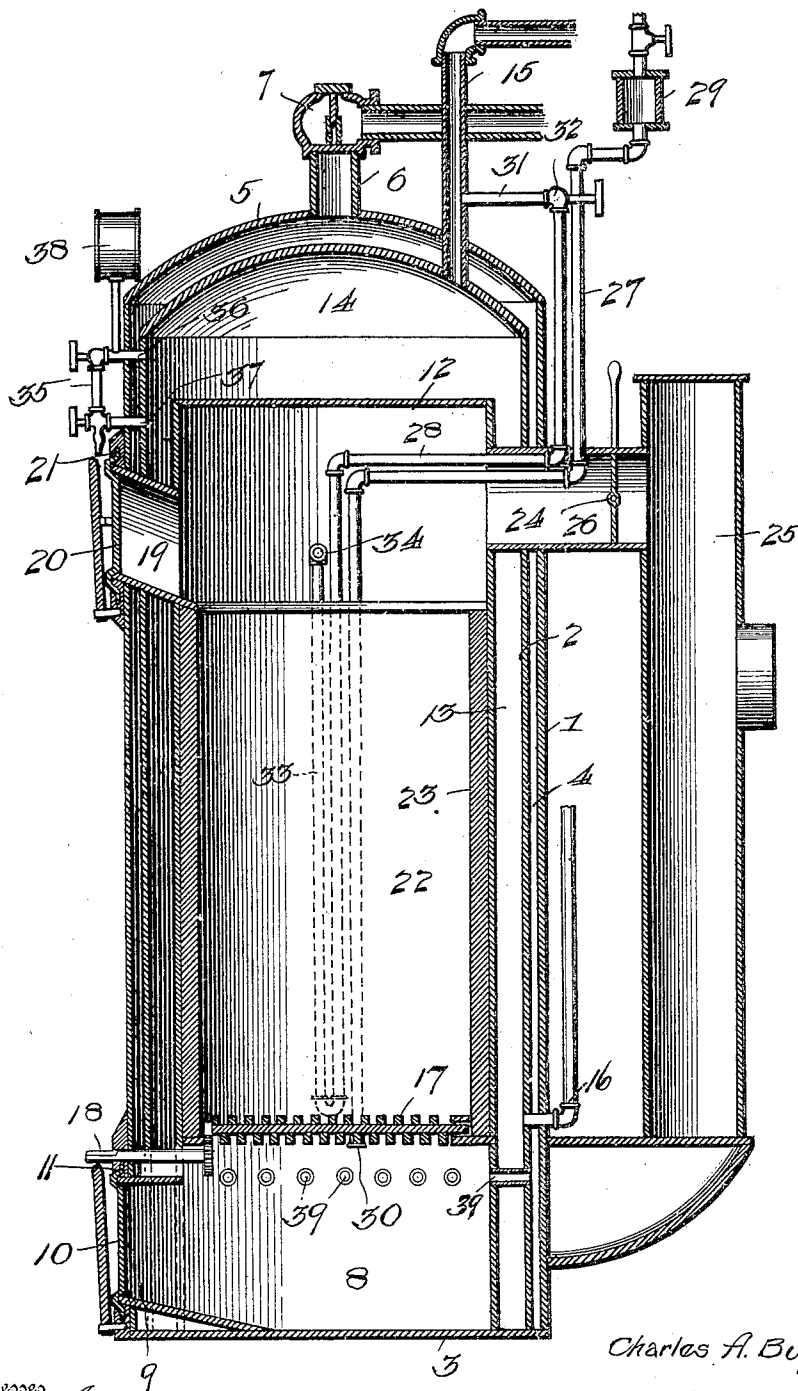


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PATENTED JUNE 26, 1906.

C. A. BUZZELL.  
GAS GENERATING FURNACE.

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# UNITED STATES PATENT OFFICE.

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## GAS-GENERATING FURNACE.

No. 824,337.

Specification of Letters Patent.

Patented June 26, 1906.

Application filed July 10, 1905. Serial No. 269,050.

*To all whom it may concern:*

Be it known that I, CHARLES ALBERTO BUZZELL, a citizen of the United States, residing at Newburyport, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Gas-Generating Furnaces, of which the following is a specification.

This invention relates to domestic gas plants, providing means for the economical manufacture of gas for illuminating and heating purposes.

To this end the invention primarily contemplates an improved gas-generating furnace of the steam-heating type, said furnace comprising means for not only generating steam for heating or other purposes, but also embodying a construction which provides for the generation of the so-called "water-gas." In this connection the invention provides a practical form of furnace having simple and easily-controlled means for effecting a combination between steam and the gases from hard coal and oil to produce a high-grade gas suitable for illuminating and heating purposes.

One of the special objects of the present invention is to provide a gas-generating furnace wherein the coal which is cooled by the steam coming in contact therewith is arranged at the top of the fire-pot, so that the same readily burns up again when the natural draft of the furnace is allowed to operate, and also the construction is of such a nature that the generated gas gives off a part of its heat to assist in the generation of the steam.

