferred.

In Fig. 1 I have shown the lower end of the pipe 20 submerged in a water-seal formed by a body of water contained in a closed tank 25, which is provided with a gas-exit pipe 26, that may lead to any suitable gas-holder (not shown) or to the place of consumption.

Adjacent to the water-gas generator 1 is an oil and coal-gas generator composed of a cy-

lindrical shell 27, of iron or steel, having a lining 28 of fire-bricks or other refractory material. In the lower part of the generator 27 is a grate 29, below which is a self-sealing door 30 for use in removing ashes and cinders. Above the grate 29 is a similar door 31 to give access to the generator for the purpose of removing clinkers and for igniting the fuel. The generator 27 is charged with coke to a depth of from four to six feet above the grate, and above the bed of coke the generator is filled with bituminous coal. A self-sealing door 32 in the upper part of the generator is used for feeding in the fuel as required. The generator 27 may be about five or seven feet in diameter and from twelve to eighteen feet in height. By first placing coke in the base or lower portion of the generator and soft coal at the top the intense heat from the incandescent coke will pass up through the soft coal, drive the gas therefrom, and convert the coal into coke, so that while the generator will now be fed with soft coal it will continually burn coke.

In the generator-lining or fire-brick wall 28 is placed a vertically-arranged air-pipe 33, that acts as a superheater for the air admitted from a blower or air-compressor. (Not shown.) The blast of air enters the lower end of the pipe 33 through a suitable opening 34 in the generator-wall, and passing upward through said pipe enters a descending branch pipe 35, by which the superheated air-blast is delivered beneath the generator-grate.

Steam may be admitted at an opening 36 in the lower part of the generator 27, so that passing upward through a pipe 37, placed in the fire-brick lining 28, it will enter a descending branch steam-pipe 38, that discharges below the grate-bars.

The fire in the generator 27 is started with a bed of coke, and when this has been well ignited and become incandescent throughout its entire mass the generator should be filled to the top with soft coal or slack. Air is then admitted at the opening 34 under a pressure of from six to twelve ounces from an air compressor or blower, and in passing through the pipes 33 and 35 is thoroughly superheated before it is discharged beneath the fire. Steam may be admitted to the pipes 37 and 38, in which it becomes thoroughly dried and superheated by the time it reaches the space beneath the grate. The hot air and steam pass upward through the bed of incandescent fuel, the steam is decomposed, and a perfect combustion of the fuel is maintained. During this operation crude oil or naphtha is preferably admitted by means of a pipe 39 onto the top of the soft coal, where the heat is moderate. At this point the lighter constituents of the oil are converted into gas, while the heavier parts work down through the coal until each gravity of the oil finds the proper degree of heat to gasify the same, and at the same time

the residuum or coke in the oil is consumed by the fire, thus producing a gas free from tar or sediment of any kind. The hot air and gas from the coke fire passing up and through the soft coal liberates all the gas there is in the coal and converts the coal into coke, besides vaporizing the oil.

The gas produced in the generator 27 is not a fixed gas, but simply a hydrocarbon vapor, and is conveyed through a pipe 40 to the generator 1, previously described, which generator it enters through an opening 41, that may be located either above or below the top of the bed of incandescent coke contained therein. The intense heat of the coke fire in the generator 1 converts the oil-vapors into a fixed gas, which passes off, together with the water-gas, through the opening 24 into the retorts or superheaters 15 and 16, where the gases become thoroughly mingled and fixed. The gases then pass off through the pipe 20 to the water seal 25, in passing through which the said gases are washed free from lamp-black or dirt of any kind and may then be conducted into a holder.

It will be observed that in this apparatus there is no superheater filled with checker-work of fire-brick or other refractory material, which must be heated at the expense of the fuel in the generator and requiring a long run with a strong blast between each run of gas.

In my apparatus the retorts 15 and 16 serve as gas superheaters or fixing chambers, and being in close contact with the coke fire are always hot, which enables the gas runs to be continued from two to three times longer than in any other apparatus now in use.

In other forms of apparatus when oil or naphtha is used to carburet the water-gas it is usually admitted either direct to the fire in the generator or onto the brick in the superheater, which has a tendency to cool the fire or superheater, thus making a vast amount of unfixed gas, that congeals into oil or tar and is wasted, requiring from four to five gallons of crude oil to carburet one thousand feet of gas, while in my apparatus the oil is rapidly and thoroughly vaporized in the vapor-generator and passes to the water-gas generator hot and in a gaseous state, which has no tendency to cool the fire or retort, thus producing a fixed gas from all the oil-vapors and making no tar.

