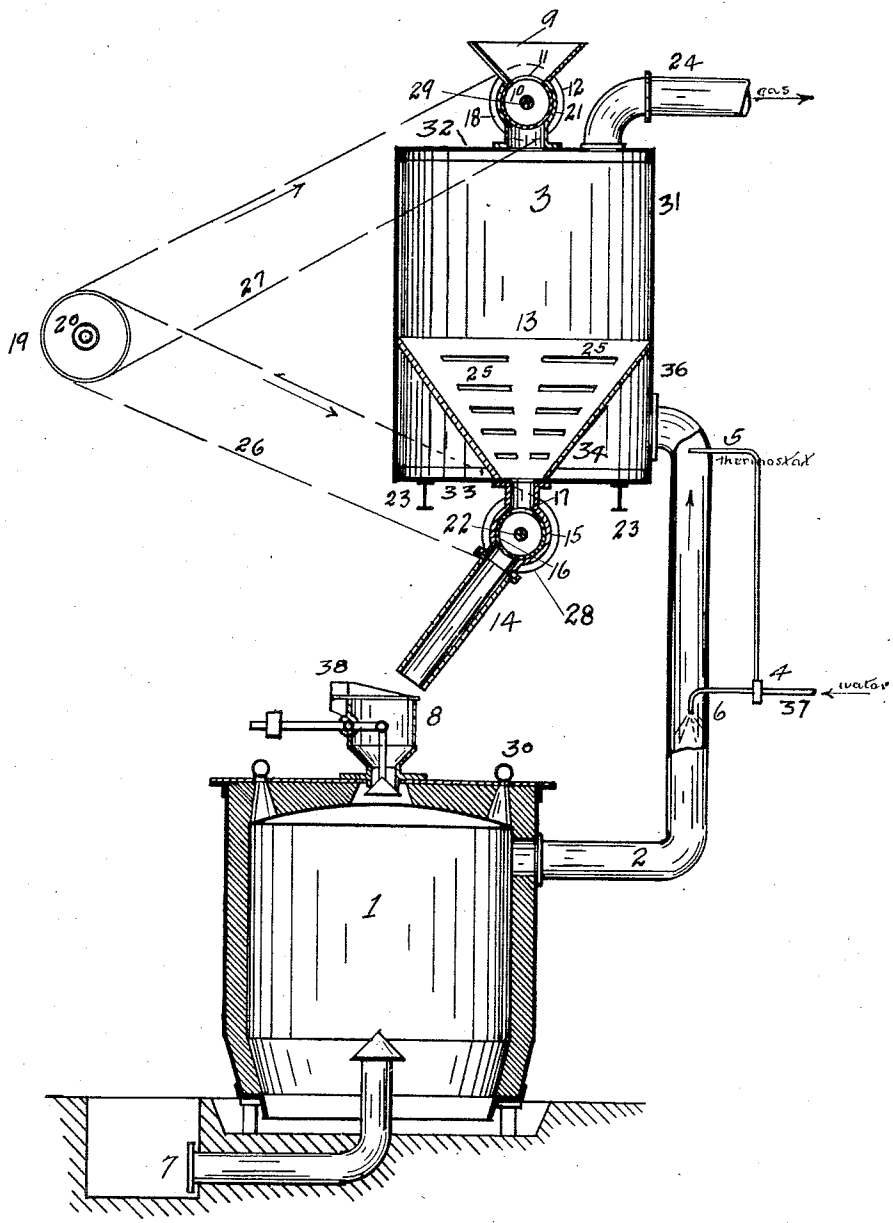
C. M. GARLAND.

GAS GENERATING APPARATUS.

APPLICATION FILED APR. 3, 1913.

1,082,117. Patented Dec. 23, 1913.



WITNESSES

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GAS-GENERATING APPARATUS.

1,082,117. Specification of Letters Patent. Patented Dec. 23, 1913.

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To all whom it may concern:

Be it known that I, CLAUDE M. GARLAND, a citizen of the United States, residing in Chicago, Illinois, have invented certain Improvements in Gas-Generating Apparatus, of which the following is a specification.