With these and other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts, which will be more fully described, illustrated, and claimed.

The essential features of the invention involved in carrying out the objects above indicated are necessarily susceptible to modification without departing from the scope of the invention; but a preferred embodiment thereof is shown in the accompanying drawing, in which the figure is a vertical longitudinal sectional view of a gas-generating furnace constructed in accordance with the present invention.

The furnace includes in its general organization spaced outer and inner casing-walls 1 and 2, arranged in upright position and is preferably of a cylindrical form. These cas-

ing-walls 1 and 2 are mounted upon a suitable furnace-base 3 and are disposed in approximately parallel relation the full height of the furnace-body to provide in the interval or space therebetween a gas-circulating jacket 4, which receives the generated gas and conducts the same to the gas-dome 5, located at the top of the furnace body or casing between the upper heads of the separate inner and outer casing-walls 1 and 2. This gas-dome 5 at the top of the furnace-body has connected therewith a suitable gas-outlet pipe 6, having therein a check-valve 7 of any approved type.

At the bottom the furnace-body is provided with a gas-tight ash-pit 8, provided with the usual door-opening 9, adapted to be covered and uncovered by an ash-pit door 10; but in carrying out the present invention the door 10 is so mounted as to have a gas-tight connection 11 with the edges of the opening 9, which it covers, so there can be no escape of gas through the ash-pit door when the same is closed. This is essential, for the reason that the ash-pit 8 acts in the capacity of a mixing-chamber for the steam, oil, and coal-gas, as will be presently explained.

Above the plane of the combined ash-pit and mixing-chamber 8 the furnace-body has mounted therein in an upright position an interior fire-chamber 12. This fire-chamber extends nearly the full height of the furnace-body and is closed upon all sides and at the top. Said chamber is preferably of a cylindrical form corresponding to that of the inner and outer casing walls 1 and 2 and is of less diameter than the inner casing-wall 2, so as to provide an intervening space 13, constituting a water-jacket, which accommodates the supply of water from which the steam is generated. The closed top of the interior fire-chamber 12 is spaced a material distance from the crown or top of the inner casing-wall 2 to provide between the latter and the top of the fire-chamber an upper steam-chamber 14, with which connects a steam-outlet pipe 15, through which the steam is led or conducted for heating or other purposes.

The water-jacket 13 is supplied with water through a water-inlet connection 16, piercing the outer and inner casing-walls 1 and 2 at the bottom of the water-jacket and connected with a pump, injector, or other equivalent apparatus usually employed for supplying water to steam-boiler furnaces and the like.

The upright interior fire-chamber 12 is in

open communication at the bottom with the combined ash-pit and mixing-chamber 8; but within the lower open end of the said fire-chamber is arranged a fuel-supporting grate 17 of any suitable construction, but preferably having an exterior shaker connection 18, whereby the ashes and clinkers may be readily worked out of the fire and into the pit 8, from which latter they may be readily removed through the door-opening 9. Contiguous to the upper closed end thereof the interior fire-chamber 12 is provided at one side with a fuel-receiving throat 19, extending through the outer and inner spaced casing-walls and adapted to be covered and uncovered by the fire-door 20. This fire-door, like the ash-pit door 10, has a gas-tight connection 21 with the edges of the opening which it covers, so that when the fire-door is closed no gas can escape through the fuel-receiving opening of the fire-chamber.

As indicated in the drawing, the fuel-receiving throat 19 is arranged quite a distance above the plane of the fuel-grate 17 at the lower open end of the fire-chamber. This entire space is occupied by a deep fire-pot 22, which accommodates the fuel. This fire-pot is preferably provided with a lining 23 to protect the metal wall of the fire-chamber 12, and the smoke and other products of combustion from the fire are carried off from the fire-chamber through an outlet-flue 24, connected with the chamber near the upper end thereof and at the side opposite the fuel-throat 19. The outlet-flue 24 pierces the two walls 1 and 2 of the casing and is connected with the exterior smoke-pipe 25, which is in communication with a chimney in the usual way.

The outlet-flue 24 for the interior fire-chamber is provided with a suitably-operated cut-off gate 26, which, in conjunction with the fire-door 20 and the ash-pit door 10, provides means for making the interior fire-chamber an absolutely closed one as far as the natural draft circulation is concerned for the purpose to be presently explained.

In connection with the gas-generating phase of the invention there are employed an oil-feed pipe 27 and a steam-feed pipe 28. The oil-feed pipe has a connection exterior to the furnace-body with an oil-supply reservoir 29 of suitable form, and to secure a maximum heating effect on the oil circulated through said pipe the latter is preferably passed into the furnace-body through the outlet-flue 24 of the fire-chamber 12, thence downward through the fire-pot, preferably behind the lining 23 thereof, and has its delivery end 30 opening into the ash-pit 8 directly beneath the grate-line, as clearly shown in the drawing.