The gas made from the soft coal in the hydrocarbon-vapor generator more than compensates for the cost of the coal, as by this method the oil is thoroughly vaporized at slight expense, and by thus supplying the water-gas generator with hot hydrocarbon gases it suffers but little loss of heat and permits a long and steady production of gas.

All other water-gas generators must employ a blower of some kind in order to reheat the apparatus after a run of gas has been made, and when the blower is started into operation

the valve at the superheater must be opened in order that the blast-gases may pass through the superheater and escape. The brick and other refractory material in the superheater are saturated with oil and unfixed gas, which is all blown out of the stack, and thus there is a loss of more than half of the oil used in the manufacture of gas. Instead of employing a blower in connection with the water-gas generator, I open the doors 4 and 6 slightly and raise the purge-valve 21, thus causing a draft, which soon reheats the generator without the loss of much fuel and with no loss of oil or unfixed gas. In case the retorts 15 and 16 need a little extra heat, the valve 21 is closed and the purge-valve 22 opened, which allows all the heat to pass through the retorts, thus heating them very rapidly and with a small consumption of fuel as compared with the reheating of other generators.

In another application, Serial No. 417,579, of even date herewith, I have described and claimed the process of manufacturing carbureted water-gas, which consists in generating water-gas and hydrocarbon vapors in separate generators, conducting the hydrocarbon vapors in a hot gaseous state into the water-gas, and then superheating the mingled water-gas and hydrocarbon vapors to convert them into a fixed gas, as herein described.

I would have it understood that I do not herein claim the specific construction of water-gas generator shown in the drawings, as such is the subject of a separate application, Serial No. 417,580, filed by me January 9, 1892.

What I claim as my invention is—

1. In an apparatus for the manufacture of carbureted water-gas, the combination of a water-gas generator having a valve in its upper part and provided below the bed of fuel with inlets for air and steam, gas-superheating retorts located in said generator and communicating with the interior thereof above the bed of fuel, a valve connected with one of said retorts, a hydrocarbon-vapor generator having at its top an inlet for oil and provided below the bed of fuel with inlets for air and steam, and a pipe for conducting hot hydrocarbon vapors from the hydrocarbon-vapor generator into the water-gas generator, substantially as described.

2. In an apparatus for the manufacture of carbureted water-gas, the combination, with a water-gas generator, of a generator for hydrocarbon vapors provided with a grate and having doors above and below said grate, superheating air and steam pipes located in the refractory lining of the said hydrocarbon-vapor generator and discharging below the bed of fuel therein, a pipe for the admission of oil into the upper part of said hydrocarbon-vapor generator, and a pipe for conducting the hot hydrocarbon vapors from said last-named generator into the water-gas generator, substantially as described.

3. In an apparatus for the manufacture of carbureted water-gas, the combination of a water-gas generator having a valve in its upper part and provided with inlets for air and steam below the bed of fuel, gas-superheating retorts located in the said generator and communicating with the interior thereof above the bed of fuel, couplings that connect the ends of said retorts outside the generator, a valve in one of said couplings, a hydrocarbon-vapor generator provided at the top with an inlet for oil and having air and steam inlets below the bed of fuel, a pipe for conducting hot hydrocarbon vapors from the hydrocarbon-vapor generator into the water-gas generator, and a pipe for conveying gas from the superheating-gas retorts of the water-gas generator into a washer or holder, substantially as described.

4. In an apparatus for the manufacture of carbureted water-gas, the combination of a water-gas generator having the valve 21 at its top, the steam-superheaters 7, located in the refractory lining of said generator, the steam-pipes 9 and 10, extended through and form-

ing part of said superheaters, the gas-superheating retorts 15 and 16, located in and extended across the upper portion of said generator and communicating therewith, the valve 22, communicating with one of the retorts, a hydrocarbon-vapor generator having superheating air and steam pipes 33 and 37, provided with branches 35 and 38, communicating with the lower part of the generator, the oil-inlet pipe 39 for the admission of oil into the top of the hydrocarbon-vapor generator, the pipe 40 for conducting hot hydrocarbon vapors from the hydrocarbon-vapor generator into the water-gas generator, the water seal 25, and the pipe 20, connecting the said water seal with the gas-superheating retorts in the water-gas generator, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

JOSEPH ASKINS. [L. S.]

Witnesses:

WILL HALLER,
J. M. HALLER.