My invention relates to that class of gas generating apparatus in which a bituminous fuel that is a solid fuel containing volatile hydro-carbons is converted into fixed and partially fixed gases through the partial oxidation and distillation resulting through the admission of air or air and steam to the base of a retort containing the fuel.

As carried out at the present time the fresh fuel is charged directly on to the bed of incandescent fuel remaining from the previous charge, this results in the rapid distillation of the volatile matter at a high temperature, which, as is well known, produces a large volume of partially fixed gases which condense when cooled forming a tar which is principally in the form of pitch. This pitch at ordinary temperatures is sticky and exceedingly difficult to remove from the fixed gases and to dispose of after removal. On the other hand it is also well known that if the volatile matter in the fuel be distilled off at a low temperature, that is a temperature of about 700° F., that a large portion of the volatile will form fixed non-condensable gases at the ordinary atmospheric temperatures, a comparatively small amount of pitch, and the remainder of the volatile will be converted into an oily tar which is fluid at atmospheric temperatures, easily removable from the fixed gases and may be used as a valuable product to replace fuel, oil preserving fluids for wood, etc.

It is therefore the object of my invention to construct gas generating apparatus in which the volatile matter contained in bituminous fuels will be distilled off at a low temperature thereby producing a larger volume of fixed gases from a given weight of fuel than has heretofore been possible which consequently results in a gas of higher calorific value, a gas that is easier to scrub and which contains in the place of the undesirable pitch a large quantity of easily removable oils which form a valuable by-product. In addition to this I increase the thermal efficiency of the gas generator.

Another object of my invention which is also accomplished by the low temperature distillation is to make caking and coking coals readily gasifiable in this general type of gas producer.

It is a well known fact that caking coals when used in gas producers cause serious difficulty in the operation of the producers through their tendency to fuse into large cakes of solid coke which close up the top of the fuel bed and prevent the escape of gas. In my apparatus the coking or caking properties of the fuel are destroyed by the low temperature distillation before these fuels reach the generating chamber proper. The destruction of these properties therefore results in the requirements of a smaller amount of labor to operate my apparatus.

The above objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings in which the figure is a vertical section of gas producer apparatus constructed in accordance with my invention.

Referring to this figure it will be seen that my apparatus consists of a gas generating chamber 1 which is of the ordinary construction and is provided with the blast pipe 7, charging hopper 8, poke holes 30 and the gas off-take pipe 2. Above and to one side of the generating chamber a distillation chamber 3, is provided. This chamber I preferably make circular in section, and at the top I provide a fuel charging device of a type common to the art which consists of a casing 21 provided with a magazine 9. Within the casing 21 a rotating drum 10 is mounted on a shaft 29 which carries a driving pulley 12 which may be driven by the belt 27 from the pulley 19 mounted on the shaft 20. The drum 10 is provided with a slot 11 which when in the position shown allows any fuel contained in the magazine 9 to drop into the drum. On the rotation of the drum through an angle of 180 degrees the fuel drops into the distillation chamber 3. From this construction it will be noted that the fuel may be charged into the distillation chamber without the escape of gas. At the bottom of the distillation chamber is located a discharging device exactly similar to the charging device located at the top. The discharging device as will be seen consists of the drum 16 mounted on the shaft 22, which shaft is provided with the driving pulley 28 which is driven by the belt 26 from the pulley 19, mounted on the shaft 20. The drum 16 is

provided with the slot 17 for the admission of the fuel and the drum is housed in the casing 15. To the casing 15 is attached the discharge chute 14 which is adapted to deliver the discharged fuel to the charging hopper 8 located on the generating chamber 1. This device 8 is also a type common to the art which permits the fuel to be delivered to the chamber without the escape of gas.

Since the drum 10 of the charging device 9 is made exactly similar to the drum 16 of the discharging device and since these drums are driven from the same pulley at the same speeds it will be seen that I have provided a means for charging and discharging an equal amount of fuel to and from the distillation chamber 3 in the same interval of time. The distillation chamber 3 is made up of the shell 31 the top 32 and the bottom 33, and is mounted on the beams 23.

24 is a gas off-take pipe which leads to the scrubbing apparatus.