The steam-feed pipe 28 has a connection 31 with the steam-outlet pipe 15 exterior to the furnace-body and is provided with a con-

trolling-valve 32. From this point of connection 31 with the steam-outlet pipe the steam-feed pipe 28 is passed into the fire-chamber through the outlet-flue 24 thereof, and within the fire-chamber said steam-feed pipe is provided with a superheating-loop 33, preferably protected behind the lining 23 of the fire-pot, and one leg of which loop is provided at its upper end with a discharge-port 34, opening into the fire-chamber directly above the plane of the fire-pot 22.

There is preferably associated with the steam-chamber 14 and the water-jacket 13, in communication therewith, a water-glass 35, having upper and lower nipple connections 36 and 37 with the steam-chamber and water-jacket, respectively, and the upper of said nipple connections 36 preferably has connected therewith a steam-gage 38 of suitable form.

A plurality of gas-escape ports 39 lead from the ash-pit 8 directly beneath the grate-line to the lower end portion of the gas-circulating jacket 4.

In the operation of the furnace for gas-generating purposes the fire within the fire-pot is allowed to become well started under the influence of natural draft through the ash-pit door 9 and the outlet-flue 24, and after thus being started the fire and ash-pit doors are closed and also the cut-off gate 26 in the outlet-flue 24. With the furnace thus adjusted the oil is permitted to feed through the pipe 27, and the same is vaporized under the influence of the heat upon the pendent portion of the oil-feed pipe within the fire-chamber. The gas from the oil is discharged from the delivery end 30 of the oil-pipe immediately beneath the grate-line, and during the same operation a supply of steam is admitted through the steam-feed pipe 28, and the same becoming superheated in the loop or coil 33 is discharged from the discharge-port 34 above the fire. The pressure of steam in the space at the top of the fire-chamber above the fire serves to drive the steam and gas from the products of combustion down through the entire depth of coal and into the ash-pit, where said steam and other gaseous products mix with the oil-gas within the ash-pit and pass out through the ports 39 into the gas-circulating jacket 4, from which the gas is carried off through the dome 5 and the pipe 6 to the point of use.

In further explanation as to the condition to which the fire is brought before sealing the fire-chamber it is to be noted that the fire is carried to a sufficiently high temperature above the steam-generating point to provide first for not only generating a considerable quantity of steam, but also for placing this steam under sufficient pressure to cause the steam to be forced through the fired bed of fuel. Also the temperature of the fire is brought to a sufficient degree to place the bed

of fuel in suitable condition for decomposing the steam injected at the point 34.

It will be observed that the construction described provides an arrangement whereby the coal which is cooled by contact with the steam is located at the top of the fire-pot, and hence burns up readily again when the natural draft of the furnace is restored, and it will also be observed that the generated gas assists materially in the generation of steam which may be utilized for heating or other purposes.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described furnace will be apparent without further description, and it will be understood that various changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a gas-generating furnace, a furnace-body having a steam-generating chamber, an interior fire-chamber provided with a bottom fuel-grate and having gas-escape ports below the grate, an oil-feed pipe extending through the fire-chamber and having a delivery-port beneath the grate, and a steam-feed pipe arranged to deliver steam under pressure into the fire-chamber above the fire-bed therein.

2. In a gas-generating furnace, the furnace-body having a steam-generating chamber, a fire-chamber, and a mixing-chamber below the fuel-grate of the fire-chamber, said mixing-chamber having gas-escape ports, means for discharging oil in gaseous form beneath the grate, and means for passing steam under pressure downward through the fired fuel

and through the grate into the mixing-chamber.

3. In a gas-generating furnace, a furnace-body having an enveloping gas-jacket provided with an outlet connection, an interior fire-chamber spaced from the jacket to provide an intervening water-jacket opening at the top into a steam-chamber, said furnace-body being further provided below the grate with a mixing-chamber having ports communicating with said jacket, an oil-pipe arranged to discharge oil-gas into the mixing-chamber, and a steam-pipe in communication with the steam-chamber and also with the fire-chamber above the fire-line in the latter.

4. In a gas-generating furnace, the furnace-body having inner and outer spaced casing-walls inclosing therebetween a gas-circulating jacket having an outlet connection at the top, an interior fire-chamber having gas-tight closures and spaced from the inner casing-wall to provide an intervening water-jacket communicating at the top of the steam-chamber and having a steam-outlet connection, said furnace-body being further provided below the grate-line with a combined ash-pit and mixing-chamber having gas-tight closures and also having gas-ports in communication with said gas-circulating jacket, an oil-feed pipe arranged to discharge oil-gas into said ash-pit and mixing-chamber, and a steam-feed pipe arranged to deliver steam in the fire-chamber above the fire.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES ALBERTO BUZZELL.

Witnesses:

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