13 is a perforated inverted truncated cone which serves as a grate for supporting the fuel in the distillation chamber and which also provides a gas space 34 in the lower portion of the distillation chamber. The perforations 25 in the cone 13 insure that the gas will pass uniformly through the fuel contained in this chamber. The gas off-take pipe 2 connects at 36 with the distillation chamber 3.

At 6 a water spray is inserted into the pipe 2.

At 5 a thermostat is inserted into the gas off-take pipe 2 and this thermostat which is operated by the temperature of the gases passing through the pipe 2 acts on the valve 4 placed in the pipe line 37 to regulate the amount of water discharged by the water spray 6. The thermostat 5 may be of any type now used on the market and requires no special description.

The operation of my apparatus is as follows: The shaft 20 is driven at a slow speed in any convenient manner. Coke is charged into the generator 1 and a fire is started in the ordinary manner. At the same time fuel is charged into the charging hopper 9 and the distillation chamber 3 filled with green fuel by the rotation of the drum 10. The gas from the coke fire in chamber 1 is allowed to pass through the pipe 2 into the distillation chamber 3 and through the gas outlet pipe 24 to the scrubbing apparatus. The gas as it passes through the pipe 2 meets the spray of water at 6, the amount of which water is regulated from the valve 4 by the thermostat 5 which permits just sufficient water to pass the valve 4 to maintain the gas at 5 at a temperature of about 700° F. since the temperature of the gas is maintained at a temperature of 700 degrees F. all of the water will be evaporated into steam and be carried away with the gas. If the temperature tends to rise above this the thermostat 5 opens the valve 4 which permits more water to be sprayed into the pipe 2 discharging the gases from the chamber 1. If the temperature tends to drop below 700° F the thermostat 5 tends to close the valve 4 which decreases the amount of water supplied at 6.

After the gases from the coke fire in chamber 1 have passed through the green fuel contained in the distillation chamber 3 for a period of ten or twelve hours the belt 26 is placed on the pulley 28 which causes the fuel in chamber 3 to be discharged into the charging device 8 by the relation of the drum 16. When the device 8 is filled the cover 38 is placed over the hopper as shown and the fuel dropped into the chamber 1. The process is now continuous. Green fuel is continuously charged into the distillation chamber 3 in which the volatile matter is slowly driven off and the devolatilized fuel is continuously discharged into the hopper 8 and at the same rate as the green fuel is charged into the chamber 3. It will thus be seen that I have provided a simple means for the low temperature distillation of the volatile.

Having thus described my invention I claim and desire to secure by Letters Patent—

1. In a gas generating apparatus, a gas generating chamber, a distillation chamber, a communicating means for the passage of gas between the said chambers, a cooling means for cooling the gas within the said communicating means and between the said chambers and a gas outlet in the said distillation chamber.

2. In a gas generating apparatus, a gas generating chamber, a distillation chamber, a communicating means for the passage of gas between the said chambers, a cooling means for cooling the gas within the said communicating means, a means for controlling the said cooling means from the temperature of the gases leaving the said communicating means and a gas outlet in the said distillation chamber.

3. In a gas generating apparatus, a generating chamber, a distillation chamber, a pipe communicating with the gas space in the upper portion of the generating chamber, and with the gas space in the lower portion of the distillation chamber, for the passage of gas between the said chambers, a water spray within the said pipe, and between the said chambers, and a gas off-take pipe located on the said distillation chamber.

4. In a gas generating apparatus, a gas generating chamber, a distillation chamber, a pipe for the passage of gas communicating

with the gas space in the upper portion of the gas generating chamber and with the gas space in the lower portion of the distillation chamber, a water spray within the said pipe and between the said chambers, a thermostat near the discharge end of the said pipe and in contact with the gases passing therethrough a valve for controlling the water to the said water spray, mechanical means connecting the said valve with the said thermostat whereby the said thermostat operates the said valve to deliver variable quantities of water to the water spray to maintain a constant temperature of the gases leaving the said pipe and a gas off-take pipe communicating with the gas space in the upper portion of the distillation chamber.

5. In a gas generating apparatus, a gas generating chamber, a fuel charging device at the top of the said chamber, a twyer at the bottom of the said chamber, a distillation chamber, a fuel charging device at the top of the said distillation chamber, a fuel discharging device at the bottom of the said distillation chamber, a pipe for the passage of gas communicating with the gas space in the upper portion of the gas generating chamber, and with the gas space in the lower portion of the distillation chamber, a thermostatically controlled water spray within the said pipe, and a gas off-take pipe communicating with the gas space in the upper portion of the said distillation chamber.

6. In a gas generating apparatus, a gas generating chamber, a fuel charging device at the top of the said chamber, a twyer at the bottom of the said chamber, a distillation chamber, a fuel charging device at the top of the said distillation chamber, a fuel discharging device at the bottom of the said distillation chamber, mechanical means for operating the said charging and discharging devices on the said distillation chamber in unison thereby to deliver and remove equal quantities of fuel from the said chamber in the same interval of time, a pipe for the passage of gas communicating with the gas space in the upper portion of the gas generating chamber and with the gas space in the lower portion of the distillation chamber, a thermostatically controlled water spray within the said pipe and a gas off-take pipe communicating with the gas space in the upper portion of the said distillation chamber.

7. In a gas generating apparatus, a gas generating chamber, a fuel charging device at the top of the said chamber, a twyer at the bottom of the said chamber, a distillation chamber, a fuel charging device at the top of the said distillation chamber, a fuel discharging device at the bottom of the said distillation chamber, mechanical means for operating the said charging and discharging devices on the said distillation chamber in unison, thereby to deliver and remove equal quantities of fuel to and from the said chamber in the same interval of time, a fuel conveyer adapted to deliver the fuel from the discharging device to the charging device on the top of the said generating chamber, a pipe for the passage of gas communicating with the gas space in the upper portion of the said generating chamber and the gas space in the lower portion of the said distillation chamber, a thermostatically controlled water spray within the said pipe and a gas off-take pipe communicating with the gas space in the upper portion of the said distillation chamber.

8. In a gas generating apparatus, a gas generating chamber, a distillation chamber, an inverted truncated cone grate within the said distillation chamber, a gas space in the lower portion of the said distillation chamber, a pipe for the passage of gas communicating with the gas space in the lower portion of the said distillation chamber and with the gas space in the upper portion of the said generating chamber, a thermostatically controlled water spray within the said pipe and a gas off-take pipe communicating with the gas space in the upper portion of the distillation chamber.

9. In a gas generating apparatus, the combination of a gas generating chamber, a distillation chamber, a pipe for the passage of gas communicating with the gas space in the upper portion of the said generating chamber and with the gas space in the lower portion of the said distillation chamber, a thermostatically controlled water spray within the said pipe and between the said chambers, a charging device at the top of the said generating chamber, a charging device at the top and a discharging device at the bottom of the said distillation chamber, means for operating the said charging and discharging devices in unison, to deliver and remove equal quantities of fuel from the said distillation chamber in the same interval of time, a fuel conveyer adapted to deliver the fuel from the said discharging device to the said charging device on the top of the said generating chamber, and a gas off-take pipe on the top of the said distillation chamber.

10. In a gas generating apparatus the combination of a gas generating chamber, a twyer at the bottom of the said chamber, a fuel charging device at the top of the said chamber, a distillation chamber, a fuel charging device at the top of the said distillation chamber, a fuel discharging device at the bottom of the said distillation chamber, a truncated cone grate within the said distillation chamber, a gas space formed thereby in the lower portion of the said distillation chamber, a pipe for the passage

of gas communicating with the said gas space in the lower portion of the said distillation chamber and with the gas space in the upper portion of the said generating chamber, a water spray within the said pipe, a thermostat within the said pipe and near the discharge end thereof, a valve controlling the water to the said water spray, connecting means between the said valve and the said thermostat whereby the said thermostat actuates the said valve to deliver variable quantities of water to the spray for the purpose of maintaining a constant temperature of the gases leaving the said pipe, and a gas off-take pipe communicating with the gas space in the upper portion of the distillation chamber, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLAUDE M. GARLAND.

Witnesses:
EDWARD W. TUCKER,
MYRTLE B. GARLAND.

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